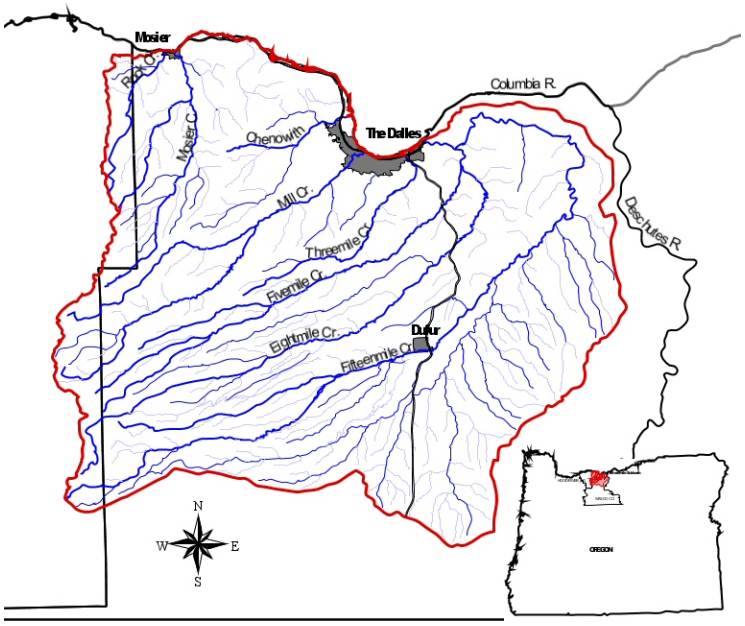
Fifteenmile Subbasin Plan



DRAFT

May 25, 2004

Prepared by

Wasco County Soil and Water Conservation District

and Fifteenmile Coordinating Group

for

The Northwest Power and Conservation Council

Fifteenmile Subbasin Plan

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Fifteenmile Subbasin Plan

DRAFT May 25 2004

Wasco County Soil and Water Conservation District,
in cooperation with Fifteenmile Coordinating Group

1. Executive Summary

The Fifteenmile Subbasin Plan has been developed as part of the Northwest Power and Conservation Council's Columbia River Basin Fish and Wildlife Program. Subbasin plans will be reviewed and eventually adopted into the Council's Fish and Wildlife Program to help direct Bonneville Power Administration (Bonneville) funding of projects that protect, mitigate and enhance fish and wildlife habitats adversely impacted by the development and operation of the Columbia River hydropower system. The National Oceanic and Atmospheric Administration (NOAA) Fisheries, and the U.S. Fish and Wildlife Service (USFWS) intend to use subbasin plans as building blocks in recovery planning to meet the some of their requirements of the 2000 Federal Columbia River Power System Biological Opinion (BiOp). Subbasin planning through the Council's program will also assist Bonneville with some of the requirements they have under the 2000 BiOp.

The Fifteenmile Coordinating Group intends the Fifteenmile Subbasin Plan to serve multiple purposes. The Group intends the plan to meet the Council's call for subbasin plans as part of its Columbia Basin wide program and to provide a resource for all entities involved with natural resource planning efforts. Equally important, this plan is a locally organized and implemented effort involving the major resource managers, local governments, and local citizens working together to develop the best possible approach to protecting, enhancing and restoring fish and wildlife in the Fifteenmile Subbasin. This plan is intended to provide resources necessary to develop activities forwarding the vision of the Fifteenmile Coordinating Group at both subbasin/programmatic scales and to provide the context and information for developing site specific projects.

The overall purpose of the planning effort goes beyond the requirements of the NWPPC subbasin planning process. The FCG seeks to develop a watershed restoration plan that identifies and prioritizes actions needed to:

- Protect and enhance streamflows to meet water quality standards, existing water rights, instream water rights, and fish and wildlife habitat objectives;
- Maintain the productive natural resource base in the Basin, consistent with existing land use plans, conservation plans, and the economic viability of the resource-based economy in the Basin;

- Promote sustainability and conservation consistent with the custom, culture and quality of life in the Basin.

The Fifteenmile Subbasin Plan is comprised of 3 main volumes that are interdependent, but each provides a unique way to understand the characteristics, management, and goals for the future of the Fifteenmile subbasin. The 3 volumes generally conform to the guidance set forth in the Council's *Technical Guide for Subbasin Planners* (2001).

2. Introduction

2.1. Description of Planning Entity

The Wasco County Soil & Water Conservation District (SWCD) is a local government, a subdivision of the State of Oregon, organized under O.R.S.568. The district responsibilities include identifying and prioritizing natural resource conservation needs within the district, obtaining technical, financial, and educational resources, and focusing and coordinating those resources to meet local conservation needs.

Wasco County SWCD provided project and fiscal management, along with contract administration for the development of the Fifteenmile Subbasin Plan.

2.2. List of Participants

The Fifteenmile Coordinating Group (FCG) was formed to collaborate on the Fifteenmile Subbasin Plan. The FCG contracted with the Council on May 2003 for this purpose. Participating organizations in the Fifteenmile Coordinating Group include but are not limited to:

- Confederated Tribes of the Warm Springs Indian Reservation
- Natural Resources Conservation Service
- National Oceanographic and Atmospheric Administration (NOAA) Fisheries
- Oregon Department of Agriculture
- Oregon Department of Fish and Wildlife
- Oregon Department of Environmental Quality
- US Forest Service
- US Fish and Wildlife Service
- Wasco County Soil and Water Conservation District
- Wy'East Resource Conservation and Development Board

The FCG is chaired by Wasco County Soil and Water Conservation District. Extensive public input has been provided by the Fifteenmile Watershed Council, The Dalles Area Watershed Council and the Mosier Watershed Council.

2.3. Stakeholder Involvement Process

- Website
- Flyer
- Newspaper Ad

- Mailing/Request for review
- Watershed Council meetings

An extensive stakeholder listing was developed to aid in the outreach and public participation effort. Wy'East RC&D developed a flyer on the Fifteenmile Subbasin planning efforts that was distributed to that stakeholder listing. They also developed a website that encouraged public participation and comment. The website was established for use during the entire planning process and was publicized during the startup period.

The FCG has utilized The Dalles, Fifteenmile and Mosier Watershed Council meetings as a means to reach a segment of the public. Those attendees have provided valuable input to the final document.

2.4. Overall Approach to the Planning Activity

The Fifteenmile Subbasin planning effort was initiated with the development of watershed assessments and discussion meetings among key participants.

The Fifteenmile Coordinating Group's first move was to solicit participation from other qualified entities in the subbasin. Wy'East RC&D served as Outreach Coordinator and met with public officials and local boards throughout the Basin to make them aware of the planning process and to solicit their issues and concerns. The website was developed. The Project Manager submitted monthly written progress and financial reports to the Oregon Coordinating Group and BPA.

The FCG prepared the subbasin plan using the NWPPC Technical Guide for Subbasin Planners and Oregon Specific Guidance. The basic approach was to prepare the document in three sections plus an overview. The overview was written first, followed by the assessment, inventory and then the management plan. Each step was distributed to the FCG, watershed councils and other stakeholders for input and comment. The assessment and management plan were portioned out to participating biologists with appropriate technical expertise. Final comments were submitted by May 20, 2004, with a final Plan submitted to the NWPPC Council by May 28, 2004.

2.5. Process and Schedule for Revising/Updating the Plan

The plan is scheduled to be released in September-October 2004 for public comment. There is a short period for revisions before the plan is adopted in November-December 2004 by the NWPPC. The subbasin plan is meant to be a living document that will be revised periodically, approximately every three to five years. We intend to revise and update the Fifteenmile Creek subbasin plan to coordinate with the three-year rolling provincial reviews or the Council's program amendment process.

3. Fifteenmile Subbasin Assessment

DRAFT

May 25 2004

Compiled by Wasco County Soil and Water Conservation District
in cooperation with
Fifteenmile Coordinating Group

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Assessment Overview

The Fifteenmile Subbasin Assessment focuses on four aquatic focal species and seven wildlife species. The majority of the assessment focuses on the aquatic focal species, and particularly on Mid-Columbia winter steelhead, which is listed as threatened on the Federal Endangered Species List.

The discussion of fish is broken geographically into three regions: Fifteenmile Watershed, The Dalles and Mosier. Fifteenmile Watershed includes Fifteenmile Creek

and its tributaries, Eightmile Creek, Fivemile Creek, Ramsey Creek, Dry Creek and Cedar Creek. The Dalles area includes Threemile, Mill Creek and Chenowith Creek, each of which are tributaries of the Columbia River flowing through the City of The Dalles. Mosier includes Mosier Creek and Rock Creek, tributaries of the Columbia flowing through the city of Mosier.

Most fish population and habitat data is available for Fifteenmile Watershed. Therefore, Ecosystem Diagnosis and Treatment (EDT) was run for winter steelhead in Fifteenmile Watershed. Much of the assessment is based on the results of this model. EDT was used to characterize the life history diversity, productivity, capacity and abundance of winter steelhead in Fifteenmile Subbasin. EDT results were compared to on-the-ground data to verify accuracy and calibrate conclusions.

Because of the major data gaps in The Dalles and Mosier areas, Qualitative Habitat Assessment was used to prioritize reaches for restoration and protection in these areas.

Both the EDT and QHA analyses were limited by gaps in our knowledge of the focal species and their habitat. These gaps are identified at each stage of the analysis of results. Major data gaps are summarized.

Wildlife is discussed in section 3.5. Seven focal species were chosen based on an analysis of habitat changes since settlement of the area by American pioneers. This analysis is not as in-depth and quantitative as the aquatic assessment, because of lack of population data for the chosen focal species.

3.1. Subbasin Overview

3.1.1. General Description

The Fifteenmile Subbasin, located in north central Oregon, drains approximately 368,300 acres (575 square miles) of Wasco and Hood River Counties. The Subbasin actually consists of several distinct watersheds, all of which originate on the east slopes of the Hood River Range, a north-south mountain range running from about nine miles east of Mount Hood north to the Columbia River. These watersheds are the Fifteenmile, Threemile, Mill Creek, Chenowith, Mosier Creek and Rock Creek Watersheds.

Fifteenmile Creek originates within the Mount Hood National Forest near Lookout Mountain (highest point in Watershed, 6,525 feet). Eightmile Creek originates north of Fifteenmile, and Fivemile Creek originates immediately north of Eightmile. All three flow toward the northeast. Fifteenmile then curves north, then west, before merging with Eightmile and turning northwest for the final two miles to the Columbia River. The elevation at the mouth of Fifteenmile is 78 feet. Fivemile Creek flows into Eightmile one mile up from the mouth of Eightmile Creek. Dry Creek originates on the north side of Tygh Ridge, and flows northward, before turning northeastward and paralleling Fifteenmile for approximately three miles, collecting most of the runoff from Tygh Ridge (maximum elevation 3,200 feet) before joining Fifteenmile at the historic site of Rice. Mill Creek originates north of Fivemile Creek at an elevation of 4,900 feet. Mosier

Creek originates north by northwest of Mill Creek at an elevation of 3,400 feet and Rock Creek originates at an elevation of 3,000 feet. Threemile Creek and Chenowith Creek both originate at approximately 2,600 feet in elevation.

The geology of Fifteenmile Subbasin is dominated by north-tilting basalt lava flows that are collectively more than 3,000 feet thick. Tygh Ridge, an anticline or convex fold in the geologic layers, forms the south boundary of the subbasin. From there, the landscape slopes gradually to the north. Fifteenmile Creek and its major tributaries cut through the geologic layers, forming a landscape of rolling ridges and valleys.

Through the Columbia Gorge, geology is characterized by a number of north-south oriented folds visible in the northern part of the subbasin from The Dalles westward. The areas around Mosier Valley and The Dalles represent synclines (downward folds), whereas Sevenmile Hill and Hood River Mountain (west of Mosier) represent anticlines (upward folds). The Rock Creek Watershed is an active fault line splitting the Hood River Mountain Anticline.

The climate in the Fifteenmile Subbasin is influenced both by marine air that flows through the Columbia Gorge from the west and by continental weather patterns that spread from the Great Basin to the East. Both summer and winter air temperatures can be somewhat extreme in the eastern portion of the subbasin.

The majority of the precipitation is generally brought by winter storms blowing east from the Pacific Ocean. The Hood River Range, including Lookout Mountain, Surveyor's Ridge and Fir Mountain, which forms the western boundary of the subbasin, features the highest elevations and therefore receives the highest precipitation and the highest percentage of precipitation as snow. Persistent winter snowpack is found only at elevations above approximately 2,800 feet. The Cascade Mountains produce a rain-shadow effect, drastically reducing the total precipitation in the eastern end of the Fifteenmile Subbasin. Average annual precipitation varies from 65-80 inches in the higher elevation headwaters to 10 inches on the eastern border of the subbasin.

Only 5-10% of the precipitation falls from June through August. Because of both the seasonality of moisture and the low total precipitation, tributaries originating at lower elevations are usually not perennial.

The higher elevations of the subbasin are located in 3 separate ecoregions[1]:

Cascade Crest Montane Forest: a mixture of Western Larch *(Larix occidentalis)*, Mountain Hemlock *(tsuga mertensiana)*, Western Red Cedar *(thuja plicata)*, Pacific Silver Fir (*Abies amabilis*) and Englemann Spruce (*Picea engelmannii*).

Grand Fir Mixed Forest: a mixture of Grand Fir (*Abies grandis*), White Fir (*Abies concolor*) and some ponderosa pine.

[1] OR Natural Heritage Foundation, http://www.gis.state.or.us/data/alphalist.html April 2004.

Oak/Conifer Eastern Cascades Foothills: Douglas fir dominates in the coolest and wettest sites, while ponderosa pine is more common at lower elevations, and Oregon White oak dominates in the driest and warmest sites. This ecoregion is also commonly found at lower elevations along the Columbia River between The Dalles and Mosier.

The eastern part of the watershed is located in the Columbia Plateau and Pleistocene Lake Bottom ecoregions, characterized by bunchgrass prairie with mixed hardwood trees in the riparian zones. Further information on each of these ecoregions can be found in the appendices.

Of the 368,300 acres in the subbasin, about 37% is cropland, 21% is rangeland; and 38% is forestland. Urban areas constitute about 1.5% (5,500 acres) and another 2.5% (9,700 acres) is zoned for rural residential development. Of the cropland, less than 15,000 acres (4% of the subbasin) is irrigated. The irrigated cropland consists mostly of orchards, vineyards, pasture and hay, with some irrigated wheat and other crops.[2] "The non-irrigated cropland is almost exclusively in wheat or other grain production."[3]

The population of Wasco County was estimated at 23,750 in July of 2002.[4] The average population density in Wasco County is 12 people per square mile.

The economy of the Fifteenmile Subbasin is based on agriculture, recreation, and grazing, with a smaller component of forest production. Until 2001, the aluminum plant in The Dalles was a significant employer. The aluminum plant has since shut down most operations. Mid-Columbia Medical Center is currently the largest single employer with its latest addition of the Celilo Cancer Treatment Center.

The entire Fifteenmile subbasin is located within the boundary of lands ceded to the United States government by the seven bands of Wasco- and Sahaptin-speaking Indians whose representatives and head men were signatories to the Treaty with the Tribes of Middle Oregon of June 25, 1855. The Confederated Tribes of the Warm Springs Reservation of Oregon are the legal successors to the Indian signatories to the treaty.

The majority of the acreage (81%) in Fifteenmile subbasin is privately owned. This includes 20,000 acres owned by private timber companies and the Nature Conservancy.

The U.S. Forest Service manages the mid to high elevation forests in approximately 15% (35,000 acres) of the Fifteenmile Creek subbasin. The primary land uses on the National Forest are timber management and recreation.

The Bureau of Land Management (BLM) owns 2,770 acres (approx. 1%) of mostly forested land in the middle elevations of the subbasin.

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[2] Clark, Jennifer, SWCD. Personal Communication. 2003.

[3] Eddy, Dusty, NRCS. Fifteenmile Creek Subbasin Summary. 15 Nov. 2000.

[4] OR Economic & Community Development Department: The Dalles Community Profile. August 2003

Major human disturbances include:

- Changes to land cover that affect wildlife habitat, hydrologic regimes, and erosion rates;
- Alteration of instream and riparian conditions through channelization of streams, road-building, removal of large woody debris, and historic logging patterns;
- Pesticide and fertilizer use;
- Groundwater overdraft.

The disturbances noted above are not distributed evenly throughout the subbasin. Some stream systems are more affected by certain factors than others.

3.1.2. Subbasin Existing Water Resources

Irrigation is the largest water use in the watershed. Low stream flows during the growing season limit the amount of irrigation. Summer flows on most streams have been fully appropriated since the early 1900's.

The hydrologic regime of the Fifteenmile Subbasin is influenced by many factors, with no single factor adequately explaining the streamflow patterns. Factors include precipitation and snow levels, soil characteristics, land management, and interbasin water transfers.

Precipitation varies across the watershed from high elevations to low, and from west to east. Average annual precipitation varies between 50 and 80 inches per year[5] on Lookout Mountain, to as low as 10 inches in the eastern part of the subbasin.

The majority of the precipitation in the Fifteenmile Subbasin falls during the winter. Winter snowpack is mostly confined to elevations above approximately 4,000 feet. Streams with headwaters in this region tend to exhibit an extended period of high flow lasting from April to June due to spring snowmelt.

Oregon Department of Environmental Quality lists all mainstem streams in the Fifteenmile Watershed as water quality limited due to high summer water temperatures.[6] In addition, the Fifteenmile and Eightmile creeks are listed as water quality limited due to sedimentation, which affects spawning success of salmonid fish. Organophosphate pesticides were detected in the mainstem of Mill Creek in 2002 and 2003 and in Threemile Creek in 2003. DEQ plans to list Mill Creek for this form of pollution in 2004.

[5] Climate. Maps. USDA, Oregon State Climatological Service, Hood River Department of Forestry.

[6] 303(d) List of Water Quality Limited Waterbodies. Department of Environmental Quality. 2002.

Hydrology is heavily influenced by the permeability of soils and underlying geologic strata. Sixty-three percent of all soils in the subbasin are "B" soils, typically deep, sandy loam or silt loam soils with low clay contents[7].

Small wetlands are found throughout the subbasin in the form of artificial or natural ponds. Many of these wetlands are vernal in nature. The higher forest ecosystems include more year-round palustrine wetlands, though most are still small. Larger wetlands are found at the mouths of Threemile, Chenowith and Mosier creeks. The mouth of Mill Creek was formerly an extensive delta, until it was put into an 800-foot culvert with construction of Interstate 84.

3.1.3. Hydrologic and Ecologic Trends in the Subbasin

Climate varies across the Subbasin from west to east and from high elevations to low. The natural hydrology and ecology of the subbasin are affected by this variation, as is the sensitivity of the subbasin to human disturbance.

The forested ecosystems of the western part of the subbasin have had less human disturbance. These areas have naturally low runoff rates, which are not greatly increased by forest management activities. Very little conversion has taken place from forestry to other land uses. Road densities in commercial timber management areas are comparable to urban areas. Paved roads are uncommon, but placement of roads alongside streams is a widespread issue and a source of sedimentation and pollution.

By contrast, the eastern end of the watershed, which receives much less precipitation, is a shrub-steppe ecosystem of which over half has been converted to tilled agriculture. The hydrologic regime in Fifteenmile and Eightmile creeks is highly sensitive to these land use changes.

Because of the permeability of the soils and porous nature of the geologically young Cascade Mountains, most of the subbasin has active groundwater aquifers, featuring relatively quick recharge rates.

Conversion of shrub-steppe habitat to tilled agriculture increased runoff rates and peak flows in Fifteenmile Creek and its tributaries. According to USDA models, peak flows increased by as much as 600% between 1850 and 1950.[8] Since that time, peak flows have partially recovered with the adoption of minimum-till techniques, and most recently with no-till farming techniques. From 1998 to 2003 nearly half the agricultural acreage in the Fifteenmile Watershed has been converted to direct-seed/no-till systems, dramatically reducing runoff and erosion while increasing water infiltration.[9]

[7] Soil Survey: Northern Wasco County Oregon. March 1982.

[8] Fifteenmile Watershed Assessment. Wasco County Soil & Water Conservation District and Fifteenmile Watershed Council. 2002.

[9] Fifteenmile Watershed Assessment. Wasco County Soil & Water Conservation District and Fifteenmile Watershed Council. 2002.

Forest management activities in the Mount Hood National Forest are modeled to have increased runoff events in the forest from 1 to 6%.[10]

3.1.4. Regional Context

Fifteenmile Subbasin is home to the easternmost run of wild winter steelhead (*Onchorhynchus mykiss*) in the Columbia Basin. This run is considered part of the Mid-Columbia Evolutionarily Significant Unit, which was listed as threatened under the Endangered Species Act by NOAA Fisheries in March 1999. The run is particularly significant because no hatchery steelhead have ever been stocked in Fifteenmile Subbasin. Therefore, the run represents a relatively intact wild genetic stock, and should be considered highly significant for recovery of Mid-Columbia winter steelhead. NOAA fisheries identifies Fifteenmile winter steelhead to be an independent population.[11] In addition to steelhead, aquatic focal species are Pacific lamprey (*Lampetra tridentata*), coastal cutthroat trout (*O. clarkii*), and resident red-band trout (*O. mykiss*). The Fifteenmile Subbasin does not support bull trout, and is not believed to have done so historically.

The Fifteenmile Subbasin represents the eastern end of the Columbia Gorge Province, an area of extreme climatic and habitat diversity and home to eight hundred species of flowering plants, including fifteen endemic plant species.[12]

3.2. Aquatic Focal Species Characterization and Status

3.2.1. Fish of Ecological Importance

At least 18 species of fish inhabit the Fifteenmile Subbasin, including 4 anadromous species, and 5 salmonid species, 3 of which are anadromous. Table 3.1 lists fish species observed or known to have been introduced in the past.

Table 3.1. Fish Species in Fifteenmile Subbasin:

Common Name	Scientific Name	Where found
Winter Steelhead	*Oncorhynchus mykiss*	Most habitat found in Fifteenmile and Mill Creek watersheds. Believed to be found in Threemile, Chenowith, Mosier and Rock creeks, downstream of passage barriers.
Rainbow-type Trout	*Oncorhynchus mykiss*	Fifteenmile, Threemile, Mill, Chenowith, Rock Creek.
Coho salmon	*Onchorhynchus kisutch*	Mill Creek, Mouths of Fifteenmile, Threemile, Chenowith, Mosier and Rock
Chinook	*Onchorhynchus*	Fifteenmile and tributaries

[10] Miles creeks Watershed Analysis. US Forest Service. 1994. See also Fifteenmile Watershed Assessment.

[11] ICB-TRT July 2003.

[12] Jolley, Russ. Wildflowers of the Columbia Gorge. 1988.

salmon	*tshawytshaw*	
Cutthroat Trout	*Oncorhynchus clarkii*	Mill Creek, Mosier Creek, Rock Creek, Fivemile and Lower Fifteenmile Creek.
Pacific Lamprey	*Lampetra tridentata*	Fifteenmile and tributaries; Distribution not well defined, Possibly in Mill Creek
Western Brook Lamprey	*Lampetra richardsonii*	Fifteenmile and tributaries; Distribution not well defined, possibly in Mill Creek
Sculpin	*Cottus spp.*	Fifteenmile and tributaries, Mill, Threemile, Chenowith, Mosier
Mountain sucker	*Catostomus platyrhynchus*	Lower Fifteenmile and tributaries, Mill, Threemile, Chenowith
Bridgelip sucker	*Catastomid columbianus*	Lower Fifteenmile and tributaries, Mill, Threemile, Chenowith
Largescale suckers	*Catostomus macrocheilus*	Spawning run from Columbia in mouths of all streams
Speckled dace	*Rhinichthys osculus*	Fifteenmile and tributaries, Mill, Threemile, Chenowith
Northern Pikeminnow	*Ptychocheilus oregonensis*	Mouths of Fifteenmile, Mill, Threemile, Chenowith
Redside shiner	*Richardsonius balteatus*	Mouths of Fifteenmile, Mill, Threemile, Chenowith
Chiselmouth	*Acrocheilus alutaceus*	Mouths of Fifteenmile, Mill, Threemile, Chenowith
Three-Spined Stickleback	*Gasterosteus aculeatus microcephalus*	Mouths of most creeks on Columbia, noted in Chenowith and Threemile
Non-native Rainbow trout	*Oncorhynchus mykiss*	Fifteenmile, Mosier (introduced in past, probably no longer present)
Non-native Brook trout	*Salvelinus fontinalis*	Certain tributaries of upper Mosier Creek (probably an illegal introduction)

Rainbow trout were stocked by ODFW in Fifteenmile Creek at the Taylorville bridge until 1974 and the downtown Dufur bridge until 1991. Hanel Lake has been stocked annually with approximately 500 catchable trout since 1994. These are coastal rainbow trout from a private hatchery/trout farm near Sandy, OR. Wolf Run Ditch is screened, preventing migration of stocked fish out of the reservoir. ODFW stocked rainbow trout in Mosier Creek from 1952-1963 and 1968-1971. Hatchery rainbow trout can interbreed with rainbow-type and steelhead, but gene pool dilution is believed to have been minimal.[13] The particular stock of rainbows used for these introductions were believed to not survive the summer due to susceptibility to a naturally occurring disease

[13] Appendix F. USFS. 1994

(Ceratomyosis), to which native rainbow-type are resistant.[14] Brook trout have been found in Ketchum Reservoir and in one tributary in upper Mosier Creek. As there is no record of legal stocking of brook trout, these appear to be an illegal introduction.

3.2.2. Focal Species Selection

Aquatic Focal Species

Fisheries management in Fifteenmile Subbasin focuses on cold-water anadromous fish, downstream from natural passage barriers, and on cold-water resident salmonids throughout the watersheds. The cumulative range of the chosen focal species covers all perennial streams, and many seasonal reaches.

All focal species are native to the subbasin. Chinook and coho were rejected as focal species, both for their limited range, and because the fish that have been observed are not believed to be native. Table 3.2 lists the focal species and the reasoning behind their selection.

Table 3.2. Aquatic Focal Species in the Fifteenmile Subbasin and Reasoning for Choice

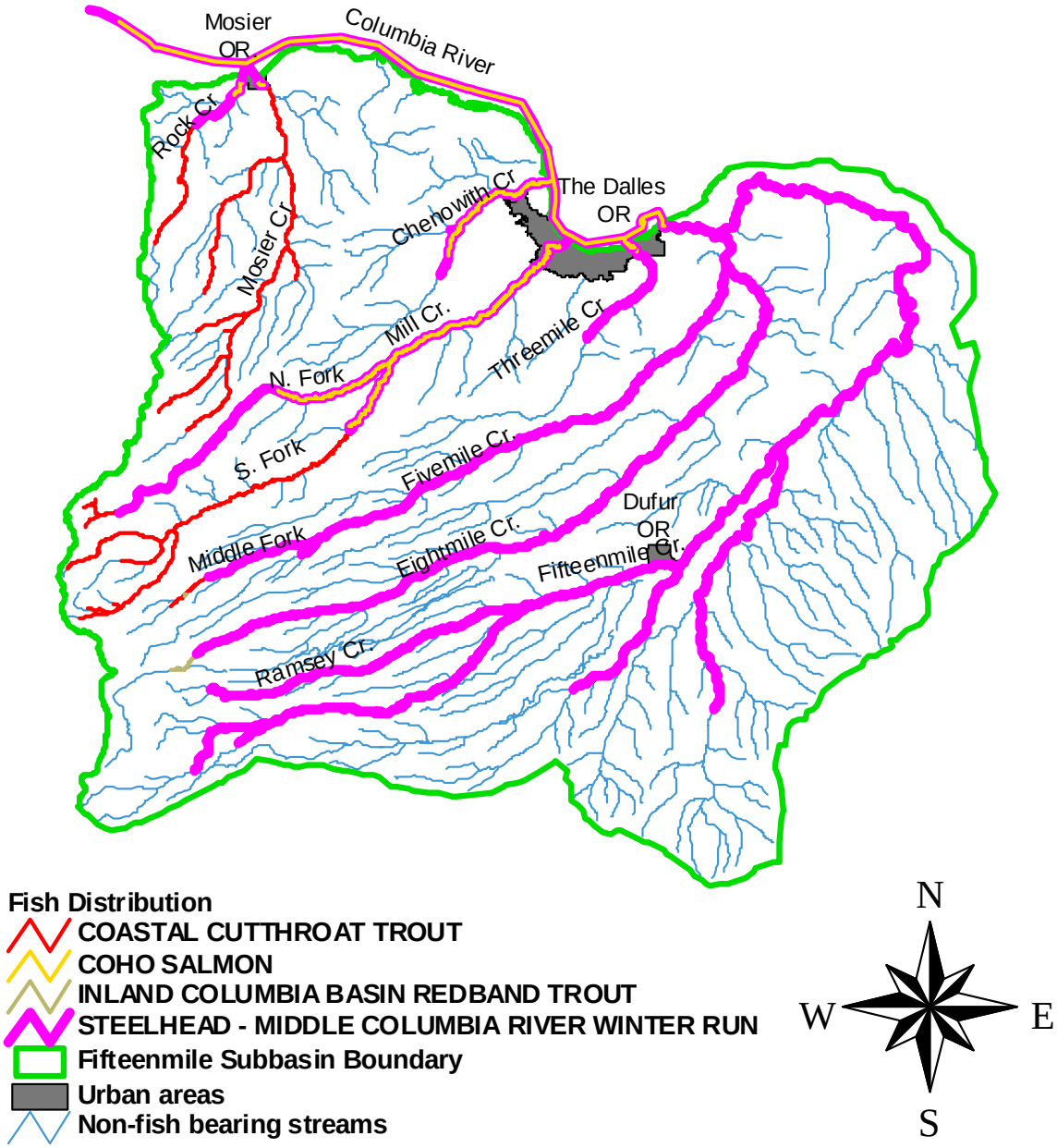
Species	Reason for Choice
Winter Steelhead	Federally listed as threatened, unique run of anadromous fish, culturally important to tribes
Rainbow-type/Rainbow Trout	Same species as steelhead, greater range within tributaries, slightly different habitat needs
Pacific Lamprey	Anadromous fish with similar habitat and range as steelhead, culturally important to tribes
Cutthroat Trout	Resident cold-water fish that tend to occupy habitat not accessible to anadromous species

Figure 3.1 shows the distribution of salmonid fish throughout Fifteenmile Subbasin, as noted on the StreamNet website.[15] The map fails to show Chinook salmon, which are consistently sited in Mill Creek, and have been noted in recent years in Fifteenmile Creek.

[14] French, Rod. Personal Communication. 2002

[15] http://www.streamnet.org/online-data/GISData.html

Figure 3.1. Distribution of Salmonid Fish in Fifteenmile Subbasin (Source: Streamnet website)*



* Chinook salmon are found in Mill Creek at least to the forks, and have been found in Fifteenmile above Ramsey Creek.

[16] French, Rod. ODFW. Personal Communication. 2002.
[17] ODFW 2003
[18] ODFW 2003
[19] Oregon Department of Fish and Wildlife, 1999b
[20] Steve Pribyl. Oregon Department of Fish and Wildlife. Personal Communication. 2003.

Coho salmon have been documented spawning in the lower part of Fifteenmile Creek below and just above Seufert Falls. They are thought to spawn only in the lower few miles of Fifteenmile Creek.[21] It is believed that coho spawning in this area are likely stray hatchery fish from other subbasins. Coho would have difficulty completing their juvenile freshwater rearing in this portion of the stream.

From 1998 to 2000, ODFW maintained a screw trap near the mouth of Fifteenmile Creek to monitor out-migrating smolts (salmonids that are physiologically changing in preparation for migration to the ocean). The screw trap was operated again in 2003 jointly by US Forest Service and ODFW. A screw trap is a downstream migrant juvenile fish trap. Captured fish are held in the trap until sampled. Coho juvenile migrants were captured in 1998 and 2003. In each year, two juveniles were captured. In 1999 and 2000, no coho were captured at the screw trap.[22]

Chinook salmon appear to spawn and possibly rear in Mill Creek at least to the forks. These salmon are believed to be hatchery strays from the Klickitat fall Chinook stock.

Chinook salmon have been sighted in recent years in Fifteenmile Creek. Juvenile migrants captured at the screw trap have varied from a high of 90 in 1999 to a low of 2 in 2003[23]. The population was estimated in 1999 at 928 (+/-609) juvenile downstream migrants.[24] In 1997, one carcass and one live adult Chinook were seen in Fifteenmile Creek above the Dufur City Water Intake and one live adult was seen in Eightmile.[25] Prior to 1997, Chinook had not been documented in Fifteenmile Watershed. The origin of these fish is uncertain, but they are believed to be hatchery strays. Fifteenmile Creek generally lacks large pools and cool water temperatures that adult *spring* Chinook require for summer holding before spawning in the fall. On the other hand, Fifteenmile Creek generally lacks adequate streamflow in the late summer or fall that would be required by migrating adult *fall* Chinook.

Prior to settlement, warm water fish, such as stickleback and Northern Pike Minnow, were probably restricted to the mouths of the creeks on the Columbia. Their range may be expanding with warmer water temperatures. They are not a focus of local management, and were rejected as a focal species. Likewise, suckers and dace are restricted to the lower watershed.

Sculpin are commonly found in the upper parts of the watershed. They are not a focus of local management, but are likely ecologically important.

Fisheries management in the Fifteenmile Subbasin is based on the species listed as focal species in Table 3.2. All four species are cold-water species, and occupy the higher levels in the aquatic food chain.

[21] French, Rod. ODFW. Personal Communication. 2002.
[22] ODFW 2003
[23] ODFW 2003
[24] Oregon Department of Fish and Wildlife, 1999b
[25] Steve Pribyl. Oregon Department of Fish and Wildlife. Personal Communication. 2003.

Steelhead and rainbow-type trout are the same species and are generally found in the same habitats. Steelhead are listed as threatened on the Federal Endangered Species list. Rainbow-types are on the Forest Service and Oregon State sensitive species lists. Steelhead are a culturally important species to the Confederated Tribes of the Warm Springs Indian Reservation.

The Confederated Tribes of Warm Springs retained the right to hunt, fish, and gather within the lands ceded to the United States government. Species of significance to the Warm Springs Indians for subsistence and for cultural and spiritual purposes include elk, deer, steelhead, cutthroat trout, and lamprey.

A significant population of Native Americans are known to have historically utilized resources within the Fifteenmile Subbasin with a suspected harvest on elk, deer, steelhead, and lamprey. Cutthroat trout may be included as a resident fish providing basic sustenance during the off season when steelhead and lamprey were not present.

Pacific lamprey are another anadromous species that are believed to have largely the same habitat requirements as steelhead. They are also a culturally important species to the Confederated Tribes. Little is known about this species' range or population within the subbasin. They are generally believed to have a range similar to steelhead.

Coastal cutthroat trout are generally found in the Fifteenmile Subbasin in areas that are isolated from anadromous fish and rainbow-type trout. South Fork Mill Creek, Mosier Creek and Rock creeks all have resident populations of coastal cutthroat above natural migration barriers. Fivemile Creek also has a population of cutthroat, even though it does not have a complete migration barrier. In some parts of Fivemile Creek, rainbow-type and cutthroat are found to overlap. More information is included below.

3.2.3. Aquatic Focal Species Population Delineation and Characterization

Steelhead were listed as threatened throughout the Mid-Columbia River Evolutionarily Significant Unit, under the Endangered Species Act in the spring of 1999.[26] Steelhead were chosen as a focal species because they are Federally listed as threatened, and are the species of primary concern in management decisions by State, Federal and Tribal natural resource agencies. Pacific Lamprey were also chosen as a focal species, because of their cultural significance to the Confederated Tribes, and because their habitat needs are similar to those of steelhead. For those reaches where steelhead are not present, rainbow-type and cutthroat were used as focal species.

[26] Endangered Species Act Status of West Coast Salmon & Steelhead. http://www.nwr.noaa.gov/1salmon/salmesa/pubs/1pgr.pdf March 2004.

Steelhead and Rainbow-type Trout

Population Description

Winter steelhead (Table 3.3) have been found in Fifteenmile Creek, Ramsey Creek, Eightmile, Fivemile, Dry Creek, Mill Creek and its forks, Mosier Creek, and Rock Creek, as well as near the mouths of Threemile and Chenowith creeks and many intermittent streams.

Table 3.3. Rationale for Selection of Steelhead and Rainbow-type Trout as Focal Species.

Species Designation	Special Ecological Importance	Tribal Recognition
Fifteenmile winter steelhead are included in the Mid-Columbia ESU, that portion of the Columbia River Basin extending from White Salmon River and Fifteenmile Creek in the west, and up to and including the Yakima River in Washington. Steelhead within this ESU were federally listed as threatened in March 1999. The resident rainbow-type trout was proposed for ESA listing throughout its range, but a listing was determined not warranted at that time.	Steelhead and rainbow-type trout serve as an important food source for a variety of wildlife and contribute nutrients that have wide-reaching benefits to the biota of the subbasin. Spawning of steelhead and rainbow-type is partially separated both temporally and geographically. Resident trout tend to use smaller gravels and spawn later in the year, thus maintaining two separate populations, though offspring of either steelhead or resident may adopt either life history pattern.	Native Americans throughout the Pacific Northwest, including the Confederated Tribes of the Warm Springs, maintain strong cultural values for steelhead. These fish have long had important tribal subsistence, ceremonial and commercial value.

It is not known if steelhead in the other watersheds are genetically identical to those in Fifteenmile. Resident rainbow-type trout are the same species as steelhead and probably interbreed with them. There is some uncertainty as to whether all rainbow-type trout in the subbasin are of this subspecies. Local fish biologists suggest that there may be some intergradation between coastal "rainbow" trout and interior "rainbow-type" trout (Fifteenmile Coordinating Group meeting, 4/16/04). Genetic analysis of trout taken from Fifteenmile Creek suggests that they are more closely related to rainbow-types than to coastal rainbows.[27] The Miles Creeks Watershed Analysis refers to these resident trout as Eastern Cascades "redbands."[28]

The Interior Columbia Basin Technical Recovery Team suggests that the resident trout may represent a separate population with little or no interbreeding with steelhead:

[27] Gregg, R. and F. W. Allendorf. 1995. Spruell, P., et. al. 1998.
[28] Miles creeks Watershed Analysis Appendix F. US Forest Service. 1994..

> "Within the population, genetic samples from Eightmile Creek (Currens 1997) Interior Columbia River Salmon Populations July 2003 91 were highly divergent from samples from Fifteenmile Creek, the Deschutes River, and the Lower Columbia ESU (see Appendix A). These Eightmile Creek samples appear to represent a resident redband rainbow population with little or no interbreeding with anadromous fish…"[29]

For the purposes of this assessment, resident *O. mykiss* trout will be called "rainbow-type trout."

Relatively little life history information has been collected on winter steelhead and rainbow-type trout in the Fifteenmile Subbasin. What information has been collected is almost entirely from Fifteenmile Watershed. Steelhead in Mill Creek and other Columbia tributaries are presumed to have similar life histories to Fifteenmile Watershed.

Winter steelhead enter Fifteenmile Creek during February and March. Spawning is generally completed by the end of May when stream flows are sufficient to provide good fish passage. Fry emergence has been estimated to occur in Fifteenmile streams from May into July. Juvenile steelhead spend 1 to 4 years rearing in Fifteenmile Creek before smolting and migrating downstream in the spring.

Rainbow-type trout spawn during April and May. Emergence of fry is usually from May into July. Rainbow-type trout adults are usually smaller than adult steelhead and utilize a finer size of gravel.

In 2002, the US Forest Service conducted redd surveys on the Forest in North Fork Mill Creek. Five redds and nine adult steelhead were found on the National Forest. Steelhead passage appeared to be limited by a culvert three miles upstream of the Forest Service boundary. The Forest Service plans to replace this culvert by 2005 to open up at least one more mile of spawning habitat.[31]

Local observation confirms steelhead spawning in South Fork Mill Creek below Mill Creek Falls and in the mainstem of Mill Creek[32], as well as North Fork Mill Creek to mile 9, and the mouth of Chenowith Creek.[33] Local residents report steelhead migration into the lower portions of Mosier Creek and Rock Creek, but as of January 2003, these reports are unconfirmed by qualified observers. Rod French, ODFW, speculates that largescale sucker may be commonly confused with steelhead by untrained observers. Natural waterfalls prevent upstream migration on South Fork Mill Creek at mile 3, Mosier Creek at mile 0.4, and Rock Creek at approximately mile 2.

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[29] ICB-TRT July 2003.

[30] Miles creeks Watershed Analysis Appendix F. US Forest Service. 1994..

[31] USFS report to The Dalles Area Watershed Council. August 2002.

[32] Anderson, Dave. City of The Dalles Water Quality Manager. Personal Communication. January 2003.

[33] French, Rod. Oregon Department of Fish & Wildlife. Personal Communication. January 2003.

Abundance Estimates

Spawning surveys have been conducted by the Forest Service and ODFW for more than 15 years in Fifteenmile and Eightmile upstream of US 197 and in Ramsey Creek. Within the surveyed areas, the following reaches appear to be particularly productive for steelhead: Eightmile Creek from US197 to Walston Grade, the lower five miles of Ramsey Creek, and Fifteenmile Creek from US197 to 1 mile above Dufur City Intake. Prior to 2003, neither Fifteenmile Creek nor Eightmile Creek had been surveyed downstream of US197, although redds had been seen in those reaches.[34] These areas were assumed, based on habitat and water quality, to be the primary spawning reaches in the watershed. Fivemile Creek had been surveyed upstream of the Forest Service boundary.

In 2003, a new protocol was used to estimate basin-wide spawning. The watershed was broken up into five-mile reaches. From each of these reaches, one mile was chosen at random for redd surveys. In addition to these randomly chosen reaches, five miles were chosen by fisheries managers aiming to capture the most productive spawning areas. Spawning was documented in 2003 from the mouths of Fifteenmile Creek, Ramsey Creek and Eightmile Creek to their headwaters on the Forest.[35] They also documented spawning in the lower 10 miles of Fivemile Creek.

Estimates of the winter steelhead run in Fifteenmile Watershed since 1990 vary from 127 to 1,077 adults[36]. Several methods were used to generate these estimates:

- Best professional judgement of four local fish biologists sets the population level between 300 and 800 adult spawners.[37]

- A limited series of juvenile smolt counts are available (See discussion below and table 3.4). Applying a 6.5% smolt-to-adult survival ratio to the counts of outmigrants 165mm and larger produces a population range from 296 to 683.

- Counts are available for wild winter steelhead passing Bonneville Dam. Dan Rawding estimates that 40% of these fish return to Hood River, 25% to the Klickitat River, 5% to Mill Creek, 5% to the Wind River, and 25% to Fifteenmile Creek. Estimating on this basis gives a low value of 129 spawners to Fifteenmile for the 1995 brood year and a high value of 663 spawners for the 2002 brood year.[38] This method also produces the only

[34] Steve Springston, Oregon Department of Fish & Wildlife. Personal Communication. January 2003.

[35] USFS and ODFW draft spawning report 2003

[36] ODFW 2004, Memorandum from Steve Pribyl to Rod French.

[37] Dan Rawding, Washington Department of Fish and Wildlife, Gary Asbridge, Mount Hood National Forest, Chris Rossel, Barlow Ranger District, USFS, and Steve Pribyl, Oregon Department of Fish and Wildlife, as quoted in March 26th memorandum from Steve Pribyl to Rod French, District Fish Biologist, The Dalles OR ODFW.

[38] IBID

available estimate of Mill Creek spawning runs which varies from 26 to 133 adult returns.

- In 2003, the first attempt was made to estimate total redds in the Fifteenmile Subbasin using multiple passes, total redd counts in randomly selected reaches thought to be representative of the total available spawning habitat in the watershed. Counted redds were expanded using two separate methods, and estimates of 525 and 645 redds were produced. Multiplying this by Steve Pribyl's estimate of 1.67 spawners per redd gives a range of 877 to 1,077 spawners for the 2003 run. While the 2003 redd counts provide the best available estimate of total redds in the system, it should be noted that 2003 is believed to have been a favorable year for salmonid runs throughout the Columbia Basin.

NOAA Fisheries Interior Columbia Technical Recovery Team (TRT) set interim abundance targets for steelhead in each subbasin of the Middle and Upper Columbia River. While Fifteenmile Subbasin was inadvertently left out of the published report,[43] the target generated for Fifteenmile Subbasin was 500 adult steelhead. This number was based on the drainage area of the subbasin, smolt production estimates from the NWPPC Smolt Density Database, and state/tribal quantitative objectives (1991 SubbasinPlan).[44] This target includes production from Mill Creek Watershed, as well as Fifteenmile Watershed. Based on Dan Rawding's estimate that 5% of the wild winter steelhead that pass Bonneville Dam return to Mill Creek, while 25% return to Fifteenmile[45], the IC-TRT interim recovery goal could be split with 417 spawners returning to Fifteenmile and 83 returning to Mill Creek or other streams in the subbasin.

In years 1998, 2000, and 2003, ODFW maintained a screw trap near the mouth of Fifteenmile to monitor out-migrating smolts. A screw trap is a downstream migrant juvenile fish trap. Captured fish are held alive in the trap until sampled. Captured fish are enumerated by species, and a subsample is marked before being released. Marked fish are released upstream of the trap to determine a recapture rate and trap efficiency. This mark-recapture methodology is employed to estimate the total number of downstream migrants. Steelhead smolt estimates for each year are given in table 3.4. Due to the low number of recaptured marked fish, population estimates are not precise. In many cases, 95% confidence intervals exceed the population estimates themselves (Table 3.4). Furthermore, due to the extreme annual variation in flows on Fifteenmile Creek, the screw trap is operated from April to early June only. A certain number of fish may

[39] Pribyl, Steve. ODFW. Personal Communication. 2004. Based on a study
[40] USFS report to The Dalles Area Watershed Council. August 2002.
[41] Anderson, Dave. City of The Dalles Water Quality Manager. Personal Communication. January 2003.
[42] French, Rod. Oregon Department of Fish & Wildlife. Personal Communication. January 2003.
[43] NOAA Fisheries 2002
[44] Lynn Hatcher, pers. comm. Via e-mail, 4/30/2004.
[45] Dan Rawding, WDFW. Quoted in memorandum from Steve Pribyl to Rod French, March 26th, 2004

migrate out of the subbasin before or after that period. Smolt to adult survival is unknown in Fifteenmile Watershed, but is estimated at 5-7% in the Hood River.[46]

Table 3.4. Estimated total number of downstream migrant rainbow/steelhead at mouth of Fifteenmile Creek. Figures in parentheses are 95% confidence intervals. [47]

Year	Fork length below 150mm (Represents mostly presmolts and Rainbow-types)	Fork length 150mm or greater*	Fork length 165mm or greater (represents mostly smolts)
1998	2,169 (+/-1,572)	5,835 (+/-4,439)	4,559 (+-3,500) [a]
2000	1,328 (+/-1,905)	13,221 (+/-19,913)	10,504 (+/-15,700) [a]
2003	4,266 (+/-5,026)	16,779 (+/-10,718)	9,794 (+/-6,300) [a]

*Steelhead juveniles with fork lengths between 150mm and 165mm may or may not be smolts. Smolts are salmonids that are physiologically changing in preparation for migration to the ocean.

[a]Estimate is based on the size distribution of fish captured in the trap.

Diversity and Spatial Structure

The Interior Columbia Technical Recovery Team considers the Fifteenmile Subbasin (including Mill Creek and other streams) to be an independent population with only minor straying from nearby subbasins such as Klickitat River or Hood River.[48]

Hatchery steelhead have never been released in the Fifteenmile Subbasin. Because Fifteenmile represents an independent population and is at the upper end of the winter steelhead distribution in the Columbia Basin, the probability is that few hatchery strays enter Fifteenmile. According to the local ODFW staff, few hatchery strays are positively identified during spawning surveys.[49]

From approximately 1885 to 1937, the Seufert Cannery maintained a diversion dam at the top of Seufert Falls that was most likely a complete barrier to adult passage. Two local residents independently report that there were no steelhead in Fifteenmile Creek during their childhoods prior to the removal of the Seufert diversion dam, but there were steelhead in Mill Creek at that time.[50] Furthermore, numerous other passage barriers existed on the stream up through the 1990's. Between 1988 and 1997, the ODFW Fish Screen and Passage Program installed 80 fish screens and five fish ladders at diversion structures that were considered adult passage barriers.

[46] Olson, Ron & Rod French. Oregon Department of Fish & Wildlife. Draft Summary of Fifteenmile Screw Trap Results. 2000. Unpublished data.

[47] Unpublished Reports, ODFW. 1999 and 2003.

[48] IC-TRT 2003

[49] Steve Pribyl, ODFW The Dalles, pers. comm.. 5/13/04

[50] Rick Cantrell and Dick Overman, pers. comm..

If this is so, the presence of steelhead in Fifteenmile today may be due to primarily to continuous spawning in Mill Creek. However, since the Mill Creek Watershed has an estimated 1/5 of the capacity of Fifteenmile Watershed (see above), this period of time may have compromised the genetic diversity or integrity of the population.

Five culverts are currently considered to be total barriers to adult steelhead migration: one on Middle Fork Fivemile, two at Eightmile Campground, and two on Ramsey Creek, on the National Forest. Together, these eliminate spawning in a total of 7,623 feet of marginal spawning habitat. A recent review of the Endersby Road culvert at RM10 on Eightmile Creek revealed that it is a juvenile passage barrier during summer flows, and is an adult barrier in some flows. Spawning surveys show the reaches above this culvert to be some of the most productive spawning areas in the watershed. Infrared aerial surveys were conducted on Eightmile Creek on August 3, 2002. At the time of the surveys, the stream temperature just downstream from this culvert was 6^{o}C warmer than it was upstream (17^{o}C versus 23^{o}C).[51] Thus, this culvert might have a significant effect on juvenile survival in August.

On Mill Creek, numerous structures become barriers in certain flows, including the City water pipeline, which follows the mainstem of the creek and crosses it at multiple points. Passage is the major issue on Threemile Creek. The culvert at I84 cuts off all steelhead access to that watershed. Upstream of that, a stabilized headcut creates a 20 foot cascade at RM 4.5. Between those points, there are other potential barriers. Prior to settlement, Threemile Creek might have provided up to ten miles of steelhead spawning habitat.

An even more serious loss of spatial structure is likely due to the concentration of water quality problems in the lower watershed. Fifteenmile Creek, Eightmile Creek, Mill Creek and other tributaries are listed on the Oregon Department of Environmental Quality's 303(d) list for temperature and/or sedimentation. These problems originate from nonpoint sources throughout the watershed, but the effect on water quality is heaviest in the lower part of the watershed. While spawning appears to occur throughout most of the presettlement spawning range, as much as half of that range may be unsuitable for survival of one or more lifestages. The majority of successful smolt production in the subbasin may be due to the upper half to one third of Fifteenmile and Mill Creek watersheds (west of longitude -121^{o} 15').

Cutthroat Trout

Cutthroat trout are found in Middle and South Forks of Fivemile Creek, Threemile Creek, South Fork Mill Creek, Mosier Creek and Rock Creek.

Cutthroat trout have been documented as the most numerous species in lower Threemile Creek.[52] This population was reported to be strong and self-sustaining.

[51] Watershed Sciences, LLC, 2003.
[52] Field Inventory. Oregon Department of Fish & Wildlife. December 1986.

On April 24, 1989, gill nets were used in Crow Creek Reservoir to sample the fish population. The bulk of the cutthroat trout among those captured were small, with only five of the 68 individuals exceeding 11 inches in length. The fish were also very slender with the 66 fish samples yielding an average condition factor of 0.82. This is considerably lower than the optimum condition factor of 1.00 to 1.20 for cutthroat trout.

On August 22, 1989, a follow-up sampling of the fish population in Crow Creek Reservoir was taken. A total of 26 cutthroat trout were found and, was the case in April, the population consisted of small, rather slender fish. In this sample, 7.7% of the fish were over 11 inches compared to 7.4% in the previous sample. The average condition factor was 0.89, which is not significantly higher than the 0.82 of the previous sample. The length frequencies of the captured fish indicated that their growth rate was fairly slow. It is possible that trout have entered the reservoir via the aqueduct from Dog River, a tributary of the Hood River. This aqueduct diverts water from Dog River for the City of The Dalles water supply. [53]

Mosier Creek is locally known for its population of cutthroat trout. This population lives upstream of Pocket Falls, and thus does not represent an anadromous population. Cutthroat have been observed both in the mainstem of Mosier Creek, and in West Fork Mosier Creek, as well as numerous smaller tributaries.

The selection of cutthroat trout as a focal species is justified in Table 3.5. According to the Mile creeks Watershed Analysis, resident cutthroat trout are found in the Middle Fork and South Forks of Fivemile Creek. Cutthroat are often found in smaller headwater streams than rainbow-type trout. Typically cutthroat and rainbow-type trout are not sympatric. In areas where they are, cutthroat are often more abundant in areas where rainbow-type trout cannot gain access, such as above waterfalls or gradient barriers. As no natural barriers exist in Fivemile that would separate the two species, the potential for hybridization exists.[54] A total of 46 cutthroat trout were captured in the 4 years that the ODFW screw trap has been in operation at the mouth of Fifteenmile Creek.[55] No cutthroat were recaptured, and thus population estimates are not possible. These migratory fish may or may not represent an anadromous population. Cutthroat trout are an Oregon state and USFS sensitive species, however USFWS has determined that listing under the ESA is not warranted at this time.

Table 3.5. Rationale for Selection of Cutthroat Trout as a Focal Species.

Species Designation	Special Ecological Importance	Tribal recognition
Cutthroat trout are listed as a sensitive species by the State of Oregon and USFS. Coastal cutthroat were considered for Federal listing in 2002, but listing was considered not warranted.	Cutthroat trout occupy a range that overlaps with rainbow-type trout and steelhead, but they also occupy streams above barriers to anadromous migration in Mosier Creek, Mill Creek and Rock Creek. Their presence in these	A native resident fish species, cutthroat is culturally important to the Confederated Tribes of the Warm Springs. They were utilized, in conjunction with other native foods to complement diet for the tribal people.

[53] ODFW 1994.
[54] Miles creeks Watershed Analysis, Appendix F. US Forest Service. 1994.
[55] Unpublished Report ,Oregon Department of Fish & Wildlife. 2003.

	watersheds indicates that they have been present longer than rainbow-type trout. Because these populations exist above anadromous barriers, these populations likely contain diverse genetic characteristics.	

Little life history information has been collected on the cutthroat trout in the Fifteenmile Creek subbasin. It is assumed that this population has a life history cycle similar to that of cutthroat trout in other lower Columbia River subbasins. Spawning of cutthroat trout occurs from April through May in small headwater streams. Fry emerge from the gravel in approximately two months. Emergence is dependent on the spawning date and the water temperature.[56]

Lamprey

Pacific lamprey are an Oregon state sensitive species. Pacific lamprey were historically and are currently of significant cultural value to the Confederated Tribes of the Warm Springs Reservation of Oregon. Their selection as a focal species is made apparent in Table 3.6.

Table 3.6. Rationale for Selection of Pacific Lamprey as a Focal Species.

Species Designation	Special Ecological Importance	Tribal recognition
Pacific lamprey were listed as a state sensitive species in 1993. In 1997 they were given further legal protected status by the state. They are not listed as a federally threatened or endangered species. Conservation groups in several western states petitioned to give lamprey federal protection under the Endangered Species Act in January 2003. Budget limitations forced the USFWS to defer formal consideration of the petition.	Historically this species likely had the widest distribution of any anadromous species in the subbasin. Lamprey can often negotiate barriers that effectively interrupt migration of other fish. Most adult lampreys die shortly after spawning, feeding various scavenger species and contributing rich nutrients throughout their freshwater habitat.[57]	The species is culturally significant for Native Americans, including the Warm Springs Tribes. They have ceremonial importance. Fatty and highly nutritious, they are a traditional food for some Native Americans..[58] The only active Tribal fishery in the subbasin is the Lamprey fishery at Seufert Falls.

Historic lamprey counts at Bonneville and The Dalles dams suggest that lamprey production swung between tens of thousands and hundreds of thousands in just a few years.[59] In recent years, Pacific lamprey abundance throughout the Columbia River Basin has decreased significantly.[60] The current carrying capacity for Pacific lamprey in the Fifteenmile Subbasin is unknown. However, because of their high fecundity rate, lamprey

[56] Wydoski & Whitney. 1979.
[57] Kostow. 2002.
[58] Kostow. 2002.
[59] Kostow 2002
[60] Oregon Department of Fish & Wildlife 1997.

populations may be able to quickly rebound if freshwater and ocean survival conditions are favorable.

The distribution and population of lamprey have not been extensively studied in the Fifteenmile Subbasin, but the historic range of Pacific lamprey in the Columbia Basin was coincident with anadromous salmonids. Pacific lamprey use similar spawning gravel as steelhead. Lamprey spend 1 to 2 years in the ocean before returning to fresh water to spawn.[61] Adult Pacific lamprey probably enter the Fifteenmile Creek subbasin in early summer. Pacific lampreys are an anadromous species that is parasitic during their life in the ocean. It is assumed that they over-winter in subbasin streams before spawning the following spring or early summer. Spawning occurs from May through June in depressions up to 2 feet in diameter in the small gravel of riffles. Lampreys' fecundity is thought to be highly variable, possibly ranging from 15,500 to 240,000 eggs/female. This may suggest a variety of life history patterns or age classes in a single spawning population. Most authorities believe that all lampreys die after spawning. However, there have been several reported observations of robust lamprey kelts migrating downstream and an indication of repeat spawning in one Olympic Peninsula population.[62]

Lamprey eggs hatch within 2-3 weeks, depending upon water temperature. Newborn ammocetes emerge from the spawning gravel at approximately 1 cm in length and burrow into the soft substrate downstream from the nest, where they may spend up to seven years. They are filter feeders that feed on algae and diatoms. The ammocoetes will move gradually downstream, often at night, seeking coarser sand/silt substrates and deeper water as they grow.

They appear to concentrate in the lower parts of basins before undergoing their metamorphism, or body transformation. After completing their metamorphism from the juvenile to adult stage, they migrate to the ocean from November through June. In the Umatilla River this out-migration was observed to occur in the winter to early spring. Pacific lampreys enter saltwater and become parasitic. They feed on a wide variety of fish. They appear to move quickly offshore into waters up to 70 meters deep. Some individuals have been caught in high seas fisheries. The length of their ocean stay is unknown, but some have speculated that it could range from 6 to 40 months.[65]

Little is known about straying of lamprey from neighboring subbasins to the Fifteenmile Subbasin. Studies of sea lamprey (*Petromyzon marinus*) in the Great Lakes indicate that some lampreys have essentially no homing behavior. Instead, the adults may be attracted to streams with concentrations of ammocoetes, which were detected by some chemical stimuli.[66] If these observations apply to Pacific lampreys, straying may be common if the chemical stimuli are an indiscriminate attractant for all lampreys.

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[61] Wydoski & Whitney, 1979.
[62] Kostow 2002.
[63] Kostow. 2002.
[64] Kostow. 2002.
[65] Kostow 2002
[66] Kostow 2002.

There have been no artificial lamprey production programs anywhere within the Fifteenmile Subbasin or within the neighboring Deschutes or Hood Subbasins.

Pacific lampreys are not parasitic while in fresh water. There is an overlap of fresh water habitat with other subbasin focal fish species, but since the lampreys are filter feeders there is little opportunity for competition. Juveniles are likely a food source for other fish.

Rapid or prolonged water withdrawals that dry out edgewater habitat are the greatest risk to larval lamprey.[67] Risks to lamprey populations include stream habitat degradation (including erratic or intermittent flow, decreased flows, increased water temperatures and poor riparian areas), predation in all life stages, artificial barriers and the lack of appropriate screening for lampreys. They are particularly vulnerable to pollution and erratic stream flows during their juvenile or ammocoete life stage because of the length of time they reside in the stream substrate. Because of their high lipid (fats and oils) content, they can concentrate lipid-soluble toxic chemicals. Migrating ammocoetes are especially vulnerable to predation during their in-river and ocean migration. While most movement appears to occur at night, their small size (up to 10 cm) and the number of predators, especially in the Columbia River and impoundments, pose a serious risk.

A total of 97 adult lamprey and 1,501 juvenile lamprey were caught in the screw trap at the mouth of Fifteenmile Creek over the four years of its operation[68]. In August 2000, a pesticide spill caused by an accident on US 84 killed a documented 5000-6000 juvenile lamprey and 20 adults in the lower quarter mile of Fifteenmile Creek.[69] Population estimates are not available.

Fishing Regulations in Fifteenmile Subbasin

Table 3.7 defines the current fishing regulations by creeks within the subbasin. Sportfishing for steelhead has been closed in Fifteenmile Subbasin since 1979. Trout fishing is open for catch and release angling from May 22nd to October 31st.

Table 3.7 Fishing Regulations in the Fifteenmile Subbasin

Fifteenmile Creek	Catch and release for trout fourth Saturday of May to Oct 31.
Chenoweth Creek	Catch and release for trout fourth Saturday of May to Oct 31.
Mill Creek and tributaries	Catch and release for trout fourth Saturday of May to Oct 31.
Mosier, Rock, Threemile creeks	Open fourth Saturday of May to Oct 31 for trout. Catch limit of 2 per day, 8-inch minimum size.

[67] Miles creeks Watershed Analysis, Appendix F. US Forest Service. 1994.
[68] Unpublished Report. ODFW. 2003.
[69] Pribyl, Steve, comments at Fifteenmile Coordinating Group meeting, April 16th, 2004

The intent of the current regulations is to provide protection to juvenile steelhead where they are present, since they can be mistaken for trout by anglers. In steelhead streams, only catch and release is allowed. In Mosier, Rock and Threemile creeks, which are considered non-steelhead streams, a limited trout harvest is allowed between May 22nd and October 31st.

Tribal harvest of lamprey remains popular at the Suefert Falls area during the spring.

Environmental Conditions for Aquatic Focal Species

Fifteenmile Watershed

Historic Conditions and Changes

Historically, Fifteenmile Watershed is believed to have been substantially different in its lower reaches than the current condition. From their headwaters in the conifer forests, the mainstem creeks flowed into relatively wide valleys with galleries of cottonwood, willow and conifers. Streams interacted strongly with floodplain soils. Beavers dammed the creek in multiple locations. Both peak flows and base flows were probably moderated, compared to the current condition. Stream temperatures were probably moderated both by the steady baseflows and by the floodplain interaction within the riparian galleries.

Uplands were conifer forests in the western half of the watershed and shrub-steppe in the eastern half of the watershed.

The Tribes of Middle Oregon ceded the Fifteenmile Watershed to the United States of America in the Treaty of 1855. They retained rights to hunt, fish and gather at usual and accustomed locations in common with the people of the USA and are known to have utilized the natural resources within the subbasin.

The first major change to the condition of the watershed occurred in the early 1800's, when the Northwest Company, and later the Hudson's Bay Company, trapped beaver out of most of the Oregon Territory. By 1838, the fur trade was declining due to a lack of beaver.[70]

American pioneers began settling in the watershed in the 1850's and '60's. The first permanent homestead at Dufur dates to 1852.[71] Petersburg dates to 1858.[72] Early settlements were established close to Fifteenmile Creek. The first wheat was planted in the uplands of Fifteenmile Watershed in about 1863.[73]

Mount Hood National Forest was first established as the Cascade Forest Reserve in 1893. The name was changed to Mount Hood National Forest in 1924.[74]

[70] Corning, 1956
[71] Dufur Historical Society, 1993
[72] Wagenblast, unpublished. Available at Columbia Gorge Discovery Center.
[73] McNeal, 1953.
[74] Friends of Maupin Library, 1986

By 1910, the population of Wasco County had reached 16,191 people—about 70% of its current level.[75] Irrigated farms and pastures occupied the floodplains of Fifteenmile, Eightmile and Fivemile creeks.

The Seufert Cannery was established near the mouth of Fifteenmile Creek in 1885. A diversion dam at Seufert Falls may have blocked fish passage into Fifteenmile Watershed until it was removed in 1937.

A number of other major fish passage barriers remained after 1937. Fifteenmile Watershed Council members recalled at least half a dozen concrete dams that remained in Fifteenmile Creek up through the 1980's. The ODFW Fish Screening and Passage Project (see Inventory, section 4.3.3.) designed and installed 5 fish ladders and 80 fish screens in the Fifteenmile Watershed between 1988 and 1997. While these structures are no longer considered barriers to adult migration, some may still be barriers to upstream juvenile migration. During the time that these structures were adult barriers, the winter steelhead population may have been reduced to near zero.

World Wars I and II increased demand for wheat. By 1950, dryland wheat farms had been established on more than 100,000 acres in the Fifteenmile Watershed. Soil loss from water erosion reached as high as 20 tons per acre per year, due to steep slopes and the practice of "clean tillage" with a moldboard plow. Peak flows by this time are estimated to have been increased by 300 to 600% over pre-settlement conditions, leading to exaggerated streambank erosion and sedimentation.[76] Baseflows were lowered due both to the changed hydrologic conditions and to irrigation withdrawals.

The flooding that occurred throughout the Northwest in 1964 is credited with motivating construction of terraces and sediment basins to reduce erosion. Further flooding in the 1970's motivated stream channel straightening and cleaning with federal assistance from the USDA.[77] Further stream manipulation has occurred over the years due to road-building.

Between 1950 and 1980, timber harvest from the Mount Hood National Forest approximately doubled.[78]

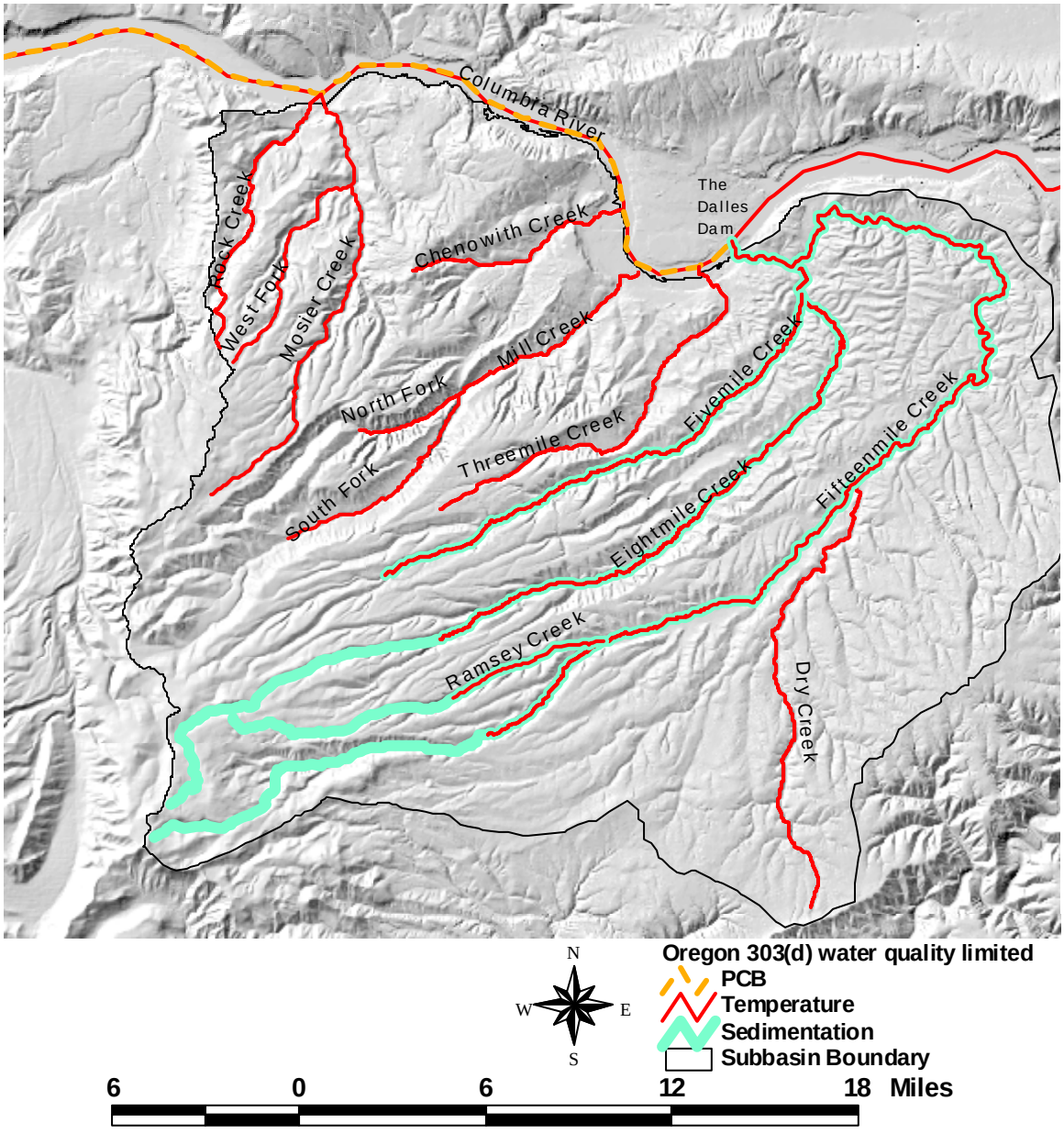
By 1980, riparian vegetation and large woody debris had been nearly eliminated, leading to an almost complete loss of floodplain function. Riparian areas on forest were also heavily impacted, though to a lesser extent.

Due to the combination of reduced riparian function and extensive irrigation withdrawals, summer stream temperatures in the lower half of Fifteenmile watershed reached lethal temperatures for cold-water fish. Pre-settlement water temperatures are unknown, but are presumed to have been significantly lower than current conditions, due to higher flows,

[75] Internet: http://usgenweb.com
[76] Wasco Co. SWCD 2003a.
[77] Wasco Co. SWCD 2003a
[78] Friends of Maupin Library, 1986

greater shade and strong riparian/floodplain interactions. Fifteenmile Creek, Eightmile Creek and Dry Creek are listed on the Oregon State List of Water Quality Limited Waterbodies (303(d) List) for exceeding the state water temperature standards for cold water fish.

Figure 3.2. Water Quality Limited Waterbodies in the Fifteenmile Subbasin and Nearby Columbia River.



The lower half of the Fifteenmile Watershed (Lower Fifteenmile, Eightmile and Fivemile) have been particularly hard hit by the combination of low flows, high summer temperatures, erosion, channel constriction and general loss of habitat. This combination of factors has led fish managers to assume that fish survival is minimal in the lower

reaches. Assuming that the lower part of the watershed was amenable to fish survival prior to settlement, this represents a significant loss of life history diversity and species range.

Soil management in upland farm fields began to change with the 1985 Farm Bill, which required residue management on all highly erodible lands enrolled in USDA farm subsidy programs. "Clean tillage" was largely abandoned in favor of "minimum till." Today, the trend is toward the adoption of "no-till," which uses state-of-the-art seed drills and fertilizer injectors to plant seed directly into standing crop stubble. Nearly half of the non-irrigated croplands in Fifteenmile Watershed are now farmed using the no-till equipment and practices. While these changes are highly positive, runoff and erosion levels are still elevated compared to pre-settlement conditions. Pebble count data from the Forest Service indicates elevated sand and fine sediment in many locations throughout the watershed, including both public and private land.[79]

The Northwest Forest Plan adopted in 1994 changed management priorities in the Mount Hood National Forest, resulting in a sharp decline in harvest levels and new guidelines for both riparian and upland management. For instance, since the late 1980's, the Forest Service has been attempting to replace large woody debris in stream channels and on floodplains.

In 1998, ODFW conducted a culvert survey with funding from Oregon Department of Transportation (ODOT)[80] The surveyor identified eleven culverts in the Fifteenmile Watershed as not meeting fish passage criteria, affecting Long Hollow, Douglas Hollow, Standard Hollow, Japanese Hollow, Mays Canyon Creek, Whiskey Gulch, Japanese Hollow and North Fork Fivemile Creek. All of these sites are dry in the summer.

Several thousand acres of uplands have been converted to orchards, irrigated with groundwater, with a cover crop between the tree rows. This system includes a number of environmental tradeoffs. On the positive side, it features a very low runoff and erosion rate. On the negative side, orchards are water and chemical intensive, requiring careful management and monitoring to reduce environmental impacts.

Riparian areas in the lower parts of the Watershed have been re-established and protected through ODFW and USDA programs. Beavers have recently begun to re-colonize the lower watershed. During the recent Aquatic Inventory Survey, more than 30 beaver dams were noted in the lower 20 miles of Fifteenmile Creek. Beavers are not only an indicator of improved riparian conditions, but will further improve conditions by their activities.

Despite the recent positive trends, summer stream temperatures and low flow in the lower half of the watershed remain above lethal limits for cold-water fish during portions of the summer. Fine sediment (less than 6mm) levels remain at levels detrimental to spawning and fry emergence.

[79] Provided by Bonnie Lamb, Oregon DEQ April 2004
[80] McDermott, February 1999.

Potential Reference for Long-Term Sustainability

This document generally assumes a reference condition similar to pre-settlement conditions. For the future, however, Fifteenmile Watershed will have a certain density of population, roads, and agriculture. However, human land use can be managed to minimize hydrologic effects, pollution, and direct impacts on riparian corridors. In a priority situation, roads could be realigned to avoid riparian corridors. Agriculture and grazing can be carefully managed to allow healthy riparian corridors and floodplain function. Housing and other infrastructure can be placed back from streams.

Future With No Actions

If current conservation programs are allowed to lapse, and no further actions are taken, then:

- Upland runoff and erosion rates will remain elevated compared to presettlement condition, particularly on agricultural lands that have not yet adopted no-till farming methods.
- Upland activities will have unknown impacts on wildlife populations.
- Impacts from orchards will increase directly with increasing orchard acreage.
- Streambank erosion and stream sedimentation will remain above reference levels, particularly in reaches where restoration has not yet taken place.
- Baseflows in summer and fall will remain significantly below presettlement conditions.
- Summer stream temperatures will remain lethal to cold-water fish in the lower watershed.
- If climate change scenarios are accurate, summer flows will decrease due to decreases in snowpack.[81] High temperature areas will extend upstream.
- Forest fire frequency may increase in the upper watershed, increasing risk of flood events and erosion.
- Stream channels will remain straightened and incised and habitat will remain degraded.

The Dalles Area Watersheds—Threemile Creek, Mill Creek and Chenowith Creek

Historic Conditions and Changes

Threemile Creek, Mill Creek and Chenowith Creek all run to the Columbia through the present day location of the City of The Dalles. All three have provided habitat for anadromous fish in recent years. Mill Creek provided more habitat than the other two systems combined.

Both forks of Mill Creek originate above 4,000 feet elevation. High flows were generated both by spring snowmelt and by rain-on-snow events. Steelhead spawned in North Fork

[81] Service, 2004

Mill Creek from headwaters to mouth. On the South Fork, steelhead spawned up to the base of Mill Creek Falls at RM 3. In total, the system boasted greater than 20 miles of anadromous habitat. Today, coho utilize much of the same habitat, and Chinook are also seen to enter the system. It is not known whether coho or Chinook salmon historically utilized any habitat in Mill Creek, although conditions near the mouth were suitable for both. Upstream of Mill Creek Falls, the South Fork and its tributaries offer another fifteen to twenty miles of resident salmonid habitat, currently utilized by cutthroat trout.

Upland vegetation varied from a mixed conifer forest in the headwaters, through an extensive area of pine-oak forests and open grasslands, and trended toward more open and drier conditions near the mouth. South-facing slopes were generally warmer and more open than north-facing slopes.

Floodplains were relatively unconstrained along the entire mainstem and near the mouths of the forks. Riparian vegetation most likely consisted of mixed conifer and hardwood galleries throughout the watershed. The mouth of mainstem Mill Creek expanded into an extensive delta with wetland characteristics.

Both Threemile and Chenowith creeks originate at lower elevations. Their hydrology was and is dominated by rain-on-snow events and winter rainfall. Flow in both streams was lower than in Mill Creek, and the headwaters reaches dried up in the summer. Both streams flowed into wetland deltas near their mouths. Both streams provided from five to ten miles of steelhead habitat. Threemile Creek also had cutthroat trout, with a range that overlapped that of anadromous salmonids.

The Tribes of Middle Oregon ceded the Fifteenmile Watershed to the United States of America in the Treaty of 1855. They retained rights to hunt, fish and gather at usual and accustomed locations in common with the people of the USA.

A Methodist mission was established near present-day The Dalles in 1838.[82] In 1843, the first group of settlers arrived on the Oregon Trail.[83] In 1860, there were 1,300 people living in "Dalles City." Nineteenth century industries included timber harvest, cattle ranching, fruit orchards, a brewery, and—on the Columbia River—the commercial salmon fishery.

Sawmills were erected along Mill Creek, both in The Dalles and near the headwaters.

The earliest fruit orchards date back to 1854 in Rowena, 1866 in the Chenowith Creek Watershed, and 1877 in the Mill Creek Watershed. Cherries were first planted commercially in 1886 and have since come to dominate the orchard industry around The Dalles. The most extensive orchards were established in the lower valley bottom along mainstem Mill Creek and Threemile Creek, and on the ridge between them. As farming expanded and roads were built up the valley bottoms, the streams were constricted and channelized, and riparian vegetation was eliminated or reduced to, in many cases, a single

[82] Howell, 1966.
[83] The Dalles Watershed Assessment. Wasco County Soil & Water Conservation District. 2000.

row of trees. Almost the entire length of the mainstem of Mill Creek is downcut and channelized. The banks have been extensively armored to protect roads, homes or agricultural lands.

In the 1920's, The Dalles Water Commission constructed a diversion pipeline to take water from Dog River, a tributary of Hood River, to South Fork Mill Creek. The maximum capacity of the diversion is 12 cfs. The City holds a municipal water right for the entire flow of the Dog River. The City built the Wick's Water Treatment Plant and reservoir to collect and water from the South Fork for municipal drinking water. From the 1920's to the 1980's, the reservoir was a complete fish passage barrier. Wick's Reservoir was removed in the 1980's to allow spawning as far upstream as Mill Creek Falls.[84] Until 2002, the City would, at times, withdraw all water from South Fork Mill Creek at the point of diversion. In 2002, the City built a fish screen with the assistance of ODFW. The City now spills a minimum of 2-3 cfs throughout the summer to provide bypass flow for this screen. The natural flow at the mouth of South Fork Mill Creek would be 7.2 cfs in September.[85]

Crow Creek Reservoir was constructed in 1967 and 1968 upstream of Mill Creek Falls on South Fork Mill Creek. The dam is 100 feet high and 800 feet across. The reservoir has a storage capacity of 267 million gallons.[86] Cutthroat trout now reside in the Crow Creek Reservoir. As there was no fish screen on the Dog River diversion, some or all of these fish may have originated in Dog River.

The first aluminum plant was established in The Dalles in the 1950's. From the 1950's until it closed in 2002, it was a major employer in The Dalles.

Bonneville Dam on the Columbia River was completed in 1938,[87] backing water up into the mouths of all three creeks. For a time, the former wetland deltas were probably replaced with open water, until sedimentation recreated wetlands.

The Union Pacific railroad was established along the southern bank of the Columbia River in 1882. Construction began on the Columbia River Scenic Highway (US 30) in 1913 and was completed in 1925. Interstate 84 was constructed in 1955 and widened to four lanes in 1976. By that time, Mill Creek had been placed in an 800-foot long culvert from Second Street in The Dalles to the Columbia River, in which it remains to this day. All wetland characteristics at the mouth of Mill Creek were destroyed at that time. Threemile Creek was also highly affected by the construction of these roads.

The Schoolmarm Fire burned 9,710 acres of forestland in the South Fork Mill Creek Watershed in 1967. The sediment and ash from this fire created such a treatment problem for the municipal water supply that the City and the US Forest Service developed a cooperative management agreement designed to maximize water quality in

[84] Dave Anderson, Report to The Dalles Watershed Council, January 18th, 2001.
[85] Oregon Water Resources Department website http://www.wrd.state.or.us (WARS)
[86] IBID
[87] Internet April 27th 2004: https://www.nwp.usace.army.mil/pa/cms/history.asp

the South Fork and in Dog River. The entire watershed of the Dog River is within the Mount Hood National Forest. Of the 22,000 acres in the South Fork Watershed, 15,000 acres are within the Mount Hood National Forest and another 5,000 acres are owned by the City of The Dalles. The majority of the remaining acres are owned by SDS Lumber Company. The municipal watershed is closed to public access, except under the conditions of permits issued from time to time by the City. Timber cuts in the municipal Watershed have focused on forest health. Most harvests are selective cuts, with no single clearing of more than five acres created at any time.[88]

The Dalles Irrigation District was established in 1965 with the help of the Bureau of Reclamation. The Irrigation District provides 2 feet of water from the Columbia River to 5,900 acres in the Threemile and Mill Creek Watersheds from April through October. Some orchards also have water rights from wells or from the creeks.[89] Prior to establishment of The Dalles Irrigation District, limited water availability required frequent tillage in the orchards to eliminate grass between the tree rows. This resulted in very high rates of erosion and runoff. Following establishment of the irrigation district, orchardists were abler to plant cover crops and virtually eliminate erosion in their orchards.

In 2000, DEQ placed electronic temperature loggers in Threemile Creek, Mill Creek, and Chenowith Creek., as part of their TMDL development process. All streams were found to exceed the state temperature standard for salmonid spawning and rearing. These streams were subsequently placed on the 2002 303(d) list of Water Quality Limited Waterbodies.

In 2002 and 2003, DEQ tested for organophosphate pesticides in Mill Creek at the request local growers. They discovered chlorpyriphos in March and malathion in June. A single sample in Threemile Creek also found malathion. Both of these chemicals exceeded state standards and were potentially lethal to fish.[90] Potential sublethal effects include changes in the food web, fish behavior, fecundity, fertility, and sex ratio.

In response, the Wasco County Fruit and Produce League and Wy'East Resource Conservation and Development Council have developed an Integrated Fruit Production program designed to minimize the use of broad-spectrum pesticides and minimize the impacts of those that are used. Practices include use of insect growth regulators and other low-impact pesticides, weather monitoring to improve spray timing and minimize drift, and the planting of spray drift buffers along the creeks.[91] Since this program was implemented, 1.5 miles of Threemile Creek have been enrolled in the Conservation

[88] Dave Anderson, City of The Dalles, Report to The Dalles Area Watershed Council, January 18th, 2001.

[89] Mike Richardson, The Dalles Irrigation District, Report to The Dalles Area Watershed Council, January 18th, 2001.

[90] Eugene Foster, Report to The Dalles Area Watershed Council, March 19th, 2003 and pers. comm.. 2003.

[91] Mike Omeg, Report to The Dalles Area Watershed Council, March 19th, 2003.

Reserve Enhancement Program, which establishes forested riparian buffers.[92] Monitoring must be continued to determine if current voluntary efforts by orchardists resolve the issue.

During the 1996 flood, debris flowing down Mill Creek plugged the Mill Creek tunnel, causing water to back up into the downtown of The Dalles, parts of which is built on fill that covers the former Mill Creek delta. This water had no outlet and did not drain until the Mill Creek tunnel was unplugged. Debris included household appliances, house-trailers, and associated urban pollutants.

The City's pipeline follows the stream from Wick's Water Treatment Plant to the City distribution system. It crosses the stream at numerous places, where it has been armored with concrete in response to flood events. These crossing points have been identified as partial fish passage barriers, along with a number of irrigation diversion structures, and road crossings. From time to time, one or another of these barriers becomes a more serious passage barrier due to streambed erosion. Most recently, City and ODFW officials witnessed Chinook salmon attempting to pass a City sewer line below the Ninth Street Bridge at RM1.[93] Typically, the City addresses such issues by filling the stream channel downstream of the pipeline with large rock, thereby bringing the channel bottom up to the top of the obstruction. Results have been satisfactory in the short term, but the structures may not perform as intended over the long term.[94]

The flood event in 1996 created a number of fish passage barriers in Threemile Creek. Sediment was deposited on the floodplain between US 30 and I84, raising the streambed to above the level of the I84 culvert. Currently, water actually drains vertically downward to the mouths of the culvert, creating a complete fish passage barrier. ODOT has tentative plans to upgrade this culvert in 2006. Two more culverts exist within 2000 feet of the US 30 culvert which may or may not be passage barriers.

At river mile 4.5 on Threemile Creek, a deep headcut beneath a bridge on a private driveway was stabilized with federal assistance following the 1996 flood. The vertical drop at this point is approximately 20 feet, creating a complete fish passage barrier.

Chenowith Creek is currently a perennial stream only along its lower 2 miles. The mouth of this creek is affected by fluctuations in the Bonneville Pool. Upstream of this fluctuation, the stream flows through a braided channel wetland inhabited by beaver and utilized by steelhead for spawning. The vegetation in this region is dominated by reed canary grass, Himalayan blackberry, poison oak, and various native and nonnative hardwood trees—similar to the wetland vegetation on Threemile Creek.

Between US 30 and I84, Chenowith Creek flows through a horse pasture owned by Northwest Aluminum. In 2002, the streambed was studied using a Wolman pebble count.

[92] USDA NRCS records, The Dalles Field Office, March 2004.

[93] Dave Anderson, City of The Dalles, Comments to The Dalles Area Watershed Council, October 20th, 2003.

[94] Rod French. ODFW. Personal Communication. Dec. 2003

The streambed was found to be heavily polluted by horse manure. In 2003, following fencing of the creek, the same site was resurveyed. The streambed consisted entirely of gravel with no visible sign of horse manure. [95]

Between US 30 and 10th Street, Chenowith Creek flows past the western end of residential development in The Dalles. The Creek flows through many different land ownerships at this point, and management of the creek is highly variable.

Upstream of 10th Street (river mile 2), Chenowith Creek is considered to be in relatively good condition, due to its position in the bottom of a steep canyon.

ential Reference for Long-Term Sustainability

Mill, Chenowith and Threemile creeks have the potential to provide spawning and rearing habitat for anadromous fish, including steelhead, coho and Chinook salmon. However, a number of human impacts must be considered permanent changes to the landscape in this area.

The combination of the Bonneville Pool, Interstate 84 and the Union Pacific Railroad has modified the mouths of all three streams, but most noticeably Mill Creek. While the delta/wetland environment that previously existed at that site will probably never be completely recovered, modification of the Mill Creek Tunnel to recreate some floodplain function may remain within the realm of possibility.

The City of The Dalles Municipal Water Supply will remain in place to serve the people of The Dalles. This includes the Dog River Diversion, Crow Creek Reservoir and the diversion at Wick's Water Treatment Plant.

In year 2000, the population of The Dalles was 11,637. The urban area of the City of The Dalles covers more than 3000 acres of land, approximately half of which is impervious surface. Runoff from this area is routed into a storm sewer system, much of which flows into Mill Creek below RM1.

For subbasin planning purposes, the stabilized headcut at RM4.5 was treated as the upper end of fish distribution in Threemile Creek, although anadromous fish may have ranged higher than that under presettlement conditions.

While these features can be modified to improve watershed health, they must be considered permanent features of the landscape.

Future With No Actions

If no action is taken, anadromous use of the watershed will be limited by passage barriers, pollution sources, urbanization, low flows, high temperatures and habitat simplification.

[95] Wasco Co. SWCD, with assistance from US Forest Service.

Future flood events on the scale of 1996 are expected to recur approximately every 25-50 years. Such events will again back water up into the downtown of The Dalles, likely leading to heavy sediment and chemical pollution loads for short periods of time.

Stream channels will remain straightened and incised and habitat will remain degraded.

Mosier Area Watersheds

Historic Conditions and Changes

In the 1850's, Mosier Watershed and Rock Creek Watershed were both heavily forested from headwaters to mouth. Forest types varied from mixed conifer stands in the headwaters to Ponderosa pine, Oregon White oak and Douglas fir near the mouth. The mouth of Mosier Creek is known from photographs to have flowed over an alluvial delta through a dense cottonwood gallery. Stumps of these trees can still be seen when the Bonneville Pool is low.

Prior to construction of Bonneville Dam, the shores of the Columbia River were lined with wetland habitat. Mosier Creek flowed into the side-channel which today forms Mosier City Lake. This channel varied seasonally from open water in the early spring to mudflat in the late summer.

Mosier Creek is believed to have had a higher flow than it does currently, due to additions from groundwater. Rock Creek reportedly flowed year-round until the late 1950's. Since then, the rock pit at RM1 is believed to have contributed so much cobble that stream flows now run under the surface.

In 1854, the first sawmill was established at Pocket Falls in the current location of the City of Mosier. Timber harvest was soon a major industry, with movable sawmills following the creeks and logging the riparian corridors first. As logging operations continued, permanent roads were established following the creeks, and homesteaders, many of whom started as loggers, filed claims in the newly cleared land. Portable sawmills gradually gave way to permanent mills. Permanent sawmills operated in at least two locations on Mosier Creek, and one location on Rock Creek through the 1950's.[96]

The use of drain tiles and ditches to drain wet areas for agriculture and roadways was common and continues to the present. Many wetlands and stream channels have been drained or diverted to reduce saturated soil conditions.

The first passable wagon road through Mosier to Hood River was built in 1863and improved in 1867. In 1882, the railroad came through Mosier. Wood was the fuel for both the steam-driven paddle wheel boats on the river and the locomotives. Mosier became an important fueling stop for both these vehicles. In the winter months, many Mosier farmers cut oak wood and hauled it to the railroad station and to the steamboat landing.

[96] Mosier Watershed Assessment. 2002.

Bonneville dam was constructed in 1938. The Bonneville Pool backed water up to the base of Mosier Falls, nearly one mile upstream of the mouth of the creek, creating a navigable harbor, in which local residents built a boat launch. In 1955, Interstate 84 was constructed, initially with 2 lanes. In 1976, the interstate was widened to 4 lanes. The interstate, railroad and dam eliminated floodplain habitat from the banks of much of the river, while simultaneously creating lakes on the south side of the road.

The 1964 flood deposited debris behind the interstate, railroad and the historic highway, ending the navigability of this reach. The lower half-mile of the creek now meanders through a well-vegetated and functioning wetland. Further sedimentation has created a delta at the mouth of the creek. Willows and other riparian vegetation are currently establishing themselves on both the delta and the banks of the interstate, recreating some of the floodplain functions that existed before construction of the dam.

The first fruit orchard in Mosier was installed in 1878. Mosier Fruit Growers was formed in 1907. The maximum extent of orchards was probably in the 1950's, after which many of the higher elevation orchards were removed, and have since reforested or remained as grasslands[97].

Most of the orchards in Mosier were not irrigated until the 1970's. In the late 1960's, designs were developed for an irrigation district that would divert water from a reservoir on upper Mosier Creek. Many of the prospective members opted out, and the proposal was abandoned. Beginning in the 1970's and continuing into the 1990's, almost all 1440 acres of commercial orchard were converted to irrigation from either private stream water rights or wells.

In 1971, the City of Mosier drilled Well #3, an artesian well in the lower Mosier Valley that has served ever since as the main source of domestic water for the City. The City has no other water supply suitable for drinking water.

Oregon Department of Water Resources conducted a thorough study of well levels in the Mosier Valley from 1985 to 1987. This study found that groundwater in the Lower Mosier Valley was being overdrawn. As a result of this study, the Pomona and Priest Rapids aquifers in the Lower Mosier Valley were closed to new groundwater withdrawals. Since 1988, the Water Resources Department has continued to monitor numerous wells within and around the area of withdrawal. Results of this monitoring suggest that the Priest Rapids aquifer continues to be overdrawn. In addition, the Frenchman Springs aquifer, which had been little used prior to the 1980's, now appears to be dropping as well.

In the 1960's, USGS studied the interaction of the aquifers with Mosier Creek. They found that at that time, the stream gained flow as it intersected the upper end of the Priest Rapids aquifer. In the 1980's, the Water Resources Department duplicated that study, and found that the stream actually **lost** flow as it intersected the same geologic layers, indicating that the stream interacts with the section of the aquifer that has lost hydrologic

[97] Hastings, Ron. Personal Communication. 2001.

head. This potentially may affect not only stream flows, but surface water temperatures, and loss of springs and wetlands.

Oregon Water Resources Department believes that wells in the Mosier Valley are prone to "co-mingling," in which water flows under artesian pressure from one aquifer into water-bearing strata at higher elevations. City of Mosier's Well #3 was identified as a co-mingler. In 1989, the City was served with an order to abandon well #3. Since that time, the City of Mosier has been searching for an alternate drinking water source, but has had trouble securing financing.

In 2000, DEQ placed electronic temperature loggers in Mosier Creek and Rock Creek., as part of their TMDL development process. Both streams were found to violate the state temperature standard for salmonid spawning and rearing. These streams were subsequently placed on the 2002 303(d) list of Water Quality Limited Waterbodies.

The upper ends of Mosier and Rock creeks are subject to the heaviest commercial timber harvest in the Fifteenmile Subbasin. While this is so, general runoff levels seem little affected, and the stream has not been observed to carry a heavy sediment load under most high water events.

Extensive channel modification has occurred in the lower portions of both Mosier Creek and Rock Creek. Most channel modification in the lower Mosier Creek Watershed occurs because of rural residences located in the riparian areas. In Rock Creek, the lower one-mile of the creek has been channelized and rip-rapped to accommodate the ODOT gravel quarry and several bridge crossings. Rock Creek currently runs subsurface during the summer in this reach. Downstream of the gravel mining area, Rock Creek is further restricted by a private building (Giroux House), the US30 bridge, Union Pacific trestle and Interstate 84 overpass. Between the railroad and the Interstate, the Rock Creek floodplain is used as a parking lot and launch site by windsurfers and local fishermen. Mosier Creek is similarly constricted at its mouth by US30, the railroad and the interstate.

Potential Reference for Long-Term Sustainability

The mouths of both Mosier and Rock creeks have been permanently changed by the inundation of the Bonneville Pool and the construction of Interstate 84, the Union Pacific railroad and US 30. These features are unlikely to change.

Roads have been built along most of the length of Mosier Creek, as well as parts of its tributaries. These features would be difficult, but not impossible, to move.

Future With No Actions

If current trends are allowed to continue, groundwater depletion will result in loss of streamflow in Mosier Creek and therefore, continued loss of water quality and fish habitat quality. It will also result in severe economic loss for the local community not limited to the collapse of the commercial orchard industry in the Mosier Valley.

3.3. Out of Subbasin Effects (OOSE) for Aquatic Species

Steelhead and Pacific Lamprey migrate to the ocean and back, spending a large portion of their lives outside the subbasin. Lamprey typically spend most of their life as juveniles in freshwater, but gain most of their growth in the ocean. Planning requires accounting for conditions during the time these populations exist away from their natal subbasin. Out-of-subbasin effects (OOSE) encompass all mortality factors from the time anadromous fish leave a subbasin to the time they return to the subbasin. These effects can vary greatly from year to year. Out-of-subbasin factors can be natural in origin (e.g. ocean productivity), human-caused (e.g. fisheries) or a combination (e.g. mainstem survival is dependent on both mainstem flows and dam operations).

Juvenile survival through the mainstem Columbia River depends upon habitat quality and quantity, river flow at the time of migration, juvenile travel time, juvenile migration timing, dam survival, transportation survival, estuary effects, natural ocean survival, and harvest.

The model used for this assessment, Ecoystem Diagnostic and Treatment (EDT)[98] does not directly input all of these factors. EDT allows the user to specify the age distribution (age 1, age 2, and age 3) of outmigrating smolts. It then summarizes the major sources of out-of-subbasin mortality into a survival multiplier from the point that juveniles enter the mainstem Columbia River to the point that adults reenter the subbasin. The Smolt-to-Adult Survival rate (SAR) is computed as the total number of adult returns divided by the total number of smolts. If local data exists for this rate, the model can be calibrated to agree with local data.

The age of out-migrating smolts from the Fifteenmile Watershed has been estimated based on data collected at the fish trap operated by Oregon Department of Fish and Wildlife near the mouth of Fifteenmile Creek[99]. Approximately 27% of the outmigrating smolts from Fifteenmile appear to be one year old fish, 59% are two years old, and 14% are three years old or more. The number of one year old smolts is quite high when compared to similar data collected in Hood River, where only 9% of all smolts were one-year-olds, and 77% were two-year-olds (Table 3.8). This would tend to increase juvenile production by speeding up the process of producing a generation, and by eliminating second-year mortality.[100] Further monitoring is called for to verify these numbers.

Table 3.8. Age of Out-migrating Winter Steelhead Smolts from Fifteenmile Watershed and Hood River (based on juvenile migrant counts conducted by ODFW)

	Age 1	Age 2	Age 3
Fifteenmile	27%	59%	14%

[98] Mobrand Biometrics, Inc.
[99] ODFW Unpublished data, 1999 and 2004, Eric Olson ODFW, pers. comm.
[100] Greg Blair, Mobrand Biometrics, Inc. pers. comm.. April 2004.

Hood River	9%	77%	14%

Smolt-to-Adult Survival rates have not been determined for Fifteenmile Creek, as returning adults have never been counted. However, both outmigrating smolts and returning adults have been counted in the Hood River since 1994. The average SAR for wild winter steelhead in Hood River for brood years 1994 to 1999 is approximately 6.7%, varying from 3.66% to 9.45%[101]. The relatively younger age of the Fifteenmile smolts might be expected to result in a higher out-of-subbasin mortality rate than that experienced by the Hood River population, thus resulting in a lower Smolt-to-Adult Survival rate. EDT was calibrated to produce a Fifteenmile Smolt-to-Adult survival rate of 5.5%. Monitoring of returning adults would be necessary to confirm the validity of this assumption.

3.3.1. Modifying Conditions

Steelhead spend one to four years in the ocean. Early ocean survival is considered to be a time of particularly high mortality. A growing body of evidence from field, tagging, and correlation studies shows that juvenile anadromous fish making the transition from freshwater to marine environment experience large year-to-year fluctuations in survival rates.[102] Climate-related changes have the most effect on salmon survival early in the salmon's marine life history.[103]

Pacific Decadal Oscillation: The Pacific Decadal Oscillation (PDO) is a recurring pan-Pacific pattern of ocean-atmospheric variability that alternates between climate regimes every 20-30 years.[104] The PDO affects water temperatures off the coast of Oregon and Washington and has cold (negative) and warm (positive) phases.[105] A positive PDO phase brings warmer water to the eastern North Pacific, reducing upwelling of nutrient-rich cooler water off the coast of North America and decreasing juvenile salmon survival.[106] The negative phase of the PDO has the opposite effect, tending to increase salmon survival.

Climatic changes are manifested in both returns and harvests. Mantua et. al. [107] found evidence of an inverse relationship between harvests in Alaska and off the coast of Oregon and Washington. The negative phase of the PDO resulted in larger harvests of Columbia River stocks and lower harvests of Alaskan stocks. Phase reversals occurred around 1925, 1947, 1977, and possibly 1999. The periods from 1925-1947 and from 1977-1999 were periods of low returns to the Columbia River, while periods from 1947-1977 and the current period are periods of high returns.

[101] ODFW Hood River/Pelton Project Annual Report, 2001.
[102] Hare et al. 1999
[103] Pearcy. 1992. & Francis and Hare 1994.
[104] Hare et al. 1999
[105] Hare et al. 1999
[106] Hare et al. 1999
[107] Mantua et al. 1997

El Nino/Southern Oscillation: The El Nino-Southern Oscillation (ENSO), like the PDO, affects water temperatures off the coast of Oregon and Washington and has both a cold (negative) and warm (positive) phase. ENSO events are much shorter than PDO events in that events typically occur every 2-7 years and last 12-18 months. Positive ENSO events occur more frequently during positive PDO phases and less during negative PDO phases.[108] ENSO events intensify or moderate the effects of PDO changes on salmon survival, depending on whether the phases of these cycles coincide or not.

PDO and ENSO also affect freshwater habitat of salmon. Positive PDO and ENSO events generally result in less precipitation and lower streamflows in the Columbia Basin. Lower stream flows result in higher water temperatures and a longer outmigration. Negative PDO and ENSO events have the opposite effect.

Climate Change

Climate change on a longer term than the PDO could have a large impact on the survival of Columbia Basin salmon. Finney et. al. [109] used lake sediment elemental composition to find evidence of long term cycles of abundance of sockeye salmon in the Bristol Bay and Kodiak Island regions of Alaska over the past 300 years. There may have been similar variations in the abundance of Columbia Basin salmon.

Computer models agree that the climate in the Pacific Northwest will become, over the next half century, warmer and wetter, with an increase of precipitation in winter and warmer, drier summers.[110] These trends agree with observed changes over the past century. Wetter winters would mean more flooding of certain rivers, with higher levels of wood and grass fuels and increased wildland fire risk compared to previous disturbance regimes.[111] The region's warm, dry summers may see slight increases in rainfall, according to the models, but the gains in rainfall will be more than offset by increased evaporation. Warmer temperatures will lead to less snowfall and more rain at mid-elevations. Loss of mid-elevation snowpack will have negative impacts on the region's water resources, forests, and salmon,[112] including diminished ability to store water in reservoirs for summer use, and spawning and rearing difficulties for salmon. For salmon runs that are already under stress from degraded freshwater and estuarine habitat, these changes may cause more severe problems than for more robust salmon runs that utilize healthy streams and estuaries.

Climate models lack the spatial resolution and detailed representation of critical physical processes that would be necessary to simulate important factors like coastal upwelling and variation in currents. Different models give different answers on how climate change will affect patterns and frequencies of climate variations such as ENSO and PDO.

[108] Hare et al. 1999
[109] Finney et al. 2000
[110] USDA Forest Service 2004
[111] USDA Forest Service 2004
[112] Mote et al. 1999

While it is straightforward to describe the probable effects of these environmental patterns individually, their interaction (PDO, ENSO, climate change) is more problematic. The main question appears to be the duration of the present favorable PDO period and the timing and intensity of the subsequent unfavorable period. Prudence suggests planning for a shorter favorable period and a subsequent longer, if not more intense, unfavorable period.

3.4. Limiting Environmental Factors and Populations of Aquatic Species

Two tools were used to identify and analyze factors leading to decline of aquatic focal species. Ecosystem Diagnostic and Treatment[113] (EDT) was applied to the Fifteenmile Watershed. Qualitative Habitat Assessment[114] (QHA) was used for all other watersheds. To the extent possible, EDT relies on habitat data, whereas QHA relies primarily on professional opinion. There was insufficient data to use EDT in the watersheds other than Fifteenmile.

3.4.1. Winter Steelhead in Fifteenmile Watershed

Fifteenmile Watershed was broken into forty one reaches, including five passage barriers with reach length equal to zero. These reaches are defined in Figure 3.3.

The forty one reaches represent the known or potential range of steelhead in Fifteenmile Watershed. For each of these reaches, habitat characteristics were described by a team of biologists and natural resource managers familiar with the Fifteenmile system. EDT uses this habitat data, together with certain assumptions about the life cycle and out-of-subbasin effects of Fifteenmile winter steelhead to generate an estimate of the adult and juvenile *life history diversity, productivity, capacity* and *abundance*.

- *Life history diversity*, as reported by EDT, refers to the percentage of steelhead life history trajectories generated by EDT that complete a life cycle. Life history diversity in EDT is a measure of habitat breadth--the "window of opportunity" for the focal species in regard to space (reaches along the stream) and time (months within a year) in which suitable habitat conditions exist for the focal species.

- *Productivity* refers to the steelhead survival rate, from redds to a particular life stage, when density-dependent factors are not in play—i.e. when competition for resources is not a factor. In this context, productivity is not equivalent to the current rate of expansion of the population. Productivity refers rather to the potential rate of expansion, if no other factors limit the population.

- *Capacity* is the maximum population that the habitat can support given a specified level of natural resources.

[113] EDT, Mobrand Biometrics
[114] QHA, Mobrand Biometrics

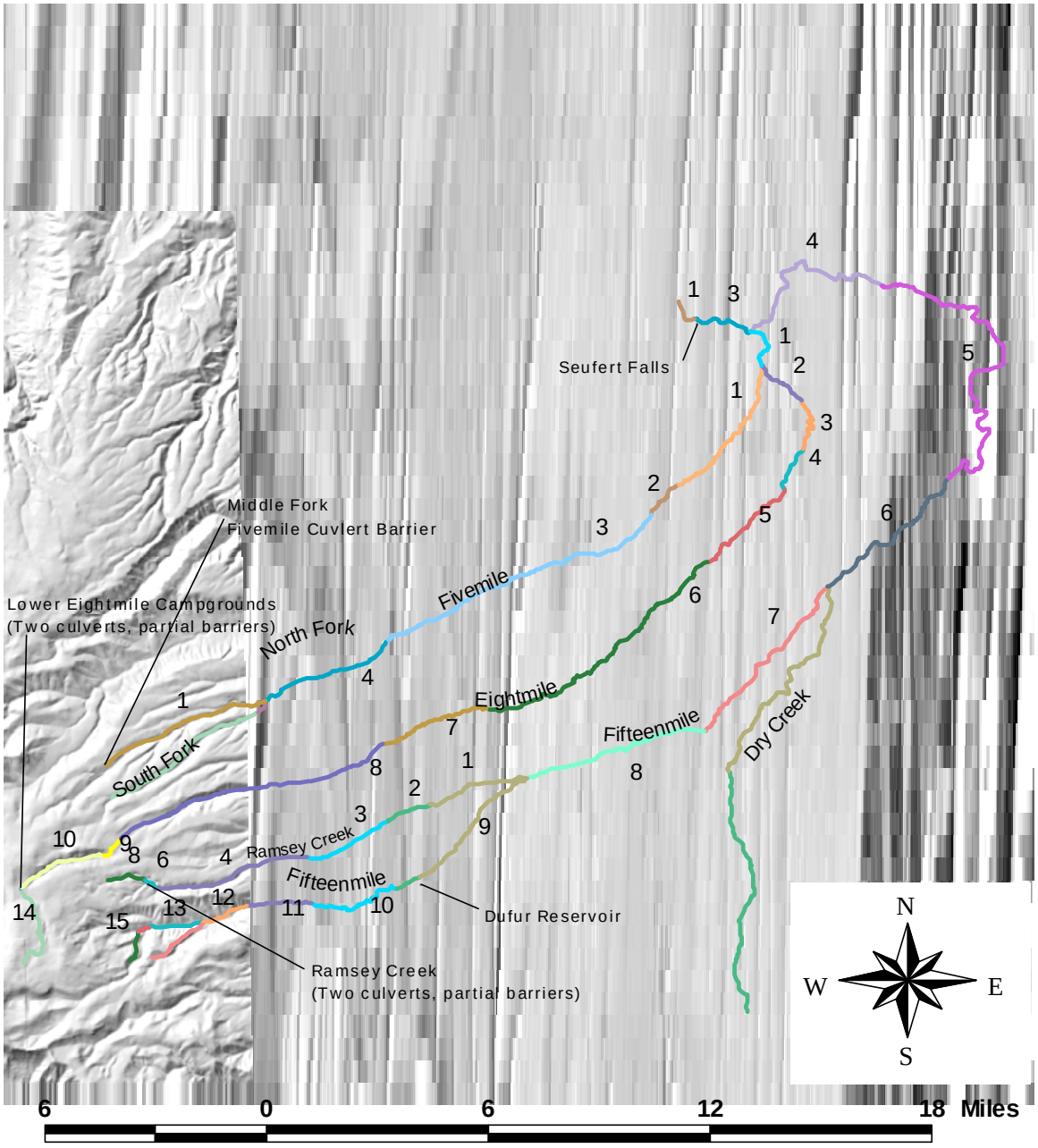
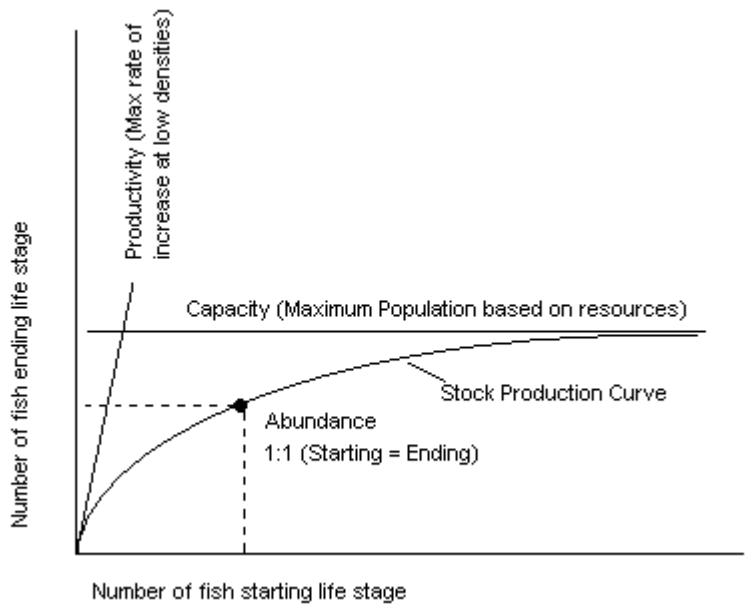

Seufert Falls
Middle Fork
Fivemile Cuvlert Barrier
Lower Eightmile Campgrounds
(Two culverts, partial barriers)
Fivemile
North Fork
Eightmile
South Fork
Fifteenmile
Dry Creek
Ramsey Creek
Dufur Reservoir
Ramsey Creek
(Two culverts, partial barriers)
N
W
E
S
6 0 6 12 18 Miles

Figure 3.4. Stock Recruitment Curve showing Theoretical Relationship of Productivity, Capacity and Abundance.



EDT produces a diagnostic report describing the limiting factors in each stream reach and prioritizing reaches for restoration or protection based on their potential response to restoration or further disturbance.

EDT estimates that the current steelhead abundance of Fifteenmile Watershed is approximately 1,261 adults and 21,061 juveniles. This compares to 4,367 adults and 47,377 juveniles under modeled presettlement conditions (Tables 3.9 and 3.10).

The life history diversity index (Table 3.9, column two) indicates that under modeled presettlement conditions, 97% of the life histories generated by the model successfully produced spawners, but in the current condition, only 34% did so. As described by Chip McConnaha of Mobrand Biometrics, Inc.: "The habitat breadth is 66% smaller under the current condition than it was under the reference condition. There is now a smaller window of opportunity and therefore a greater likelihood that a catastrophic event or environmental change will extirpate the population."[115]

Geographically, the areas with viable life histories show a distinct geographic pattern. Figure 3.5a shows that in the modeled presettlemtn condition, steelhead could complete viable life histories throughout the majority of the watershed. Figure 3.5b shows that steelhead are currently not able to survive to spawning stage in the lower two thirds of the Fifteenmile Watershed. The population now appears to be restricted to the reaches in the forested upper elevations, where flows and temperatures remain in fairly good condition. Further degradation would quickly put this population at risk of extinction.

[115] Chip McConnaha, Mobrand Biometrics Inc, vie e-mail, 5/5/04

EDT reports productivity to have been reduced from 29.5 returns per spawner under modeled presettlement conditions to 11.2 returns per spawner under current conditions (Table 3.9, column 3). Again, this does not represent the return rate for any given year, but rather the potential return rate when the population is not limited by density-dependent factors, natural disasters or other mortality factors. It represents the potential for a depressed population to recover when conditions improve. The high productivity noted for Fifteenmile is encouraging.[116] It indicates that the population could recover rapidly in response to improved habitat conditions.

Table 3.9. Fifteenmile Winter Steelhead Adult Productivity, Capacity and Abundance (output from EDT).

Scenario	Life History Diversity Index	Productivity (returns per spawner at low densities)	Capacity (maximum population, as modeled by EDT)	Abundance (self-sustaining population, as modeled by EDT)	Abundance as estimated locally
Current	34%	11.8	1,261	1,155	127-1,077
Modeled Presettlement	97%	41.3	4,367	4,261	

Table 3.10. EDT Estimates of Fifteenmile Creek Winter Steelhead Juvenile Outmigrant Productivity, Capacity and Abundance.

Scenario	Productivity (Outmigrants per spawner at low densities)	Capacity (maximum population)	Abundance (self-sustaining population, as modeled by EDT)	Abundance according to on-the-ground counts in Fifteenmile
Current	207	23,098	21,067	4,559-10,504
Modeled Presettlement	483	48,494	47,377	

[116] By contrast, the productivity generated by EDT for the nearby Klickitat River is only 4.5 returns per spawner under current conditions and 14.6 under modeled presettlement conditions (EDT Online, registered dataset for Klickitat River winter steelhead, April 30, 2004).

Figure 3.5a. Percentage of Viable* Life Histories Modeled in the Template Condition (Mobrand Biometrics, May 2004)

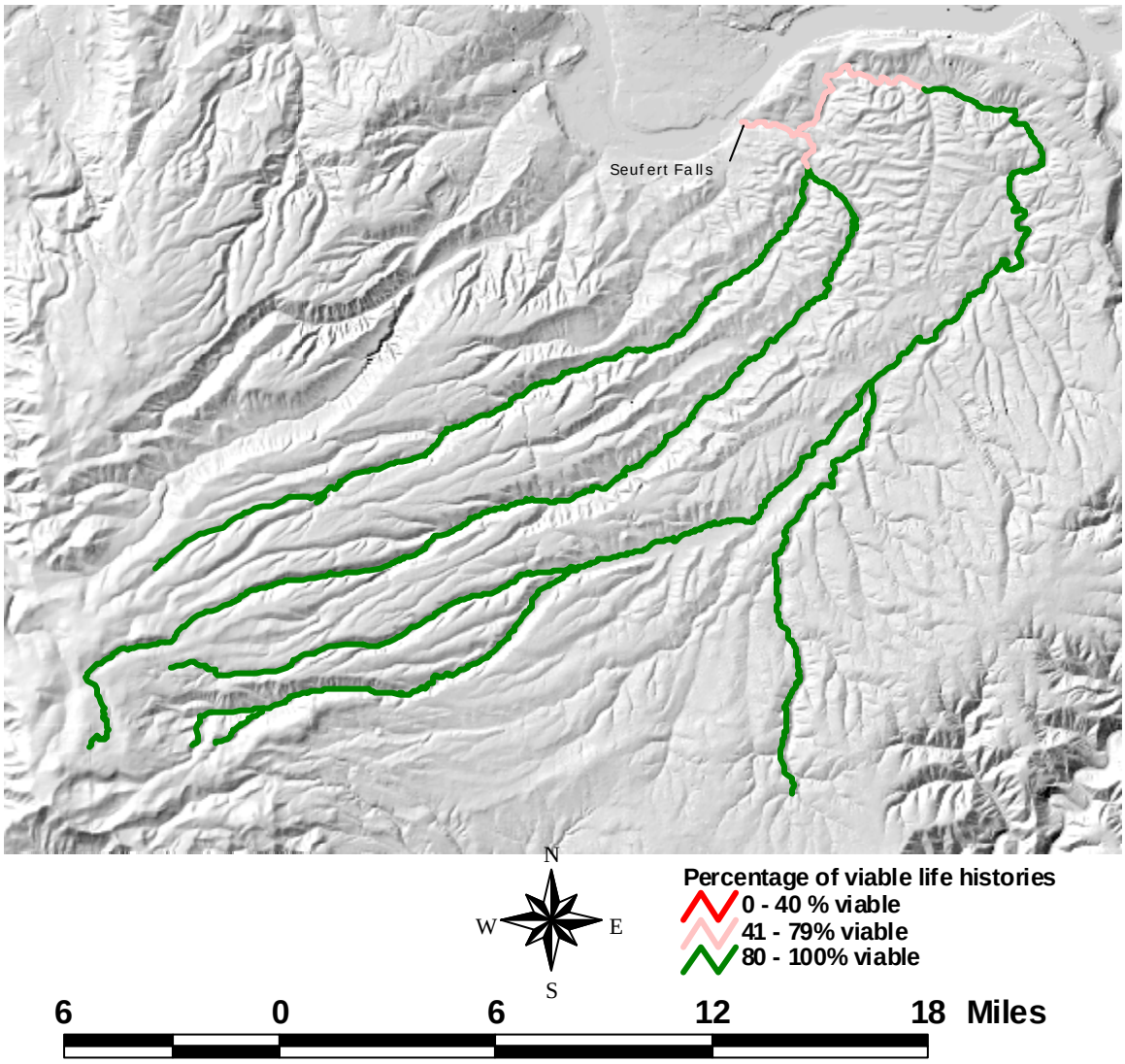
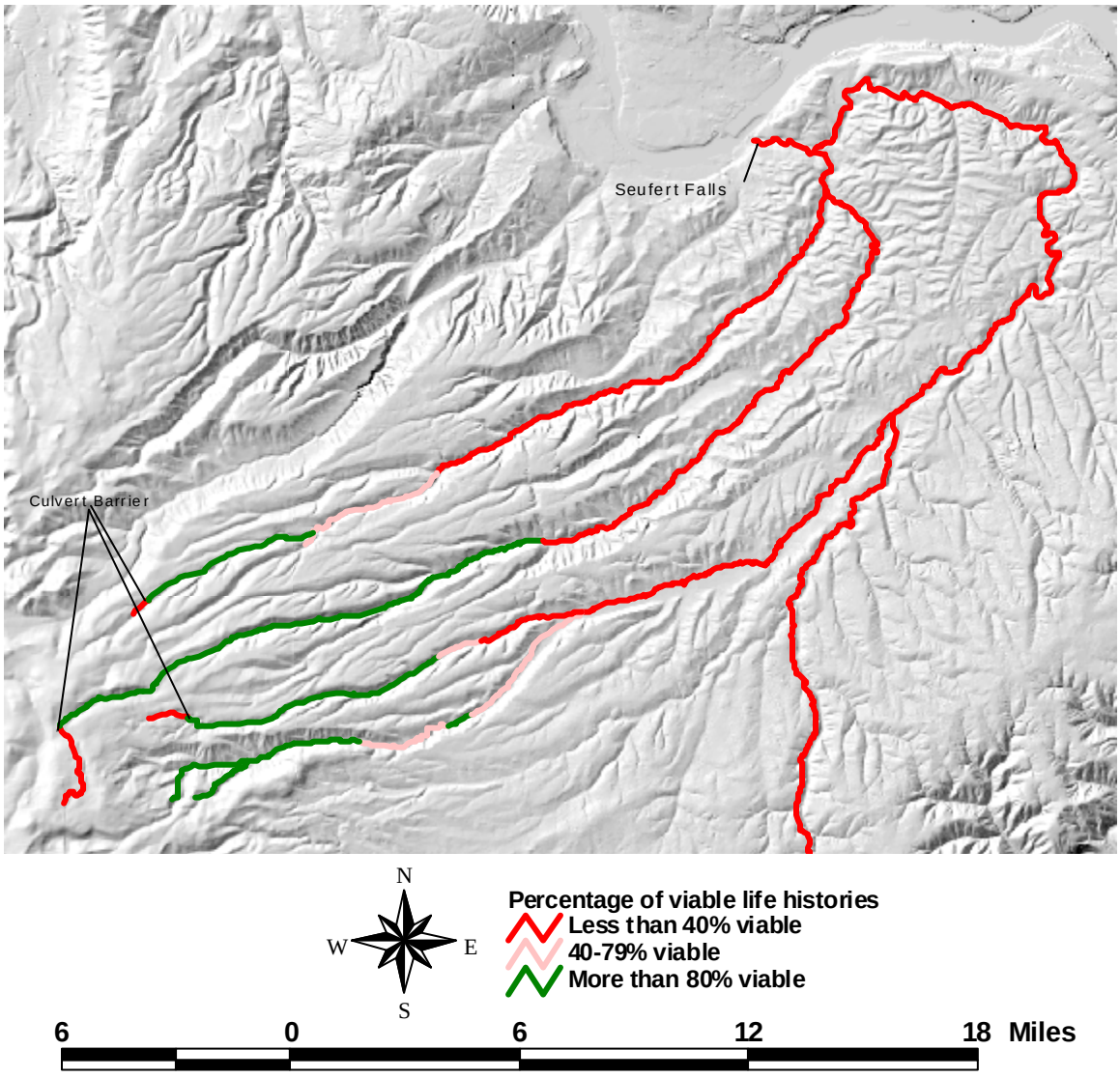


Figure 3.5b. Percentage of Viable* Life Histories Modeled in the Current Condition (Mobrand Biometrics, May 2004)



*Viable is defined here as having a productivity >1.0.

Reality Check: Model Output versus Local Data

The EDT output for adults is slightly above the high end of local estimates. As described in section 3.2.3, the number of spawners in 2003 can be estimated based on redd counts somewhere between 845 and 1,077 fish. That year was marked by good ocean conditions and heavy runs throughout the Columbia Basin. By contrast, in the late 1980's and early 1990's, estimates of adult spawners range between 127 and 800 fish.

In terms of juvenile migrants, the best available data is based on the screw trap studies conducted in 1998, 2000 and 2003 by ODFW at the mouth of Fifteenmile Creek. In 1998, the estimate was 4,559 smolts, whereas in 2000, the estimate was 10,504 smolts and in 2003, there were an estimated 9,794 smolts.

EDT outputs over twice as many smolts as the screw trap data indicates (Table 3.10). As noted before (Table 3.8), steelhead juveniles in Fifteenmile appear to smolt at an earlier age than in Hood River (or in coastal streams[117]). Estimates of juvenile migrants from Fifteenmile only exist for three years, but are comparable to values from the Deschutes River, where 29% of steelhead in a sample of 100 had smolted at one year of age.[118] As an experiment, EDT was run for Fifteenmile assuming the smolt-age distribution found in Hood River, the next subbasin to the west. Using the Hood River age distribution, EDT estimates the Fifteenmile smolt production at 12,000, which is quite close to the numbers counted in 2000 and 2003. Further monitoring of juvenile migrants is needed to determine the true age distribution of Fifteenmile smolts.

Little or no data exists regarding the true presettlement condition. Model input for the presettlement condition was based on professional opinion and experience with similar systems. In particular, the presettlement estimate is based on the assumption that Seufert Falls was passable prior to the establishment of Seufert Cannery. Seufert Cannery, established in 1885, built a diversion structure at Seufert Falls which was impassable part or all of the year. In 1937, this diversion was removed by ODFW, although pilings are still visible. It is not known whether the steelhead population was actually extirpated while the obstruction was present. Rick Cantrell, a local resident born in 1920 on a farm near Fifteenmile Creek, reports that there were no steelhead in Fifteenmile Creek during his childhood, though there was a healthy trout population with adult sizes reaching 10-14 inches. [119] Dick Overman, another lifelong resident, independently reported the same thing, but noted that steelhead were present in Mill Creek.[120] Bob Hammel noted that there were at least six concrete dams on Fifteenmile Creek, most of them with no fish passage provisions, until as late as the 1990's.[121] NOAA Fisheries considers the steelhead in Mill Creek and Fifteenmile to be a single population.[122] It is possible that this population would have been extirpated in the early 20th Century, were it not for the continuous presence of steelhead in Mill Creek.

Key Disturbance Factors and Potential Responses

As indicated by EDT, the key factors inhibiting steelhead populations and aquatic ecological processes within the Fifteenmile Watershed are habitat diversity, sedimentation, flows, water temperature, key habitat quantity, pathogens, and channel

[117] Greg Blair, Mobrand Biometrics, Inc, pers. comm.
[118] Olsen, et. al. 1991.
[119] Rick Cantrell, pers. comm.. April 17th, 2004
[120] Dick Overman, Wasco Co. SWCD Board Meeting, 5/5/04
[121] Bob Hammel, Wasco Co. SWCD Board Meeting, 5/5/04
[122] ICB-TRT 2003.

stability,. Other factors that have a lesser effect are food supply, harassment and dissolved oxygen. These environmental factors are defined by life stage in Table 3.11.

Table 3.11: Key Environmental Correlates for each Life Stage (EDT 2004, Fifteenmile Subbasin)

Life Stage	Key Environmental Factors
Spawning	Habitat Diversity, Temperature, Sediment
Egg incubation	Temperature, Sediment, Channel Stability
Fry colonization	Temperature, Flow, Habitat Diversity, Oxygen
0-age active rearing	Temperature, Flow, Habitat Diversity, Pathogens
0,1-age inactive (Winter inactivity)	Temperature, Flow, Habitat Diversity, Sediment
1-age migrant	Habitat Diversity and Quantity, Sediment
1-age active rearing	Temperature, Flow, Habitat Diversity
2+-age active rearing	Temperature, Flow, Habitat Diversity
2+-age migrant	Habitat Diversity and Quantity
2+-age transient rearing	None
Prespawning migrant	Habitat Quantity, Sediment
Prespawning holding	Habitat Diversity and Quantity

Habitat Diversity and Key Habitat Quantity

EDT tracks the percentage of various types of habitat in each reach. The categories tracked are backwater pools, beaver ponds, glides, large cobble/boulder riffles, small cobble/gravel riffles, pool tailouts, primary pools and off-channel habitat. The Fifteenmile Subbasin has been extensively surveyed over the last four years, and this data was entered into the model. The makeup of habitat types on forest in the presettlement condition was estimated based on channel type[123]. In middle elevations, presettlement assumptions were based on Shitike Creek Reach 2, a stream in the Deschutes Subbasin

[123] Catherine Serres, Mt. Hood National Forest, 2003

with a gradient and flow similar to Fifteenmile Creek. Shitike Creek 2 has a gradient of approximately 2%, so was used as a reference only for reaches with a gradient between 1 and 3%[124].

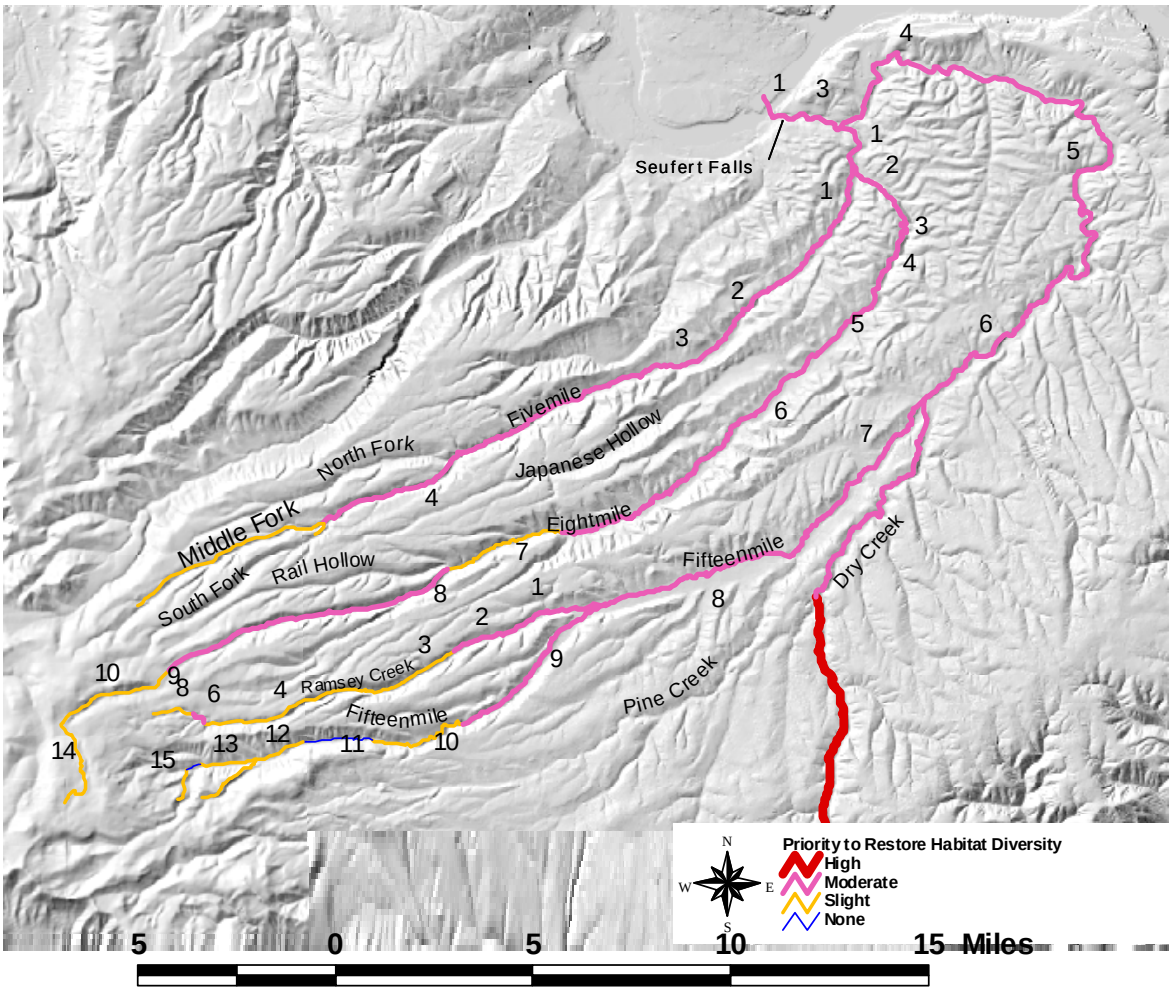
Fifteenmile has been extensively channelized and straightened and has subsequently downcut. Based on historical aerial photos, the stream is known to be shorter and steeper now than prior to the 1970's. The priority to restore habitat diversity was **high** in Dry Creek and **moderate** in most of the watershed (except in one reach near the headwaters) on spawning, active rearing of all age classes, juvenile migration, winter inactivity, and prespawning holding.

Key habitat quantity refers to specific habitat types that are important to various lifestages. EDT's priority reaches for restoring habitat diversity are portrayed in Figure 3.4. EDT typically found a small to moderate loss in key habitats for all lifestages except 2+ age transient rearing. In all reaches, at least six lifestages were affected (EDT recognizes 12 lifestages).

Habitat diversity and quantity can be restored through activities that address the floodplains and allow the stream to recover its former floodplain and channel complexity. Possible activities include riparian buffers, tree planting, large woody debris placements. Placement of engineered structures (weirs, jetties, etc.) might be used in particular cases, in conjunction with other activities.

[124] Shitike Creek #2, from Warm Springs water intake to road crossing at 2300 foot level; Deschutes Subbasin EDT: Pools: 17%, tailouts: 3%, backwater, 0%, beaver ponds, 0%, glides 2% small cobble 59%, large cobble 18%.

Figure 3.6. Priority Reaches to Restore Habitat Diversity (EDT, May 2004)

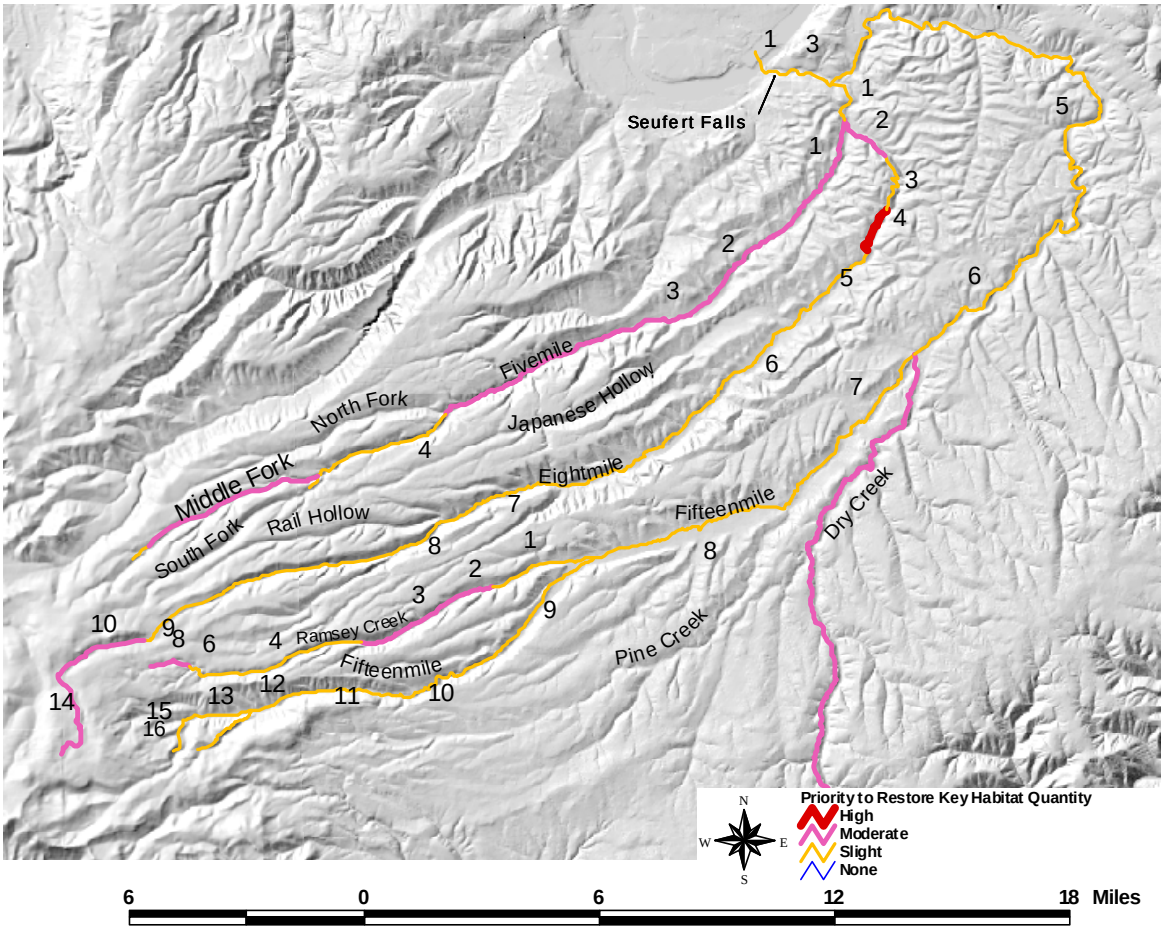


Confidence in the Data: EDT rates habitat diversity primarily based on gradient, and secondarily based on confinement, riparian function, and wood. Channel straightening and confinement by dikes and roads has shortened the stream length, thereby increasing gradients in many reaches. Current gradients were estimated based on map analysis. Estimated presettlement gradients were adjusted based on the amount of confinement estimated for each reach. For each artificially confined reach, the presettlement gradient was decreased by 20% of the assumed confinement. Therefore, a reach that was rated as 90% confined was arbitrarily assumed to have been 18% less steep in the presettlement condition, compared to the current (measured) condition. A reach that was modeled as 20% confined was assumed to have been 4% less steep in the presettlement condition. Similarly, reach length was assumed to have been longer in the presettlement condition by the same percentage. These estimates are based on professional judgement and are open to question.

Key habitat is different for each life stage. Pool tailouts are the key habitat for spawning in EDT, whereas primary pools are key habitat for rearing and holding lifestages. However, EDT models all habitat as reduced where stream width and length are reduced.

EDT's priority reaches for restoring key habitat quantity are identified in Figure 3.6. Maximum stream width was estimated to have been reduced in artificially confined reaches, and reach length was estimated to have been decreased in the confined reaches, thus explaining the high importance that EDT placed on key habitat quantity. The accuracy of the assumptions about presettlement length and width are open to question.

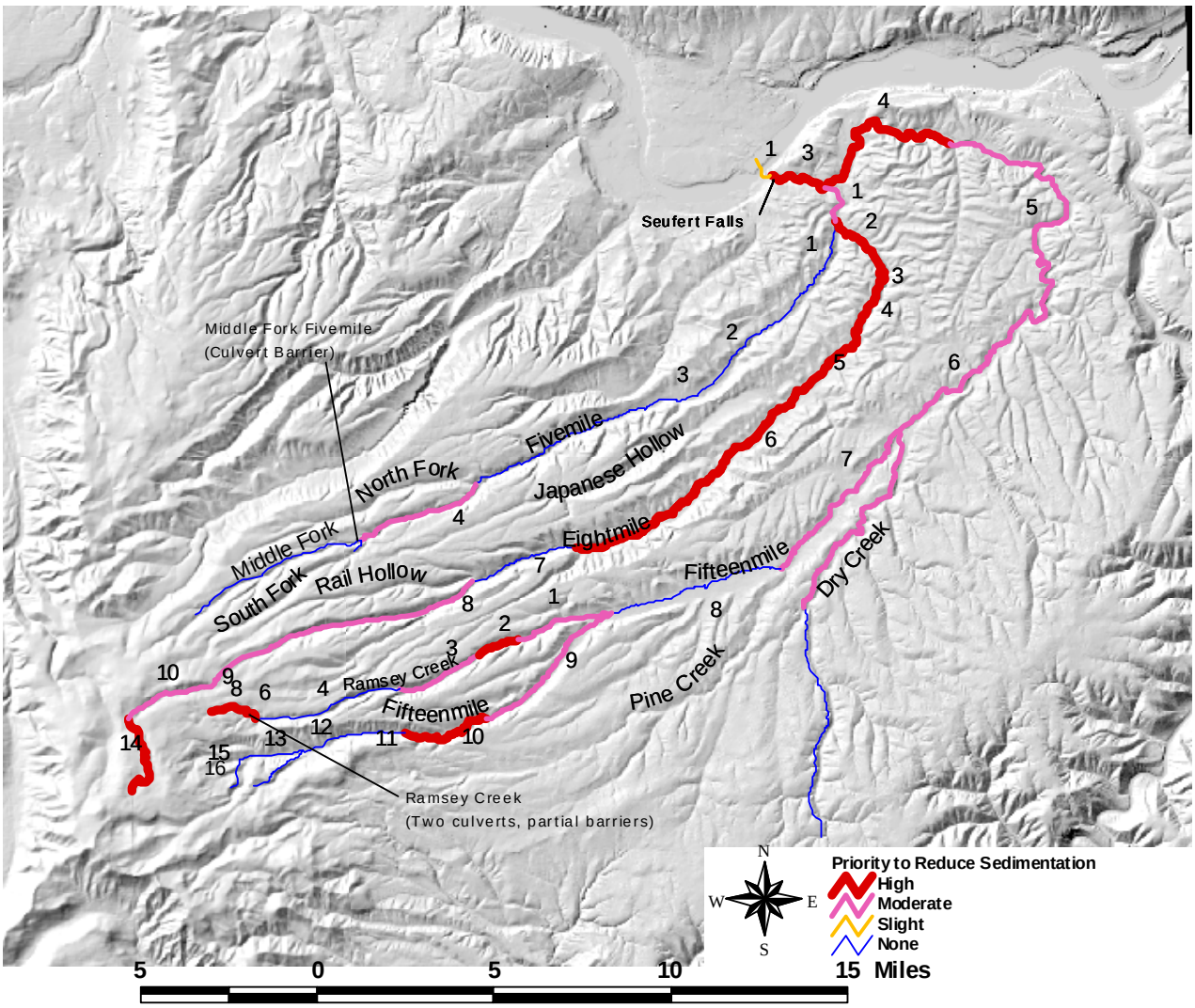
Figure 3.7. Priority Reaches to Restore Key Habitat Quantity (EDT, May 2004)



Sediment

Fine sediments (particles of silt, clay and organic material less than 1mm in diameter), when present in high levels, can clog spawning gravels and smother eggs. Sand (particles from 1-6mm in diameter) can also reduce spawning success when present in high enough quantities. Fifteenmile Creek and Eightmile Creek are listed for sediment on the 2002 Oregon State 303(d) list of Water Quality Limited Waterbodies. Priority reaches for reducing sedimentation of spawning beds, as rated by EDT, are shown in Figure 3.8.

Figure 3.8. Priority Reaches in which to Reduce Sedimentation of Spawning Beds (EDT, May 2004)



Sediments enter the Fifteenmile through both natural and anthropogenic causes. The most widespread natural cause is The Dalles Formation, a highly erodible layer of pyroclastic sandstone located between the less erodible and more common basaltic lava flows that make up the geologic landscape of Fifteenmile Watershed.

Three primary sources of anthropogenic sediment exist in the watershed:

- Approximately 100,000 acres are used for production of cereal grains without irrigation. Many of these lands are located on steep slopes and are considered highly erodible by the US Department of Agriculture. Under the tillage techniques common in the watershed prior to the 1990's, erosion rates commonly exceeded 50 tons per acre on the most erodible soil types. Since the passage of the 1985 Farm Bill, the adoption of first minimum till and later direct-seed practices has reduced these erosion levels. However, in cases where land is kept

clear of vegetation through the winter, erosion rates can still be above sustainable levels. Sediment delivery to the streams is highest where such fields are located adjacent to streams.

- Roads can be a significant source of sediment when poorly maintained or designed, when placed near a stream, or on steep slopes. The highest densities of roads within riparian areas are on the private lands of Mosier Creek, Fivemile, Eightmile, and Lower Fifteenmile, all of which have more than a half mile of road per mile of stream within 200 feet of the stream. The Mount Hood National Forest has an active program of road closures to deal with the high density of logging roads in prior timber sale areas.

- Eroding streambanks deliver 100% of their sediment to the stream. Streambank erosion may be natural or may be caused by removal of riparian vegetation, stream channel manipulation, or other human activities.

Confidence in the Data: Aquatic Inventory Project (AIP) data did not support the rating of sediment as a high priority for restoration. When EDT was run based solely on AIP habitat survey data, sediment was a minor factor in steelhead mortality. However, this result did not agree with local experience. Local fish biologists uniformly believe that Fifteenmile Watershed is more highly impacted by fine sediment than any steelhead system other than the Umatilla River system (Fifteenmile Coordinating Group, April 16th, 2004).

AIP surveys used "ocular estimates" of sediment, a highly subjective method that tends to overestimate larger substrates, such as gravel and cobble which are easier to see. In year 2000, the Forest Service conducted Wolman Pebble Counts at 28 sites throughout Fifteenmile, Eightmile, Fivemile and Ramsey Creeks. Dry Creek was not tested, nor were the forks of Fivemile. Wolman pebble counts are more objective than ocular estimates, but also tend to be biased toward larger substrates. The Forest Service data showed that sediment of less than 6mm in size constituted more than 30% of the substrate at 10 sites. When EDT was run again using this new data, sediment and habitat diversity tied as the greatest restoration priority in Fifteenmile Watershed. This sensitivity of the model demonstrates the need for further pebble counts to pinpoint the distribution of this problem.

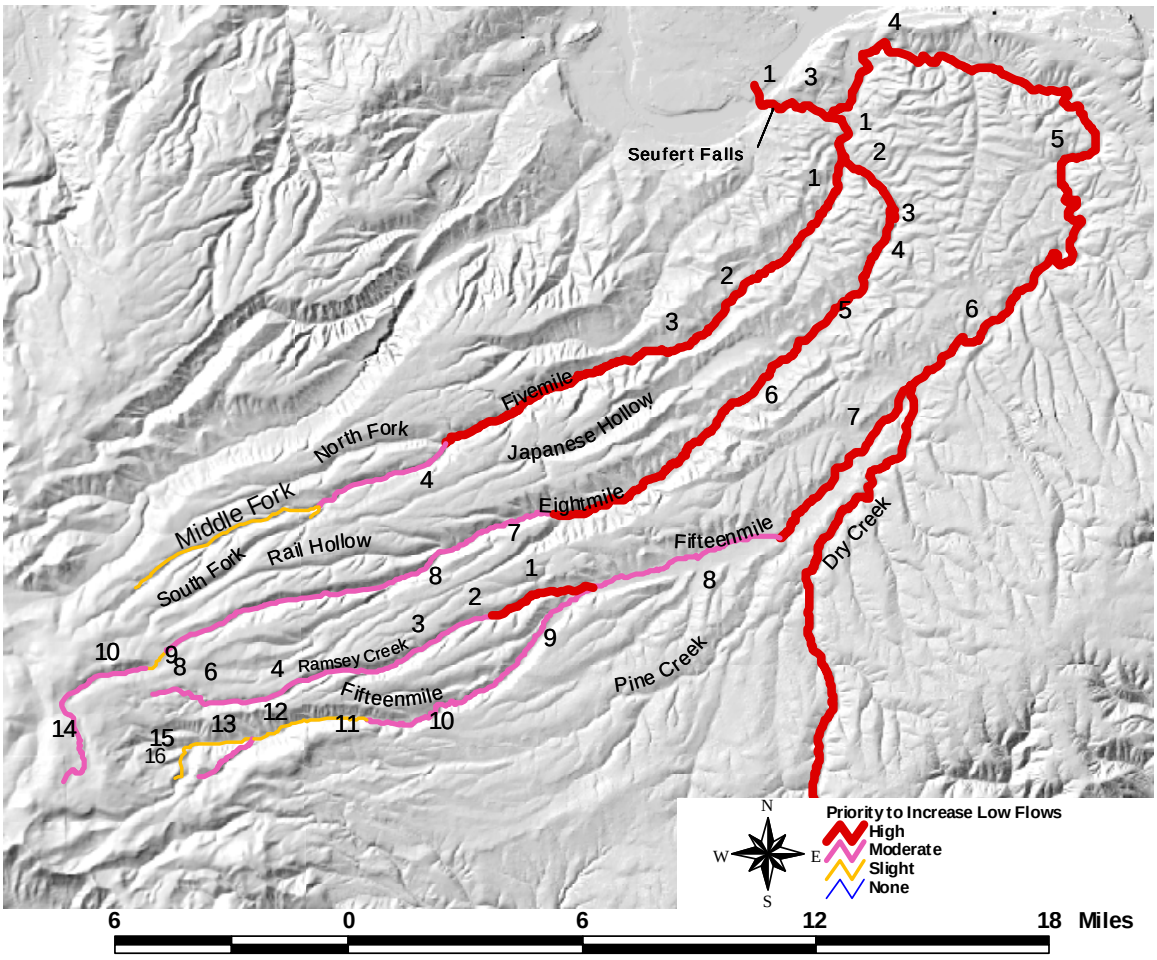
Low Flow

According to EDT, both high flows and low flows reduce steelhead populations in every reach (Figures 3.9 and 3.10). Fifteenmile Watershed naturally experiences extreme annual fluctuation in flow levels which are only made more intense by irrigation withdrawals and human-caused changes in the runoff characteristics of the watershed. In the absence of any withdrawals, average monthly flow at the mouth of Fifteenmile Creek

varies from 197 cfs in March to 10.7 cfs in August .[125] After irrigation withdrawals, the figure in August is 3.45 cfs.

Low flows affect active summer rearing for 0-2 age juvenile steelhead. The priority to restore low flows ranged from **low** to **high**, with the priority increasing downstream. Restoration of low flows is a high priority in the lower reaches of Eightmile and Fivemile, in Fifteenmile from the mouth upstream to Dufur, in Ramsey Creek from the mouth to the Olsen Diversion and in Dry Creek. Low flows had only a moderately negative effect in Fifteenmile Creek upstream of the National Forest boundary.

Figure 3.9. Priority Reaches in which to Increase Low Flows (EDT, May 2004)



Low flows can be restored primarily by reduction of irrigation withdrawals, either through efficiency projects, water rights transfers or reduction in irrigated acreage. Low flows are also addressed by actions that address the hydrologic behavior (i.e. upland

[125] 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.

runoff) of the watershed, such as continued adoption of no-till farming and floodplain restoration.

Confidence in the Data: Flow data came from Oregon Water Resources Department (OWRD) hydrologic modeling. The data was specific for each tributary and each month, and was calibrated to stream gage on measurements, to the extent that measurements had been taken. Stream flow data has been collected at seven places in Fifteenmile Watershed, at various times and for various periods of time from 1918 to 1984. The most recent data was collected on Fifteenmile Creek at Rice, where a stream gage was in operation from 1946 to 1953 and again from 1970 to 1984. All other sites were in operation for less than five years.[126] OWRD models flows both prior to water withdrawals and flows after water withdrawals. These figures were used for presettlement and current conditions. Thus, the presettlement figures represent the modeled flows if there were no water withdrawals. The presettlement figures do not take into account any runoff changes.

Peak Flow

The frequency and magnitude of peak flows have been increased in Fifteenmile by changes in soil and vegetation characteristics of the uplands, and increases in road surfaces. Fifteenmile Watershed has experienced an increase of up to 650% in peak flows since the 1850's.[127] This effect is believed to have been most marked in the 1950's, when cropland had expanded to its maximum extent, and conservation tillage had not yet been adopted. Figure 3.10 identifies the priority reaches, by EDT ratings, in which to decrease peak flows.

Impervious surfaces, such as paved or compacted roads, rooftops, and parking lots, increase peak flows. The watershed assessments conducted by Wasco County SWCD for Fifteenmile, The Dalles and Mosier Watershed Councils all analyzed road density and road placement through aerial photo interpretation. Road densities were analyzed separately for each tributary watershed and for each land use. Road densities were highest in the urban areas, where impervious surface areas can greatly increase runoff and can collect pollutants from paved surfaces, including motor oil, radiator fluid and home pesticides and chemicals. Outside of urban areas, the highest road densities were found in the rural residential areas of the Mosier Valley (22 miles per square mile over a total area of 0.87 square miles).[128] At this density, roads have a high potential to increase runoff levels due to the amount of compacted or paved surfaces. Whether these roads are also a sediment source depends on their placement, maintenance and design (see *Sediment*, above).

Effects of forestry practices and road building may have been greatest in the 1980's, when harvest levels were highest, and the majority of forest roads had been completed.

[126] Oregon Water Resources Department website 2004, http://www.wrd.state.or.us/.
[127] Wasco Co. SWCD, 2003a
[128] Wasco Co. SWCD. 2002.

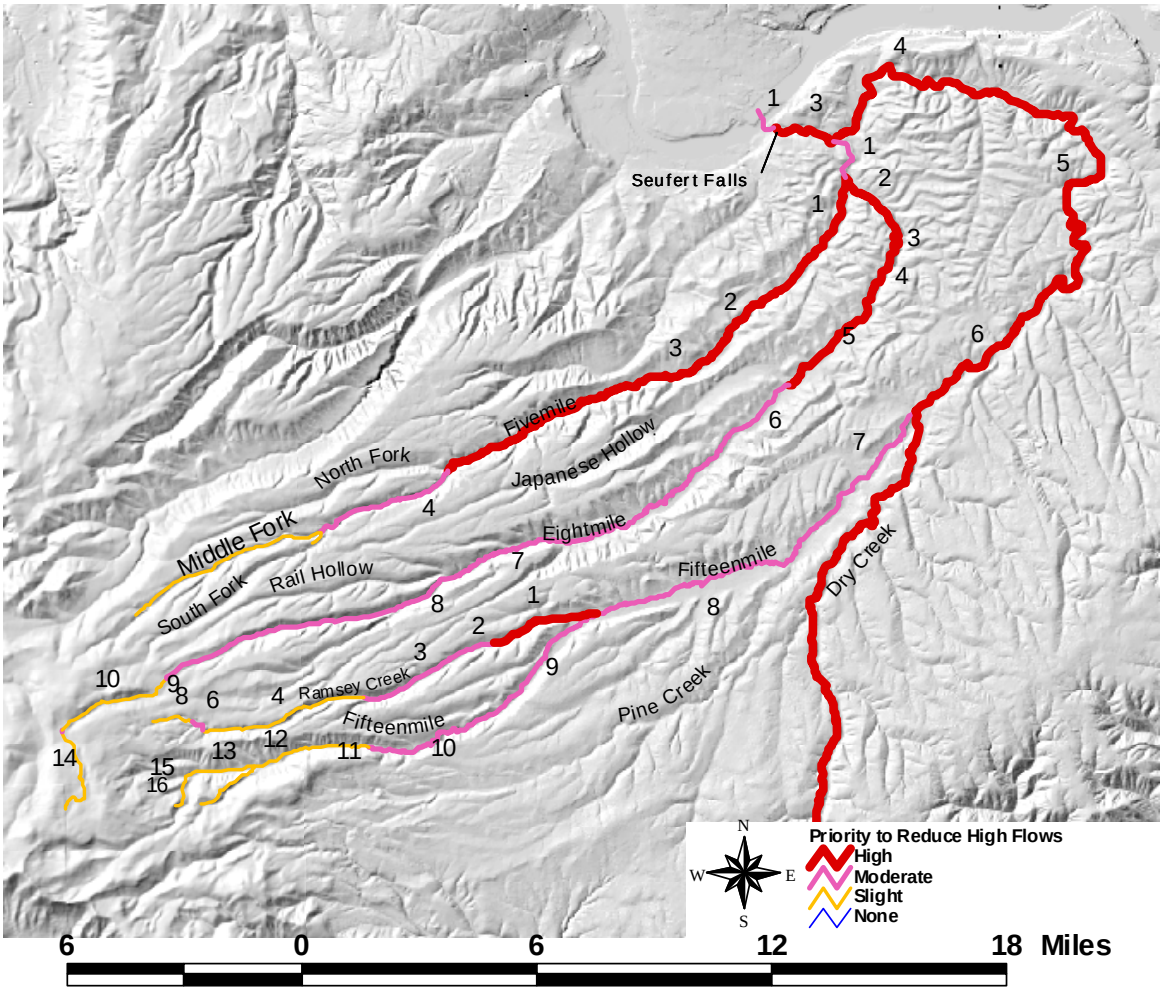
The power of peak flows have been exaggerated further by stream channel straightening and loss of floodplain function.

Today, after the adoption of minimum till, partial adoption of no-till and various forest road closures, peak flows in lower Fifteenmile Creek are modeled to be reduced 50% from the historic high in the 1950's, but remain 350% higher than in the 1850's.[129]

Because peak flows occur primarily in winter and spring, exaggerated peak flows affect egg incubation, fry colonization and overwintering juveniles. Moderation of peak flows is a **high** priority in the lower watershed.

The destructive energy of peak flows can be moderated by reducing upland runoff, reducing impervious surfaces, increasing vegetative cover, and restoring floodplain function and meanders. Methods include continued adoption of no-till farming, closure of forest roads and restoration of the length and complexity of the stream channel.

Figure 3.10. Priority Reaches in which to Decrease Peak Flows (EDT, May 2004)



[129] Wasco Co. SWCD 2003a

Confidence in the Data: The source of the ratings for peak flows was the same Water Resources Department models used as source for low flows. In addition, EDT looks at the change in intra-annual flows, described as the "flashiness" of the system. The Fifteenmile Watershed Assessment used USDA hydrologic models to document this increase in runoff levels[130]. Because of the well-documented changes in the upland hydrology due to tillage and the extensive channelization throughout Fifteenmile, this parameter was rated as a high concern throughout the watershed, and highest in the lower reaches. This parameter particularly affects spawning and egg incubation.

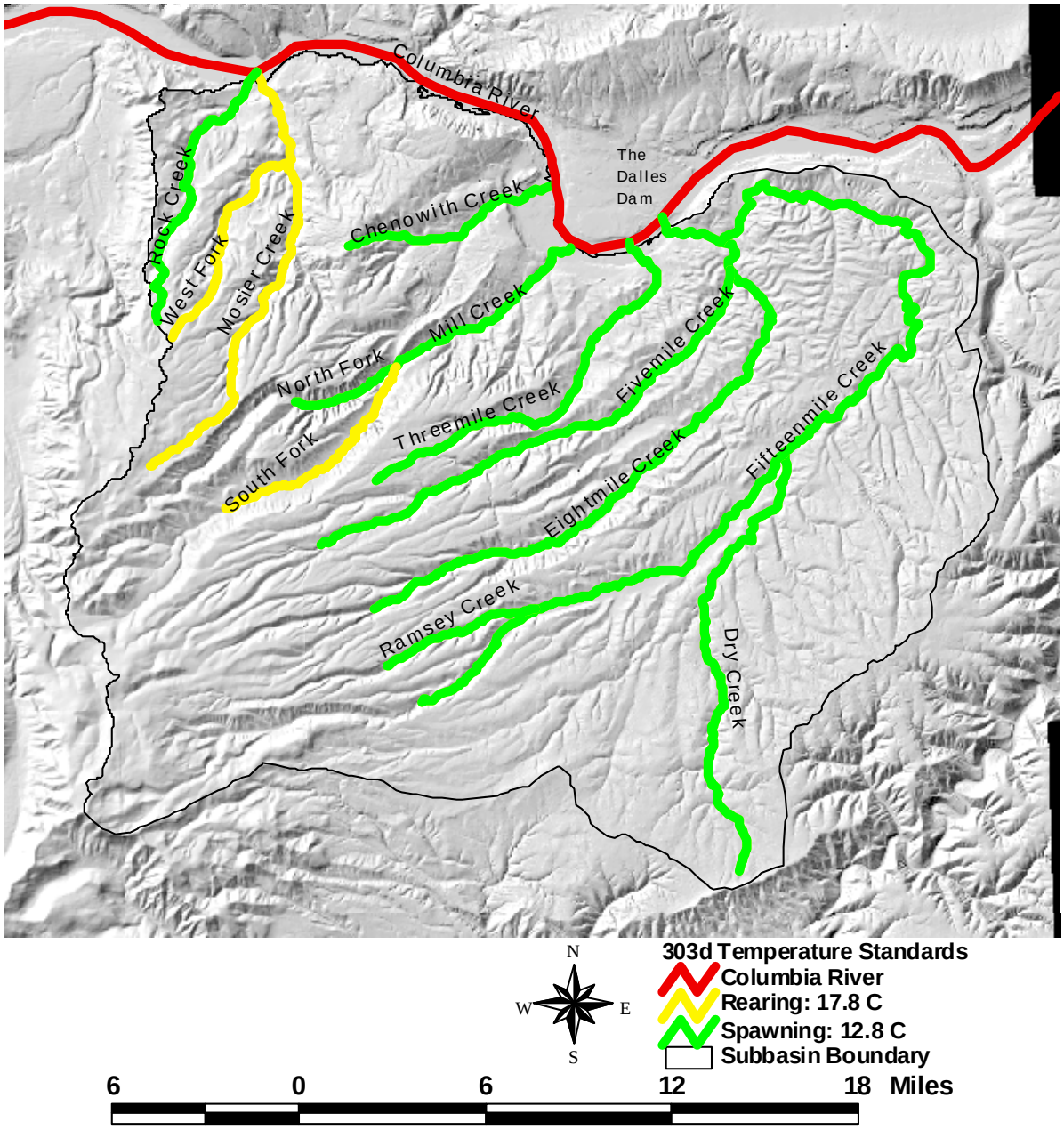
Water Temperature

Optimum temperatures for steelhead vary with lifestage. Oregon Department of Environmental Quality has recently set new temperature criteria based on biological requirements of salmonids. During spawning periods, DEQ calls for water temperatures not to exceed 13C (55.4F). During rearing and migration periods (i.e. summer), the water temperature should not exceed 18C (64.4F). Certain streams are considered core cold-water habitat areas, and are held to a temperature standard of no more than 16C (60.8F). at any time of year.

All of these standards apply to the portion of Fifteenmile Watershed in which steelhead occur (Figure 3.11). Water temperatures in parts of Fifteenmile Watershed exceed the cold water standard and the rearing standard and are believed to exceed the spawning standard as well, although most temperature monitoring has concentrated on the summer rearing period. Fifteenmile Creek and Eightmile Creek are listed for temperature on the 2002 Oregon State 303(d) list of Water Quality Limited Waterbodies.

[130] Wasco Co. SWCD 2003a

Figure 3.11. Oregon State Water Temperature Criteria exceeded in the Fifteenmile Subbasin and nearby Columbia River (303(d) List, 2002).



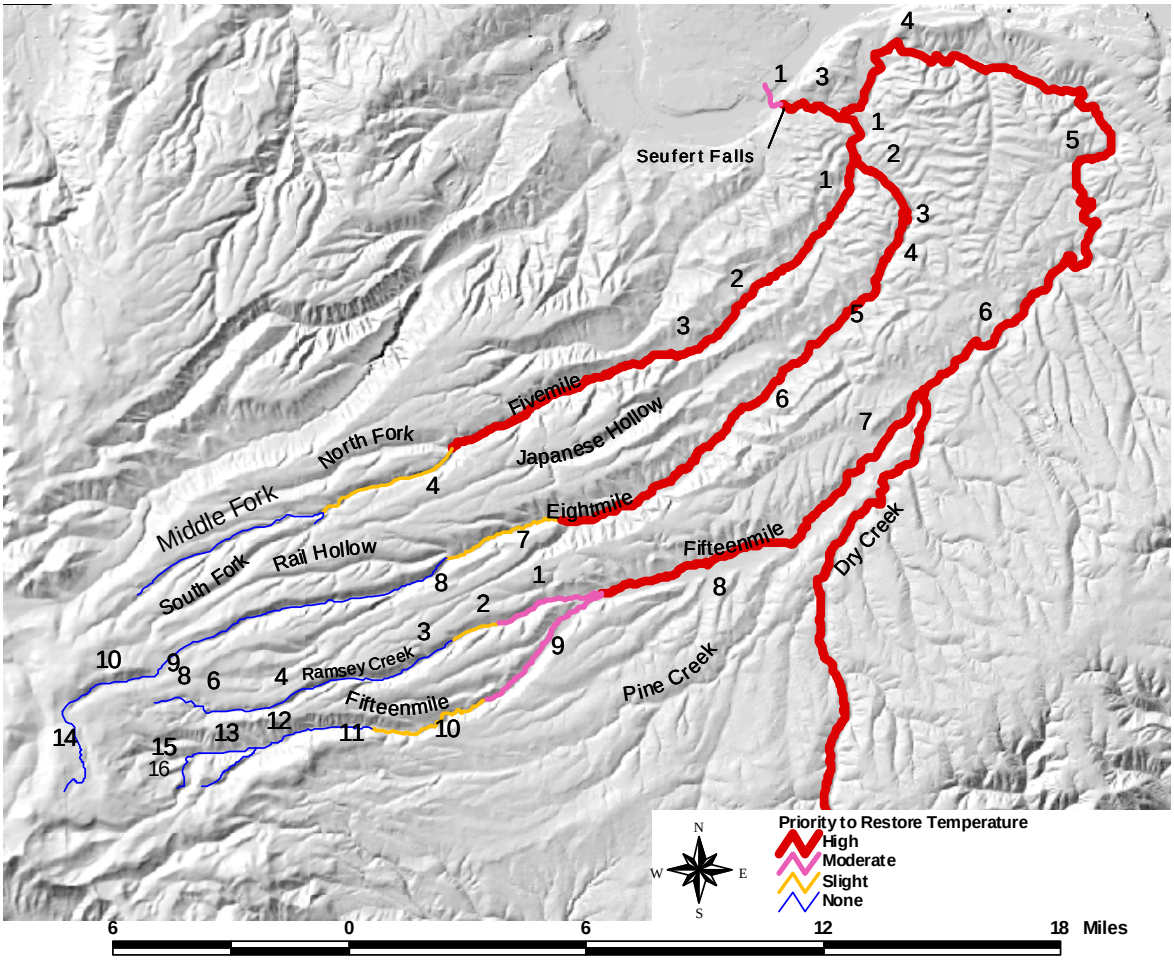
High water temperatures negatively affected spawning, egg incubation, fry colonization and rearing of all age classes. The priority to restore temperature varied from **low** to **high**, with the priority being higher in the lower watershed (Figure 3.12).

Priority reaches in which to reduce summer water temperatures corresponded closely with the priority reaches to restore low flows. Specifically, temperature restoration is a high priority in Fifteenmile Creek from Seufert Falls to Ramsey Creek, in Eightmile Creek from the mouth to the Wolf Run diversion, in Fivemile Creek from the mouth to

North Fork, in Ramsey Creek from the mouth to Olsen diversion, and in Dry Creek throughout the stream.

Water temperature is a function of flows, shade, climate and groundwater interactions, among other factors. Radiative and conductive heat exchange is proportional to the air-water surface area of the stream. At the same time, conductive heat exchange at the water-soil interface tends to moderate stream temperatures. Activities that reduce the width-to-depth ratio of the streams will reduce air-water surface and increase soil-water surface area, thereby moderating stream temperature. Activities that restore low flows, such as reduction of irrigation withdrawals, riparian buffer plantings, and improvements in upland hydrology, will all yield a corresponding reduction in summer water temperatures. Secondarily, activities that increase riparian shade will help keep temperatures low. Most activities that improve floodplain function, such as riparian buffers, will also improve shade.

Figure 3.12. Priority Reaches in which to Reduce Summer Water Temperature (EDT, May 2004)



Confidence in the Data: Water temperature has been extensively monitored in the Fifteenmile Watershed. Water temperatures have been monitored continuously for many years by Wasco County Soil and Water Conservation District, Oregon Department of Fish and Wildlife and the Forest Service in every fish-bearing tributary at multiple locations. ODFW and Forest Service records go back more than fifteen years. In addition, Wasco County SWCD and the Oregon Department of Environmental Quality contracted for an aerial infrared survey of surface temperatures in August 2002.[131] This study provided a greater understanding of geographic temperature patterns and influences.

Channel Stability

Channel stability, as used in the EDT model, refers to "the effect of 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."[132] Channel stability does not refer to immobility of the channel.

A stream would be rated down for erosion or movement beyond natural levels. It would also be rated down for erosion or movement significantly below natural levels, as in a diked stream or one constricted by road construction. A stream might be rated down for channel stability either for eroding sideways or for cutting downward.

Channel stability had a **slight** to **high** effect on egg incubation, fry colonization, rearing and overwintering. Channel stability was a negative factor in all reaches with the exception of Fifteenmile 14, which is on the Forest from Cedar Creek to Deadman Gulch (Figure 3.13).

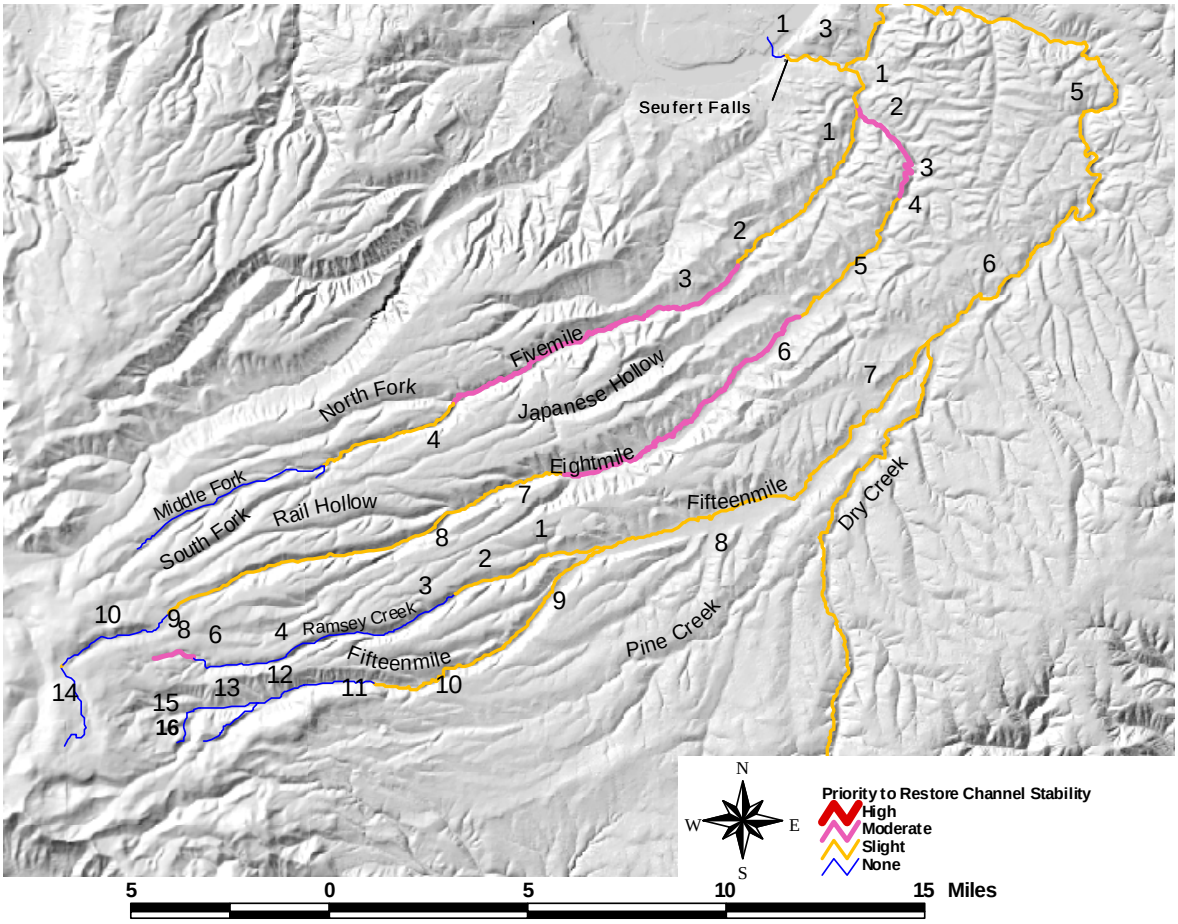
The priority to restore channel stability was **low to moderate** on private lands and gradually reduced upstream of the Forest boundary.

Channel stability can be addressed by activities that address floodplain health, such as riparian buffers and large woody debris placements, and by activities that correct peak flows, such as continued adoption of no-till farming practices. In extreme cases, where floodplain restoration is not an option, bank stabilization through bioengineering would be an option.

[131] Watershed Sciences, LLC. 2003

[132] Information Structure of EDT. Mobrand Biometrics Inc. October 2003.

Figure 3.13. Priority Reaches in which to Restore Channel Stability (EDT, May 2004)



T

Confidence in the Data: EDT bases its description of channel stability primarily on a rating of depth of bed scour during peak flow events.[133] Bed scour refers to the movement of streambed substrate. The Fifteenmile Coordinating Group did not have any data on bed scour. Ratings were based on consultation with Mark Kreiter, Forest Service Hydrologist. The Shear-Stress Equation (62.4 x depth (ft) x slope) was applied to reaches to determine the size of substrate particle movement. This was then converted into a bed scour rating, despite the fact that it does not directly measure the parameter (depth of bed scour) that the EDT model requires. Therefore, confidence in the accuracy of these ratings is low.

Other Environmental Factors

Several other environmental factors are notable in the Fifteenmile Subbasin.

[133] Information Structure of EDT. Mobrand Biometrics Inc. October 2003.

Food is modeled in EDT as a function primarily of alkalinity, with benthic invertebrates and salmonid carcasses as modifying factors.[134] Scarcity of food negatively affects rearing and overwintering in some reaches. In all cases, the priority to restore food is **low**. Activities that lead to improvements in the other key environmental correlates will theoretically lead to improvements in water quality and quantity and increases in fish populations. This would increase salmonid carcasses, which would increase benthic invertebrates.

Dissolved oxygen was a **low** to **medium** priority for restoration in Fifteenmile Creek from the mouth to the City of Dufur. Data on dissolved oxygen is lacking. The attribute was rated in EDT based on the mean monthly water temperature and nutrient enrichment ratings. Data for nutrient enrichment was also lacking. Ratings for nutrient enrichment assumed that areas of the stream with higher temperature and turbidity would likely suffer from algal growth. Because of the uncertainty in these assumptions, little confidence should be assigned to the priority ratings output by EDT for dissolved oxygen.

Harassment refers to the amount of activity on the water's edge that might disturb fish and cause them to abandon an area or key habitat. Harassment exerted a **low** to **medium** effect throughout the private lands of the Fifteenmile Watershed. Harassment ratings were based on the proximity of the stream to roads, road crossings or other human activity centers.

Five culvert barriers were recognized by EDT. In reality, a number of partial barriers may exist throughout the watershed. In March 2004, Forest Service personnel audited a culvert on Eightmile Creek at the request of Wasco County SWCD. The culvert, located at approximately RM9, was found to be a barrier to adult migration at some flows and likely a complete juvenile barrier. As spawning has been consistently documented above that point, the culvert is clearly not a complete barrier. Yet, the finding underlines the possibility that partial barriers may limit the success of steelhead spawning and reduce juvenile survival in some years.

Where human intervention can or cannot have a beneficial effect

Potential Activities

Following description of the current and assumed presettlement conditions of the Fifteenmile watershed, EDT can generate scenarios that model the results of various restoration activities or degradation events. Five restoration activities were modeled using the EDT Scenario Builder.

The first scenario modeled the effect of a 100% restoration of all habitat parameters in Fifteenmile Watershed, together with removal of all culvert barriers. This would model the effect of restoring Fifteenmile Watershed to a presettlement condition, while leaving the rest of the Columbia Basin in its current condition. This scenario, while impossible to

[134] Information Structure of EDT. Mobrand Biometrics Inc. October 2003.

achieve, was important to model, in order to determine the range of possible outcomes of any **possible** and **feasible** in-subbasin habitat restoration alternatives. It served to separate the in-basin effects from the out-of-subbasin effects. In this scenario, EDT predicted a 245% increase in adults and a 218% increase in juveniles above current levels (Table 3.12 and 3.13). This represents an adult population that is 29% less than the modeled presettlement population.[135]

The US Forest Service is currently in the process of implementing a stream and floodplain recovery effort focusing on the Fifteenmile Reaches 10 and 11. These are the reaches between Orchard Ridge Ditch and the Dufur Intake. Identified issues in these reaches include lack of large woody debris, loss of floodplain function, and the potential for the stream to undercut the Orchard Ridge Ditch, releasing a plume of sediment that would travel downstream at least to the Dufur Reservoir. The proposed project would place logs and boulders both instream and in the floodplain in order to recover instream structure and floodplain function, and also would redirect the energy of the stream away from the endangered part of the Orchard Ridge Ditch. This project is known as Fifteenmile Riverkeeper.

To model the effect of the Fifteenmile Riverkeeper Project, two scenarios were run. One modeled the beneficial effects of the restoration activities. The recovery scenario assumed 100% recovery of floodplain function, riparian function and large wood in reaches Fifteenmile 9 to 11. The Fifteenmile Riverkeeper Project results in an increase of 6% in both returning adults and smolts (Table 3.12 and 3.13).

The other Riverkeeper scenario modeled the effects of allowing the Orchard Ridge Ditch to be undercut. The degradation scenario assumed 100% degradation of sediment, embeddedness and turbidity in Fifteenmile 9, 10 and 11, from the ditch to Ramsey Creek. At the same time, it assumed 90% restoration of low flows and stream high temperature, as the diversion would become inoperative. If the Orchard Ridge Ditch fails, the result is a 6-7% decrease in adults and smolts. The positive effect of restored flows almost cancels out the negative effect of sediment delivery from the damaged ditch.

Five culverts are considered to be total barriers to adult steelhead migration: one on Middle Fork Fivemile, two at Eightmile Campground, and two on Ramsey Creek, on the National Forest. Removing these barriers resulted in an 8% increase in adult spawners and 1% increase in smolt production (Table 3.12 and 3.13).

To model the effect of converting all crop fields to no-till, a scenario was run featuring a 40% recovery of High Flows, 50% recovery of Intra-annual Flow Variation, and a 10% recovery of Low Flows compared to the current condition. This effect was applied to all reaches on private land. This action led to an increase of 13% in returning adults and 11% in smolt production (Table 3.12 and 3.13).

[135] Until 5/29/04, EDT reported a "restored" out-of-subbasin condition for presettlement (template) winter steelhead, but not for coho or Chinook. Therefore, the presettlement (template) result reported here will not be comparable to coho or Chinook template results reported in other subbasins (Mobrand Biometrics, via e-mail, 5/5/04).

To determine the maximum effect of restoring low flows, a scenario was run in which low flows were restored to modeled presettlement condition. This scenario would require both elimination of water withdrawals, complete restoration of the presettlement vegetation and virtual elimination of roads. The scenario is not believed to be technically feasible or socially desirable, but was run simply to determine the maximum effect that could be achieved by low flow restoration. This scenario led to an increase of 122% in adults and 121% in smolts (Table 3.12 and 3.13).

A scenario was run to model the effect of placing large woody debris in the ten highest priority reaches identified by EDT. These reaches were Fifteenmile 4, 5, 7, 8, 9, Eightmile 6, 8, and Fivemile 1, 3, 4. This scenario increased the adult spawner population by 40% and increased juveniles by 32% (Table 3.12 and 3.13).

To model the effect of enrolling all reaches in wide riparian buffers and actively replanting native trees and shrubs, a scenario was run featuring a 100% recovery of riparian vegetation, 70% recovery of channel length and width, 80% recovery of wood, 40% recovery of stream temperature and 70% recovery of artificial confinement. These effects were applied to all reaches on private lands. This action led to an increase of 84% in returning adults and 78% in smolt production (Table 3.12 and 3.13).

To model the effects of implementing a suite of restoration actions, a scenario was run in which riparian buffers and no-till were implemented, large woody debris was placed, the Riverkeeper project was completed, all culvert barriers were fixed and water withdrawals were reduced by 50%. This scenario yields a 111% increase in spawners and 78% increase in smolts (Table 3.12 and 3.13).

Table 3.12. Results of Various Restoration Scenarios on Productivity and Abundance of Fifteenmile Winter Steelhead Adults (EDT 5/5/04).

Scenario	Life History Diversity	Productivity (Returns per spawner at low density)	Abundance: Percent of current (modeled by EDT)	Projected population range
Current	**34%**	**11.8**	**100%**	**127-1,077***
Modeled presettlement	**97%**	**41.3**	**346%**	**439-3,726** [a]
Orchard Ridge Ditch Failure	31%	12.2	93%	118-1,001 [a]
Riverkeeper Project	35%	13.4	106%	135-1,141 [a]
Fix all culvert barriers	38%	11.6	108%	137-1,163 [a]
Implement No-till on all cropland	42%	12.0	113%	144-1,217 [a]
Restore Low Flows	65%	11.4	122%	155-1,313 [a]
Strategic LWD Placements	48%	14.3	140%	178-1,507 [a]
Riparian buffers	88%	16.9	184%	234-1,982 [a]
All proposed actions (no-till, LWD, riparian buffers, Riverkeeper and reduce water withdrawals by 50%)	95%	22.2	211%	268-2,272 [a]
100% Habitat Restoration, all parameters, all reaches	**97%**	**29.1**	**245%**	**311-2,638** [a]

* See section 3.2.3.

[a] Current population estimates times percent increase modeled for this action.

Table 3.13. Results of Various Restoration Scenarios on Productivity and Abundance of Fifteenmile Winter Steelhead Juvenile Outmigrants (EDT 5/5/04).

Scenario	Productivity (Outmigrants per spawner at low density)	Abundance: Percent of Current	Projected population range
Current	**207**	**100%**	**4,559-10,504***
Modeled presettlement	**483**	**225%**	**10,256-23,634** [a]
Orchard Ridge Ditch failure	214	94%	4,285-9,874 [a]
Riverkeeper Project	232	106%	4,833-11,134 [a]
Fix all culvert barriers	201	101%	4,614-10,609 [a]
Implement No-till on all cropland	210	111%	5,042-11,659 [a]
Restore Low Flows	208	121%	5,532-12,710 [a]
Strategic LWD Placements	243	132%	6,032-13,865 [a]
Riparian buffers	281	164%	7,498-17,227 [a]
All proposed actions (no-till, LWD, riparian buffers, Riverkeeper and reduce water withdrawals by 50%)	366	178%	8,125-18,697 [a]
100% Habitat Restoration, all environmental parameters, all reaches	**477**	**218%**	**9,939-22,899** [a]

* See section 3.2.3.

[a] Current population estimates times percent increase modeled for this action.

Consistency of EDT Predictions

The staff of Mobrand Biometrics Inc. cautions that EDT is not a population model, but rather a habitat and restoration model. It should not be used to predict fish runs, but can be used to predict the response of the fish population to changes in habitat. This position is consistent with what was observed in the course of the Fifteenmile Subbasin Assessment.

In the process of the Fifteenmile Subbasin Assessment, EDT was run more than a dozen times with various modifications of habitat and population parameters intended to improve the description of the watershed and the steelhead run. Specific population predictions were relatively insensitive to minor variations of habitat parameters, but were very sensitive to changes in the juvenile age distribution and out-of-subbasin assumptions.

On the other hand, the relative value of restoration alternatives remained perfectly consistent throughout all model runs. While specific predictions of fish numbers changed, the ratio of the scenario abundance to the current abundance remained stable. For this reason, tables 3.12 and 3.13 describe scenario output as percentage change from current population, rather than as specific population numbers. This convention will be used throughout this document.

Furthermore, EDT consistently noted the same reaches as high priorities for restoration, regardless of how the habitat inputs were modified, although midlevel and low priorities would shift from one run to another.

3.4.2. The Dalles and Mosier Watersheds

Qualitative Habitat Analysis (QHA) was used to analyze all stream reaches for which there was insufficient data to run EDT. QHA was conducted on December 17th and 18th, 2003 by a team consisting of Rod French (Oregon Department of Fish and Wildlife), Gary Asbridge (US Forest Service), Steve Pribyl (ODFW), and Jennifer Clark (Wasco Co. Soil and Water Conservation District). Megan Prine (Wy'East Resource Conservation & Development) collected data.

All stream reaches in Threemile Creek, Mill Creek, Chenowith Creek, Mosier Creek and Rock Creek Watersheds were analyzed using QHA. In addition, QHA was used on several smaller tributaries in Fifteenmile Watershed for which not enough data existed to run EDT. The only reaches in Fifteenmile Watershed that were ranked using QHA were North Fork Fivemile, Japanese Hollow, Rail Hollow (tributary of Eightmile), Pine Creek, and Deadman Gulch.

Qualitative Habitat Analysis is not a model, but rather a procedure for ranking streams based on riparian condition, channel stability, habitat diversity, fine sediment, low flow, high flow, oxygen, low temperatures, high temperatures, pollutants, and obstructions. It is based on data, where available, as well as professional judgement. It can be applied to any species of fish, or even, with some adjustment, to more than one species. In this case, steelhead were used as focal species on reaches with potential for anadromy, and rainbow-type or cutthroat trout were considered the focal species in the nonanadromous reaches.

The output from QHA consisted of a ranking of restoration and protection priorities. Restoration priorities are based on the difference between the current condition and the assumed presettlement condition. Protection priorities are based on the difference between the current condition and complete degradation. Results are summarized and analyzed below. Complete results and notes regarding rationale are included in appendix X.

Steelhead Priorities in The Dalles and Mosier Areas

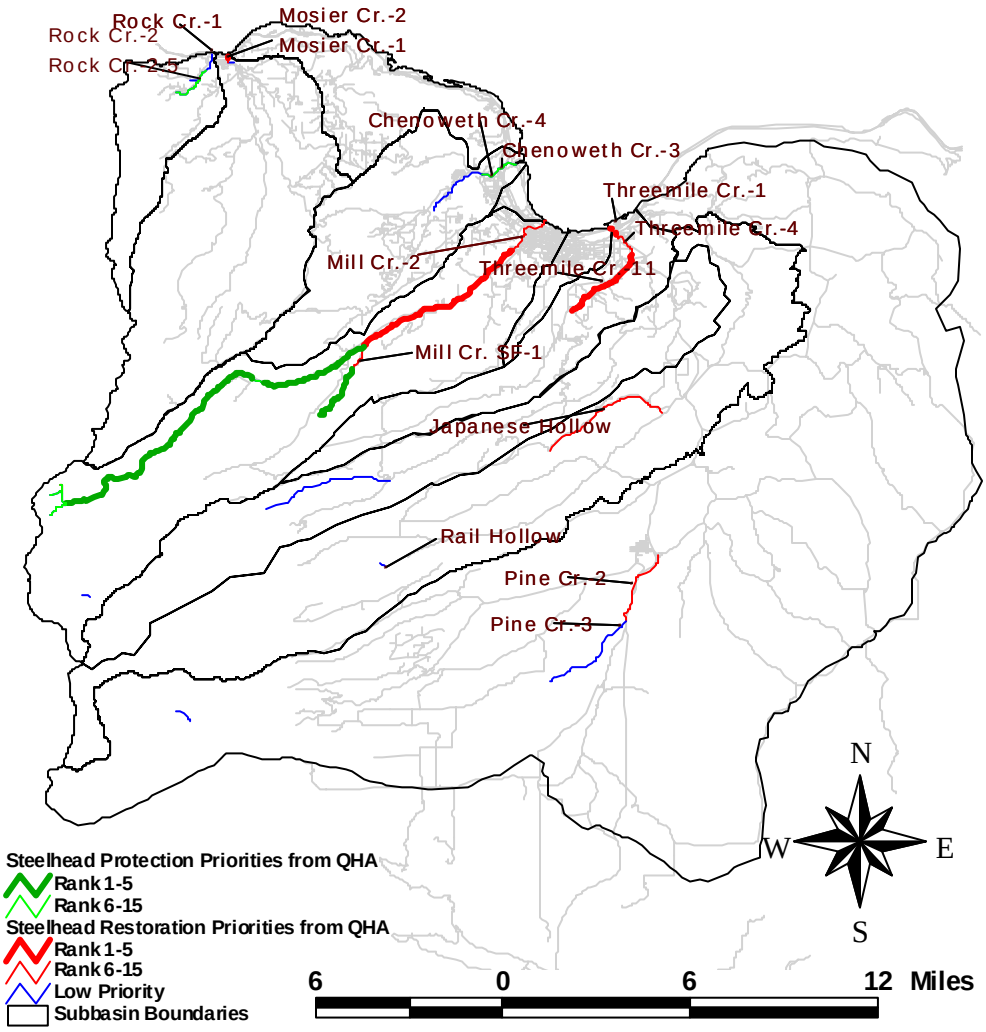
The highest priorities for restoration activities in reaches accessible by steelhead were in Threemile Creek and in Mill Creek downstream of the forks (Figure 3.14).

In particular, the reaches that run through orchard and pastureland have been degraded in terms of channel form, habitat diversity, summer flows and temperature, and agrichemical contamination. In both these streams, these reaches have the potential to be more productive steelhead spawning reaches. Orchards and pastures crowd the streams on both sides, and riparian vegetation is limited to a narrow strip. The stream is incised, and numerous manmade structures reduce fish passage in both streams. The reaches of Threemile and Mill Creek that run through urban habitat ranked lower for restoration priority, because they are considered primarily migration corridors, rather than spawning reaches.

In addition to the environmental factors noted above, Threemile Creek suffers from manmade fish passage barriers. Specifically, the culvert under Interstate 84 has been impassible at all life stages since 1996, if not earlier. Several other culverts upstream may be partial or complete barriers as well.

Other streams that appeared as relatively high priorities for restoration were Mosier Creek, Pine Creek, South Fork Mill Creek, and Japanese Hollow, in that order.

Figure 3.14. Restoration and protection opportunities in steelhead streams of the Fifteenmile Subbasin, as determined by Qualitative Habitat Analysis, December 18th to 19th, 2003.



The highest protection priorities were North Fork Mill Creek and South Fork Mill Creek, between the Wick's Water Treatment Plant and Mill Creek Falls. These streams are generally upstream of the majority of the population base. South Fork Mill Creek is managed for water quality by the City of The Dalles. The Forks are upstream of the majority of the population base. North Fork parallels Mill Creek Road, which comes very

close to the stream in some locations. South Fork Mill Creek also parallels a road, which is rarely used, due to its location within a restricted access area.

Other streams with relatively high protection values are Rock Creek and the lower portion of Chenowith Creek. Again, these streams received high protection values, because they were judged to be relatively unchanged from presettlement conditions in all environmental parameters.

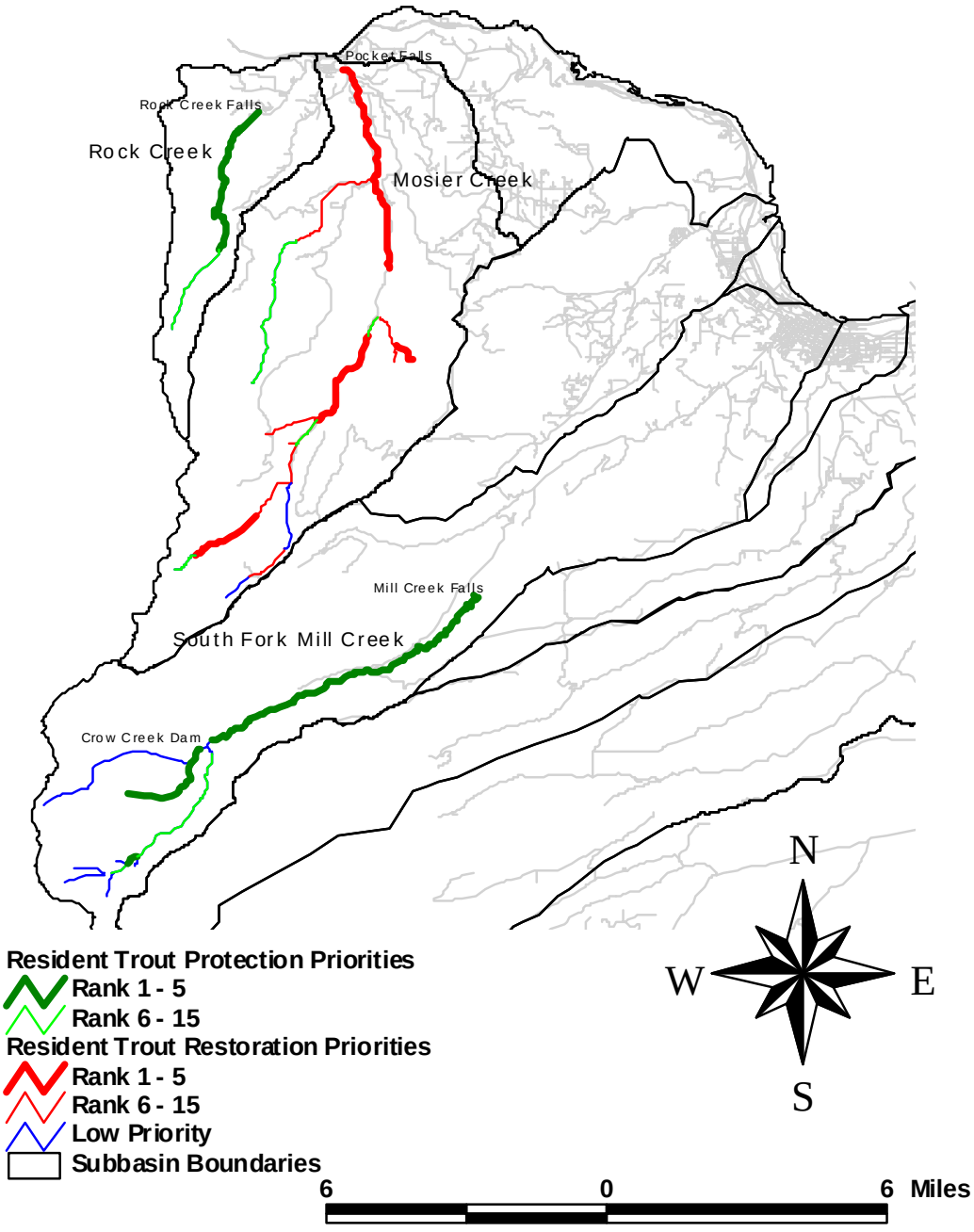
Resident Fish Priorities in The Dalles and Mosier Areas

South Fork Mill Creek, Mosier Creek and Rock Creek each have natural fish passage barriers that prevent the migration of steelhead. These creeks each have resident populations of cutthroat trout upstream of the passage barriers.

The highest priorities for restoration of resident fish reaches are all within the Mosier Creek Watershed (Figure 3.15), which has the highest human population density, and the most intensive land use. Key environmental factors affecting fish populations in Mosier Creek include changes in channel form, loss of habitat diversity, low summer flows and consequent high temperature, and potential agrichemical contamination. Data is lacking on chemical pollutants in Mosier Creek. Mosier Creek Road follows the stream for nearly its first eight miles, and riparian vegetation is interrupted by rural residential development. Groundwater overdraft has been shown to have an effect on stream flows, but that effect may vary in different parts of the stream corridor.

Rock Creek and South Fork Mill creeks are high priorities for protection. Rock Creek is sparsely populated and heavily forested. South Fork Mill Creek upstream of Mill Creek Falls is entirely unpopulated and heavily forested. The watershed is managed by the Forest Service and City of The Dalles to maximize water quality.

Figure 3.15. Restoration and protection opportunities in streams of the Fifteenmile Subbasin with Resident Fish Populations (Qualitative Habitat Analysis, 12/18&19/03).



3.4.3. Major Data Gaps

Water Quality and Habitat

Bed scour has never been collected in the Subbasin.

Alkalinity has never been collected in the Subbasin.

Pesticides have been measured in Mill Creek for two years. Malathion and chlorpyrifos were found to exceed state standards. A single sample was collected in 2003 from Threemile Creek and one from Fifteenmile Creek. Malathion was found in both samples. Further testing is needed in all creeks.

Dissolved oxygen has not been directly measured in the Subbasin.

Habitat inventories have not been conducted in the streams outside of Fifteenmile Watershed.

Sediment and embeddedness have been studied in Fifteenmile Watershed by ocular estimate through the Aquatic Inventory Project. More accurate measurements (pebble counts) were collected at 29 sites in 2000. None of these measurements included Dry Creek or the forks of Fivemile. Limited pebble counts have been collected in Mosier Creek and Chenowith Creek, but not in Mill Creek or Threemile.

Lamprey

Nothing is known about the population status of lamprey in the Fifteenmile Subbasin, except that the Tribal fishery at Seufert Falls is still active. It is not known whether lamprey migrate into Threemile, Mill, Chenowith or Mosier creeks.

elhead

No counts exist of returning adult steelhead to Fifteenmile Watershed. Juvenile counts exist for only three years.

In the other creeks within the subbasin, there are no fish counts, no juvenile counts and - no redd counts with the exception of two years of redd counts on North Fork Mill Creek on the National Forest. Habitat inventories are lacking on private lands.

Five culvert barriers were recognized by EDT. In reality, a number of partial barriers may exist throughout the watershed. In March 2004, Forest Service personnel audited a culvert on Eightmile Creek at the request of Wasco County SWCD. The culvert, located at approximately RM9, was found to be a barrier to adult migration at some flows and likely a complete juvenile barrier. As spawning has been consistently documented above that point, the culvert is clearly not a complete barrier. Yet, the finding underlines the possibility that partial barriers may limit the success of steelhead spawning in some years.

Cutthroat and Rainbow-type Trout

Population estimates and trends are lacking for these species in this subbasin, though electroshock measurements have been conducted from time to time.

3.5. Terrestrial Focal Species and Habitats

3.5.1. Wildlife Focal Species Selection, Population Delineation and Characterization

The wildlife assessment will describe the species' life histories, historic and current distributions, threat to the species, limiting factors, and relationships to salmonid fish.

ODF&W biologists Scott Ziegenhagen and Keith Kohl and US Forest Service biologist Rich Thurman began with a preliminary list of 47 species (Table 3.14) created from the Deschutes Subbasin all-species list (250 species). The preliminary list of 47 species was based on the Oregon State Sensitive species list, US Forest Service Region 6 sensitive species list, game animals, Partners in Flight[136] list (Table 3.15), Threatened and Endangered Species–Federal (Table 3.16) and State lists, known or suspected to occur in the Fifteenmile Subbasin.

[136] Partners In Flight is a cooperative effort involving partnerships among federal, state and local government agencies, philanthropic foundations, professional organizations, conservation groups, industry, the academic community, and private individuals. Partners In Flight was launched in 1990 in response to concerns about declines in the populations of many land bird species, and in order to emphasize the conservation of birds not covered by existing conservation initiatives. The initial focus was on neotropical migrants, species that breed in the Nearctic (North America) and winter in the Neotropics (Central and South America), but the focus has spread to include most landbirds and other species requiring terrestrial habitats. Further information is available at http://www.partnersinflight.org.

Table 3.14. Preliminary Wildlife Focal Species for Fifteenmile Subbasin

SPP ID	Common Name	State and Federal Status
20200	Oregon Slender Salamander	State Sensitive –Forest Service Region 6 sensitive
20030	Long-toed Salamander	Critical function link species
20040	Cope's Giant Salamander	State Sensitive –Forest Service Region 6 sensitive
20220	Tailed Frog	State Sensitive – V
20280	Cascades Frog	State Sensitive – V
20320	Northern Leopard Frog	State Sensitive – C
30020	Painted Turtle	State Sensitive – C, Forest Service Region 6 –sensitive
30030	Western Pond Turtle	State Sensitive – C, Forest Service Region 6 – sensitive
41000	Bald Eagle	Federally Threatened, State Threatened
41040	Northern Goshawk	State Sensitive – C
41150	Peregrine Falcon	SE, Forest Service Region 6 – sensitive
41240	Blue Grouse	Game, Partners In Flight
41270	Mountain Quail	Game, State Sensitive – US
42450	Flammulated Owl	State Sensitive – C
42500	Northern Pygmy-owl	State Sensitive – C
42520	Spotted Owl	Federally Threatened, State Threatened
42720	Lewis's Woodpecker	State Sensitive – C, Partners In Flight
42740	Williamson's Sapsucker	State Sensitive – US, Partners In Flight
42810	White-headed Woodpecker	State Sensitive – C, Partners In Flight
42830	Black-backed Woodpecker	State Sensitive – C, Partners In Flight
42850	Pileated Woodpecker	State Sensitive – V
42860	Olive-sided Flycatcher	State Sensitive – V, Partners In Flight
43000	Ash-throated Flycatcher	Partners In Flight
43060	Loggerhead Shrike	State Sensitive – V, Partners In Flight
43220	Clark's Nutcracker	Partners In Flight
43330	Bank Swallow	State Sensitive – US
43450	Pygmy Nuthatch	State Sensitive – V, Partners In Flight
43460	Brown Creeper	Partners In Flight
43580	Western Bluebird	Partners In Flight
43640	Hermit Thrush	Partners In Flight
43710	Sage Thrasher	Partners In Flight
43880	Nashville Warbler	Partners In Flight
44320	Brewer's Sparrow	Partners In Flight
50190	Western Small-footed Myotis	State Sensitive – US
50200	Yuma Myotis	State Sensitive – US
50220	Long-legged Myotis	State Sensitive – US
50230	Fringed Myotis	State Sensitive – V
50250	Long-eared Myotis	State Sensitive – US
50260	Silver-haired Bat	State Sensitive – US
50320	Pallid Bat	State Sensitive – V
50410	White-tailed Jackrabbit	State Sensitive – US
50660	Western Gray Squirrel	State Sensitive – US, Game
50810	American Beaver	Fur bearer, Critical function link species
51240	Fisher	State Sensitive – C
51280	Wolverine	State Threatened, Forest Service Region 6 – sensitive
51395	Rocky Mountain Elk	Game
51405	Mule Deer	Game

Table 3.15. Land Birds listed in the US Fish and Wildlife Service Partners in Flight Program identified by Interactive Biodiversity Information System IBIS as possibly occurring in the Fifteenmile Subbasin:

Shrub-steppe		
Sage Sparrow	Swainson's Hawk	Prairie Falcon
California Quail	Long-billed Curlew	Black-chinned Hummingbird
Gray Flycatcher	Sage Thrasher	Brewer's Sparrow
Wetlands/grasslands		
Western Grebe	Trumpeter Swan	Sandhill Crane
Tricolored Blackbird		
Coniferous Forest		
Mountain Quail	Flammulated Owl	Black Swift
Calliope Hummingbird	Lewis's Woodpecker	Williamson's Sapsucker
White-headed Woodpecker	Black-backed Woodpecker	Hermit Warbler

Table 3.16. Federally Listed Endangered Species:

Species Name	Common Name	State Listing	Federal Listing
Strix occidentalis caurina	Northern spotted owl	Threatened	Threatened
Haliaeetus leucocephalus	Bald Eagle	Threatened	Threatened

Managed wildlife species: Mule Deer, Black-tailed Deer, Elk, Wild Turkey, Western Gray Squirrel, Pheasant, Chukar, Valley Quail, Mountain Quail, Blue Grouse, Ruffed Grouse, Mourning Doves, Ducks, Geese

The Confederated Tribes of Warm Springs retained the right to hunt, fish, and gather within the lands ceded to the United States government. Species of significance to the Warm Springs Indians for subsistence and for cultural and spirtual purposes include elk, deer, steelhead, cutthroat trout, and lamprey.(Table 3.17)

Table 3.17. Wildlife Species Recognized by Tribes[137]

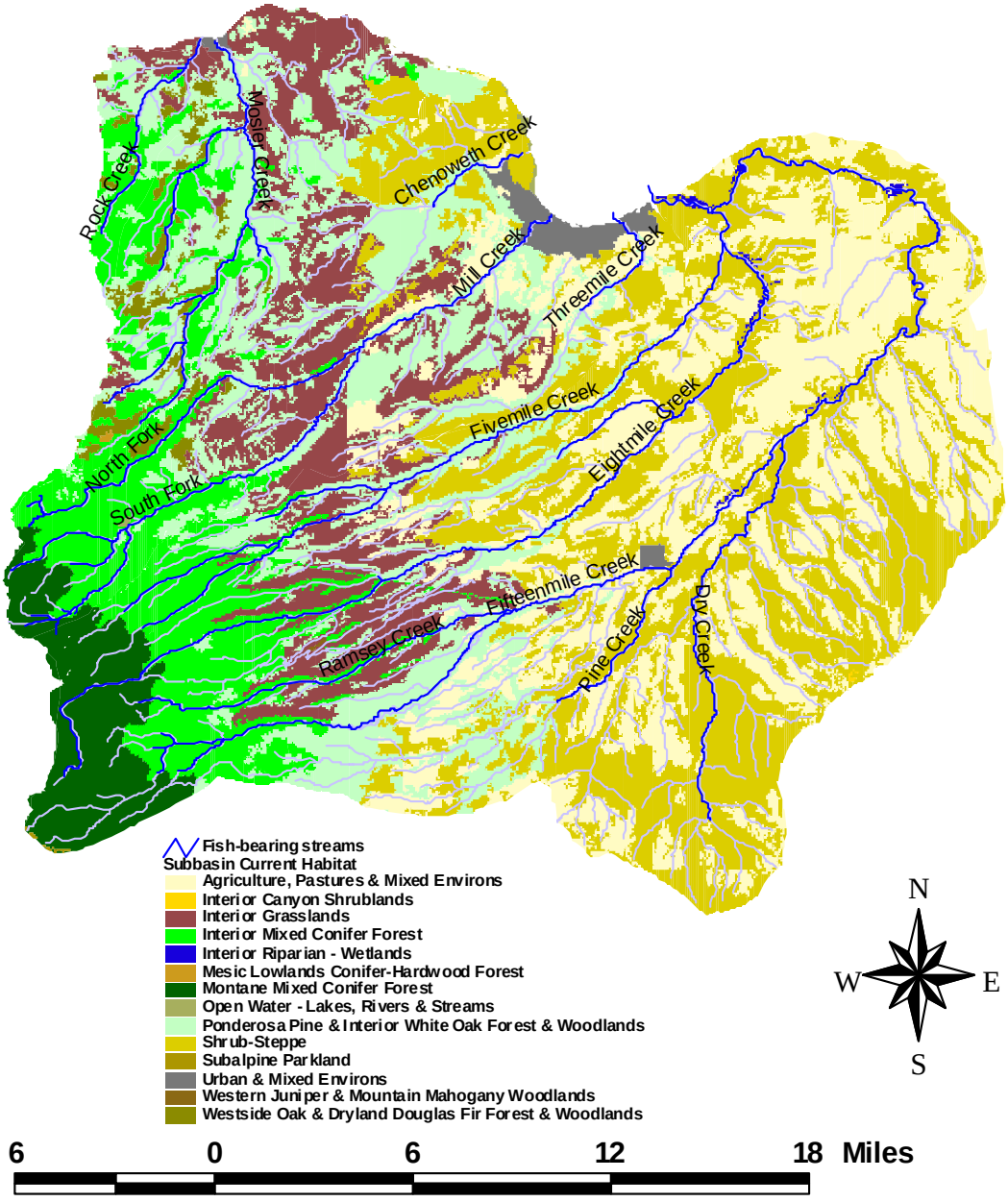
Animals:	Deer, Elk, Otter, Eagles (bald and golden), Bear, Cougar, Beaver, Frogs, Porcupine, Rattlesnakes, Hawks, Owls, Bobcat, Grouse, Waterfowl,
Plants:	Serviceberry, Hawthorne, White Oak, Elderberry, Great Basin Wild Rye, Arrowleaf Balsamroot, Biscuit root, Bitter root, Blue Camas, Indian carrot, Yellow bells, Wild onion, Mariposa lily, Indian celery, Chokecherry, Yarrow, Skunk cabbage, Mule's ear, Bracken fern, Tule reeds, Cattails, Indian paintbrush, Willows, Sagebrush, Bitterbrush, Wild Rose, Alder, Juniper, Conifers, Cottonwood,

[137] Currim, Fara Ann. Confederated Tribes of the Warm Springs Reservation, Natural Resources Department. Personal Communication via e-mail. 2004.

	Desert parsley, Mushrooms

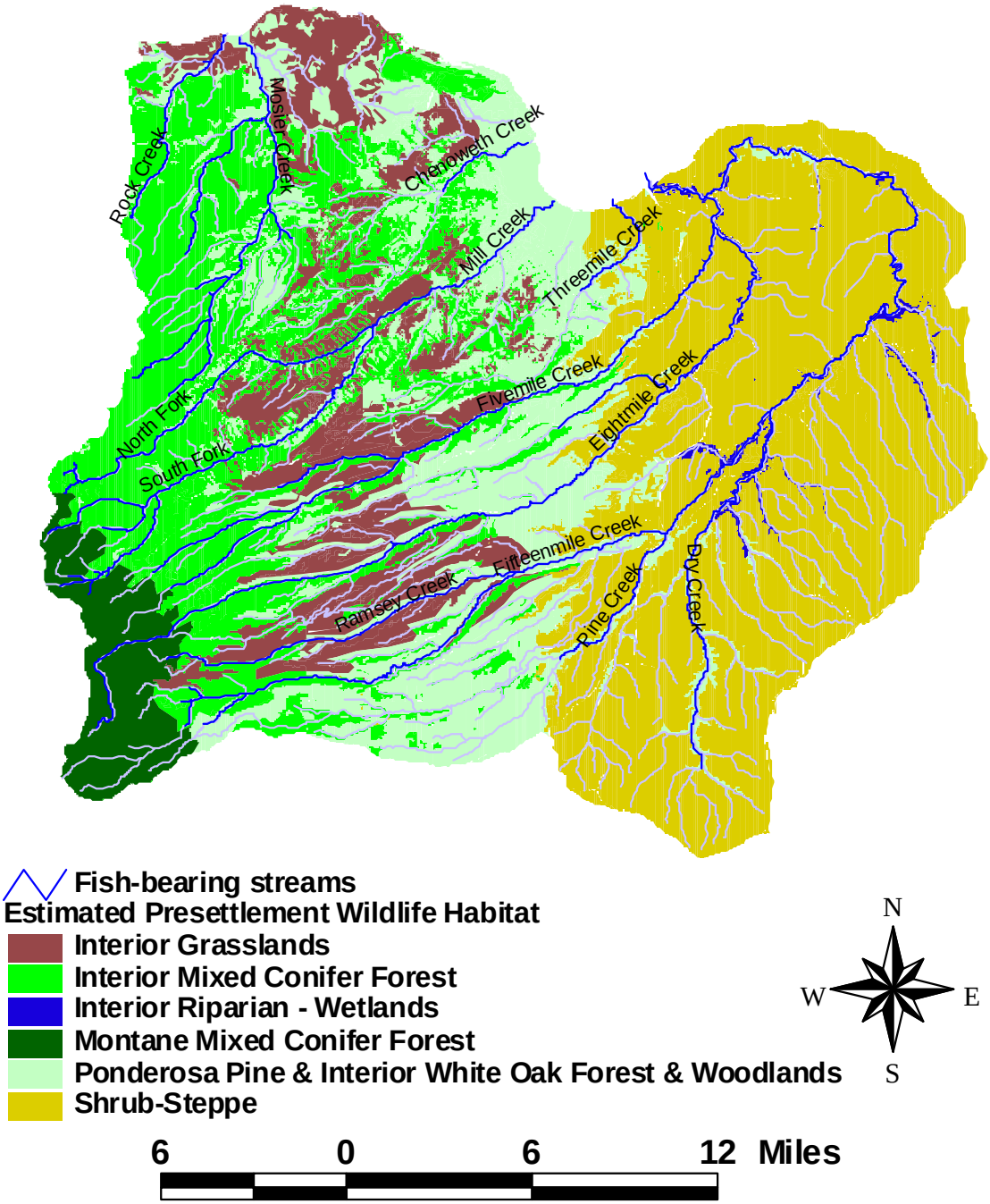
Current (Figure 3.16) and pre-settlement wildlife habitat types (Figure 3.17) were mapped and compared to note changes. Current and historic habitat types were sent to the Northwest Habitat Institute, who analyzed the species for their relationships with habitat types that had changed markedly. Using this analysis, focal species were narrowed to seven, most of which are associated with specific habitat types that have been reduced in acreage in the past 150 years.(Table 3.18)

Figure 3.16. Current Wildlife Habitat in the Fifteenmile Subbasin[138]



[138] IBIS. 2003.

Figure 3.17. Estimated Presettlement Wildlife Habitat in Fifteenmile Subbasin [139]



[139] Fifteenmile Watershed Assessment. Fifteenmile Watershed Council. 2003.

Table 3.18. Estimated Major Changes to Wildlife Habitat

	1850 acres	Current acres	Change	% Reduction
Shrub-Steppe	131,743	97,297	34,446	26%
Interior Mixed Conifer	87,224	46,210	41,014	47%
Riparian	3,924	584	3,340	85%
Urban	0	3,739	3,739	--
Pine-Oak	83,525	69,272	14,263	17%
Agriculture and Pastures	0	100,000+	100,000+	--

The most heavily impacted wildlife habitats in the subbasin were shrub-steppe, interior grasslands, and interior riparian habitat, in that order. Much of the shrub-steppe habitat and riparian habitat have been converted to agriculture, pasture and urban areas. Interior grassland habitats have been converted to forested habitats due to fire suppression.

3.5.2. Wildlife Focal Species and Associated Habitat Types

Seven focal species were chosen to represent the habitats that have undergone the most change over the past 150 years.

Bald eagle, although a threatened species, was not included as a focal species, because the potential habitat band is a very narrow strip along the Columbia River, and there are only two known nests in the subbasin.

Several bird species were considered as riparian habitat indicators, but were rejected in favor of beaver, because beaver use riparian habitat throughout the subbasin.

[140] IBIS. 2003.

Table 3.19. Wildlife Focal Species in the Fifteenmile Subbasin and Reasoning for Choice

Wildlife Focal Species	Associated Habitat Type	Reasoning
Mountain Quail	Open shrub habitats in timbered areas	Locally sensitive species, reduced habitat; Partners in Flight Species
Spotted Owl	Old growth timber	Federally listed species
Western Grey Squirrel	Pine-oak	State game species, listed as sensitive in Washington State, closely associated with a reduced habitat
Brewer's Sparrow	Shrub-steppe	More of a generalist than loggerhead shrike, indicative of condition of shrub-steppe in general; Partners in Flight species
Loggerhead Shrike	Specific niches within Shrub-steppe	Locally sensitive species, associated with specific niches within greatly reduced habitat
Mule Deer	Winter Range in several habitats	Managed game species, culturally important to Tribes; Historic winter range impacted by development
American Beaver	Riparian	Indicative of riparian conditions throughout watershed

Focal Species: Mountain Quail

Cover Types: Interior grasslands, Interior riparian – wetlands, Interior mixed conifer forest

Justification: ODF&W Game Species, Oregon State Sensitive Species – status is unknown. Populations have persisted but appear to be declining in NE Oregon and may have declined in NW Oregon. There is a potential for transplanting and reintroduction into some areas in the Subbasin. The created openings associated with timber harvest activities are becoming less frequent in the forested area.

This is an early seral species associated with grass, shrub and sapling/pole communities. Mountain quail are often observed foraging along logging roads and open, shrubby mountain slopes and ridge tops. Mountain quail is not to be confused with Valley quail, which is an introduced species. There is the possibility of a reintroduction program for this species.

Populations have persisted but appear to be declining in NE Oregon.[141] They appear to be stable and abundant in SW Oregon. Mountain quail may have declined in NW Oregon.[142]

[141] Oregon Department of Fish & Wildlife, 1999a

They are rare or absent in SE Oregon. They are hunted in western Oregon and parts of eastern Oregon. Mountain Quail can be found scattered throughout the forested portions of the sub basin based on occasional sightings. There are no routes set up to exclusively monitor Mt. quail populations in the subbasin. Sightings and numbers of mountain quail have increased over the last few years. Mountain quail are classified as a game bird and are hunted within the sub basin.

This bird is mainly associated with early successional vegetation composed of a diverse array of shrubs, often associated with early seral plantations or openings. With timber harvest activities being reduced over the last 10 years and fire suppression for the last 100 years, the created openings have been reduced. The majority of this habitat is on USDA Forest Service land.

This bird can also be found in some of the riparian areas within the pine/oak habitat zone. Birds have been observed in Ramsey Creek, North Fork Fivemile Creek, South Fork of Mill Creek, Mosier Creek and Rock Creek. The observations for Ramsey, SF Mill and NF Fivemile creeks were all on USDA Forest Service lands. The observations on Mosier and Rock creeks were on private land. The majority of riparian areas on public lands have been restored and all are protected with buffers when considering future activities. The private riparian areas are afforded some protection under current county and state zoning regulations. Overall the riparian areas on public land have been improved over the last 20 years. The riparian areas on private land have been improved (Fifteenmile, Fivemile, Ramsey creeks) in some areas or decreased in value (more residents, increased number of pets, less vegetation etc.) in other areas (Mosier and Rock creeks) over the last 20 years.

Working Hypotheses: This bird has an association with 37 different Key Environmental Correlates (KECs). This is a very high number, which may mean that this species may not be as vulnerable to habitat or environmental alterations as those species with only a few KECs.

The mountain quail has two aquatic KECs. The habitat type for this species that has changed the most from presesttlement to current conditions is the interior riparian. Currently there are 583 acres (0.16% of sub basin), while the presttlement estimate is 3,924 acres (1% of sub basin).[143] Riparian habitat, when associated with a medium or tall shrub-open shrub overstory, is used for breeding and feeding. The majority of this habitat loss has gone to agriculture, livestock grazing and residents. Habitat improvement projects for riparian areas will increase the acres available to the quail and help stabilize or increase populations.

The interior mixed conifer zone also shows a large change from a historical of 87,224 acres (24% of sub basin) to a current 46,210 acres (13% of sub basin). That is a loss of 41,014 acres. The majority of this loss can be attributed to a mapping error of the historical layer (the major portion of this loss is currently mapped as pine/oak or interior grasslands). This vegetation zone has had a lot of timber harvest during the 60s' through

[142] Marshall, et. al., 2003
[143] 15 Mile Subbasin Planning Team, GIS analysis

the 80s'. Currently, created openings from timber harvest are starting to fill in and less early seral open-brush habitat is available for the quail. Habitat improvement projects (e.g. timber harvest and underburns) that increase the number of acres of openings in this conifer zone would be beneficial to mountain quail. The brush/shrub component within these openings appears to be necessary for nesting and foraging.[144]

The mountain quail is associated with 8 Key Ecological Functions (KEFs). This bird is not a functional specialist.

The mountain quail is much less tolerant of human presence than is the California quail, though clear-cutting has expanded its habitat in many areas. It typically avoids agriculture areas.[145] The increasing numbers of residents within the subbasin has had a negative impact on this species by reducing and altering the habitat. This has been most evident in the riparian areas of the pine/oak and shrub steppe zones. These residents also bring pets such as house cats, which prey on this species especially in the winter at feeders.[146] Other prey species such as opossums, skunks and raccoons may prey on these quail when nesting.

Opportunities and Recommendations: Create or restore shrub-openings within the mixed conifer zone via timber harvest or prescribed fire. Restore the shrub component within the riparian areas and increase the amount of riparian habitat outside of residential areas.

There is an opportunity to re-introduce mountain quail into under-utilized habitat. This would help stabilize and increase the overall quail population in the subbasin.[147] Transplanting mountain quail into under utilized habitat such as Ramsey Creek (Three miles of riparian habitat restoration was completed in 2003) would improve the genetic diversity and increase numbers of quail in those areas.

Focal Species: Spotted Owl

Cover Types: Interior mixed conifer forest, Montane mixed conifer forest

Justification: Federal, OR, WA Threatened Species; Mt. Hood National Forest Management Indicator Species. There has been a loss of late seral habitat due to timber harvest in comparison to historical times.

Mixed-conifer forest cover types with late-succession structure types is the preferred habitat. Nesting occurs in platform structures (e.g., mistletoe brooms) with a preference for Douglas fir trees in this subbasin. As of 1995, there are 19 spotted owl activity centers (2 resident singles and 17 pairs) in the 15-Mile Subbasin. The number of spotted owl activity centers is thought to be stable, however some habitat loss has occurred over

[144] Thurman personal observation, Marshall et al 2003
[145] Gilligan et al. 1994.
[146] Thurman, Rich. Personal Observation.
[147] Kohl, Keith. ODFW. Personal Communication. 2004.

the last 15 years. Each activity center has been protected with a minimum of 100 acre Late Successional Reserves (LSR) or are within the Surveyor's Ridge LSR. These LSRs' allow for the protection of existing and future nest sites. All of the activity centers are on public land (Forest Service or City of The Dalles property).

The habitat is preserved for future spotted owls, however inter-species competition from the barred owl may impact future numbers of spotted owls. The barred owl was originally an east coast species. It crossed the Great Plains and arrived on the West coast in the 1940s.[148] The barred owl is 20 percent larger and seems to win out in every encounter between the two species. In Oregon, Eric Forsman and his student Elizabeth Kelly found an average of 60 new barred owl pairs every year from 1989 to 1998. Forsman says "It probably was going to happen whether people were here or not, as a result of warming climate and gradual changes in forests."[149]

As of 1995, there are 19 spotted owl activity centers (2 resident singles and 17 pairs) in the 15-Mile Subbasin. The number of spotted owl activity centers is thought to be stable, however some habitat loss has occurred over the last 15 years. Each activity center has been protected with a minimum of 100 acre Late Successional Reserves (LSR) or are within the Surveyor's Ridge LSR. These LSRs' allow for the protection of existing and future nest sites. All of the activity centers are on public land (Forest Service or City of The Dalles property). The Northwest Forest Plan emphasizes protection of large blocks of habitat (LSRs) to provide for clusters of breeding pairs of owls that are connected by habitat (Matrix) to support survival and movement across the landscape between reserves. The NWFP reserve network is designed to protect late-successional forest species, such as the owl[150].

Working Hypotheses: This bird has an association with 23 different Key Environmental Correlates (KECs). This is a medium number, which may mean that this species is less vulnerable to habitat or environmental alterations compared to species with only a few KECs. Late seral habitat (medium to large trees) is one of the key habitat components for the spotted owl. Within this sub basin, all the known nest sites are within 0.25 miles of water, which shows a strong preference for riparian habitat. This may be an indication that the majority of large trees are in riparian areas or that more prey species are present there.

The spotted owl is associated with 6 KEFs. Interbreeding with barred owls is of concern for this species. There is some debate as to why the barred owl moved from the east coast to the west coast of the United States. Eric Forsman, a biologist with the USDA Forest Service's Pacific Northwest Research Station in Corvallis, Oregon says, "My personal gut feeling is that this has nothing to do with humans". "It probably was going to happen whether people were here or not, as a result of warming climate and gradual changes in

[148] Levy 2004
[149] Levy 2004
[150] Biological Opinion 1-7-03-F-0008. USF&WS.
[151] Levy 2004
[152] Levy 2004

forests". "It's tough to watch my favorite species going to pot," says Forsman, "but I believe there's nothing we can do about it. This range expansion is going to happen, and all we can do is sit back and watch and see how the two species work it out. The only way you could even attempt to manage it would be to start shooting barred owls every chance you got. Even if you wanted to do that, it's a physical impossibility to do it on a large enough scale and for long enough time to have a real impact.[153]

Rocky Gutierrez, who has studied spotted owls for years, believes human actions made the barred owl's western movement possible. As cities and farms sprouted up on the plains, people planted shelterbelts of trees in what had been open prairie. The patchwork of small woodlands that resulted may have given the barred owl enough cover to cross the plains.

In an analysis of range expansions of 24 North American birds, Ned Johnson, of the Museum of Vertebrate Zoology in Berkeley, California, argues that many birds, including the barred owl, were responding to shifts in climate, not to human-wrought habitat change.

The Late Successional Reserve (LSR) system established in the Northwest Forest Plan has been adopted as sufficient to maintain the spotted owl in the long term. This sub basin includes parts of the Surveyors Ridge LSR and nineteen 100-acre LSRs. Maintaining this habitat for the long term is critical for Spotted owl survival. The Surveyor's Ridge LSR Plan allows for those treatments (i.e. tree thinnings, insect and disease protection, re-introduction of fire etc.) that would have a positive effect on the long term health and maintenance of this LSR.

Timber harvest of mature late seral habitat (medium and large trees) may reduce nesting, roosting and foraging habitat for spotted owls in the sub basin. The Northwest Forest Plan was established in part to allow timber harvest activities to occur and still maintain the spotted owl population over the long term.

Opportunities and Recommendations: The exclusion of fire from the ecosystem has created spotted owl nesting, roosting and foraging habitat in lowland fire ecosystems that are not sustainable over the long term (next 100 years). The US Fish and Wildlife Service is aware of this concern and has accepted the re-introduction of fire back into these ecosystems as necessary to maintain those ecosystems. Reducing the crown fire potential within the fire ecosystems would potentially reduce spotted owl habitat in the upland but reduce the risk of habitat loss in the riparian areas (where most of the activity centers are located).

The Surveyor's Ridge LSR Plan identifies some habitat areas of concern and some possible restoration and protection projects. Implementing the LSR Plan would help reduce the risk of a catastrophic loss of spotted owl habitat within the subbasin.

[153] Levy. 2004

Focal Species: Western Gray Squirrel

Cover Types: Ponderosa Pine & Interior White Oak Forest & Woodlands, Oak & Dryland Douglas Fir Forest & Woodlands

Justification: ODF&W Game Species, listed as sensitive in Washington; the amount of pine-oak habitat has been reduced from historical times.

This species is associated with ponderosa pine and dry, Douglas fir zones where Oregon white oak is a major feature. Population density in Oregon seems to fluctuate dramatically. In southern Oregon, an index to density (number seen/distance traveled) obtained along established routes ranged from 0.05 to 0.44/km with three peaks and three lows during 1960-1968.[154] Although no surveys are conducted for western gray squirrels, anecdotal observations have indicated that western gray squirrels are found throughout the subbasin in suitable habitat, a mixture of oak, pine and fir forests. Populations have increased near rural residential areas. On well traveled roads that run through the squirrel habitat, squirrels are frequently run over by vehicles.

The pine/oak habitat is estimated to have been reduced by 14,263 acres from presttlement conditions. The presettlement estimate is 83,525 acres of pine/oak habitat. Currently, there are 69,262 acres of this habitat. The major changes to this habitat have gone to residential and agricultural use.

Working Hypotheses: Western Gray squirrel is associated with 20 KECs. It utilizes mainly the pine/oak habitat and some of the mixed conifer area that has white oak. The pine/oak habitat has lost 14,263 acres from historical time. Currently, there are 69,262 acres (19% of sub basin) of pine/oak habitat. This habitat loss has gone mainly to agriculture (mainly orchards) and residential dwellings.

Western gray squirrels are associated with 9 KEFs. This is a relatively high number meaning that this species is not a functional specialist. Analysis of nest trees and their surroundings in the Friend Area south to Rock Creek (straddling the southern boundary of the subbasin) revealed that nests are most likely to be located in mature trees that have well-developed crowns and occur in stands with a high degree of canopy closure.[155] Nest trees were usually located within approximately 180 meters of permanent water and on sites with a south-southeastely exposure.

In the sites studied, western gray squirrels have two seasons of reproductive activity annually. Some individuals mate from January through March; their young emerge from the nest in May and June. Other individuals mate in May and June; their young emerge in August and September. The latter matings are usually the most productive

Home ranges of squirrels examined in this study were usually large compared to home ranges reported for this species elsewhere in its range. Given the cost of having large

[154] Cross, 1969
[155] Fostor. 1992.

home ranges, it seems possible that squirrels at these study sites exist in less than optimal ecological circumstances.[156] It is also possible that we are at the outside edge of the squirrels range.

Human factors that have negatively affected squirrel populations are timber harvest, timing of hunting seasons, and residential development. Limiting factors other than human activities may include competition with other mast-consuming animals (mule deer, elk, wild turkeys, and three other species of squirrels) for limited and variable mast crops.

Opportunities and Recommendations: On National Forest land promote oaks where conifers have encroached into its' habitat zone. Restoring fire back into this ecosystem will also improve habitat in the long term by reducing tree densities, which may also increasing mast production.

On private lands, encourage the retention and restoration of pine/oak habitat.

Focal Species: Brewer's Sparrow

Cover Type: Shrub-Steppe

Justification: Oregon Partners-in-Flight Focal Species, significant loss of shrub-steppe habitat from presettlement.

Brewer's Sparrow is a sagebrush obligate where sagebrush is abundant. It prefers a mean cover of sagebrush 10-30% and in patches rather than evenly distributed, mean height sagebrush > 24 inches, high foliage density in sagebrush shrubs, mean native herbaceous cover >10% with <10% cover of non-native annual grasses, mean open ground cover > 20%.

From the Breeding Bird Survey[157]: Columbia Plateau Region has a highly significant ($p<0.01$) long term (1966-1998) declining trend of 4.8%/year, and significant short-term (1980-1998) declining trend of 3.4%/year. The population is expected to continue to decline until habitat is stabilized and/or increased.

In the Interior Columbia Basin the source habitats considered are 2 structural stages of big sagebrush and mountain big sagebrush; open canopy, low-medium shrub, and closed canopy, low-medium shrub; the closed herbaceous structural stage of big sagebrush; juniper sagebrush; and mountain mahogany.[158]

Shrub-steppe habitat has been converted to agriculture. The majority of shrub-steppe habitat is on private land. Currently there are 97,297 acres (26.58 % of sub-basin) of shrub-steppe habitat within the sub-basin, while the presettlement estimate is 131,743

[156] Fostor. 1992.
[157] Sauer et al. 1999
[158] Wisdom et al.in press

(35.93 % of sub-basin) acres of habitat. In the Columbia Basin, shrub-steppe habitat has decreased by 20%.

From the Breeding Bird Survey:[159] Columbia Plateau Region has a highly significant ($p<0.01$) long term (1966-1998) declining trend of 4.8%/year, and significant short-term (1980-1998) declining trend of 3.4%/year. The population is expected to continue to decline until habitat is stabilized and/or increased.

Working Hypotheses: This bird is associated with 7 KECs. This is the lowest number of all the focal species for the subbasin. This species is more vulnerable to habitat and environmental alterations than those species with many KECs. The main habitat type associated with this species is shrub steppe. Historically, there was 131,743 acres (36% of sub basin) of shrub steppe habitat within the sub basin. Currently, there are 97,297 acres (27% of sub basin) of shrub steppe habitat, a reduction of 34,446 acres. The majority of this change went to agriculture, grazing and residential development.

The Brewer's sparrow is associated with 7 KEFs. This species is not a functional specialist.

Conservation Issues include:[160]

- Removal of sagebrush below 10% cover adversely affects populations, although species is persistent where incomplete loss of sagebrush creates patchy islands of habitat.[161] thus not as sensitive to fragmentation as sage sparrows (i.e., will occur in smaller patches but most abundant in larger patches),[162] but sensitive to cover of sagebrush (i.e., will use small patches of sagebrush if cover and height are adequate).
- Vulnerable to trampling of nest by cattle.
- Needs tall sagebrush with high shrub cover, low grass and litter cover; thus continuous cheatgrass cover detrimental.
- Patchy interspersion of clumped sagebrush with small openings preferred over contiguous dense sagebrush, which probably provides too much cover.

Opportunities and Recommendations:

Biological Objectives:

Habitat:

[159] Sauer et al. 1999
[160] Altman and Holmes 2000
[161] Peterson and Best. 1987.
[162] Knick and Rotenberry 1995

Where ecologically appropriate, initiate actions in sagebrush habitat to maintain or provide the following conditions:

1. Mean cover sagebrush 10-30% and in patches rather than evenly distributed.
2. Mean height sagebrush >60 cm (24 in).
3. High foliage density in sagebrush shrubs.
4. Mean native herbaceous cover > 10% with <10% cover of non-natives annual grasses.
5. Mean open ground cover (includes bare and/or cryptogamic crust) >20%.

Where ecologically appropriate at the landscape level, provide suitable habitat conditions described above in patches >8 ha (20 ac).

Population:

Columbia Plateau Breeding Bird Survey Region: In conjunction with conservation efforts described in the Idaho Landbird Conservation Plan (Ritter 2000) and Nevada Bird Conservation Plan (Neel 1999), reverse long-term declining trends to achieve stable populations (non-significant trends of <2%) or increasing populations in the next six years (by 2010).

Conservation Strategies:

1. Maintain conditions in areas relatively free from cheatgrass by minimizing soil disturbance from grazing.
2. Fire suppression should occur where there is potential loss of sagebrush.

Focal Species: Loggerhead Shrike

Cover Type: Shrub-Steppe

Justification: Oregon Partners-in-Flight Focal Species, Oregon State Sensitive list, significant loss of shrub-steppe habitat from historic times.

Loggerhead shrike uses some very specific habitat niches within the shrub-steppe habitat type – an open habitat with interspersions of tall woody shrubs (e.g., sagebrush, bitterbrush) or trees (e.g., juniper) for nesting and open ground for foraging, late-seral, big sagebrush or bitterbrush with patches of tall shrubs (mean height of shrubs > 39 inches, <15% tall shrub cover (non-rabbitbrush), herbaceous cover <20% and dominated by native species, mean open ground cover >30%. ODFW monitors for them. By contrast, Brewer's sparrow uses shrub-steppe habitat more generally.

From the Breeding Bird Survey[163] : Columbia Plateau Region has a highly significant ($p<0.01$) long term (1966-1998) declining trend of 2.7%/year, and non-significant short-

[163] Sauer et al. 1999

term (1980-1998) declining trend of 1.8%/year. The population is expected to continue to decline until habitat is stabilized and/or increased.

Its habitat is generally open with interspersions of tall woody shrubs (e.g., sagebrush, bitterbrush) or trees (e.g., juniper) for nesting and open ground for foraging. Foraging sites, particularly for young birds, need to have open ground or little vegetation cover;[164] invasion of exotic annual grasses, particularly cheatgrass, has been detrimental. Shrub-steppe habitat has been converted to agriculture. The majority of shrub-steppe habitat is on private land. Currently there are 97,297 acres (26.58 % of sub-basin) of shrub-steppe habitat within the sub-basin, historically there were 131,743 (35.93 % of sub-basin) acres of habitat. In the Columbia Basin, shrub-steppe habitat has decreased by 20%.

Working Hypotheses: This bird has an association with 20 KECs. This is a medium number, which may mean that this species has a medium vulnerability to habitat or environmental alterations. The main habitat type associated with this species is the shrub steppe. Historically, there was 131,743 acres (36% of sub basin) of shrub steppe habitat within the sub basin. Currently, there is 97,297 acres (27% of sub basin) of shrub steppe habitat. This shows a reduction of 34,446 acres. The majority of this change went to agriculture, grazing and residential development.

The Loggerhead Shrike is associated with 4 KEFs. This is the fewest of all the focal species, suggesting that the species is a functional specialist.

Conservation issues include:[165]

- Habitat loss from conversion to agriculture.
- Habitat loss from frequent fires in cheatgrass dominated sites.
- Long-term heavy grazing may ultimately reduce prey habitat and degrade the vegetation structure for nesting and roosting.
- Foraging sites, particularly for young birds, need to have open ground (bare and/or cryptogamic crusts) or little vegetative cover (Leu 1995); invasion of exotic annual grasses, particularly cheatgrass, has been detrimental.
- May suffer sublethal effects (e.g. reduced reproductive output) from certain insecticides.[166]
- Use of insecticides (e.g., for grasshopper control) may reduce prey base.

Opportunities and Recommendations:

Biological Objectives:

[164] Leu 1995
[165] Altman and Holmes 2000
[166] Anderson and Duzan. 1978.

Habitat:

Where ecologically appropriate, initiate actions in steppe-shrubland habitat to maintain or provide the following conditions:

1. Late-seral big sagebrush or bitter brush with patches of tall shrubs (mean height of shrubs > 1 m (39 in).
2. <15% tall shrub cover (non-rabbitbrush).
3. Herbaceous cover < 20% and dominated by native species.
4. Mean open ground cover (includes bare and/or cryptogamic crusts) >30%.

Population:

Columbia Plateau BBS Region: In conjunction with conservation efforts described in the Idaho Landbird Conservation Plan[167] and Nevada Bird Conservation Plan,[168] reverse long-term declining trends to achieve stable populations (non-significant trends of <2%) or increasing populations in the next six years (by 2010).

Conservation Strategies:

1. Maintain sites with patches of tall shrubs and patches of open ground.
2. Avoid insecticide spraying during breeding season in shrike nesting habitat (March 21 –August 15).
3. Light to moderate grazing may provide open foraging habitat, but sustained grazing will reduce habitat suitability.
4. Where habitat degradation is extensive and cheatgrass cover is dominant, light grazing may provide open foraging habitat and reduce fuel loads at risk from fire, which would severely reduce sagebrush cover.[169]

Focal Species: Mule Deer

Cover Types: All habitat types except Open Water – lakes, rivers, streams and urban environments.

Justification: ODF&W Game Species; Mt. Hood National Forest Plan Management Indicator Species; ODF&W & Forest Service Monitoring Species.

This species is generally associated with the edge of cover and forage. Currently within the shrub-steppe community, cover equals topography breaks and forage equates to agriculture crops. The shrub-steppe and pine-oak communities were the historic winter range areas.

[167] Ritter 2000
[168] Neel 1999
[169] Holmes and Geupel 1998

Mule deer are generally recognized to occur east of Oregon State Highway 197. The deer west of 197 are a cross between black-tailed deer and mule deer. For this planning effort, we are using mule deer as the descriptor for this whole sub-basin. The current White River Management Unit has an estimated 8000 deer. The management objective for this unit is 9000 deer.

Mule deer occupy a wide range of habitat types from shrub-steppe to conifer forest. Human development has had the greatest impact on reducing the amount of winter range available for deer. Approximately 15 percent of the sub-basin is publicly owned and the remaining 85 % privately owned.

Mule deer have been able to adapt to human presence over time. The population seems to fluctuate depending on the severity of winters and the quality/quantity of summer forage[170].

Working Hypotheses: Mule deer are associated with 40 KECs. This is a very high number, which may mean that this species may not be as vulnerable to habitat or environmental alterations as those species with only a few KECs. Mule deer are associated with 6 aquatic KECs. Winter range is generally associated with pine/oak and shrub steppe habitat. These habitat types have lost 48,709 (13% of sub basin) acres of habitat since historical time. Most of this habitat loss has gone to agriculture, grazing and residential dwellings. Deer are adaptable, and utilize the agriculture and grazing areas for winter range and summer range. This can present some conflicts with agriculture and grazing pastures, and the need for population control. One option is to improve winter range habitat on National Forest land, which would reduce animal damage complaints on private land. Projects such as underburning and timber harvest activities that create openings both improve forage on winter and summer ranges. Water developments can disperse animals into underutilized areas.

Mule deer are associated with 14 KEFs. This species ranks second highest among the focal species for KEFs. This shows that mule deer are not functional specialists but most likely functional generalists.

Opportunities and Recommendations: Improve winter range habitat on National Forest land by underburning and thinning dense tree stands (increase the amount of forage). Try to minimize the fragmentation of winter range habitat on private land by retaining current zoning laws, which limit fragmentation from 80 to 200 acres on agriculture and forestlands. Encourage restoration of shrub-steppe habitat on private land.

Focal Species: Beaver

Cover Type: Interior Riparian

[170] Thurman, Rich. US Forest Service. Personal Communication. 2004.
[171] Holmes and Geupel. 1998.

Justification: Critical Functional Link Species, riparian habitat has been reduced from historic times.

Beaver is almost always associated with riparian or lacustrine habitats bordered by a zone of trees, especially cottonwood and aspen, willow, alder, and maple. Beavers live in colonies composed of family groups. Small streams with a constant flow of water that meander through relatively flat terrain in fertile valleys and are subject to being dammed seem especially productive to beavers.[172]

Beaver are found in all major drainages with perennial water within the sub basin. Beavers are classified as a furbearer, with 28 beavers being harvested in the 2002-03 season in Wasco County. In suitable habitat, beavers will form a colony and gradually remove trees surrounding the stream to create a pond. This pond creates habitat for fish and other wildlife. Beaver ponds also act as basins to catch eroding soil, and prevent rapid runoff that might lead to downstream flooding and streambank erosion.

The current trend is for improving riparian habitat conditions throughout the sub-basin. If conservation incentives to the farmers were to stop, the private riparian areas may not continue to improve. Approximately 85 percent of the riparian areas are located on private land within the sub-basin.

Working Hypotheses: The beaver is associated with 61 KECs. This animal is associated with 28 aquatic KECs'. These are the highest number of all the focal species. The beaver is associated with all the habitat types associated with riparian areas. The habitat type for this species that has changed the most from historic to current conditions is the interior riparian. Currently there are 583 acres (0.16% of sub basin) and historically there were 3,924 acres (1% of sub basin).[173] The majority of this habitat loss has gone to agriculture, livestock grazing, timber harvest and residential dwellings. Habitat improvement projects for riparian areas (that encourage trees) will increase the acres available to the beavers.

This animal is associated with 16 KEFs. This again is the highest number of all the focal species for the sub basin. It is not a functional specialist. The beaver supplies a critical functional link for the steelhead by creating aquatic structures. These aquatic structures create pools, which become important rearing areas for juvenile steelhead.

Opportunities: Restoring the riparian habitat on National Forest land (15% of subbasin) and restoring the riparian habitat on private land (85% of subbasin) would increase the amount of habitat available for beavers. The beaver population will continue to fluctuate depending on the fur market and social tolerance. Increasing the amount of habitat would allow for an increase in population up to the social limit. Educating the public as to the important role beavers play within the riparian ecosystem may reduce animal damage complaints. This would allow more beavers to survive.

[172] Hill, 1982

[173] Determined by analysis of 15 Mile Subbasin Geographic Information System data

Locally extirpated and introduced species

Sharp-tailed Grouse were abundant in the grasslands and foothills east of the Cascade Mountains prior to the late 1800's.[175] They were considered extirpated from the state by the 1970s, but recent reintroduction programs give a glimmer of hope that sharp-tails may once again hold their own in NE Oregon.[176] They were formerly found in grasslands and shrub-steppe. Enhancing and increasing the amount of shrub-steppe habitat in the subbasin would possibly allow the reintroduction of this species.

Merriam's Wild Turkeys were introduced into this area in early 1960's. This release resulted in a viable population primarily in the pine/oak habitat. Rio Grande Turkeys were released in the late 1990's, which will likely result in an area of intergradation. Since then, turkey populations have substantially increased, chiefly because of a continued translocation program with Rio Grande subspecies and natural expansion. Wild Turkeys are primarily seed eaters, but consume a variety of greenery, berries, and insects if available.[177] The wild turkey may compete for food with Western Gray Squirrels.

Chukars were first released in this area between 1955–1970.[178] Their annual population fluctuates depending on nesting success and winter survival rates. Chukars appear to be opportunistic in their foraging habits. Habitat loss is not a factor, because most range is on public lands, but invasive weeds such as yellow starthistle may be detrimental[179], as well as replacement of shrub and bunchgrass cover types with large homogeneous expanses of annuals including cheatgrass or medusahead. Chukars fill a habitat niche that few other wildlife species use. This introduced species does not compete with any of our focal species.

Gray Partridge were introduced to eastern Oregon in the 1900s. Oregon population numbers are unknown.[180] Gray partridge can be primarily found along the margins of cultivated fields, especially wheat, grasslands, meadows, and pastures. They are occasionally found in sagebrush or grasslands several miles from agriculture areas.[181] The gray partridge's habitat preferences do not appear to compete with any of the local native wildlife species.

Ring-necked Pheasants were first introduced to Oregon in the 1880. Oregon population numbers are unknown[182], however the local population appears to be declining over the last 10 years. The pheasant is associated primarily with agricultural areas such as wheat fields, which provide cover in the form of tall vegetation. It avoids deserts, high

[174] Thurman, Rich. US Forest Service. Personal Communication. 2004.
[175] Olson 1976
[176] Marshall et al.2003
[177] Gutierrez and Delehanty 1999
[178] Marshall et al. 2003
[179] Lindbloom 1998
[180] Marshall et al. 2003
[181] Evanich 1986a, Gilligan et al. 1994
[182] Marshall et al. 2003

mountains and dense forests.[183] The pheasant does not appear to directly compete with any native wildlife species.

California Quail are native to SW Oregon and were transplanted statewide in the late 1800s. It is the most heavily hunted game bird in the State of Oregon with an annual harvest of 70,000 birds.[184] California quail are highly adaptable to a variety of habitat types. In this subbasin, California quail can be found in the shrub-steppe, grass lands, agriculture, pine/oak, and urban areas. California quail do not appear to compete directly with any native wildlife species.

3.5.3. Out-of-Subbasin Effects on Terrestrial Species

The mountain quail, western gray squirrel, beaver and mule deer are non-migratory year round residents in the subbasin.

The spotted owl, Brewer's sparrow and loggerhead shrike may migrate outside the subbasin in the winter, but all nest within the subbasin. None of these birds migrate great distances. The spotted owls most likely spend the entire year within the subbasin. The Brewer's sparrow and loggerhead shrike may migrate south but most likely do not leave sagebrush habitat and probably do not leave Oregon.

The loss of habitat range-wide is contributing towards the population decline for spotted owls, Brewer's sparrows and loggerhead shrikes. Stabilizing and increasing the amount of habitat within the subbasin could stabilize the local populations. However, if the trend in loss of habitat were not addressed range wide for these species, the overall populations would continue to decline[185].

3.5.4. Interspecies Relationships

Protection of upland wildlife habitat will support the proper hydrologic function of the watershed, thereby minimizing the negative effects of runoff and erosion from upland sources.

The loggerhead shrike and Brewer's sparrow both utilize shrub-steppe habitat. They both need patches of sagebrush for cover and some open ground cover. There is some overlap in habitat preferences. Both species are lacking detailed nest site descriptions.[186]

Mule deer compete with western gray squirrels for mast within the pine/oak habitat.[187]

Beaver, spotted owl and mountain quail all require healthy riparian areas. The beaver is a key player in developing pools utilized by fish, such as the steelhead.[188] Beaver and

[183] Gilligan et al. 1994
[184] Oregon Department of Fish & Wildlife. 1999a
[185] Altman and Holmes, 2000
[186] Altman and Holmes. 2000.
[187] Fostor. 1987.
[188] Verts and Carraway, 1998.

spotted owls both benefit from intact riparian corridors, which are also beneficial to fish. Protected riparian buffers are specified as part of the City of The Dalles' Habitat Conservation Plan for the spotted owl. Mountain quail is found in shrub-steppe areas, but only in the riparian corridors.

3.6. Synthesis and Interpretation

3.6.1. Subbasin-wide Working Hypotheses for Aquatic Focal Species

EDT results suggest that the steelhead population has been suppressed due to loss of habitat diversity and key habitat quantity, changes in the flow regime, increased temperatures, loss of floodplain function and riparian vegetation, and sediment input from land use changes.

Steelhead life history diversity and spatial structure have been severely restricted (Table 3.9), as the negative effects of activities throughout the watershed concentrate in the lower half to two-thirds of the watershed. Currently, the most productive reaches are near the headwaters of Fifteenmile, Ramsey and Eightmile Creeks, whereas the lower reaches of the watershed have been hit hard by habitat degradation. Geographic restoration priorities are on the private land reaches of Fifteenmile, Fivemile, Eightmile and Ramsey Creeks.

Life history diversity can be almost completely recovered by implementation of wide riparian buffers, placement of large woody debris, reduction of water withdrawals, replacement of five culverts, and implementation of no-till farming practices. Productivity would nearly double with this suite of actions, but would remain at approximately half of the presettlement productivity (Table 3.20). Even at the current level of productivity, the Fifteenmile steelhead population should respond rapidly to improved conditions.

Table 3.20. Predicted Abundance of Adult and Juvenile Steelhead in Fifteenmile Watershed.

Scenario	Predicted % of Current Adult Population (modeled by EDT, 5/5/04)	Adult Abundance	Predicted % of Current Juvenile Population (Modeled by EDT, 5/5/04)	Juvenile Abundance
Current	100%	127-1,077	100%	4,559-10,504
Modeled Presettlement	346%	439-3,726	225%	10,256-23,634
All proposed actions (no-till, LWD, riparian buffers, Riverkeeper and reduce water withdrawals by 50%)	**211%**	**268-2,274**	**178%**	**8,125-18,697**
100% Habitat Restoration, all	245%	311-2,638	218%	9,939-22,899

[189] Until 5/29/04, EDT reported a "restored" out-of-subbasin condition for presettlement winter steelhead, but not for coho or Chinook. Therefore, the presettlement result reported here will not be comparable to coho or Chinook reported in other subbasins (Mobrand Biometrics, via e-mail, 5/5/04)

environmental parameters, all reaches				

According to EDT, if all in-basin habitat factors were restored to modeled presettlement conditions, juvenile populations would be largely restored, but the adult steelhead run would be notably less than the modeled presettlement potential. The difference between the two is due to out-of-subbasin effects, including harvest rates, dam mortality, reservoir mortality, predation, etc.[190]

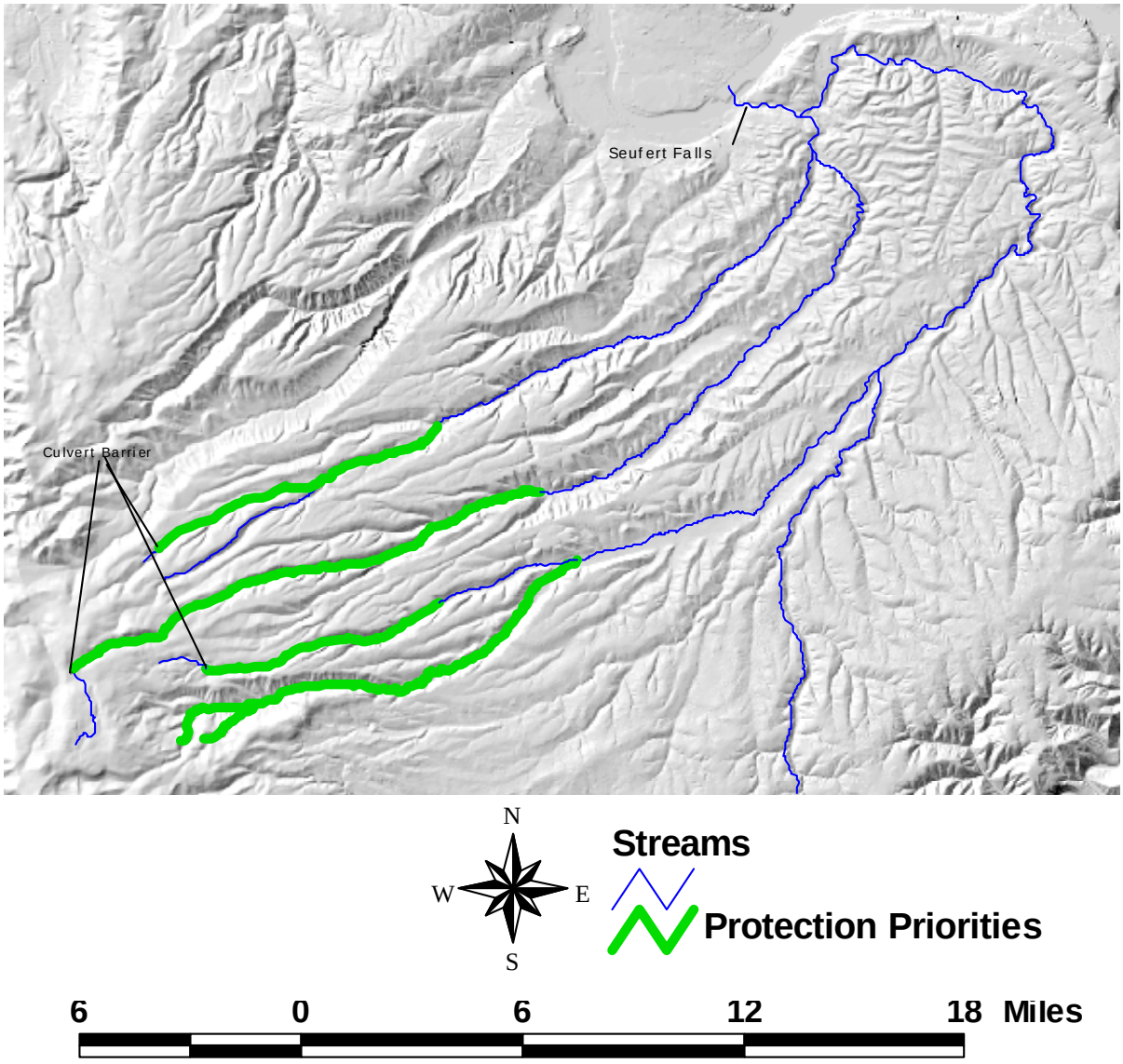
In reality, 100% restoration is not possible, given the current population level and development of the watershed. The combination of all proposed restoration actions produced a model abundance that was 211% of the current population. This corresponds to a population that could vary between 268 and 2,300 adults, depending on climatic conditions, weather events and other variables.

Priorities by Reach

EDT identified certain reaches as priorities for protection. These are reaches which are relatively productive in the current condition, but which are vulnerable to degradation. Protection priorities are assigned to those reaches in which further degradation has the most potential to lower overall life history diversity, productivity and abundance of steelhead in the Fifteenmile Watershed. Because the life history diversity in Fifteenmile is already reduced to 33%, further degradation in the remaining productive reaches puts the population at severe risk of extinction. The priority reaches for protection are shown in Figure 3.18.

[190] Until 5/29/04, EDT reported a "restored" out-of-subbasin condition for presettlement winter steelhead, but not for coho or Chinook. Therefore, the presettlement result reported here will not be comparable to coho or Chinook reported in other subbasins (Mobrand Biometrics, via e-mail, 5/5/04)

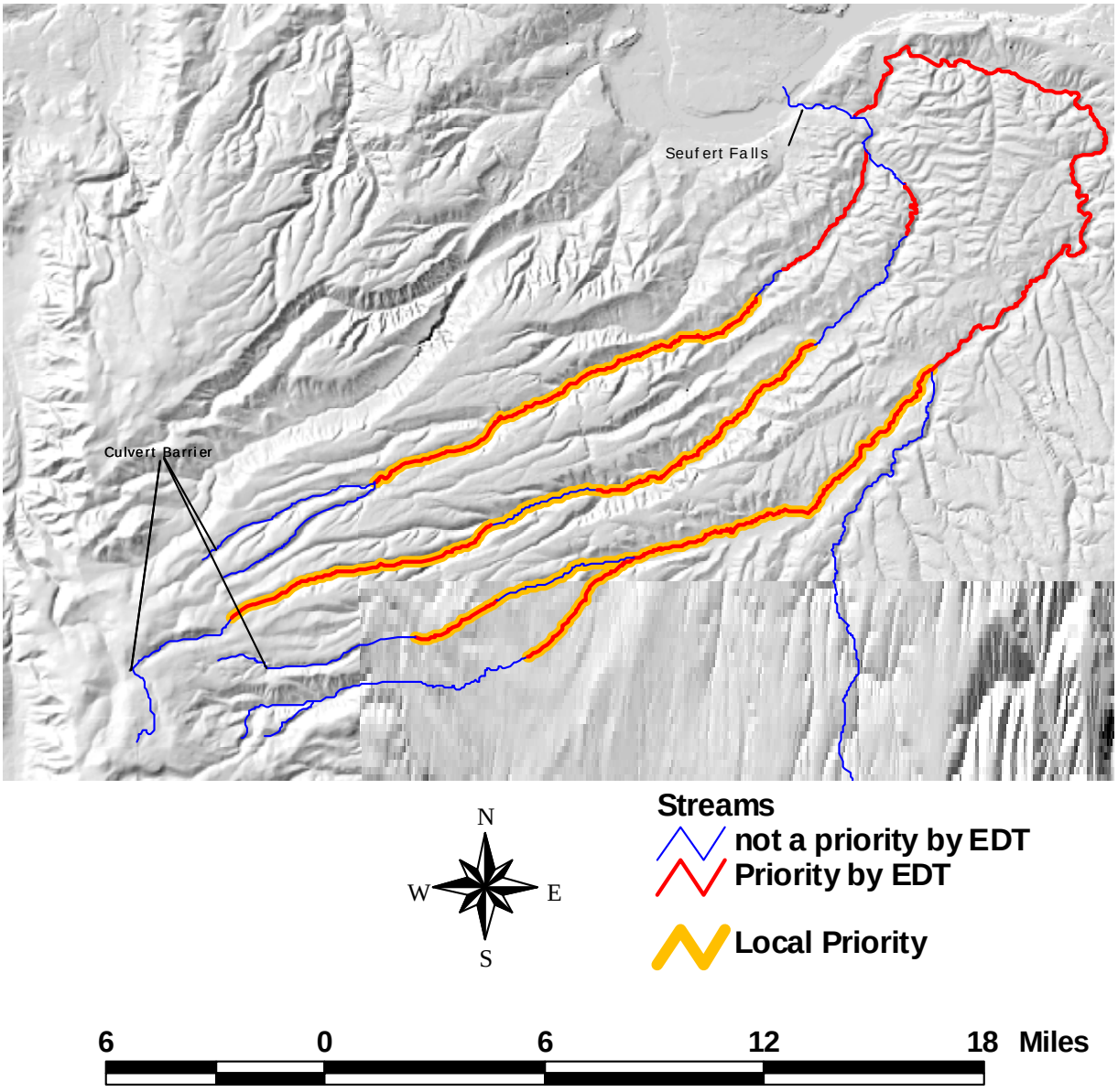
Figure 3.18: Priority Reaches for Protection (EDT, May 2004)



Choosing priorities for restoration is a more involved question. EDT ranks restoration priorities based on the difference between modeled presettlement conditions and current conditions for life history diversity, productivity and abundance. It looks at each reach in isolation, without considering the watershed context. The Fifteenmile Coordinating Group took a different approach. The Coordinating Group noted the reaches that currently have viable life histories (figure 3.5; compare also figure 3.18) and thought that the most logical approach would be to begin efforts immediately downstream, where environmental degradation begins to build up. This approach would immediately begin to build up the current viable population in the headwaters, and increase life history diversity. Furthermore, this approach would have a multiplier effect that would be felt downstream. As water quality and watershed function improved in the priority reaches,

water quality (temperature, sediment, flow, etc) would also improve downstream. Removal of culverts in the headwaters is not a priority because these culverts appear to be above the presettlement spawning range and have minimal effect on the steelhead population (see tables 3.12 and 3.13). The priority reaches as determined by EDT and by the Fifteenmile Coordinating Group are mapped on Figure 3.19.

Figure 3.19: Priority Reaches for Restoration, showing EDT's top 13 priority reaches, and Fifteenmile Coordinating Group Priorities.



3.6.2. Desired Future Conditions for Aquatic Focal Species

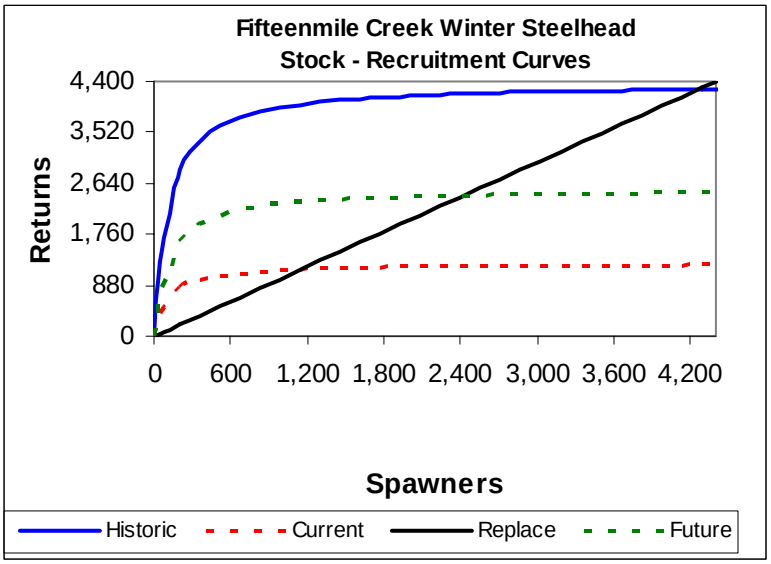
Fifteenmile Watershed

The thought process described under subbasin hypothesis leads to a restoration goal of 8,125-18,697 smolts per year and 268-2,274 returning spawners per year. This restoration goal will be elaborated further in the Fifteenmile Subbasin Management Plan.

It would be desirable to once again have angling opportunities within the Fifteenmile Subbasin. This would provide recreational opportunities to the local population, provide potential tribal harvest at Seufert Falls and potentially improve the local economy by bringing in recreation. Some level of harvest could be sustainable if the *productivity* of the habitat were improved. Productivity, as used by EDT, refers to the steelhead survival rate, from redds to a particular life stage, when density-dependent factors are not in play—i.e. when competition for resources is not a factor. On-the-ground, a high productivity means a population that bounces back quickly after a disturbance. EDT models the current productivity at 11.2 returns per spawner (Table 3.12), whereas the proposed restoration alternative increases productivity to 22.1 returns per spawner, and the presettlement productivity was modeled at 41.5 returns per spawner.

The stock production curves generated by EDT suggest that escapement of about 1,200 would be sufficient to provide a stable population, either under current conditions or under projected restored conditions (figure 5.1). In-basin harvest goals have not been discussed among the co-managers. However, it could be tentatively suggested that returning adults in excess of 1,200 could be harvested in-basin with little or no effect on the next generation of returns.

Figure 3.20: Stock Recruitment Curves for current conditions, modeled presettlement conditions and restoration goal (EDT 5/5/04).



The Dalles and Mosier Area Watersheds

Management goals for steelhead in The Dalles and Mosier area watersheds can not be set until the habitat and population in these streams is better understood.

It is known that steelhead spawn in both forks of Mill Creek, which also supports coho salmon. Steelhead are also believed to spawn in the lower parts of Chenowith Creek, Mosier Creek and Rock Creek, but their level of success in these creeks is unknown. Steelhead are also believed to have spawned in Threemile Creek until recent flood events cut off access.

Certain issues with water quality and passage are known to exist and were documented in the Qualitative Habitat Assessment process. Certain water quality data has been collected over the last few years. Water quality data is particularly abundant for South Fork Mill Creek at the Wick's Water Treatment Plant.

The following additional information (at a minimum) would be needed to determine management goals for steelhead in Mill Creek and the other streams:

- Habitat Surveys (habitat types, stream widths, LWD, etc.)
- Flow
- Temperature
- Spawning Counts/Redd surveys
- Toxic Chemicals
- Other water quality parameters
- A comprehensive survey of potential passage barriers

3.6.3. Opportunities

Fifteenmile

The high productivities generated by EDT indicate that steelhead populations in Fifteenmile Watershed would rebound rapidly in response to habitat restoration, and would subsequently be fairly resistant to disturbances (figure 3.17).

Landowners in Fifteenmile are currently quite willing to participate in voluntary incentive programs to protect and restore fish habitat in the Fifteenmile Watershed. High participation rates in buffer programs and other environmental incentive programs proves that these approaches are successful in the Fifteenmile Watershed.

Other Streams in Subbasin

Relatively pristine habitat conditions are found in both forks of Mill Creek, and in the upper part of Rock Creek. These reaches represent the highest priorities for protection. North Fork Mill Creek is accessible to steelhead and is currently used by steelhead for spawning. South Fork Mill Creek and Rock Creek are both primarily cutthroat habitat.

The mainstem of Mill Creek and the South Fork below Wick's Water Treatment Plant represent degraded habitat that is currently accessible to steelhead and other anadromous fish. These areas represent the highest priority for restoration in the subbasin outside of Fifteenmile Watershed. For cutthroat trout, the highest restoration priority in the subbasin is in Mosier Creek, which is impacted by falling aquifers, road runoff, and potential pesticide contamination.

Known Passage Barriers

Culverts at the following locations are 100% passage barriers:

Middle Fork Fivemile Creek—one culvert, would open up 875 feet of headwater habitat—unknown whether that habitat would be used for spawning or rearing

Ramsey Creek on Forest— two culverts, would open up 2,357 feet of headwater habitat—unknown whether that habitat would be used for spawning or rearing

Above Eightmile Creek Campground— two culverts, would open up 4,391 feet of headwater habitat—unknown whether that habitat would be used for spawning or rearing.

Threemile Creek—I84 (Upgrade planned for 2005.) Would open up 4.5 miles of habitat in fair condition.

Mill Creek—Various structures, city pipeline crossings, etc. threaten to become partial fish passage barriers at certain times of year. For instance, a city sewer pipeline underneath the Ninth Street bridge became nearly a complete barrier to coho passage in October 2003. The problem was discovered toward the end of the spawning season, and a temporary solution was found. The City of The Dalles is currently (March 2004) in discussion with Oregon Department of Fish and Wildlife for a permanent solution at that site.

Many other structures on all creeks may be partial barriers to some lifestages at in some flows.

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4. Fifteenmile Subbasin--Inventory of Existing Activities

DRAFT

May 25 2004

Compiled by Wasco County Soil and Water Conservation District
in cooperation with
Fifteenmile Coordinating Group

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Inventory Overview

The Inventory of Existing Activities is split into four major sections:

1) Existing Legal Protections covers laws, policies, regulations and rules that affect natural resource management in the Fifteenmile Subbasin. Generally, this includes land use planning, federal state and local regulations, and other documents that are not specifically written for the restoration of fish and wildlife in Fifteenmile Subbasin, but nevertheless support or affect restoration or protection efforts. The documents in this section generally carry the force of law.

2) Existing Management Plans and Programs covers documents specifically written for the restoration or protection of fish and wildlife, either in Fifteenmile Subbasin, or in a larger or smaller overlapping area. These plans may or may not carry the force of law.
3) Existing Watershed Projects covers ongoing activities with the goal of recovering fish and wildlife, water quality, or habitat in Fifteenmile Subbasin.
4) The gap assessment ties the inventory specifically to the Fifteenmile Subbasin Assessment, and analyzes the extent to which the existing protections, plans, programs and projects adequately address the limiting factors for fish and wildlife noted in the assessment.

4.1 Existing Legal Protection--Laws, Policies, Regulations and Rules

Table 4.1. Summary of Primary Existing Legal Protections

Federal	Endangered Species Act
	Clean Water Act
	Fish and Wildlife Coordination Act
	Magnussen-Stevens Act
	Migratory Bird Treaty Act
	Columbia River Gorge National Scenic Area Act (See Management Plans and Programs)
Oregon State	Oregon Forest Practices Act—Department of Forestry
	Removal/Fill of Wetlands and Streams—Department of State Lands
	Water Rights—Water Resources Department
	Oregon State Water Quality Standards-- Department of Environmental Quality
	National Pollutant Discharge Elimination System (NPDES)—Department of Environmental Quality
	Water Pollution Control Facilities (WPCF) Permits—Department of Environmental Quality
	Lower Deschutes Agricultural Water Quality Management Area Rules—Department of Agriculture
	Confined Animal Feeding Operations (CAFO)—Department of Agriculture
Wasco County	Wasco County Planning Department Comprehensive Land Use and Development Ordinances
City	City of Mosier—Open Space Zoning and Flood Damage Prevention Ordinances. All wetlands zoned Open Space.
	City of Dufur—Municipal Watershed and Municipal Sewer Management City of Dufur—Comprehensive Plan Update July 2003 City of Dufur—Zoning Ordinance #288, Section 4.5—Riparian Habitat Protection
	City of The Dalles— Municipal Watershed Management Plan Habitat Management Plan including Memorandum of Agreement with US Forest Service Municipal Sewer Management

Many federal, state, tribal, county and city agencies have programs or policies that include guidelines for protection of streams, riparian areas, fish and other aquatic life.

Endangered Species Act

The 1973 Endangered Species Act (ESA) provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered in the U.S. or elsewhere. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species, and contains exceptions and exemptions. The Endangered Species Act also is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora, commonly known as CITES. Criminal and civil penalties are provided for violations of the Act and the Convention. [need to add current status (recovery plans, status reviews, etc.) of specific listed species: bald eagle, spotted owl, steelhead, etc…will need to coordinate with NOAA Fish and USFWS]

National Oceanic Atmospheric Administration Fisheries: The National Oceanic Atmospheric Administration (NOAA) Fisheries administers the federal Endangered Species Act as it pertains to anadromous fish. NOAA Fisheries reviews and comments on fill/removal permit applications on streams with anadromous salmonids and on any hydroelectric project proceedings where anadromous fish are involved.[1]

U.S. Fish and Wildlife Service: The U.S. Fish and Wildlife Service is the principal federal agency responsible for conserving, protecting and enhancing fish, wildlife and plants and their habitats for the continuing benefit of the American people. The Service manages the National Wildlife Refuge System, National Fish Hatchery System, fishery resource offices, and ecological services field stations. The agency enforces Federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies. Their primary emphasis in the Fifteenmile Creek subbasin has been to work with federal agencies on land use activities.[2]

Fish and Wildlife Coordination Act

The Act provides that whenever the waters or channel of a body of water are modified by a department or agency of the United States the department or agency first shall consult with the U.S. Fish and Wildlife Service and with the head of the agency exercising administration over the wildlife resources of the state where construction will occur, with a view to the conservation of wildlife resources. The Act provides that land, water and interests may be acquired by federal construction agencies for wildlife conservation and development. In addition, real property under jurisdiction or control of a federal agency

[1] Lynn Hatcher, personal communication, November 2003

[2] Jerry Cordova, personal communication, December 2003.

and no longer required by that agency can be utilized for wildlife conservation by the state agency exercising administration over wildlife resources upon that property.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful.

National Pollution Discharge Elimination System (NPDES)
Confined Animal Feeding Operations
Oregon Department of Agriculture

Oregon Department of Agriculture has an agreement with EPA to administer the Confined Animal Feeding Operation (CAFO) Program in Oregon. The CAFO Program is designed to keep certain livestock operations from polluting water. The CAFO program resulted from the 1972 Federal Clean Water Act, in which certain types of livestock operations were classified as "point sources" and required permits. CAFOs must effectively deal with the manure and wastewater animals produce. CAFOs must be managed so that the waters of the state, including streams, lakes, ponds, and groundwater sources, are not polluted. Simply put, ODA's CAFO program is designed to protect water quality through use of best management practices on agricultural and rural lands. The program registers CAFOs under a National Pollutant Discharge Elimination System (NPDES) permit, inspects the facilities, and works with operators to promote water quality. Voluntary compliance, supported by educational outreach, is the primary means to achieve the water quality goals of the CAFO program.

National Pollution Discharge Elimination System (NPDES)
Oregon Department of Environmental Quality

The Department of Environmental Quality administers two different types of wastewater permits. These are: National Pollution Discharge Elimination System (NPDES) permits for wastewater discharge to surface waters; NPDES permits cover the discharge of treated industrial and domestic wastewater as well as stormwater discharges. The cities of Dufur, Mosier and The Dalles all have NPDES permits with DEQ to discharge their wastewater treatment plant effluent. The NPDES permit is also a Federal permit and is required under the Clean Water Act.

Clean Water Act
Oregon Department of Environmental Quality

The Oregon Department of Environmental Quality (ODEQ) is required by the Federal Clean Water Act[3] to establish water quality standards to protect the beneficial uses of the State's waters. Based on the water quality standards, ODEQ is then required to: identify stream segments where the standards are not being met; develop a list of these water-quality limited water bodies (called the 303(d) list from Section 303(d) of the Clean Water Act); and develop a Total Maximum Daily Load (TMDL) allocation for each

[3] Federal Clean Water Act 1972

water body and each pollutant included on the 303(d) lists. The TMDL describes the maximum amount of pollutants (from all sources) that may enter a specific water body without violating water quality standards. The most current 303(d) list for Oregon is dated 2002 and includes listings for temperature and sedimentation in the Fifteenmile Subbasin area. TMDLs are slated for completion in 2004.[4]

The Department of Environmental Quality administers the Clean Water Act 319 Non-Point Source (319) Program in the State of Oregon. The 319 Program provides up to 60% cost-share for projects targeting non-point source water pollution issues. 319 funds are for implementation activities, including monitoring to support TMDL development, implementation and measuring progress toward achieving TMDL allocations.[5]

Water Pollution Control Facilities (WPCF)
Oregon Department of Environmental Quality

DEQ also administers the State's Water Pollution Control Facilities (WPCF) permits for waste disposal without a direct discharge to surface waters. Examples of systems which require WPCF permits include land irrigation systems, industrial seepage pits, and don-site sewage disposal system designed for wastewater flows greater than 2,500 gallons per day.

Fishing and Hunting Regulations
Oregon Department of Fish and Wildlife

Oregon Department of Fish and Wildlife (ODFW) is responsible for protecting and enhancing Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations. Management of the fish and wildlife and their habitats in the Fifteenmile Creek subbasin is guided by ODFW policies and federal and state legislation. ODFW sets fishing and hunting regulations. ODFW policies and plans that pertain to the subbasin include the *Natural Production Policy*[6] *The Native Fish Conservation Policy (635-007-0502 to 0505). Oregon Guidelines for Timing In-Water Work to Protect Fish and Wildlife Resources* (ODFW 1986), *Fifteenmile Basin Fish Habitat Improvement Implementation Plan* (USFS & ODFW 1987), *and Fifteenmile Creek Subbasin Salmon and Steelhead Production Plan* (ODFW & CTWS 1990). These plans present systematic approaches to conserving aquatic resources and establishing management priorities within the subbasin.[7]

[4] Bonnie Lamb, ODEQ, personal communication, November 2003.

[5] Request for Proposals, Oregon 319 Grant Program 2002, page 4.

[6] Oregon Administrative Rules 635-07-521 to 524

[7] Rod French, personal communication, November 2003.

Oregon Forest Practices Act
Oregon Department of Forestry

The Oregon Department of Forestry regulates forest management activities on non-federal lands. The Oregon Forest Practices Act[8] regulates forest management activities including harvesting, road construction, slash burning, chemical application and reforestation. The rules contain a large body of water protection rules[9] based on current science that reflect the best management practices required by operators when conducting cultural practices in the forest. These guidelines include mandatory stream buffers and riparian management areas, as well as protection to small tributaries important for maintaining cool water temperature downstream.[10]

Removal-Fill Law (ORS 196.795-990)
Oregon Department of State Lands

Oregon Department of State Lands is responsible for regulating the removal and fill of materials in natural waterways. Oregon's Removal-Fill Law (ORS 196.795-990) requires people who plan to remove or fill material in waters of the state to obtain a permit from the Department of State Lands. The purpose of the law, enacted in 1967, is to protect public navigation, fishery and recreational uses of the waters. "**Waters of the state**" are defined as "natural waterways including all tidal and nontidal bays, intermittent streams, constantly flowing streams, lakes, wetlands and other bodies of water in this state, navigable and nonnavigable, including that portion of the Pacific Ocean that is in the boundaries of this state." The law applies to all landowners, whether private individuals or public agencies. [12]

Water Rights
Oregon Water Resources Department

The Oregon Water Resources Department regulates water use in the Fifteenmile Creek subbasin. Guidelines for appropriation of water[16] determine the maximum amount of water that can legally be diverted from the streams in the subbasin. Oregon Water Resources Department also acts as trustee for instream water rights issued to the state of Oregon and held in trust for the people of the state.[17]

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[8] Oregon Revised Statutes 527 and Administrative Rules Division 629-600 through 629-680

[9] Oregon Administrative Rules 629-635 through 629-660

[10] Larry Hoffman, ODF, personal communication, November 2003.

[11] Sam Wilkins, personal communication, November 2003.

[12] http://statelands.dsl.state.or.us/r-fintro.htm

[13] Ron Graves, personal communication, November 2003.

[14] Jay Nicholas, personal communication, November 2003.

[15] Craig Gunderson, personal communication, November 2003.

[16] Oregon Revised Statutes 537

[17] Larry Toll, personal communication, November 2003.

Fifteenmile Watershed is broken into eight water availability basins (WABs). Each of these is a subunit within which the Water Resources Department determines availability of water for water rights allocation. Until 1991, the Water Resources Department determined water rights availability at the 50% exceedance level. In other words, they would grant water rights as long as there was available water in an average year. Since 1991, they have granted water rights only up to the 80% exceedance level. In other words, there must be available water in four out of five years. At the 80% exceedance level, Fifteenmile Watershed is currently overallocated in January, June, July, August, and September. Upstream of the confluence of Eightmile Creek and Fifteenmile Creek, all water availability basins are overallocated in all except two or three months during the winter and early spring.

Wasco County Comprehensive Plan and Land Use and Development Ordinance
Wasco County Planning Department

The Wasco County Planning Department regulates land use on the county level. The *Wasco County Comprehensive Plan*[18] and *Land Use and Development Ordinance* address protection of water bodies, ground water, natural areas, agricultural land and fish and wildlife resources. The plan has helped minimize impacts to riparian corridors and big game habitat, particularly deer and elk winter range.[19]

The Land Conservation and Development Commission regulates land use on the state level. County land-use plans must comply with statewide land-use goals. Land-use plans have been helpful in protecting fish habitat, particularly by curtailing excessive development along streams.[20]

City of Dufur

The City of Dufur administers approximately 730 acres of land that are located in the Fifteenmile Creek subbasin. These lands are located above the city's municipal water sources and are managed to maintain the watershed. The city's main administrative action relating to conservation has been to grant easements to ODFW and USFS for conservation projects.

The City's Comprehensive Plan Update (Ordinance #326, adopted July 2003) includes descriptions of the fish and wildlife habitat resources present within the urban boundary. The plan notes that the riparian area of Fifteenmile Creek makes up somewhat less than

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[18] Wasco County Comprehensive Plan 1983

[19] Todd Cornett, personal communication, November 2003.

[20] Todd Cornett, personal communication, November 2003.

[21] Marty Matherly personal communication, November 2003.

[22] Ron Graves, personal communication, December 2003.

[23] Marty Matherly, Public Works, personal communication, November 2003

10% of the urban area and calls out riparian vegetation as important for both fish and wildlife habitat (pp 7-9). The Plan states that it is the policy of the City of Dufur to maintain open space and riparian vegetation along the Fifteenmile floodplain (p30).

The City of Dufur Zoning Codes (ordinance 288 as updated through June 1988) provide for riparian protection within 20 feet of the high water line ("during normal seasonal runoff") of Fifteenmile Creek. Roadways and structures are restricted within that band, with some exceptions. "All trees and at least 50 percent of the understory vegetation shall be retained…" with some exceptions (section 4.5, p11).

The City of Dufur has a municipal sewer system, which is managed to comply with all state and federal rules.[24]

City of Mosier

The City of Mosier owns approximately 20 acres that is zoned Open Space, including nearly a mile of Mosier Creek and all wetlands. No uses are permitted outright in this area. Conditional uses include parks, recreation areas, community centers and public utilities.

Mosier also has a flood damage prevention ordinance that is designed to minimize the chances that human life or property will be endangered or damaged in the course of a flood. The ordinance applies to all lands within the City of Mosier within designated special flood hazard zones. It specifies construction methods, materials, utilities, and locations and requires developers to go through a special review process.

City of The Dalles

The City of The Dalles Planning Department does not have any specific zones for floodplains or environmental protection, but complies with all State and Federal guidelines for protection of water quality and fish habitat protection.[25]

Oregon State Police

The Oregon State Police regularly patrol the Fifteenmile Creek subbasin to enforce laws and regulations designed to protect fish and wildlife and their habitat.[26]

Wasco County Public Works

The Public Works Department has "fine-tuned" their general road maintenance operations to mirror the best management practices that ODOT prepared for NOAA Fisheries. The periods of the year in which maintenance cleaning of culverts is undertaken was changed. They have also acquired and are using specialized machinery for these cleaning operations to help meet the standards. All new culvert installations that may impact any species of fish will be designed for fish passage through these

[24] Gay Melvin, City of Dufur, personal communication, December 2003.

[25] Chris Bernhardt, personal communication, December 2003.

[26] Craig Gunderson, personal communication, November 2003.

structures. All State and Federal (Corps) permits that apply to any new projects adjoining or contributing to fish bearing streams will be properly prepared and processed.[27]

Oregon Department of Transportation

The Oregon Department of Transportation (ODOT) maintains state highways that cross streams in the Fifteenmile Creek subbasin. Bridges and culverts, as they are upgraded or replaced, must meet guidelines designed to protect fish and fish habitat. In particular, guidelines are specified in the 4d Rule for threatened Mid-Columbia steelhead, written by NOAA Fisheries.[28]

Natural Resources Conservation Service

The USDA Natural Resource Conservation Service (NRCS) provides technical support associated with the conservation of all natural resources to the SWCD and private landowners. The NRCS provides technical assistance in all disciplines including agronomy, rangeland, forestry, soils, geology, biology, engineering and economics. Several federal cost-share programs are administered by NRCS through the local guidance of the SWCD. These cost share monies address priority local resource concerns including soil erosion, water quality/quantity and sustaining agricultural production on privately owned land. The Environmental Quality Incentives Program (EQIP) is the most commonly used USDA cost-share program in the Fifteenmile Subbasin.[29] Another highly active program is the Conservation Reserve Enhancement Program (CREP)and the Continuous Conservation Reserve Program (CCRP).

U.S. Bureau of Land Management

The U.S. Bureau of Land Management (BLM) administers approximately 2770 acres of forested land in the Fifteenmile Creek subbasin. These forests are managed under guidelines established in the *Northwest Forest Management Plan*[30] as described for those lands managed by the USFS.[31]

Confederated Tribes of the Warm Springs Reservation of Oregon

The Confederated Tribes of the Warm Springs Reservation of Oregon reviews proposed management on public lands within the subbasin and provides comments relative to protection of natural resources. Tribal range managers utilize livestock grazing leases on

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[27] Marty Matherly personal communication, November 2003.

[28] Sam Wilkins, personal communication, November 2003.

[29] Dusty Eddy, personal communication, November 2003

[30] *Northwest Forest Management Plan* 1994

[31] John Hanf, personal communication, November 2003

tribal allotments within the subbasin. The Confederated Tribes are co-managers of state fisheries resources with the Oregon Department of Fish and Wildlife.[32]

The Fifteenmile Watershed is entirely located on lands ceded to the United States Government by the Confederated Tribes of the Warm Springs Reservation in the Treaty of 1855. The Treaty mandates sufficient water quality and quantity to maintain the fishery resource. Additionally, the Treaty reserved the right to fish "at all... usual and accustomed stations, in common with citizens of the United States, and of erecting suitable houses for curing the same; also the privilege of hunting, gathering roots and berries, and pasturing their stock on unclaimed lands, in common with citizens, is secured to them."[33] Currently, the tribal fisheries in Fifteenmile are closed to allow stocks to recover.

4.2 Existing Management Plans and Programs

4.2.1 Watershed Assessments and Watershed Council Action Plans

Fifteenmile Watershed Council

Fifteenmile Watershed Council provides a forum for discussion of natural resource issues within the Fifteenmile Watershed. Fifteenmile Watershed Council acts as an advisory council to many of the public natural resource agencies, in particular, Wasco County Soil and Water Conservation District, US Forest Service, Oregon Department of Fish and Wildlife and Oregon Department of Environmental Quality. Fifteenmile Watershed Council has completed a comprehensive watershed assessment. Fifteenmile Watershed Council has acted as the public forum for development of Total Maximum Daily Loads in the Fifteenmile Watershed.[37]

The Dalles Area Watershed Council

The Dalles Area Watershed Council provides a forum for discussion of natural resource issues within the watersheds of Threemile, Mill and Chenowith Creeks. They act as an advisory council to many of the public natural resource agencies, in particular, Wasco County Soil and Water Conservation District, US Forest Service, Oregon Department of Fish and Wildlife and Oregon Department of Environmental Quality. The Dalles Area

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[32] Joe McCanna, personal communication, November 2003.

[33] Treaty with the Tribes of Middle Oregon, 1855

[34] Jennifer Clark, Wasco County Soil and Water Conservation District, personal communication, November 2003.

[35] Jennifer Clark, Wasco County Soil and Water Conservation District, personal communication, November 2003.

[36] Jennifer Clark, Wasco County Soil and Water Conservation District, personal communication, November 2003.

[37] Jennifer Clark, Wasco County Soil and Water Conservation District, personal communication, November 2003.

Watershed Council has completed a comprehensive watershed assessment and is beginning work on a watershed action plan.[38]

Mosier Watershed Council

Mosier Watershed Council provides a forum for discussion of natural resource issues within the Mosier Creek, Rowena Creek and Rock Creek Watersheds. They act as an advisory council to many of the public natural resource agencies, in particular, Wasco County Soil and Water Conservation District, US Forest Service, Oregon Department of Fish and Wildlife and Oregon Department of Environmental Quality. Mosier Watershed Council has assisted DEQ to collect stream temperature data, has completed a watershed assessment and is currently working on a groundwater restoration and management plan.[39]

Fifteenmile Watershed Council and Wasco County SWCD. 2003. *Fifteenmile Watershed Assessment.* This assessment reviews upland, riparian and instream conditions in the Fifteenmile Creek Watershed, including all tributaries, using and expanding upon the protocol developed by Oregon Watershed Enhancement Board (OWEB) in the Oregon Watershed Assessment Manual.

Fifteenmile Watershed Council and Wasco County Soil & Water Conservation District 1997. Fifteenmile Watershed Action Plan. The Fifteenmile Watershed Action Plan[40] provides strategies to reduce runoff and sediment generation in the uplands, improve grazing systems in the riparian zones and uplands, manage forestlands to protect watershed values, improve riparian corridors, minimize flood damage to streambanks and riparian vegetation, improve irrigation efficiency and actively improve the management of the uplands for the purpose of wildlife.

The Dalles Area Watershed Council and Wasco County SWCD. 2003. *The Dalles Watershed Assessment*. This assessment reviews upland, riparian and instream conditions in the Threemile, Mill and Chenowith Creek Watersheds, using and expanding upon the protocol developed by Oregon Watershed Enhancement Board (OWEB) in the Oregon Watershed Assessment Manual.

Mosier Watershed Council and Wasco County SWCD. 2002. *Mosier Watershed Assessment.* This assessment reviews upland, riparian and instream conditions in the Rowena, Mosier and Rock Creek Watersheds, using and expanding upon the protocol developed by Oregon Watershed Enhancement Board (OWEB) in the Oregon Watershed Assessment Manual.

Mosier Watershed Council and Wasco County SWCD. DRAFT. Mosier Groundwater Restoration and Management Action Plan. This plan will describe a program to address

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[38] Jennifer Clark, Wasco County Soil and Water Conservation District, personal communication, November 2003.

[39] Jennifer Clark, Wasco County Soil and Water Conservation District, personal communication, November 2003.

[40] Fifteenmile Watershed Council 1997

the falling groundwater levels in the Mosier Valley, and will feature goals including stable or increasing groundwater levels, sustainable agriculture, and healthy streamflows.

USFS. 1994. *Mile Creeks Watershed Analysis.* This analysis looks at forest health issues and stream health within the upper portions of Fifteenmile, Eightmile and Fivemile Creeks. The analysis includes not only national forest lands, but extends downstream to the first major confluence in each stream.

USFS. 2000. *Mill Creek Watershed Analysis.* This analysis looks at forest health issues and stream health within the entire Mill Creek watershed.

ODFW. 2001. *Fifteenmile Creek Physical Habitat Surveys.* Aquatic Inventory Project.

ODFW. 2002. *Eightmile Creek and Fivemile Creek Physical Habitat Surveys.* Aquatic Inventory Project.

4.2.2 Tribal Plans

Fifteenmile Creek Salmon and Steelhead Production Plan

The *Fifteenmile Creek Salmon and Steelhead Production Program*[41] Oregon Department of Fish and Wildlife (ODFW) and the Confederated Tribes of Warm Springs (CTWS) developed this plan to guide steelhead management actions in the Fifteenmile Watershed. This Plan was part of the Northwest Power Planning Council's original Subbasin Planning effort. The Plan provided the basis for salmon and steelhead production strategies and attempted to estimate current and potential production. The Plan summarized management goals and identified problems and opportunities associated with increasing salmon and steelhead production.

Wy-Kan-Ush-Mi Wa-Kish-Wit

This is the Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes.[42] This plan includes adult return targets for each subbasin in the Columbia Basin. Wy-Kan-Ush-Mi Wa-Kish-Wit recommends habitat restoration actions that focus on limiting, restricting, or eliminating land uses and enhancing populations with implementation of new broodstock, release and production programs. The plan was published in 1996, and habitat restoration projects emphasizing implementation of forest, range, and agricultural best management practices have been initiated in priority watersheds since 1997 through the Council's program.

4.2.3 Federal Plans

National Resources Conservation Service Deschutes Basin Strategic Plan

In the State of Oregon, the Natural Resources Conservation Service (NRCS) is organized loosely by river basins. The Fifteenmile Subbasin is included in the NRCS "Deschutes Basin." NRCS is developing a Deschutes Basin Strategic Plan that describes the goals

[41] The Fifteenmile Creek Salmon and Steelhead Production Program 1990

[42] Columbia Inter Tribal Fish Commission 1996

and objectives of the agency. The Strategic Plan describes the federal programs administered by NRCS, and includes the Annual Plans for each of the six SWCDs in the Deschutes Basin.[43]

Northwest Forest Plan
Mt. Hood National Forest Land and Resource Management Plan

The U.S. Forest Service (USFS) manages approximately 15 percent (55,245 acres) of the Fifteenmile Creek subbasin. Management of these lands is guided by USFS policies and federal legislation. Management guidelines for the subbasin are contained in the *Mt. Hood National Forest Land and Resource Management Plan* and *Attachment A: Standards and Guidelines for Management of Habitat for Late Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* of the 1994 *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.*[44] These plans provide standards and guidelines for management of the national forest lands in the subbasin. Included in the *Northwest Forest Management Plan* is the Aquatic Conservation Strategy (ACS) which was developed to maintain and restore the ecological health of watersheds and aquatic ecosystems on public lands. The four components of the ACS, riparian reserves, key watersheds, watershed analysis, and watershed restoration, are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems. The ACS provides protection of salmon and steelhead habitat on federal lands by striving to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources, and restore currently degraded habitats. This approach seeks to prevent further degradation and restore habitat over broad landscapes. All proposed and existing projects in the subbasin are designed to meet the intent of the ACS objectives.[45]

Columbia Gorge Scenic Area Management Plan—Columbia Gorge Commission & US Forest Service

The Columbia River Gorge National Scenic Area was created on November 17, 1986 when President Reagan signed into effect Public Law 99-663. After nearly 5 years of scenic, cultural, natural and recreational resource data collection and analysis, a Management Plan for the Scenic Area was adopted by the Columbia River Gorge Commission on October 15, 1991 and concurred upon by the U.S. Secretary of Agriculture on February 13, 1992.

In compliance with the federal act establishing the Columbia River Gorge National Scenic Area, Wasco County has adopted land use regulations to implement the Management Plan within its portion of the Scenic Area. In the Fifteenmile Subbasin, the Scenic Area Management Plan is implemented within General Management Areas by

[43] Dusty Eddy, personal communication, December 2003.

[44] Northwest Forest Management Plan

[45] Gary Asbridge, US Forest Service, personal communication, November 2003.

Wasco County Planning Office with oversight by the Columbia Gorge Commission. Urban areas of The Dalles and Mosier are exempt from the Scenic Area Plan.

The US Forest Service directly manages certain Special Management Areas on Chenowith Table and around the community of Rowena. These areas are primarily federally owned. Federal undertakings within the Scenic Area are regulated by the US Forest Service.[46]

Endangered Species Act Implementation Plan for the Federal Columbia River Power System

The three action agencies have prepared the implementation plan[47] in acknowledgement of responsibilities for fish protection under the Northwest Power Act and water quality protection under the Clean Water Act, and their obligations to Indian tribes under law, treaty, and Executive Order. The plan responds to the December 2000 Biological Opinions issued by the U.S. Fish and Wildlife Service and the NOAA Fisheries on the effects to listed species from operations of the Columbia River hydropower system.

The plan is a five-year blueprint that organizes collective fish recovery actions by the three agencies. The plan looks at the full cycle of the fish, also known as "gravel to gravel" management or an "All-H" approach (hydro, habitat, hatcheries, and harvest). However, it describes only commitments connected to the Federal Columbia River Power System (FCRPS), not the obligations of other federal agencies, states, or private parties. The plan describes the three agencies' goals; the performance standards to gauge results over time; strategies and priorities for each H; detailed five-year action tables for each H; research, monitoring, and evaluation plan and expectations for regional coordination.

Federal Columbia River Power System Biological Opinion and Salmon Recovery Strategy

NOAA Fisheries has recently developed several documents and initiatives for the recovery of Endangered Species Act listed Snake River steelhead, chinook and sockeye. The Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp) and the Basinwide Salmon Recovery Strategy issued at the end of 2000 contain actions and strategies for habitat restoration and protection for the Columbia River Basin. Action agencies are identified that will lead fast-start efforts in specific aspects of restoration on nonfederal lands. Federal land management will be implemented by current programs that protect important aquatic habitats (PACFISH, ICBEMP - Interior Columbia Basin EcoSystem Management Project). Actions within the FCRPS BiOp are intended to be consistent with or complement the Council's amended Fish and Wildlife Program and state and local watershed planning efforts.

NOAA Fisheries has also initiated recovery planning with the establishment of a Technical Recovery Team for the Interior Columbia, which includes Snake River stocks. The Technical Recovery Team will identify delisting criteria and viability criteria for populations within Evolutionary Significant Units, identify factors that limit recovery,

[46] Mike Ferres, Columbia River Gorge National Scenic Act, personal communication, March 2004

[47] Bonneville Power Administration et al. 2001

and identify early actions for recovery among other things. A stakeholder-based forum will develop a formal recovery plan from these products.

Under the 2000 Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp), NOAA Fisheries expects the Bonneville Power Administration, the Corps of Engineers, and the Bureau of Reclamation to meet their Endangered Species Act obligations in part through offsite mitigation.[48] Subbasin plans will become local recovery plans or will become a substantial component of NOAA Fisheries recovery planning. The BiOp relies on subbasin plans to identify and prioritize specific actions needed to recover listed salmon and steelhead in tributary habitats. NOAA Fisheries expects subbasin plans to include implementation of the BiOp's offsite mitigation actions. NOAA Fisheries also expects subbasin plans to incorporate their recommended research, monitoring, and effective strategies and actions.

NOAA Fisheries is currently undergoing a remand of the 2000 Biological Opinion. Sections of the opinion might change. However, for the purposes and timeframe of this subbasin plan, the 2000 BiOp is the operative document.

Columbia River Fish Management Plan

The Columbia River Fish Management Plan (CRFMP) is an agreement resulting from the U.S. District Court case of U.S. V. Oregon .[49] This agreement between federal agencies, Indian tribes and state agencies (except Idaho) set guidelines for the management, harvest, hatchery production, and rebuilding of Columbia River Basin salmonid stocks. Appropriate harvest levels and methods were established for various levels of attainment of interim population goals for spring chinook, summer chinook, sockeye, fall chinook, summer steelhead, and coho salmon. The plan guaranteed the treaty Indian fisheries a minimum of 10,000 spring and summer chinook annually, not dependent on run size. The original CRFMP terminated in 1998; it is currently being renegotiated, with completion anticipated by December 2003. In the interim, seasonal fish management plans have been drafted and agreed to by relevant parties.

4.2.4 State Plans

The Oregon Plan for Salmon and Watersheds

The purpose of the Oregon Plan for salmon and Watersheds is to restore Oregon's wild salmon and trout populations and fisheries to sustainable and productive levels that will provide substantial environmental, cultural, and economic benefits and to improve water quality.[50]

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[48] Lohn 2002

[49] U.S. District Court case of U.S. V. Oregon , Case No. 68-513

[50] Jay Nicholas, personal communication, November 2003.

Lower Deschutes Agricultural Water Quality Management Area Plan—Oregon Department of Agriculture

In cooperation with Lower Deschutes Local Advisory Committee and Wasco County Soil and Water Conservation District, Oregon Department of Agriculture (ODA) developed the *Lower Deschutes Agricultural Water Quality Management Area Plan*[51] (2000) to address agricultural water quality issues in the lower Deschutes River and all streams flowing into the Columbia River between the Hood River and John Day River, including the Fifteenmile Creek subbasin. It identifies strategies to reduce water pollution from agricultural lands and achieve water quality standards. It applies to lands in current agricultural use and those lying idle or on which management has been deferred .[52]

Fifteenmile Basin Fish Habitat Improvement Implementation Plan

Fifteenmile Basin Fish Habitat Improvement Implementation Plan[53] is the main source of guidance for Oregon Department of Fish and Wildlife fish habitat projects in the Fifteenmile Watershed. The objective of this program is to maximize winter steelhead production in the subbasin. This plan identified existing habitat problems, solutions, goals and objectives, and identified fisheries benefits that would accrue with implementation.

4.2.5 Other Plans

City of The Dalles--Municipal Watershed

The South Fork of Mill Creek constitutes the municipal drinking water source for the City of The Dalles. Most of this subwatershed is publicly owned and managed, either by the City of The Dalles or by the US Forest Service as part of the Mount Hood National Forest. The Dalles Watershed is managed to protect forest health and water quality. Public access is restricted. Both the City and the Forest Service practice selective logging using prescriptions designed to improve forest health and minimize the risk of wildfire. Mill Creek Falls restricts the range of anadromous fish to the lower five miles of South Fork Mill Creek. Upstream of the falls, South Fork and many of its tributaries provide 18 miles of habitat for redband trout.

In addition to Forest Service plans and programs, there are three management plans that guide operations within The Dalles Municipal Watershed. The first is the Comprehensive Management Plan which is part of the 1972 MOU with the Mount Hood National Forest, USFS. The MOU provides that the primary resource to be managed for is the protection of water quality, as does an agreement between the City and the US Secretary of Agriculture which dates back to 1912. The Plan provides guidance on allowable timber harvests (methods and acreages), road construction and maintenance, and planning and protection measures to be taken to protect water quality.

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[51] Lower Deschutes Agricultural Water Quality Management Area Plan, 2000.

[52] Ron Graves, personal communication, November 2003

[53] Fifteenmile Basin Fish Habitat Improvement Implementation Plan, Oregon Department of Fish and Wildlife and US Forest Service, 1987

The second plan is a Habitat Conservation Plan between the City, US Fish and Wildlife Service, and the USFS for the protection of northern spotted owls. This 30-year plan outlines the protection measures that the City will implement during timber harvests on City-owned lands to protect the owls. As part of this plan, the City has committed to the following on City-owned properties in the Watershed:

> "maintenance of riparian buffers along South Fork Mill Creek and Crow Creek for a slope distance equal to or greater than the height of two site-potential trees from the edge of the stream channel in which 60-80% conifer canopy closure will be maintained if present and practicable."[54]

The third plan is the City's 5-year Timber Management Plan that outlines activities planned to occur on the City's forested lands within the Watershed. These activities include timber harvests, planting, timber stand surveys, forest health assessments, and gopher control activities. The City utilizes a contracted forester to develop these 5-year plans and assist the City in administering the identified activities.

ODF stream protection regulations would require, at most, 100-ft buffers (where conifer basal area retainage requirements would apply) along streams during timber harvest operations. The City's current 5-year Timber Management Plan recognizes our commitments made in the HCP by establishing 275-ft riparian buffers along all streams in the Watershed. These riparian reserves have been mapped and are essentially off-limits for timber harvest activities as long as they remain healthy and maintainable.

Wasco County Soil and Water Conservation District Strategic Plan
Wasco County Soil and Water Conservation District Annual Plan of Work

Wasco County SWCD works with farmers and ranchers to develop farm conservation plans and resource management plans. The SWCD administers grants to encourage conservation work on private lands in the Fifteenmile Creek subbasin and other lands in Wasco County. Wasco County SWCD has assisted Wasco County Public Works and other agencies in design and installation of conservation structures and practices.[55]

Wasco County SWCD has assisted the Public Works department in design modification and installation of settling basins, drop-structures, ditches, and culverts. Wasco County SWCD also installed a bank and roadside protection structure near Company Hollow Road and Fifteenmile Road intersection in Fifteenmile Creek itself.[56]

Wasco County Soil and Water Conservation District adopts a strategic plan on a five-year basis. The strategic plan describes the goals, objectives and priorities of the SWCD during that five-year period. Every year, the SWCD adopts an annual plan of work that specifies actions and responsibilities for that year.

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[54] City of The Dalles Habitat Conservation Plan

[55] Ron Graves, personal communication, December 2003.

[56] Marty Matherly, Public Works, personal communication, November 2003

4.3 Existing Watershed Projects

4.3.1 Riparian Buffers

Table 4.2 Recent and Ongoing Riparian Buffer Programs

Organizat-ion	Project	Where Applies	Start/End Date	Status	Limiting Factors Addressed
ODFW	Fifteenmile Creek Habitat Restoration Project (BPA #1993-040-00)	Fifteenmile, Eightmile, Ramsey, Dry Creek	1990--	In progress	Key Habitat Quantity, Habitat Diversity, Channel Stability, Temperature
USDA/FSA/ NRCS	CCRP	Non-anadromous streams	1999—2016	In progress	Key Habitat Quantity, Habitat Diversity, Channel Stability, Temperature
USDA/FSA/ NRCS	CREP	Anadromous streams	1999—2016	In progress	Key Habitat Quantity, Habitat Diversity, Channel Stability, Temperature

Table 4.2 cont. Recent and Ongoing Riparian Buffer Programs

Organizat-ion	Project	Where Applies	Start/End Date	Status	Limiting Factors Addressed
SWCD	Fifteenmile Riparian Buffers (BPA #2001-021-00)	All streams	4/2001--3/2006	In progress	Key Habitat Quantity, Habitat Diversity, Channel Stability, Temperature
CTWSR	Fifteenmile CREP/Re-seeding	Tribal lands on Fifteenmile Cr.	07/01/2002—09/30/2016	Activities completed. Contract continues until 2016.	Key Habitat Quantity, Habitat Diversity, Channel Stability, Temperature
SWCD	Riparian Protection & Upland Water Source	Standard Hollow, tributary of Fifteenmile	06-24-2002/06-10-2003	Completed	Key Habitat Quantity, Habitat Diversity, Channel Stability, Temperature
Wasco County Court	Mill Creek Floodplain Easement	Mill Creek	August 2003--	In Progress	Channel Stability
Mosier Alliance/City of Mosier	Mosier Waterfront Project	Mouths of Rock Creek and Mosier Creek	2000-Present	In Progress	Channel Stability, Temperature, Sediment
NW Aluminum	Chenowith Creek Fencing	Chenowith Creek	August 2002--	Complete	Pollutants, Channel Stability

Riparian buffers provide for a corridor of mature riparian vegetation between a stream and adjacent land uses. Such systems address multiple limiting factors identified in the Fifteenmile Subbasin Assessment. They reduce sediment inputs, stabilize streambanks, and provide shade, thus reducing summer water temperature. Wider buffers provide greater long-term benefits, as they allow for the restoration of natural stream hydrology, channel migration, floodplain interaction and habitat types.

Fifteenmile Basin Fish Habitat Improvement Implementation Program

The Oregon Department of Fish and Wildlife (ODFW) implemented the initial riparian protection program for the Fifteenmile Watershed beginning in 1988. The Program

initially built riparian exclusion fence, livestock watering facilities and instream habitat structures on privately owned land. This program protected high priority spawning and rearing habitat first, and has progressed through all areas of the Fifteenmile Watershed with receptive landowners and anadromous access. Riparian exclusion fence was constructed at no cost to landowners in exchange for a 15-year lease agreement wherein the landowner agreed to allow natural riparian vegetation to develop, and ODFW further agreed to provide fence maintenance for the term of the lease. Between 1988 and 1996, ODFW constructed approximately 110 miles of fence, protecting 55 miles of stream. Since 2000, ODFW constructed an additional 30 miles of fence in priority areas, providing continuity with previous projects and capitalizing on properties enrolled in the USDA Conservation Reserve Enhancement Program (see below). In these cases, the landowners provide fence maintenance for a period of fifteen years, in accord with both ODFW and USDA lease agreements. This program, implemented by ODFW and funded through the Bonneville Power Administration, has successfully protected 70 miles of anadromous fish-bearing streams in the Fifteenmile Subbasin.

Continuous Conservation Reserve and Conservation Reserve Enhancement Program

The Conservation Reserve Enhancement Program (CREP) and the Continuous Conservation Reserve Program (CCRP) are riparian area protection programs implemented by the USDA Farm Services Agency (FSA). These two programs are managed through the U.S. Department of Agriculture Farm Service Agency with technical assistance provided by the USDA Natural Resources Conservation Service. These programs are voluntary and include some combination of the following: incentive payments, cost-sharing with plantings, and rental payments.

The Continuous Conservation Reserve Program (CCRP) is run by the USDA Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA). The program was established in 1999 under the 1996 Farm Bill and was re-authorized in the 2002 Farm Bill. CCRP enrolls private lands under a ten to fifteen year contract under which the landowner agrees to use the land exclusively as a forested riparian buffer and is in turn paid a rental rate for the land so dedicated. Forested riparian buffers cover approximately one third of the active floodplain, and vary in width between 35 and 180 feet on either side of the stream. Landowners share the cost of planting trees, building fences and other practices with the federal government.

The Conservation Reserve Enhancement Program (CREP) is a joint effort of the State of Oregon and the NRCS. This program uses the guidelines of the CCRP program, but the State provides additional cost-share dollars to provide additional incentive for landowners to enroll. This program is only available on anadromous spawning and rearing streams. Included in the CREP program are 2,200 feet of Fifteenmile Creek owned by the Confederated Tribes of the Warm Springs Reservation. That contract covers 13.8 acres.

Wasco County Soil and Water Conservation District has supported the CCRP and CREP programs by providing two full-time planners to provide accelerated technical assistance. Funding for these planners has been provided by the Bonneville Power Administration. In addition, Wasco County SWCD has provided funds from various sources to landowners for the purpose of stream protection at specific points in the watershed.

As of May 21st 2004, the Fifteenmile Subbasin boasted more than 1,660 acres in the USDA Forested Riparian Buffer practice along Fifteenmile, Eightmile, Fivemile, Threemile, Mill Creek and various tributaries to these streams. These contracts provide over 58.5 stream miles of forested riparian buffers, including 49.8 stream miles of anadromous streams. Pending applications to this program cover another 35 stream miles in the Fifteenmile Subbasin.

Between the USDA and ODFW, over 90 miles of riparian corridor in the privately owned portion of Fifteenmile Subbasin have been protected from grazing, agriculture and other land uses.

Mount Hood National Forest

Mount Hood National Forest protects riparian corridors through the standards of the Northwest Forest Plan. Riparian Reserve widths are specified in that document for perennial and seasonal streams.

The Mount Hood National Forest has been working to improve floodplain and instream conditions in the federally-owned reaches of Fifteenmile, Ramsey, Eightmile and Fivemile Creeks. Their methods have focused on large woody debris placements, decommissioning of roads and native tree and shrub plantings and improving fish passage.

In 1998, the Mount Hood National Forest placed 250 logs in the floodplain of Fifteenmile Creek upstream of the national forest boundary. The floodplain appears to have stabilized, and streambank erosion appears to have diminished. Wetland species are taking over the area, crowding out dryland tree species (i.e. ponderosa pine) which had previously dominated the floodplain[57].

Between 2000 and 2002, Mount Hood National Forest placed more than 1400 logs instream and in the floodplain of a 3 mile stretch of Ramsey Creek. In addition, they converted a riparian road to a foot trail and planted native trees and shrubs. Much of this reach had been recently purchased by the National Forest and had previously been heavily logged by a private company.

A similar project was initiated in June 2003 along a reach of Fifteenmile Creek that includes both National Forest land and land owned by the City of Dufur. As of November 19, 2003, logs had been placed along 0.3 miles of stream. The remainder of the project includes vacating the public road, piping an irrigation ditch that withdraws water from the upper end of the affected segment, riparian planting and a similar LWD project about 2.5 miles downstream..

City of Mosier

Mosier Creek provides 0.45 miles of anadromous habitat, all of which is in public ownership. Downstream of Pocket Falls, Mosier Creek flows through a canyon and into the Columbia River, through land owned by the City of Mosier, Oregon Department of Transportation, and Union Pacific Railroad. The portion owned by the City of Mosier is

[57] Gary Asbridge, USFS, visual observation and photopoints 2003

lightly developed parkland. While harassment potential is high near the mouth of the creek, it is largely inaccessible to the public upstream of US30 due to vertical canyon walls and wetland conditions.

The City of Mosier, in cooperation with the Mosier Alliance, has been developing their waterfront for recreational purposes. The Mosier Waterfront Project is federally funded through the National Scenic Area. The goals of the project are to encourage tourism, while protecting or enhancing scenic beauty and the environment. The focus of most of the activities has been the mouths of Rock Creek and Mosier Creek, which provide the only access to the Columbia River from the south side of Interstate 84 and the Union Pacific Railway. The Waterfront Project is developing trails and access for windsurfers and other recreationalists, while attempting to minimize environmental impacts on the streams. As part of this project, riparian vegetation has been planted along the banks of Rock Creek.

Northwest Aluminum

Chenowith Creek provides 3.5 miles of anadromous habitat. Northwest Aluminum Plant owns approximately 0.25 miles of the stream between US30 and I84. They leased that piece of land as pasture for horses. In 2001, this reach was identified as highly polluted with organic waste. Streambed pebble counts in November 2002 found that spawning gravels in this reach were entirely covered by horse manure.

Northwest Aluminum required the lessee to fence off the creek, with the exception of one gap where the horses could drink. Follow-up monitoring in November 2003 indicated that manure waste had been eliminated from spawning gravels in this reach.

Wasco County--Mill Creek Conservation Easement

Wasco County proposes to purchase an easement on a floodplain along the west side of Mill Creek, across from Erickson's Addition, a neighborhood of The Dalles that abuts directly against the stream. The purpose of this easement would be to ensure that residential development does not occur on the west side of the stream, and possibly to allow development of an overflow channel that would reduce flood dangers to Erickson's Addition and downstream neighborhoods. Such a channel would hopefully provide a small amount of off-channel habitat for fish or amphibians, and would buffer downstream flood flows by a small amount, thus protecting instream habitat from damage during flood events. Engineering design was completed in January 31, 2004 on a potential overflow channel.

4.3.2 Instream Habitat Enhancement

Table 4.3 Recent and Ongoing Instream Habitat Enhancement Projects

Organizat-ion	Project	Where Applies	Start/ End Date	Status	Limiting Factors Addressed
ODFW	Fifteenmile Creek Habitat Restoration Project—Instream structures (657 on Fifteenmile, 191 on Eightmile)	Fifteenmile, Ramsey and Eightmile Creeks	1990-2000	In progress	Key Habitat Quantity, Habitat Diversity, Channel Stability
USFS	Various instream LWD placements (616 log structures)	Fifteenmile Watershed on National Forest	1987-1997	Completed	Key Habitat Quantity, Habitat Diversity, Channel Stability
SWCD	Hazard Mitigation	Fifteenmile, Threemile, Mill	1995—1998	Completed	Channel Stability, Sediment
USFS	Fifteenmile Floodplain Treatment (250 logs)	Fifteenmile Creek, 10 acres, just upstream of national forest boundary	7/1998 - 10/1998	Completed	Key Habitat Quantity, Habitat Diversity, Channel Stability
SWCD	Fifteenmile Bioengineering	Lower Fifteenmile Creek, (514 feet)	2000	Complete	Channel Stability, Sediment
USFS	Ramsey Creek Stream & Riparian LWD Addition (1400 logs, road decommission, plantings)	Ramsey Creek, 3 miles, on lands recently acquired by national forest	7/2000 - 10/2002	Completed	Key Habitat Quantity, Habitat Diversity, Channel Stability

Table 4.3 cont. Recent and Ongoing Instream Habitat Enhancement Projects

Organizat-ion	Project	Where Applies	Start/ End Date	Status	Limiting Factors Addressed
USFS	Fifteenmile Riverkeeper	Fifteenmile Creek, 1.5 miles, on MHNF and City of Dufur land	6/2002 - 10/2005	In Progress	Key Habitat Quantity, Habitat Diversity, Channel Stability
SWCD	Wrentham Bioengineering	Lower Fifteenmile Creek, (700 feet)	2003	Completed	Channel Stability, Sediment

Instream structures have been installed in various locations in Fifteenmile Subbasin by various agencies with the goal of creating or improving pools and riffles for fish habitat, stabilizing streambanks and channels, improving fish passage and reducing sediment originating from bank erosion. Key habitat quantity, habitat diversity and channel stability are limiting factors identified in the Fifteenmile Subbasin Assessment.

The Mount Hood National Forest has placed over 2,200 logs instream and on the floodplains of Fifteenmile Watershed. Most of these projects have been on Forest Service land, although the ongoing Fifteenmile Riverkeeper project also addresses lands owned by the City of Dufur, identified in the Subbasin Assessment as a high priority reach for restoration. All National Forest projects since 1998 have placed logs both instream and on the floodplain, with the goal of reducing stream energy when the stream overflows its banks and to allow for instream structure if the channel shifts..

Through the Fifteenmile Creek Habitat Restoration Project, Oregon Department of Fish and Wildlife has created 848 instream structures on 55 separate parcels along Fifteenmile, Ramsey and Eightmile Creeks. These reaches are identified in the Fifteenmile Subbasin Assessment as high priority reaches for restoration. ODFW structures include rock and log weirs, boulder placements, and jetties. Many of these structures were put into place in conjunction with riparian fencing.

Wasco County SWCD has spearheaded implementation of two bioengineering projects on Lower Fifteenmile Creek, a high priority restoration area. Goals of bioengineering are to stabilize the most serious instances of streambank erosion while allowing for riparian recovery and minimizing the use of riprap. Typical practices focus on streambank shaping, use of geotextile fabric and plantings to stabilize banks. Instream structures include grade stabilization structures to prevent headcutting and rock weirs to redirect flow away from sensitive banks.

While instream structures for fish habitat have been widely applied in Fifteenmile Watershed, they have generally not been widely applied in the other watersheds of the Fifteenmile Subbasin.

4.3.3 Fish Passage

Table 4.4 Recent, Ongoing and Planned Fish Passage Improvements

Organizat-ion	Project	Where	Start/End Date	Status	Limiting Factors Addressed
ODOT	Threemile Culvert Replacement @ US30	Threemile Creek, RM 1	Sept/03—Jan/04	Completed	Fish Passage
ODOT	Rock Creek Detention Basin	Rock Creek, RM 1	2004?	Planned	Channel Stability
ODOT	Threemile Freeway Culvert	Threemile Creek, RM 0	2006?	Planned	Fish Passage
City of The Dalles	Mill Creek Fish Passage @ Water Line	RM 6.7	Nov/01	Completed	Fish Passage
City of The Dalles	Fish Screen at City Water Intake	South Fork Mill Creek, RM 2	Mar/02	Completed	Fish Passage
City of The Dalles, ODFW	Fish Passage, Roughen Channel Fishway	Mill Creek, RM 5.4	Oct/02	Completed	Fish Passage
City of The Dalles	Fish Passage, 2 sites	South Fork Mill Creek, RM 0-2	Oct/02	Completed	Fish Passage
City of The Dalles/ODFW	Fish Ladder @ City Water Intake	South Fork Mill Creek, RM 2	May/03	Completed	Fish Passage
ODFW	Fish Screening and Passage: Fifteenmile (5 ladders, 5 rotary screens and 75 pump screens)	Fifteenmile and Ramsey Creeks	1988-1997	Completed	Fish Passage
ODFW	Fish Screening and Passage: Mill Creek (13 pump screens)	Mill Creek, between RM 1.5 and RM 10.5	June/00—May/02	Completed	Fish Passage

Table 4.4 cont. Recent, Ongoing and Planned Fish Passage Improvements

Organizat-ion	Project	Where	Start/End Date	Status	Limiting Factors Addressed
ODFW	Fish Ladder	Mill Creek, RM 1.5	Planned 2004	Planned	Fish Passage
USFS	Orchard Ridge Ditch Weir	Fifteenmile, RM 37	1995	Completed	Fish Passage
USFS	4440-160 Culvert Replacement	SF Fivemile Creek	1998	Completed	Fish Passage
USFS	4431 Culvert Replacement	MF Fivemile Creek	1998	Completed	Fish Passage
USFS	Eightmile Creek Fish Passage Improvement	Eightmile Creek, RM 21	7/2002--10/2002	Completed	Fish Passage
USFS	North Fork Mill Creek Passage Improvement	North Fork Mill Creek, RM 7	2004	In Progress	Fish Passage

Natural barriers to fish passage limit anadromous habitat on Fifteenmile Creek, South Fork Mill Creek, Mosier Creek and Rock Creek. Pocket Falls on Mosier Creek, Mill Creek Falls on South Fork and an unnamed water fall on Rock Creek are all total barriers to upstream migration.

In addition to the natural barriers noted above, anthropogenic fish passage barriers exist on all streams. Fish passage barriers have been removed or mitigated by the Forest Service, City of The Dalles, Oregon Department of Fish and Wildlife, and Oregon Department of Transportation. Anthropogenic fish passage barriers found in the Fifteenmile Subbasin include culverts, irrigation diversions, pipelines and abandoned structures, headcuts, and natural features.

In Fifteenmile Watershed, ODFW has provided assistance to build fish ladders and screens at every irrigation diversion in Fifteenmile, Eightmile and Ramsey Creeks. As of 2003, none of those sites are considered passage barriers to adult steelhead. Several diversion structures may still constitute barriers to upstream movement of juveniles, and may cause mortality by preventing movement of juvenile fish in the summer, when water temperatures reach lethal levels in the lower portions of the watershed.[58] In 1998, ODFW conducted a culvert survey with funding from Oregon Department of Transportation

[58] Steve Springston, Oregon Department of Fish and Wildlife, comments at EDT Work session, November 25, 2003.

(ODOT)[59] The surveyor identified seventeen culverts in the Fifteenmile Subbasin as not meeting fish passage criteria, affecting Threemile Creek, Chenowith Creek, Brown's Creek, Long Hollow, Douglas Hollow, Standard Hollow, Dry Creek (tributary of Mosier Creek), Japanese Hollow, Mays Canyon Creek, Whiskey Gulch, Japanese Hollow and North Fork Fivemile Creek. All of those sites are dry in the summer, with the exception of Threemile Creek and Chenowith Creek. All of the noted culverts on other streams were listed as low priority for repair. The Threemile culvert is on US Highway 30, near the intersection with US197, and is currently being upgraded by ODOT.

A steep headcut dating back to the 1996 flood event has created a waterfall on Threemile Creek at RM 4.5 that will likely become the new limit to anadromous fish passage in that system.

The US Forest Service has been replacing culverts on forest service roads on all creeks. As of 2003, the Forest Service has identified eight more culverts as needing replacement. These culverts affect fish passage on Eightmile Creek, Middle Fork Fivemile Creek, South Fork and North Fork Mill Creek, and Alder Creek, a tributary of South Fork Mill Creek.[60]

4.3.4 Agricultural Lands

Table 4.5 Recent and Ongoing Agricultural Conservation Projects

Organizat-ion	Project	Where Applies	Start/End Date	Status	Limiting Factors Addressed
SWCD	Soil Moisture Monitoring for irrigation efficiency	Adopted by various orchard growers from Mosier to Dufur	June 2001--August 2002	Completed	Low Flows
SWCD	Nelson Drip Irrigation Conversion	Threemile Watershed	08/19/2002—06/11/2003	Completed	Low Flows
SWCD	Fifteenmile Creek Watershed Enhancement	Private lands in Fifteenmile Watershed	1995—2015	In progress, partially funded	Low Flows, High Flows, Sediment
USDA/NRCS	Environmental Quality Incentives Program	All Private Lands	1995-2010	In progress	Low Flows, High Flows, Sediment, Pollutants

[59] McDermott, February 1999.

[60] Gary Asbridge, US Forest Service, personal communication, December 2003.

Table 4.5 cont. Recent and Ongoing Agricultural Conservation Projects

Organizat-ion	Project	Where Applies	Start/End Date	Status	Limiting Factors Addressed
USDA/FSA/NRCS	Conservation Reserve Program	Highly Erodible Croplands	1985—2010	In progress	Low Flows, High Flows, Sediment
Wy'East RC&D/Wasco Co. Fruit and Produce League	Integrated Fruit Production/IFPnet	Orchard Area	2000--	In progress	Pollutants

Uplands play a critical role in watershed function by determining the hydrologic behavior of the watershed. Land use in the Fifteenmile Subbasin is dominated by agriculture, forestry and urban land uses. The latter two land uses have dramatic effects on runoff. Hydrologic models predict that these effects have a noticeable effect on both high and low flows even in an average precipitation year with no unusual rainfall events. Exaggerated overland runoff also ahs the potential to erode soil and carry sediment and other pollutants to streams. Upland conservation activities aimed at providing better vegetative cover on the ground therefore have a highly protective effect on streamflows and address several of the limiting factors identified in the Fifteenmile Subbasin Assessment.

Wasco County SWCD, in partnership with USDA Farm Services Agency and Natural Resources Conservation Service, provides incentives to private landowners to install conservation practices on uplands. NRCS and the SWCD provide planning and design services as well as funding. Most commonly, USDA programs target commercial agricultural producers, and are employed to implement Resource Management Systems on farms and ranches. Other USDA programs target wildlife habitat and wetlands restoration. All USDA funding is limited in availability and highly competitive. Applicants compete on the basis of total environmental benefits.

The SWCD employs other funding sources, such as BPA and Oregon Watershed Enhancement Board, to provide services to other rural residents. Funding may be used for reforestation, biological control of insects, erosion control, wildlife habitat, and other conservation goals.

One of the highlights of agricultural conservation in the Fifteenmile Subbasin is the recent adoption of No-till or Direct-seed farming methods. Since 1997, approximately 45,000 acres of non-irrigated farmland has been converted to "Direct-Seed" or "No-till" farming practices in the Fifteenmile and Threemile Watersheds. Compared to the commonly used minimum-till techniques, No-till vastly reduces agricultural runoff and erosion, and therefore reduces sediment delivery to streams. Most participating farmers could not have made the necessary investments in new equipment without USDA or SWCD programs. Another 55,000 acres or more are farmed using the more traditional "Minimum till" farming methods.

In 2003, one third of EQIP funds were set aside for irrigated agriculture. Those funds were targeted toward growers who directly bordered on steelhead-bearing streams—primarily Mill Creek, but also on Threemile Creek and Fifteenmile Creek.[61]

Another highlight of upland agricultural conservation is the recent adoption of Integrated Fruit Production (IFP) in the orchards of Threemile, Mill Creek and Mosier Creek Watersheds. IFP is a management-intensive method of pest control that, among other conservation goals, minimizes the use of broad-spectrum pesticides, and also minimizes spray drift. Detailed weather information is needed to predict pest outbreaks and improve timing of orchard operations. Wyeast RC&D, working with the Wasco County Fruit and Produce League, has spearheaded the installation of a network of weather stations throughout the orchard areas that provide the necessary data. They have also provided an entomologist to growers who develop IFP plans with growers and scouts for pests, thereby pinpointing the location of outbreaks.

Oregon Water Resources Department demonstrated in 1988 that the falling aquifers in the Mosier Valley were affecting stream flows in Mosier Creek[62]. Mosier Watershed Council has proposed to address the is sue of falling groundwater levels in the agricultural zone of the Mosier Valley. The Watershed Council has been working with Wasco County SWCD, Oregon Water Resources Department and US Geological Survey to develop a plan that includes research, conservation, and technological upgrades to achieve the goal of stable or increasing aquifers and sustainable irrigated agriculture in the Mosier Valley.

[61] Dusty Eddy, National Resource Conservation Service, personal communication, December 2003.

[62] Ken Lite, Oregon Water Resources Department, presentation to the Mosier Watershed Council, March 2003 and August 2003.

4.3.5 Uplands—Forestry

Table 4.6 Recent and Ongoing Conservation Projects on Forestlands

Organizat-ion	Project	Where Applies	Start/End Date	Status	Limiting Factors Addressed
USFS	Road Obliteration or closure	Mt. Hood National Forest	1991--	Ongoing	High Flows, Sediment
Oregon Dept. Forestry (ODF)	National Fire Plan-- Defensible Space Grants	Dry Creek (Mosier), Sevenmile Hill, Rowena and Chenowith Creeks	2002—2004	Ongoing	Forest Health: High Flows Sediment, Wildlife Habitat
ODF	Forestland Enhancement Program	Forestlands throughout subbasin	2003--	Authorized but Unfunded	Forest Health: High Flows Sediment, Wildlife Habitat
ODF	East Cascades Bark Beetle Mitigation	Forestlands throughout subbasin	2003	Ongoing	Forest Health: High Flows Sediment, Wildlife Habitat

Table 4.6 cont. Recent and Ongoing Conservation Projects on Forestlands

Organizat-ion	Project	Where Applies	Start/End Date	Status	Limiting Factors Addressed
Wasco Co. SWCD	Emergency Wildfire Recovery	Sheldon Ridge Fire	11-02/05-03	Completed	Forest Health: High Flows Sediment, Wildlife Habitat

Forestlands in Fifteenmile Subbasin are believed to suffer from unnaturally dense forest stands and underbrush. This condition is a result of fire suppression. Wildlife habitat has been heavily modified compared to what existed prior to the implementation of fire suppression. Open canopy forests and interior grassland habitats have been reduced (Fifteenmile Subbasin Assessment). Meanwhile, the increased fuel loads create a hazard of catastrophic fire. Catastrophic fires have, in the past, become sources of increased sedimentation and flooding instream. The Schoolmarm Fire of 1967, for instance, created such a sediment load in South Fork Mill Creek that the City of The Dalles was unable to use the stream for drinking water supply for several years. This event led to the development of the Municipal Watershed Management Plan, in which the City and the Forest Service collaborate to manage the South Fork Mill Creek Watershed specifically for forest health and water quality protection.

Most upland conservation projects on forestland have the primary goal of reducing the risk of catastrophic fire, with a secondary goal of providing open canopy wildlife habitat in the pine/oak zones. Upland conservation projects in forested lands have been conducted by the Forest Service on federal lands and by the Oregon Department of Forestry (ODF) on private lands. To a lesser extent, Wasco County SWCD has provided funds for forestland conservation as well.

The US Forest Service is guided by the Northwest Forest Plan, which emphasizes forest health practices. Timber harvest prescriptions follow selective cutting regimes intended to mimic the role of fire in the landscape and thus reduce the risk of catastrophic wildlife or insect infestations. The same approach is used by the City of The Dalles in the South Fork Mill Creek Watershed, which is managed in cooperation with the Forest Service. In addition to harvest prescriptions, the Forest Service has also emphasized road obliteration as a method of reducing erosion and runoff, and to limit public access to sensitive areas.

ODF has used several programs and grants to assist private landowners in applying the same sort of forest health practices. For instance, the Defensible Space Grants, funded by the National Fire Plan, have provided up to 80% cost-share to private landowners to thin tree densities to 15-foot spacing, and to remove underbrush, thereby reducing the threat of catastrophic fire. This practice is also believed to provide wildlife habitat more similar to historic (pre-fire suppression) conditions. These grants have focused on the Sevenmile Hill area between Mosier and Chenowith Creek Watersheds, in order to protect the high density of rural residential development in that area. The program has been quite popular

with landowners in the eligible area, particularly in the wake of the Sheldon Ridge Fire, which burned 12,000 acres in summer 2002.

Other private forestlands in the Fifteenmile Subbasin have been eligible for the Forestland Enhancement Program (FLEP) and the East Cascades Bark Beetle Mitigation Program, both administered by ODF. FLEP has not yet been funded since the passage of the 2002 Farm Bill that created it. As of April 2004, the Office of Management and Budget had not released funding for FLEP in 2004. The East Cascades Bark Beetle Mitigation Program, while not as well funded as the National Forest Plan, has provided funding for forest health practices throughout the forested rural portions of the subbasin.

Wasco County SWCD provided funds for reforestation, biological control and erosion control, following the Sheldon Ridge Fire. Funding was provided by OWEB, as well as USDA.

4.3.6 Urban Lands

The cities in the Subbasin have conservation responsibilities in two main areas—their urban areas, and in any watershed lands that they own and manage. Mosier gets its drinking water from wells and does not own any watershed lands. Dufur currently gets its water from wells, but does have a water right on Fifteenmile Creek, and has an existing intake structure, and owns lands abutting the National Forest, which they manage for forest health, income and water quality. The City of The Dalles gets its water from South Fork Mill Creek and Dog River (tributary of Hood River). They own the stream corridor up to the National Forest boundary, and actively manage their municipal watershed for forest health, income and water quality.

Each of the three cities in the Subbasin manages their sewer systems in accordance with discharge permits issued by the Department of Environmental Quality.

The Dalles and Dufur both have storm sewer systems, although Dufur's storm sewer only covers the downtown area. Mosier has no storm sewer system.

The City of Dufur provides for a 20-foot riparian buffer in its zoning ordinances. It also takes note of wildlife habitat in its Comprehensive Plan, which notes that upland areas outside of the residential zone are mostly used for agriculture and provide little wildlife value (City of Dufur Zoning Ordinance, June 1988 and Comprehensive Plan Update, July 2003).

The City of The Dalles has no zoning areas within the urban area specifically for riparian or wetland protection (The Dalles City Planning, 12/4/03).

The City of Mosier noted that all wetlands within the City are zoned Open Space. In addition, the City of Mosier noted that their flood zone ordinance protects water quality (Jeanne Reeves, City of Mosier, 12/05/03).

4.3.7 Research, Monitoring, and Evaluation Activities

Table 4.7 Recent and Ongoing Monitoring Efforts in the Fifteenmile Subbasin

Organization	Parameters	Location	Start/End Date	STATUS
City of The Dalles	Drinking Water Quality—turbidity, temperature, pH, coliform, others	South Fork Mill Creek	1969--	Ongoing
DEQ/SWCD/ODFW	Suspended Sediment & Turbidity	Fifteenmile Watershed	2000—2003	Completed
DEQ/SWCD	Fifteenmile Forward Looking Infrared Project—surface temperature	Fifteenmile Watershed	2002	Completed
DEQ	Temperature Monitoring for TMDL	Fifteenmile, Eightmile, Ramsey, Fivemile	1999--2002	Completed
DEQ	Temperature Monitoring for TMDL	Threemile, Mill, Chenowith, Mosier, Rock	1999-2000	Completed
Mosier Watershed Council	Bacteria	Mosier Creek, near mouth	August 2002	Completed (one-time effort)
Mosier Watershed Council	Turbidity	Mosier Creek	Winter 2002-2003	Completed
ODFW	Temperature	Fifteenmile Watershed	1980's--	Ongoing
ODFW	Fish Habitat	Fifteenmile Watershed	2002-2003	Complete
ODFW	Fifteenmile Smolt Trapping (BPA #1993-040-01)	Fifteenmile Mouth		Completed, then restarted as new project
ODFW/USFS	Fifteenmile Smolt Migration (BPA #2001-020-00))	Fifteenmile Watershed, Private Lands	2003--	Ongoing
The Dalles Area Watershed Council	Turbidity	Mill Creek, Chenowith Creek	Winter 2002-2003	Completed
USFS	Fish Habitat	Fifteenmile Watershed, Federal Lands	1998--	Ongoing
USFS	Temperature	Mt. Hood National Forest	1988--	Ongoing

Table 4.7 Recent and Ongoing Monitoring Efforts in the Fifteenmile Subbasin

Organization	Parameters	Location	Start/End Date	STATUS
USFS	Sediment Embeddedness	Mount Hood National Forest	early 1990's	Ongoing
SWCD	Temperature	Fifteenmile, Mill	2000--	Ongoing
SWCD	Groundwater Levels	Mosier Valley	2004?	Proposed
Wy'East RC&D, DEQ	Pesticides	Mill	2002--	Ongoing

Fifteenmile Watershed itself has been extensively monitored for the purposes of developing Total Maximum Daily Loads (TMDLs) and to manage the winter steelhead run in that watershed. Parameters that have been monitored in the Fifteenmile Watershed include fish habitat, water temperature, and sediment.

Mill Creek has been monitored for agricultural pesticides, temperature, and on the South Fork, for other water quality parameters relating to drinking water quality. Entities that have studied parts of the Mill Creek Watershed include the US Forest Service, City of The Dalles, Soil and Water Conservation District, Oregon Department of Fish and Wildlife, The Dalles High School, Oregon Department of Environmental Quality, and Wy'East Resource Conservation and Development Board.

Samples have been collected of cutthroat trout in the South Fork of Mill Creek. These fish were found to be undersized and of poor body condition compared to cutthroat in more productive streams.

Other watersheds have not received the same amount of monitoring. DEQ conducted two years of temperature monitoring in Threemile, Mill, Chenowith, Mosier and Rock Creeks, in order to collect data for TMDL implementation.

4.4 Gap Assessment of Existing Protections, Plans, Programs and Projects

4.4.1. Gap Analysis of Limiting Factors

The Fifteenmile Subbasin Assessment identifies the following limiting factors in Fifteenmile Watershed:

- Key Habitat Quantity
- Sediment
- Habitat Diversity
- Low Flows
- Peak Flows
- Summer Water Temperature

- Channel Stability

To a lesser extent, food, dissolved oxygen and harassment were also noted as limiting factors in certain parts of the watershed.

The Subbasin Assessment identifies an urgent need to protect the upper third of the watershed, since these are almost the only reaches in which steelhead can survive to smolt stage. Restoration priorities consist of the stream reaches roughly in the middle one third of the watershed. Improved conditions in these middle reaches will expand the existing viable steelhead population and will conduct improved environmental conditions downstream.

In the other watersheds of the subbasin (Threemile, Mill, Chenowith, Mosier and Rock Creek), limiting factors were similar, but also included chemical pollutants in Threemile, Mill and Mosier Creeks, and groundwater overdraft in Mosier Creek.

Are there programs in place to address all of these factors?

Riparian buffer programs address channel stability, temperature, habitat quantity and diversity.

Instream structures address channel stability, and habitat quantity and diversity.

Pollution issues are being addressed in Mill Creek and Threemile, but not yet in Mosier.

The problem of groundwater overdraft in the Mosier Valley has not yet been resolved and represents an impending natural resource crisis in that area.

Upland conservation programs address wildlife habitat and hydrologic function. They therefore address peak flows and address low flows by increasing seasonal water storage in the soil. Because Fifteenmile and its tributaries are currently over-appropriated, considerable water conservation will be needed to increase stream flows. On the other hand, increased groundwater inputs will help reduce instream temperature.

Low flows have not been adequately addressed to date. Water in Fifteenmile and all of its tributaries is overallocated from May to October. Low flows are linked to loss of habitat, high temperatures, low dissolved oxygen, and possibly to other water quality issues in Fifteenmile Watershed. Low flow issues can only be addressed by programs aimed at reducing surface water withdrawals. A certain amount of progress can be made by improved irrigation efficiency, either on-farm or in irrigation ditches. Progress can also be made by improving enforcement of existing water rights and minimum instream flows.

Any significant improvements to flow levels in Fifteenmile Watershed will require a reduction in water withdrawals on the part of private irrigators. To be successful, any voluntary program must adequately compensate the landowners for lost income and income potential. It must also provide for an alternative use of the previously irrigated land, such as dryland farming, pasture, or forested riparian buffers. Weed management may become an issue if land use changes result.

4.4.2. Geographic Coverage of Riparian and Instream Conservation

Of the 242 stream miles of salmonid habitat in the Fifteenmile Subbasin, approximately 154 miles are protected by some form or another of riparian buffer program. Approximately 87 stream miles of perennial fish habitat are currently unprotected by riparian buffers, including at least 59 miles of anadromous (steelhead, salmon and lamprey) habitat. The majority of this unprotected habitat is moderately to heavily impacted by roads and urban, residential or agricultural land uses.

Fifteenmile Watershed itself has the greatest coverage by percent of stream miles. Approximately 126 stream miles in the Fifteenmile Watershed are protected by some form of riparian buffer, either through the Northwest Forest Plan or the various programs available to private landowners. Only about 30 miles of anadromous habitat lack a forested buffer in the Fifteenmile Watershed.

EDT gave the highest protection priorities to Fifteenmile Creek upstream of the Dufur Intake, Eightmile upstream of Wolf Run, Ramsey Creek upstream of the National Forest boundary, and in Fivemile Creek upstream of North Fork and continuing into the Middle Fork.

In Fifteenmile Creek, the protection reaches begin upstream of the confluence of Fifteenmile and Ramsey Creek, and continue to the headwaters, including the small tributary Cedar Creek. Of the 15 miles in this reach, 7.6 are on the National Forest, including about 4 miles in the Badger Creek Wilderness. These stream miles will be protected consistent with the Northwest Forest Plan. Downstream of that point, 3.85 miles of the stream are owned by the Dufur Water Commission and managed in consultation with the Forest Service for water quality, and are currently the target of the Fifteenmile Riverkeeper Project, which aims to restore stream and floodplain functions using large wood and boulder emplacements, save water by piping the Orchard Ridge Ditch, and limit public access by closing part of the road that follows the floodplain up this canyon. A tract of private land sits in the midst of the Dufur Water Commission property. In consideration of the high priority for protection of this reach, this landowner has applied to enroll his riparian areas in the CREP program. His application is currently pending, awaiting technical assistance. Downstream of the Dufur Intake, another 4 miles of protection priority reaches flow through a number of private ownerships. At least half of these are enrolled in the ODFW buffer program.

On Ramsey Creek, 6.8 miles are included as protection priorities, from RM4.1 to RM10.9. The upper end of this reach is defined by the culvert barrier at Forest Road 4450. The Mount Hood National Forest covers this entire reach. Roughly the lower half of it was the object of a large stream/floodplain restoration project that finished in year 2001. Post project monitoring by the Forest Service documents responses by the stream to the restoration project.

On Eightmile Creek, 14.3 miles are included in the protection reaches, beginning upstream of Wolf Run Creek and continuing to the impassable culverts at Lower Eightmile Campground. The National Forest manages 7.7 miles of these protection reaches. Directly downstream of the Forest Service boundary, the next 2.7 miles of Eightmile Creek are protected until year 2015 by a 400 foot wide riparian buffer enrolled in the Conservation Reserve Enhancement Program. Another 1.6 miles is enrolled in the

ODFW buffer program. This leaves almost two miles not specifically managed for stream and riparian protection. This gap is owned by three separate landowners.

In the Fivemile Watershed, the protection priorities start in Fivemile Creek upstream of the confluence with the North Fork, and then continue up into the Middle Fork of Fivemile to the culvert barrier on Forest Road 4430. The 4.8 miles of the Middle Fork are entirely on the National Forest. The 3.8 miles of the mainstem are on private lands. The protection reach on mainstem Fivemile Creek is owned by 16 separate private landowners. None of this reach is enrolled in either USDA or ODFW riparian buffer programs.

In the Mill Creek Watershed, the Forest Service and the City of The Dalles protect 27 miles of salmonid stream, including 11 miles of anadromous habitat. Mill Creek Watershed has approximately 18.5 miles of anadromous habitat that is not protected by riparian buffers, much of which is impacted by urban, residential and agricultural land uses, and constrained by roads. North Fork Mill Creek includes 6.5 miles of stream that was identified by the assessment as a steelhead protection priority that is on private lands and not specifically managed for stream protection. This reach is paralleled by dirt roads along most of its length. Several culvert barriers and point sources of sedimentation have been identified in this reach.

Along Threemile Creek, 1.51 miles are protected by forested riparian buffers. None of the 4.5 miles of anadromous habitat are yet protected. Threemile Creek is impacted by roads, noxious weeds and both urban and agricultural land uses.

Chenowith Creek has the potential to provide 3.5 miles of anadromous habitat. None of this area is officially protected, although, as noted previously, Northwest Aluminum has voluntarily fenced off 0.24 miles near the mouth.

Almost the entire 0.4 miles of anadromous habitat on Mosier Creek is protected as undeveloped wildland by the City of Mosier. Mosier Creek includes approximately 26 miles of stream habitat for cutthroat trout that is not protected by any sort of riparian buffer. Much of this riparian area is impacted by either roads or residential development.

The upper 6 to 7 miles of Rock Creek are owned by four landowners, all of whom utilize the land for commercial timber management. One of these owners is the Hood River County Department of Forestry. All of these lands are subject to the Oregon Forest Practices Act, which is administered by the Oregon Department of Forestry. The Oregon Forest Practices Act specifies conifer basal area retainage requirements within approximately one mature tree height along fish bearing streams. Protection of Rock Creek currently relies entirely on effective enforcement of these standards. Upper Rock Creek would lose this protection if the lands were subdivided and converted to rural residential land use, a process that has already taken place in the lower 2 miles.

4.4.3. Geographic Coverage of Upland Conservation

Determining the geographic coverage of upland programs is more difficult than determining the geographic coverage of riparian and instream programs for a number of reasons.

One reason is that conservation programs may be theoretically available throughout a certain area, but still be inadequate to meet the demand. In such cases, funding may be applied unevenly to different geographic areas or to different land uses.

For example, the Environmental Quality Incentives Program (EQIP) can be used to fund management practices in any agricultural or rangeland. However, funding is highly competitive. Applications are ranked and evaluated based on a locally developed procedure intended to compare total environmental benefits of each proposal. Out of 240 applications in 2002, only 17 were funded. It has been very difficult to get funding through EQIP for rangeland practices or for agronomic practices on non-highly-erodible lands. In 2002, no EQIP funds were available for rangeland conservation, nor for any practices in the Mosier Valley.

Weather data is available throughout the Subbasin to orchardists wishing to implement integrated fruit production plans. Due to limited funding, the coverage is much lighter in the Mosier Valley than in other areas of the Subbasin.

Similarly, all private forest landowners are eligible to apply for assistance through the Forestland Enhancement Program from Oregon Department of Forestry (ODF). However, the limited funding for the Forestland Enhancement Program does not meet the demand. Therefore, the only part of the subbasin where ODF has sufficient funding to meet the demand for assistance is in the Sevenmile Hill and Chenowith Creek areas, which are targeted by the Defensible Space Grants from the National Fire Plan.

4.4.4. Geographic Coverage of Research and Monitoring Efforts

To some extent or another, monitoring efforts have been undertaken in all major streams in the subbasin. However, the intensity of monitoring efforts varies across the watershed from multiyear, high quality monitoring, to one-time volunteer sampling efforts.

Wasco County SWCD, on behalf of the three watershed councils in the subbasin, has completed watershed assessments for the entire Fifteenmile Subbasin, using the methods outlined in the Oregon Watershed Assessment Manual. The Forest Service has completed watershed analyses in "Mile Creeks"—Fifteenmile, Eightmile and Fivemile—and in Mill Creek.

Fifteenmile Watershed has received the most intensive monitoring efforts. Fifteenmile Creek and its major tributaries have been the subject of monitoring by the Forest Service, ODFW, SWCD, DEQ, and various school groups. Fifteenmile Watershed has been monitored for smolt migration, spawning, temperature, turbidity, and habitat quality. Despite this, unanswered questions remain regarding the effect that past restoration efforts have had on habitat quality.

A single grab sample was taken in Fifteenmile for organophosphate pesticides in 2003. The sample tested positive for malathion.

After Fifteenmile, the next most studied watershed in the Subbasin is Mill Creek. The City of The Dalles monitors drinking water quality at its intake on South Fork Mill Creek. DEQ, with assistance from Wasco Co. SWCD, has monitored for temperature since 1999. DEQ has monitored since 2002 for pesticides and macroinvertibrate communities with the cooperation of the Wasco County Fruit and Produce League and

Wy'East RC&D. The Dalles Area Watershed Council monitored in 2003 for turbidity at one site near the mouth of Mill Creek.

Mill Creek has not been studied for habitat quality, steelhead population or lamprey population.

Threemile Creek, Chenowith Creek, Mosier Creek and Rock Creek were monitored for two years for temperature by DEQ, as part of the TMDL process. All four streams were added to the Oregon 303(d) List of Water Quality Limited Waterbodies in 2002.

Both Mosier and Chenowith Creeks were monitored for turbidity through the winter of 2002-2003. These efforts were in response to the Sheldon Ridge Fire that occurred in the headwaters of both creeks.

Other than the efforts noted above, all monitoring efforts have been one-time volunteer efforts that provide only isolated point measurements.

5. Fifteenmile Subbasin Management Plan

DRAFT

May 25 2004

Compiled by Wasco County Soil and Water Conservation District
in cooperation with
Fifteenmile Coordinating Group

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Plan Overview

The Fifteenmile Management Plan picks up where the Assessment and Inventory left off. The Assessment determined limiting factors, a working hypothesis and a desired future condition for the focal species. The Inventory described what has or is already being done. The Plan begins with the vision, goals and objectives for fish and wildlife recovery, and moves on to specific strategies.

The Plan includes an analysis of the extent to which the strategies described are consistent with the Endangered Species Act. This analysis relies on review of five Biological Opinions issues by NOAA Fisheries that cover the majority of the strategies and actions proposed in this plan.

The proposed strategies were reviewed by representatives of Oregon Department of Environmental Quality and Department of Agriculture. These reviewers analyzed the strategies for consistency with the Clean Water Act. Their statements are included.

The Plan is completed by a research, monitoring and evaluation plan designed to fill the gaps in our understanding, which were identified in the Subbasin Assessment.

5.1. Vision for the Subbasin (Desired Future Conditions or Goal Statements)

Fifteenmile Coordinating Group envisions the future Fifteenmile Subbasin as "a healthy, self-sustaining ecosystem of people, fish, wildlife, plants and other natural and cultural resources that provides direct benefits to society and nourishes the spirit."

5.1.1. Human Use of the Environment (Economic and Social Considerations)

The Fifteenmile Subbasin is home to around 18,000 people, and includes three urban areas. The primary economic drivers outside of the City of The Dalles are agriculture and grazing. More than 110,000 acres are used for agriculture in the Subbasin. Timber management occurs on both private and public lands in the higher elevations.

5.1.2. Aquatic Species

Healthy habitat can be achieved for all four aquatic focal species. Given that all other factors remain equal or improve, the populations can be supported at a sustainable level. In years of strong runs, individuals in excess of escapement goals could be harvested.

5.1.3. Terrestrial Species

Habitats for the seven wildlife focal species will be maintained or increased.

5.3.4. Goals and Objectives of the Watershed Councils

The three watershed councils in the Fifteenmile Subbasin have each updated their goals and objectives and submitted them for inclusion in the Fifteenmile Subbasin Plan. These goals and objectives represent the priorities developed by the local population for the specific areas covered by each watershed council.

Fifteenmile Watershed Council

Fifteenmile Watershed Council considers natural resource issues within the Fifteenmile Watershed itself, including Eightmile Creek and other tributaries. The mission of the Fifteenmile Watershed Council 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. Fifteenmile Watershed Council completed a watershed assessment using the Oregon Watershed Assessment Manual in 2003.

Goals:

1) Maintain or improve soil quality and quantity.

2) Increase upland water storage and availability.

3) Minimize sediment delivery to streams.

4) Improve instream habitat.

5) Improve water quality and quantity.

6) Protect or improve limiting types of wildlife habitat.

7) Sustainably manage grassland and forestland resources.

Objectives:

Primarily on agricultural lands:

A) **Erosion:** By 2010, 90% of agricultural acres in Fifteenmile Watershed will be farmed according to plans that produce erosion rates at or below "T", the soil loss tolerance. (FSA is working on ways to better track management techniques.)

B) **Soil Quality:** By 2010, 90% of agricultural acres in Fifteenmile will be farmed under management plans that maintain or increase organic matter.

C) **Weed and Pest Control:** By 2012, develop and adopt integrated pest control plans on 40% of agricultural acres in Fifteenmile Watershed.

D) **Water Quantity:** By 2012, all surface water diversions in Fifteenmile will be metered and will be in compliance with water rights certificates.

E) **Water Quantity:** By 2012, 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.

Primarily on forest or grazing lands:

E) **Forest Harvest:** Ongoing and Immediately: all forest harvest will follow plans to minimize erosion and sedimentation.

F) **Grazing:** By 2010, Identify instances of continued overgrazing and implement sustainable grazing management plans on 90% of the identified acres.

G) **Fuels Buildup:** By 2010, identify areas of dangerous fuels buildup and develop plans or programs to address 90% of them.

Throughout Fifteenmile Watershed:

H) **New Noxious Weeds:** Ongoing and immediately: Prevent invasion of new noxious weeds through education, reporting and quick response. ***Management of noxious weeds is a concern in the management of riparian buffers.***

I) **Established Noxious Weeds:** Ongoing and immediately: Those noxious weeds that are already present and widely established should be managed to prevent further damage to the resources.

J) **Riparian Vegetation:** By January 2005, on all lands, private and public, allow establishment and development of adequate riparian vegetation for streambank

stability and shading, consistent with site capability. (This is consistent with the LD Ag Water Quality Management Plan, except that it applies to all land uses, not just agriculture.)

K) **Roads and Culverts:** By 2008, identify highest priority roads or culverts that cause gully erosion, deliver sediment directly to streams, or constrict floodplain function and develop plans and programs to mitigate their negative effects. Separate plans and programs should be developed for public roads, farm roads and National Forest roads.

The Dalles Area Watershed Council

The Dalles Area Watershed Council considers natural resource issues within the watersheds of Threemile Creek, Mill Creek, Chenowith Creek, and adjoining areas that drain to the Columbia River from Threemile Creek to Rowena.

The mission of The Dalles Area Watershed Council is to foster stewardship of natural resources, deal with issues in advance of resource degradation where possible, support restoration activities where degradation has already occurred, and encourage and ensure sustainable watershed health, functions, and uses.

The Dalles Watershed Council completed a watershed assessment using the Oregon Watershed Assessment Manual in 2003.

Table 5.1. The Dalles Area Watershed Council Goals and Objectives

Goals	Objectives
1) Improved water quality	1a) In 2020, turbidity will meet City of The Dalles standards on South Fork Mill Creek and DEQ standards elsewhere.
	1b) In 2020, stream temperatures throughout the watershed will meet DEQ standards.
	1c) By 2020, there will be no detectable organophosphates or other broad-spectrum chemicals in the streams.
	1d) By 2020, there will be no nutrient loading above background levels due to land use practices.
2) Improvement in watershed awareness	Education-based objectives.
3) Protect agricultural lands and floodplains.	3a) Carefully manage growth into agricultural lands or floodplains.
	3b) Fewer zoning variances in rural areas.
4) Functioning Domestic Water Sources.	4a) In 2020, domestic water sources will continue to meet the needs of the population
5) Decreased erosion and sedimentation	5a) By 2020, soil erosion due to land use practices will be reduced to at or below the soil loss tolerance as defined by NRCS.
	5b) By 2020, cobble embeddedness in all streams will meet ODFW benchmarks (Kelly Moore, ODFW)
6) Better fish habitat for both resident and anadromous fish.	6a) By 2020, all endangered species will be recovered and delisted.
	6b) By 2020, all riparian areas will have healthy, mature vegetation, featuring an appropriate mix of plant ages and communities with little or no noxious weeds.
	6c) By 2020, cover, pool/riffle ratios, stable banks and large woody debris in 90% of stream reaches will meet ODFW benchmarks (Kelly Moore, ODFW)
	6d) By **2010**, there will be no artificial fish passage barriers in the Mill Creek system.
	6e) By **2010**, there will be no artificial fish passage barriers in Threemile Creek below RM4.5.
7) Healthy Wildlife Populations	Objectives not developed.

Mosier Watershed Council

Mosier Watershed Council considers natural resource issues in Mosier Creek, Rock Creek and Rowena Creek, as well as adjacent lands draining to the Columbia River. Their mission is to foster better stewardship of the natural resources in Mosier, Rock, and Rowena Creek watersheds and associated lands, deal with issues in advance of resource degradation, and ensure sustainable watershed health, functions, and uses. Mosier Watershed Council completed a watershed assessment using the Oregon Watershed Assessment Manual in 2002.

The Mosier Watershed Council emphasizes that the greatest threat to natural resources in the Mosier Watershed is groundwater overdraft and surface water overallocation. Groundwater and surface water are closely linked in the Mosier area. Falling groundwater levels in the aquifers of the Mosier Valley threatens not only the sustainability of agriculture within the valley, but also threatens the cutthroat and steelhead populations within the watershed. Because of this, action planning by the Mosier Watershed Council has focused on groundwater conservation.

Mosier Watershed Council Groundwater Action Plan Goals:

1) Stabilize or increase the groundwater level in Priest Rapids and Frenchman Springs Aquifers.
2) Stabilize or increase the groundwater level in the Pomona Aquifer.
3) Allow sustainable agricultural and residential groundwater use, but prevent overuse of water in the area of concern.
4) Continue monitoring efforts to determine when and if goals 1-3 are met.

Table 5.2. Mosier Watershed Council Groundwater Action Plan Objectives and Actions:

Objective	Actions	Timeline
1) Maximize efficiency of existing irrigation operations, and reduce groundwater withdrawals.	A) Inventory irrigation technologies currently in use. Quantify efficiency.	2004-2005
	B) Assist landowners to make efficiency upgrades.	2004-2005
	C) Where economically feasible and desirable for the irrigator, transfer water rights out of the area of concern.	2005-2008
	D) If needed, develop an irrigation district with withdrawals from Columbia River.	2004-2005
2) Improve well efficiency, either by casing or by replacement of old wells with new, in order to reduce	A) Identify wells that allow comingling of aquifers. Estimate total volume of comingling.	2004-2005
	B) Repair or replace comingling wells.	2004-2005

aquifer co-mingling and thus improve hydrologic head in the Priest Rapids and Frenchman Springs aquifers.	C) Replace or repair City of Mosier Well #3. Implement most cost-effective option that addresses City's legal obligations.	2004
3) Allow sustainable level of resource use, allowing conservation of local values.	A) Study and develop water budget.	2004-2006
	B) Explore critical groundwater area.	2006
	C) Develop county ordinance governing residential well use in the area of concern.	2006
4) Monitor observation wells.	A) If aquifers recover, revisit issues of aquifer withdrawal and county ordinances after 10 years.	2013
	B) If aquifers continue to drop, use public process to seek more options.	2013

5.2. Biological Objectives—Aquatic Species

Steelhead

Biological Performance—Responses of focal species to habitat conditions

Capacity and Productivity

Capacity refers to the maximum output of a given habitat unit. If, for any reason, a population exceeds the capacity of the habitat to support that population, density-dependent mortality factors increase, thus reducing the population to below the capacity. After completing all feasible restoration alternatives, EDT projects a rough doubling of smolt production capacity in Fifteenmile Watershed (figure 5.1).

Productivity is a measure of the potential expansion of a population that is at very low levels, i.e. when density dependent factors do not limit growth. A productive population will rebound more quickly from a disturbance. After modeling the integrated suite of restoration alternatives, EDT predicts an increase in productivity of the Fifteenmile steelhead population from 207 smolts per spawner to 366 (table 3.13).

Abundance

Abundance is the self-sustaining population level, given a particular capacity and productivity. When the population exceeds this level, it will tend to fall. When the population is below this level, it will tend to increase. Abundance might be thought of as the predicted population level, but this would be misleading, as the population naturally varies from year to year as conditions change. In this document, biological objectives will be expressed as a desired population range.

Biological objectives for steelhead production within Fifteenmile Subbasin should logically be expressed in terms of smolt production, rather than adult returns. Adult returns are affected by out-of-subbasin conditions. Smolt production is somewhat buffered from such effects, especially if the population is highly productive or is close to capacity. Furthermore, counts of returning adults are not available in Fifteenmile, whereas infrastructure exists to estimate outmigrating smolts from the Fifteenmile Watershed.

The thought process described in the Fifteenmile Subbasin Assessment leads to a restoration goal of 8,125-18,697 smolts per year (table 3.13). Such a range is 78% higher than the range of population estimates based on screw trap results from 1998, 2000 and 2003.

The Interior Columbia Basin Technical Recovery Team (IC-TRT) of NOAA Fisheries set an interim recovery goal of 500 spawners in Fifteenmile Subbasin.[1] Below this level, salmonid populations are noted by the IC-TRT to experience a higher risk of genetic drift due to inbreeding.[2] However, the IC-TRT recovery goal refers to the steelhead run of the entire Fifteenmile Subbasin. Based on Dan Rawding's estimate that 5% of the wild winter steelhead that pass Bonneville Dam return to Mill Creek, while 25% return to Fifteenmile[3], the IC-TRT interim recovery goal could be split with 417 spawners returning to Fifteenmile and 83 returning to Mill Creek or other streams in the subbasin (Table 5.3). These numbers exceed the low end of the estimated population range after proposed restoration. In fact, they exceed the low end of the estimated population range under the 100% restoration scenario (Table 5.3). Thus, while the average steelhead run after restoration activities would probably exceed the interim recovery goals, some poor run years would fall short. Because of the variability in life history patterns (smolting at 1-3 years and adult returns at 1-3 salt years), a single poor run would probably pose minimal risk of genetic drift.

Table 5.3. Comparison of Interim Recovery Goals with estimated population ranges under proposed restoration plan, 100% restoration scenario, and presettlement conditions.

	Interior Columbia Basin Technical Recovery Team	Estimated Spawners under proposed restoration plan	100% Restoration Scenario	Estimated Spawners under Presettlement conditions[1]
Fifteenmile	417	268-2,274	311-2,638	439-3,726
Mill Creek and other streams	83	54-455 [2]	62-528 [2]	88-745 [2]

[1] Equivalent to 100% restoration of both in-basin and out-of-subbasin conditions
[2] Fifteenmile estimate divided by 5.

The process described in the Fifteenmile Subbasin Assessment would suggest that if all proposed habitat restoration efforts were completed, adult returns would vary from 268-2,274. The stock production curves generated by EDT suggest that escapement of about 1,200 would be sufficient to provide a stable population, either under current conditions or under projected restored conditions (figure 5.1).

The eventual goal includes delisting the steelhead based on recovery of the populations. IF the steelhead were delisted, the opportunity for harvest appears. In-basin harvest goals

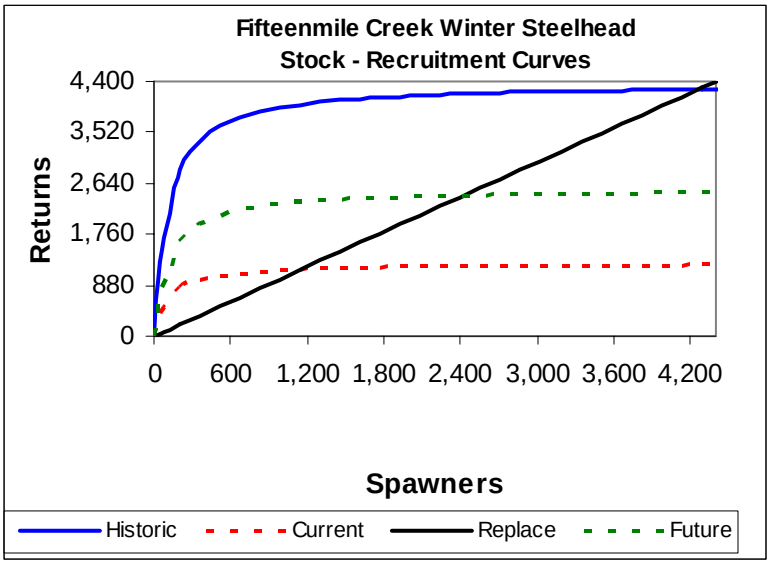
[1] Lynn Hatcher, pers. comm. Via e-mail, 4/30/2004.

[2] IC-TRT July 2003

[3] Dan Rawding, WDFW. Quoted in memorandum from Steve Pribyl to Rod French, March 26th, 2004

have not been discussed among the co-managers. However, it could be tentatively suggested that returning adults in excess of 1,200 could be harvested in-basin with little or no effect on the next generation of returns. Half of this harvest would legally be allocated to tribes and the other half might be allocated to sport fishery. If an in-subbasin harvest is included as part of our goal, it would be desirable to count returning spawners as well.

Figure 5.1: Stock Recruitment Curves for current conditions, historic conditions and restoration goal, generated by EDT.



Diversity and Spatial Structure

The spatial structure of the Fifteenmile winter steelhead population has been modified and restricted by culvert barriers and hostile environmental conditions in the middle and lower elevations of the Fifteenmile Watershed.

Five culvert barriers were identified in the Fifteenmile Subbasin Assessment on Fifteenmile Creek. Together, these cut off a total of 7,623 feet of modeled presettlement spawning habitat in Fifteenmile Creek. Fixing these barriers would, according to EDT, increase smolt production by 1%, increase steelhead spawner runs by 8%, and increase life history diversity by 4%.

While the replacement of culverts is included in the proposed suite of restoration activities, restoration activities that focus on the middle watershed have much greater potential to increase life history diversity and spatial range, as revealed by the Fifteenmile Subbasin Assessment.

Environmental Characteristics—conditions needed to achieve the desired biological performance

Fifteenmile Creek Watershed

The biological performance described above relies on improvement of conditions in the lower half to two-thirds of the Fifteenmile watershed. The following improvements in habitat are listed in the order of priority implied by results the restoration scenarios described in the subbasin assessment:[4]

1. Development of fully functional floodplains and riparian vegetation throughout the watershed.

2. Restoration of large woody debris to recreate presettlement habitat characteristics in approximately 40 stream miles where key habitat and habitat diversity are most severely reduced.

3. Restoration of summer flows throughout the watershed by about 50% of the presettlement condition. At the mouth, this would correspond to at least 7 cfs in August, with corresponding improvements in other months. Flow restoration would provide corresponding improvements in stream temperature.

4. Restoration of upland watershed function to reduce runoff, erosion and sedimentation.

Mill Creek Watershed and other Streams

Outside of Fifteenmile Watershed, Mill Creek Watershed provides the most potential habitat for steelhead, with approximately 20 miles of potential spawning grounds. Potential capacity, productivity and abundance can not be estimated without conducting habitat surveys and water quality tests. Based solely on stream miles, Mill Creek Watershed might be estimated to have a similar productivity and a steelhead capacity about one fifth that of Fifteenmile Watershed, thus leading to a *very tentative* biological objective of 1,625-3,739 smolts per year and 62-528 adults per year.

The current population abundance is probably below the biological objective due to widespread loss of floodplain function and riparian vegetation, chemical pollution, runoff, and low flows. Most of these issues are most intense in the lower mainstem, although low flows are most notable in the South Fork below Wick's Water Treatment Plant. Development and implementation of a restoration program to achieve the biological goals should begin with baseline monitoring to determine the current condition of the watershed and the steelhead population.

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[4] As of May 28th, 2004, the Fifteenmile Coordinating Group had not come to full agreement on the order of priorities.

Passage is the major issue on Threemile Creek. The culvert at I84 cuts off most or all steelhead access to that watershed. Upstream of that, a stabilized headcut creates a 20 foot cascade at RM 4.5. Between those points, other barriers have been identified, but not quantified. In addition, Threemile Creek suffers all the same water quality issues as Mill Creek.

Oregon Department of Transportation has tentative plans to replace the I84 culvert on Threemile in 2006. This plan calls for projects to study and restore water quality on Threemile Creek in the first 4.5 miles of stream. After replacement of the I84 culvert, spawning surveys should be conducted for four to five years to determine whether steelhead are entering and using Threemile Creek. If steelhead successfully spawn and rear in Threemile following the replacement of the I84 culvert, this plan might be amended to place a greater priority on Threemile Creek, and to consider restoration of access upstream of RM4.5.

Chenowith Creek, Mosier Creek and Rock Creek offer a total of four miles of habitat. Of these, the highest restoration value was in Mosier Creek. While the total stream miles open to steelhead in Mosier Creek is less than a half mile, the habitat in the canyon downstream of Pocket Falls is potentially valuable spawning and rearing habitat. Water quality impacts to this reach mostly originate upstream, from residences and agriculture. Restoration of steelhead habitat would thus correspond with restoration of cutthroat habitat and would have to do with reducing the impact of human land uses upstream of Pocket Falls.

Lamprey

The capacity, productivity, abundance and life history of lamprey in Fifteenmile Subbasin are unknown. Before biological performance objectives can be developed, data must be collected allowing estimates of abundance and capacity.

Lamprey are believed to have similar habitat requirements to steelhead. Thus, the same measures that improve steelhead habitat should improve conditions for lamprey.

Resident Rainbow-type Trout

Current capacity, productivity and abundance of resident rainbow-type trout is unknown, as are the genetic relationship and habitat interactions between resident rainbow-type trout and steelhead. Resident trout have slightly different habitat needs from steelhead, though both require cool water temperatures and clean, highly oxygenated water, and both utilize the same sorts of prey. Habitat projects designed to improve conditions for steelhead should be evaluated carefully to make sure that they do not reduce habitat quality for resident trout.

Cutthroat Trout

Management for cutthroat trout should be the focus in most areas without anadromous access, including South Fork Mill Creek above Mill Creek Falls, Mosier Creek above

Pocket Falls, and Rock Creek above Rock Creek Falls. The capacity, productivity, abundance and life history of cutthroat in Fifteenmile Subbasin are unknown, although their range is fairly well determined as a result of surveys conducted by ODFW and Oregon Department of Forestry in compliance with the Oregon Forest Practices Act. ODFW and US Forest Service have collected some data for Fivemile Creek. Before biological performance objectives can be developed, data must be collected allowing population estimates and characterizing habitat conditions.

In those areas where cutthroat and steelhead are both present (Fivemile Creek, lower South Fork Mill Creek, North Fork Mill Creek, possibly Threemile Creek), habitat projects designed to improve conditions for steelhead should be evaluated carefully for their impact on cutthroat habitat.

5.3. Prioritized Strategies--Aquatic Species

5.3.1. Restoration Strategies

Six restoration strategies are presented in the order of the relative increases each produced in life history diversity, productivity, capacity and abundance when modeled through the EDT Scenario Builder. EDT was only applied to Fifteenmile Watershed, and only applied to steelhead. However, these same restoration strategies are believed to be generally appropriate to the other focal species and to the other watersheds, as well. Following the first six restoration strategies, other restoration strategies will be listed that were not modeled, either because they address issues specific to The Dalles and Mosier Watersheds, or because they did not conform to restoration, as defined by EDT.

Riparian/Floodplain Restoration

Activities that might be undertaken in this strategy include:

- Grading/leveling/filling/seedbed preparation in riparian areas
- Establishment of riparian vegetation through active planting of grass, shrubs and trees, or through passive protection activities.
- Control or removal of invasive plant species.
- Construction of fencing to create separate grazing management units for riparian areas.
- Installation of livestock exclusion fencing, off-channel livestock watering facilities and livestock stream crossings
- Removal of levees, dikes, berms, weirs or other water control structures.
- Setback of levees, dikes, and berms.
- Reshaping of streambanks as necessary to reestablish vegetation.
- Excavation and removal of artificial fill materials from former wetlands.
- Reintroducing beavers in areas where they have been removed.
- Removing structural bank protections and other engineered or created structures that do not meet the definition of Bioengineering Methods (see below).
- Recontouring offstream areas that have been leveled.

Of any one restoration strategy, wide-spread implementation of riparian buffers on private lands produced the greatest increase in steelhead capacity and abundance when modeled by the EDT Scenario Builder. It also produced the second highest increase in productivity. This result was consistent across multiple EDT runs in which environmental and population parameters were varied.

Generally, the function of riparian restoration is to restore floodplain functions. In more detail, the purposes are: (1) Reestablish a hydrologic regime that has been disrupted by human activities, including functions such as water depth, seasonal fluctuations, flooding periodicity, and connectivity; (2) increase area available for rearing habitat; (3) improve

access to rearing habitat; (4) increase channel diversity and complexity; (5) provide resting areas for fish and wildlife species at various levels of inundation; (6) reduce flow velocities and streambank erosion; (7) provide protective cover for fish and other aquatic species; and (8) improve or reestablish riparian/wetland processes and functions which have been disrupted by human activities, such as provision of fish and wildlife habitat, flood water attenuation, nutrient and sediment storage, support of native plant communities and removal of pollutants.

Programs that are currently in place to establish riparian buffers include the Fifteenmile Creek Habitat Enhancement Program (ODFW), Conservation Reserve Enhancement Program (CREP) and Continuous Sign-up of the Conservation Reserve Program (cCRP). These three programs are well coordinated, with USDA, SWCD and ODFW personnel working together with landowners. Bonneville Power Administration supports these programs by funding the Fifteenmile Creek Habitat Enhancement Program and by funding technical assistance to develop and implement buffer plans.

Funding for these and similar programs should continue and expand. Despite the efforts of USDA personnel and BPA-supported SWCD personnel, the backlog of landowners waiting for CREP plans continues to expand. As of April 23, 2004, 51 landowners await technical assistance for CREP plans in Wasco County.

Additional incentive should be offered for landowners to enroll wide riparian buffers in the programs. The average width of riparian buffer enrolled in CREP to date is ever 100 feet on each side of the creek,[5] but many landowners still choose the minimum 35 foot width in order to maintain some economic use of the floodplain. Depending on the width of the floodplain, 35 feet on either side of the stream may not be wide enough to gain the full ecological benefit. An additional monetary incentive offered to those landowners that choose to enroll buffers wider than 100 feet might help offset economic losses.

One concern in the management of riparian buffers is the management of noxious weeds. Many species of noxious weeds can be spread by water. In the absence of management, noxious weeds can take root and spread in a riparian buffer. The Fifteenmile Watershed Council identified this as a significant concern that must be addressed whenever riparian buffers are established. The Habitat Improvement Projects Biological Opinion (HIP BiOp) does not make note of this effect, although it does encourage the use of riparian pastures "in which livestock may be managed specifically to meet riparian or aquatic restoration goals."[6]

It should be noted that this strategy will take at least 15 years and sometimes much longer to reap maximum benefits. Landowners will continue to sign up for the program for another 4-5 years. Active tree and shrub plantings will take place for 2-3 years after that.

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[5] CCRP/CREP Records, USDA Office, The Dalles OR, 5/21/04

[6] NOAA Fisheries 2003 (HIP BiOp) page 138

Then, we must wait for the trees to grow to maturity. Both CREP and ODFW lease agreements last 10-15 years.

This long time frame is both a strength and a weakness of the CREP program. Before trees reach maturity, the monetary incentive for private landowners to keep the trees there will disappear. The Fifteenmile Watershed Council identified this as a concern in March 2004 and emphasized the need to renew these leases starting in 2014.

Streambank Bioengineering

Streambank bioengineering would be used in some locations to protect and repair eroding streambanks, thereby reducing sediment loading in streams and promoting naturally functioning channels and more stable stream courses. Potential activities would include:

- Woody plantings and variations (*e.g.,* live stakes, brush layering, facines, brush mattresses).
- Herbaceous cover, where analysis of available records (*e.g.,* historical accounts and photographs) shows that trees or shrubs did not exist on the site within historic times, primarily for use on small streams or adjacent wetlands.
- Deformable soil reinforcement, consisting of soil layers or lifts strengthened with fabric and vegetation that are mobile ('deformable') at approximately two- to five-year recurrence flows.
- Coir logs (long bundles of coconut fiber), straw bales and straw logs used individually or in stacks to trap sediment and provide growth medium for riparian plants.
- Bank reshaping and slope grading, when used to reduce a bank slope angle without changing the location of its toe, increase roughness and cross-section, and provide more favorable planting surfaces.
- Floodplain roughness, *e.g.,* floodplain tree and large woody debris rows, live siltation fences, brush traverses, brush rows and live brush sills; used to reduce the likelihood of major channel movement in areas where natural floodplain roughness is poorly developed or has been removed.
- Floodplain flow spreaders, consisting of one or more rows of trees and accumulated debris used to spread flow across the floodplain.
- Flow-redirection structures known as barbs, vanes, or bendway weirs, possibly constructed with natural materials such as rootwads and logs.

Large Woody Debris (Habitat Forming Natural Material Instream Structures)

When modeled in EDT, large woody debris placement in key restoration reaches resulted in the second highest increases in capacity, abundance and productivity. This strategy aims to:

(1) Provide instream spawning, rearing and resting habitat for salmonids; (2) provide high flow refugia; (3) increase interstitial spaces for benthic organisms and juvenile

salmonids; (4) increase instream structural complexity and diversity; (5) promote natural vegetation composition and diversity; (6) reduce embeddedness in spawning gravels; (7) reduce siltation; (8) reduce the width/depth ratio of the stream; (9) mimic natural input of large woody debris in aquatic systems that have been altered by channelization and land use practices; (10) restore historic hydrologic regimes; (11) decrease flow velocities; (12) deflect flows into adjoining floodplain areas, and (13) aggrade incised channels, increasing stream channel and floodplain connectivity.

The scenario modeled in EDT applied this strategy to Fifteenmile Creek reaches 4, 5, 7, 8, and 9, Eightmile reaches 6 and 8, and Fivemile reaches 3 and 4 (see figure 3.2), the reaches that ranked highest in terms of restoration value. These reaches are all on private lands.

All activities intended for installing habitat-forming, instream structures will provide the greatest degree of natural stream and floodplain function achievable through application of an integrated, ecological approach (NOAA Fisheries 2003b). Instream structures capable of enhancing habitat forming processes and migratory corridors will be installed within previously degraded stream reaches. These structures include engineered log jams and other cover structures designed with large woody debris and/or boulder materials. Structures will be installed only in streambed gradients of 6% or less. Structure placement activities include structure types that are designed to lower a stream's width to depth ratio while providing habitat and migratory corridors capable of connecting existing habitats and promoting a naturally-functioning channel. Dependent on site location and design criteria, some structures may be anchored. If anchored, a variety of methods may be used. These include buttressing the wood between riparian trees, cabling the structure to existing structures, and/or anchoring with boulders, concrete blocks or new log wedges. Roni *et al.* (2002) citing Thom (1997) stated that pinning channel spanning logs between trees in the riparian zone is an effective method of naturally anchoring LWD (NMFS 2001f).

Placement of large wood will occur in channels with an intact, well-vegetated riparian buffer area that is not mature enough to provide large wood, or in conjunction with riparian rehabilitation and/or management. Wood placement will be limited to areas where the absence of large wood has been identified as a limiting factor for fish habitat using survey data.

The placement of large boulders will generally be restricted to streams where boulders naturally occur but are currently lacking. Boulder placement projects will usually rely on the size of boulder for stability, not on artificial cabling or other devices. Structures that include large boulders will be designed to promote naturally-functioning channel conditions.

Some of the instream habitat improvement projects may involve pulling or felling trees into streams. Although trees would be sacrificed and maneuvered within the riparian zone and stream channel, in these projects, no trees would be harvested or removed from riparian reserves. In addition, the projects would extend over substantial distances and stocking levels of remaining trees would remain high.

Private landowners often have justifiable concerns about large woody debris placement. Will the wood move? Will it back up behind bridges and culverts? Will it direct water into farm fields and infrastructure? Such concerns must be thoughtfully addressed before this strategy can be implemented on private lands. The following points should be considered on a case-by-case basis:

- The greater density of infrastructure on private lands will require anchoring, such as cables and trash racks, to be used much more frequently than would be the case in a similar project on public land. On public lands, logs are often not cabled into place. Experience has shown that large woody debris placements are more likely to mimic natural conditions if the logs have a chance to shift. However, in cases where infrastructure might be threatened, logs must be anchored and/or trash racks placed to prevent logs from moving downstream.

- The best locations for large woody debris placements may be in wide riparian buffers (as recommended by NOAA Fisheries)[7]. Such locations will generally minimize unintended stream channel movement into adjoining land uses, while allowing natural levels of channel migration to occur.

- Incentives may be required for landowners to allow large woody debris placements to occur. Incentives could include a one-time bonus payment plus an extension of the riparian buffer lease agreement, desirable in its own right for fish restoration.

- Direction and administration of a large woody debris placement program might come from ODFW, SWCD or Forest Service. The program would most likely be a cooperative venture between all three.

Low Flow Restoration

Flow restoration (both high and low flows) produced the third highest increase in steelhead capacity and abundance, although the increase in productivity was relatively low. The scenario modeled in EDT assumed that both high and low flows would be returned to presettlement conditions. This is not considered a feasible objective, but was simply used to represent the maximum potential of this strategy.

Restoration of low flows and mitigation of peak flows are actually two separate challenges requiring different actions. Low flows will be considered first.

The average natural flow at the mouth of Fifteenmile Creek in August is only 10.7 cfs, and the expected average flow after diversions is 3.45 cfs.[8]

[7] NOAA Fisheries 2003 (HIP BiOp)

[8] OWRD website, April 2004, www.wrd.state.or.us

Several actions can be undertaken that will lead to increases in the average summer low flows. Each has advantages and limitations.

Irrigation efficiency upgrades represent an early source of savings. Orchard Ridge Ditch and Wolf Run Ditch have a combined total of about 12 miles of unpiped ditches with significant water loss. Piping both of these ditches would save approximately 1.5 cfs each, which, according to the Oregon State "Allocation of Conserved Water Statute", could be allocated partially to instream flow and partially to the water rights holders, thus creating a win-win situation. Funding would be needed for design, NEPA, materials, labor and inspection. With cooperation from the Forest Service, SWCD and water rights holders, both project could be completed within four years and immediately begin to reap benefits for focal fish species.

The Fifteenmile Watershed Council recommended on January 28th, 2004 that restoration of low flows be made a priority specifically in the Dufur Valley, because this is the reach of Fifteenmile Creek in which flows and temperatures quickly degrade. For instance, on August 1 2002, the daily maximum surface temperature quickly rose from approximately 13° C at the National Forest boundary to 22°C at the City of Dufur.[9] EDT also identified these reaches as priorities (Fifteenmile 8 and 9). The same result occurs in Eightmile Creek between the National Forest boundary and Japanese Hollow. Once again, these reaches were identified as priority restoration reaches by EDT (Eightmile 6, 7, and 8).

One suggestion from the watershed council is the conversion of surface water rights to groundwater rights. This approach is recognized by the Biological Opinion on Habitat Improvement Projects (HIP BiOp) developed by NOAA Fisheries in consultation with Bonneville Power Administration. The BiOp notes several beneficial effects, but also notes the potential indirect effect that "if wells are not well regulated, pump rates can significantly reduce the level of the local water table and create a deficit in the groundwater budget."[10] This same concern was noted by the Fifteenmile Watershed Council.

Instream water rights totaling 13 cfs are registered for Fifteenmile Creek from the confluence with Eightmile to the Dufur Intake. Instream water rights in Eightmile Creek total 10 cfs below Fivemile and 5 cfs above Fivemile.[11] These instream water rights have priority dates after 1980, and therefore have relatively little effect on streamflow, because consumptive rights with priority dates prior to 1980 must be met before the instream right takes effect. Lease or purchase of selected senior water rights from willing seller/leasors would allow establishment of instream water rights with senior priority dates in key reaches, including Eightmile Creek above Fivemile Creek, and Fifteenmile Creek from the Forest Service boundary to the confluence with Eightmile Creek.

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[9] SWCD/DEQ Infrared aerial survey, 2002

[10] HIP BiOp, page 149.

[11] http://stamp.wrd.state.or.us/apps/wr/summary_reports/pod_summary.php

OWRD generally allows points of diversion to be moved downstream. In some cases, a point of diversion can be moved downstream from a tributary into a mainstem. This can be advantageous where the tributary has very low flows and the mainstem has strong flows, or where a change in point of diversion will rewater a high priority reach.

The proposed restoration scenario assumed a 50% recovery of presettlement flows throughout the watershed. It is unknown whether such an objective is possible or practical. To determine the potential for flow restoration, one would have to estimate the amount of water that could be saved through irrigation efficiency, the number of water rights holders that might be interested in instream leases or sale of water rights, the impact and potential of point-of-diversion changes, etc.

Mitigation of Upland Runoff and Sediment Sources

Peak flows can be moderated by reducing upland runoff, reducing impervious surfaces, increasing vegetative cover, and restoring floodplain function and meanders. Methods include continued adoption of no-till farming and other conservation farming practices, closure of forest roads and by restoring the length and complexity of the stream channel.

Conservation Farming on Drylands

Incentive programs will encourage private farm owners to adopt the following conservation practices, outlined in the NRCS Conservation Practice Standards:

329a Residue Management, No-till and Strip Till (NRCS 2000c)

329b Residue Management – Mulch Till (NRCS 1999a)

328 Conservation Crop Rotation (NRCS 2000f)

330 Contour Farming (NRCS 2000a)

585 Contour Strip Cropping (NRCS 2000)

590 Nutrient Management (NRCS 1999e)

777 Residue Management Direct Seed (NRCS 2000h)

586 Stripcropping (NRCS 2002b)

The most effective conservation cropping systems available for dryland crops in the Fifteenmile Subbasin is No-till or Direct Seed. These two practices are nearly the same thing. Both of them minimize soil disturbance by using high-tech drills to seed and fertilize directly into standing crop residue with no prior tillage. The practices are distinguished by the percentage of ground disturbance produced by the particular drill being used. After this, both practices will be refered to as “No-till.”

No-till has been adopted on 45,000-50,000 acres of dryland agriculture in the Fifteenmile Watershed. An additional 50,000-60,000 acres could be converted, given sufficient incentives. No-till farming techniques lead to new management challenges, some of which have been identified in recent years by early adopters of the technology. For instance, field lanes are a minor issue under minimum tillage, because tillage operations more or less obliterate them every year. Under no-till, these field lanes, if used year after year, can become compacted and incised into the soil surface. Precipitation can then collect and run off, causing gully erosion and carrying sediment to streams or other downslope areas.

Another issue is noxious weeds. One of the purposes for tillage is the mechanical control of weeds. Under minimum till, perennial weeds are largely controlled by a combination of mechanical and chemical methods. Typical herbicides used in minimum till systems are glyphosate and 2,4-D. Annual weeds, such as annual rye, downy brome, goat grass and field bindweed are the major management challenges under minimum till. By contrast, no-till discourages annual weeds due to the presence of crop stubble and the lack of soil disturbance, but perennial weeds are encouraged. Because mechanical control is eliminated, no-till systems may have a heavier reliance on herbicides to control broadleaf perennials.

Such issues must be addressed with adaptive management and education. New technologies, such as Weedseeker infrared sensors, have the potential to reduce herbicide usage by 40-80% by turning off spray nozzles where no weed is present. Demonstration projects and incentives for early adopters have proved themselves effective techniques for adoption of new technology.

Road Maintenance or Decommissioning

The primary proposed road maintenance activities are:

- Creating barriers to human access: Gates, fences, boulders, logs, tank traps, vegetative buffers, and signs.
- Surface maintenance, such as building and compacting the road prism, grading, and spreading rock or surfacing material.
- Drainage maintenance and repair of inboard ditch lines, waterbars, and sediment traps.
- Removing and hauling or stabilizing pre-existing cut and fill material or slide material.
- Relocating portions of roads and trails to less sensitive areas outside of riparian buffer areas.

Interrelated activities addressed elsewhere in this plan are:

- Native Plant Community Establishment and Protection
- Bridge, Culvert, and Ford Maintenance, Removal, and Replacement.

Roads can be significant sources of runoff and sedimentation, depending on their density, placement, design, construction and upkeep. Dirt roads, poorly designed roads, roads

within 200 feet of a stream, roads on slopes of greater than 50%, poorly maintained roads, or roads lacking culverts in appropriate places can suffer from gully erosion, becoming point sources of sediment. Early settlers often followed the canyon bottoms when building roads. In ephemeral drainages, roads were often built directly up the middle of the waterway. This issue exists on both public and private lands.

In former timber sales, primitive logging roads were often built at high densities, with multiple stream crossings. The Mount Hood National Forest has a program of road closures to address the high density of logging roads in some parts of the watershed.

In general, road maintenance will involve minor construction efforts, typically using a small work crew equipped with one or two vehicles. In some cases, heavy equipment may be used.

Decommissioning roads will be used to increase water infiltration rates, eliminate or reduce erosion and mass-wasting hazards and thereby the sedimentation potential to down-slope habitats, reduce the impact of roads on the hydrology of watersheds and eliminate or reduce human access and use/disturbance associated impacts, such as: timber theft, disturbance to wildlife, road density, poaching, illegal dumping of waste, erosion of soils, and sedimentation of aquatic habitats, particularly in sensitive areas such as riparian habitats or geologically unstable zones.

Removal of Passage Barriers

The primary proposed bridge, culvert and ford activities are:

- Culvert removal, where possible, and natural channel cross section reestablishment.
- Replacement of undersized culverts that present a barrier to fish movement with appropriately-sized culverts, bottomless arches or bridges.
- Replacement of perched culverts to meet the natural bed of the stream.
- Excavation and realignment of misaligned culverts.
- Modification of culverts by means such as installing step-and-pool weirs at culvert outlets, trash/debris racks, or erosion protection structures at culvert outlets or inlets where replacement or lowering is not feasible.
- Redesign of stream crossings determined to be inappropriate for culvert installations to steel/concrete reinforced bridge installations or fords;
- Removal or lowering of artificial structures that impede fish passage;
- Repair, upgrade or replacement of bridges and culverts, except that bridge replacements will be full-span, *i.e.*, no bents, piers, or other support structures below bankfull elevation.

These activities improve fish passage, minimize streambank and roadbed erosion, facilitate natural sediment and wood movement, and—during flood events—eliminate or reduce excess sediment loading and dynamic changes in stream flow that cause streambank erosion, undermining of roadbeds, and the washout of culverts. Proper road

drainage upgrades, culvert replacements, etc., are likely to diminish the potential adverse effects of roads, including turbidity, sedimentation, and channel extension, by allowing the drainage design features to work properly and erosion to be minimized.

In Fifteenmile Watershed itself, passage has been reestablished to the majority of the potential anadromous habitat. Replacement of the five culverts identified in the EDT model would restore 7,623 feet of headwater habitat on the Mount Hood National Forest. EDT predicts an 8% increase in spawners due to this action.

Possibly more significant is the continued search for partial fish barriers throughout the watershed. The Endersby Road culvert on Eightmile Creek was not identified in the EDT process, but was recently identified as a barrier to adult passage at flows of less than 6 or greater than 37.5 cfs[12]. Some of the most productive spawning grounds in the watershed occur upstream of this culvert, thus demonstrating that it is not an adult barrier during the spawning run under typical conditions, but that it could have a drastic effect on spawning under very low water or high water years and at certain times of year.

Furthermore, the Endersby Road culvert is a total passage barrier to juveniles during the summer. Infrared aerial surveys were conducted on Eightmile Creek on August 3, 2002. At the time of the surveys, the stream temperature just downstream from this culvert was 6^{o}C warmer than it was upstream (17^{o}C versus 23^{o}C).[13] Thus, this culvert might have a significant effect on juvenile survival, which was not modeled by EDT.

Despite the fact that culvert surveys have been done in the past, this potential barrier was not identified until 2004. More such hidden barriers may exist. Identifying and replacing such barriers may significantly improve the viability of the steelhead population in Fifteenmile Watershed.

Pesticide Reduction

Threemile Creek, Mill Creek, Chenowith Creek and Mosier Creek run through orchard areas. Conventionally managed orchards use a greater number and quantity of agricultural chemicals than do the dryland grains that predominate in the Fifteenmile Watershed. Malathion and chlorpyriphos both exceed state standards at certain times of year in Mill Creek, and malathion has been found in Threemile Creek and Fifteenmile Creek, as well. Farmworker housing is often placed near the streams, increasing impervious surfaces, roadways, household and automotive chemicals and harassment of fish species.

Additional strategies are called for to address the issues raised by these land use patterns.

[12] Asbridge, March 2004

[13] Watershed Sciences, LLC, 2003.

Strategies to reduce agrichemical input to the streams are already under way in the form of the Integrated Fruit Production Program and IFPnet. IFP is a management-intensive method of pest control that, among other conservation goals, minimizes the use of broad-spectrum pesticides, and also minimizes spray drift. Detailed weather information is needed to predict pest outbreaks and improve timing of orchard operations. Wyeast RC&D, working with the Wasco County Fruit and Produce League, has spearheaded the installation of a network of weather stations throughout the orchard areas that provide the necessary data. They have also provided an entomologist to growers who develop IFP plans with growers and scouts for pests, thereby pinpointing the location of outbreaks.

Long term funding to continue the IFP Program has not yet been secured. Nor has long-term funding been secured to continue monitoring for malathion and chlorpyriphos. Such monitoring must continue in order to track progress at reducing or eliminating pesticide detections in the waters of the creeks.

High Density Rural and Urban Issues

All three Dalles area creeks, Mill, Threemile and Chenowith, flow through urban areas, where residences abut the creek, and road density is far higher than anywhere else in the subbasin. Storm sewers feed into Mill Creek at several points in its lower mile.

The human population density throughout these watersheds is greater than in Fifteenmile Watershed, as is the road density. In addition, both Threemile Creek and Mill Creek have a number of irrigation pasture operations that abut the creek.

Strategies to reduce impacts from pasture management include riparian buffers, resource management system plans to deal with mud and manure and barnyard runoff, irrigation efficiency, and other issues typical to this land use. Both technical and financial assistance, as well as public education programs, will be needed to address these issues.

Groundwater Conservation in Mosier Watershed

Key environmental factors affecting fish populations in Mosier Creek include changes in channel form, loss of habitat diversity, low summer flows and consequent high temperature, and potential agrichemical contamination. Data is lacking on chemical pollutants in Mosier Creek. Mosier Creek Road follows the stream for nearly its first eight miles, and riparian vegetation is interrupted by rural residential development.

Groundwater declines has occurred in the Mosier Valley since commercial irrigation began in the 1970's. Declines of up to 120 ft have been documented in several wells monitored by the Oregon Water Resources Department (OWRD) since the 1970s.[14] This overdraft has been shown to have an effect on stream flows. A study conducted by OWRD in the 1980's suggested that Mosier Creek might be losing water to the Priest Rapids Aquifer in a reach that had received water from the aquifer as recently as the

[14] Larry Toll, OWRD, Comments to the Mosier Watershed Council, April 2004

1960's.[15] The largest water-level declines are occurring in the Priest Rapids basalt aquifer. Irrigation wells, municipal wells, domestic wells, and improperly completed wells that allow well bore leakage probably all contribute to the declines. With the possible exception of municipal pumping, none of these stresses on the aquifer have been well quantified.

Another consequence of water-level declines in the basalt aquifers may have been a decrease in ground-water discharge (baseflow) to Mosier Creek. If ground-water levels have fallen below the bed of the creek, there may now be losses from Mosier Creek to the ground-water system.[16] Reductions in ground-water discharge could negatively impact flow and temperature conditions in Mosier Creek, particularly during the summer and fall low-flow period when typical flows are less than 3 cfs. Mosier Creek and Rock Creek are on the Oregon 303(d) list for temperature.

Following a hydrogeologic assessment by OWRD in 1985 (Lite and Grondin, 1988) the orchard tract area, where most pumping is concentrated, was designated as a "ground-water restricted area". The Pomona and Priest Rapids Aquifers were closed to further appropriations for any use other than domestic. At the time of the OWRD study (1985), nearly 600 acres received irrigation from ground water and depending on the method used to estimate withdrawals, they ranged from 600 to 1,500 acre-ft per year. Today (2004), OWRD lists over 900 acres where ground water provides some or all of irrigation needs (WRIS data from OWRD web site, April 2004). By extrapolation, this 50-percent increase since 1985 may have resulted in an additional 300-800 acre-ft/yr of withdrawals. The increased acreage may not have resulted in a proportional increase in withdrawals because irrigation methods on new acres are usually more efficient as farms have shifted from sprinkler systems to drip irrigation.

Another factor that contributes to an unknown degree to water level declines in the Priest Rapids aquifer is discharge to the overlying Pomona aquifer and underlying Frenchman Springs aquifer via well bores. An unknown number of the irrigation and public supply wells in the area are not cased and sealed into a single aquifer and thus may "short-circuit" the natural flow system by allowing vertical flow within the well bore. This condition is called "co-mingling" by OWRD because it causes mixing of water from separate aquifers beyond that which would occur under natural flow conditions. The effect is the same as if the co-mingling wells were pumping from the Priest Rapids aquifer and injecting into the Pomona aquifer or Frenchman Springs aquifer. State well-construction standards are designed specifically to prevent this condition. The number of wells and the degree to which they co-mingle and contribute to water-level declines in the Priest Rapids aquifer is unknown.

The Mosier Watershed Council has established three goals for the watershed: 1) to reverse or stabilize water-level declines in the principal aquifers of Mosier Valley, 2) to

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[15] Lite and Grondin, 1988.

[16] Lite and Grondin, 1988

increase summer baseflows in Mosier Creek, and 3) to sustain productive, profitable agriculture in Mosier Valley.[17] To meet these goals, the Mosier Watershed Council must develop a strategy for achieving sustainability of the ground-water resource. Determining the sustainable yield of ground water from the basin is a process that relies upon having a thorough scientific understanding of the complex, three-dimensional ground-water system. In addition to this understanding, a set of water management tools is needed to facilitate an evaluation of alternative strategies and their effects on water levels, streams and springs, and wetlands.

The USGS has proposed a groundwater study to provide the necessary information. The overall objective of the proposed study is to advance the scientific understanding of the hydrology of the basin and use that understanding to develop a set of tools that can be used to evaluate the sustainable yield of the ground-water resource. Some of the key scientific questions to be addressed include:

- What are the boundaries to the ground-water system?
- What are the hydrologic inputs and outputs to and from the ground-water system and how have they changed since development began?
- What was the nature of flow between basalt aquifers under natural conditions and how has that been affected by pumping? By co-mingling wells?
- To what extent can water-level declines be attributed to pumping? Co-mingling wells? Climatic variations?

The major findings of the study, description of the data, and documentation of the model will be published in a USGS Scientific Investigations Report. A project web site will be created to disseminate information on the goals and approach of the study, as well as data and reports. Project staff will meet with the Mosier Watershed Council at regular intervals to convey progress, preliminary results, and plans. The study will take 2.5 to 3 years from inception to publication of the final report. Preliminary budget estimates are $400-$500k. USGS will provide 50% of the project funds. Bonneville Power Administration is a potential source for the matching funds.

A citizen's group called The Mosier Alliance is using federal funds obtained through the Columbia Gorge National Scenic Area to develop the Mosier Waterfront, utilizing the mouths of Mosier Creek and Rock Creek for public access under the railroad and the freeway to the Columbia River. This project includes projects intended to protect, restore and mitigate any damages to the riparian and aquatic ecosystems.

[17] Mosier Watershed Council 2004

Off-channel Water Storage

As described in the Fifteenmile Subbasin Assessment, long-term climate change is projected to reduce the snowpack in the middle elevations of the Cascade Mountains over the course of the next 50 years with probable adverse impacts on already limited stream flow. The highest elevation in the Fifteenmile Subbasin is 6,525 feet at Lookout Mountain.

In an average year, persistent winter snowpack is currently found at elevations above 2,800 feet, providing an effective water reservoir. This area encompasses approximately one eighth of the subbasin, and includes the headwaters of Fifteenmile, Ramsey, Eightmile, Fivemile, Mill and Mosier Creeks. It does not include Rock, Chenowith, Dry or Threemile Creeks which are lower elevation drainages.

One expected effect of long term climate change is a gradual increase in the proportion of winter precipitation from snow to rain, and a reduction of snowpack in mid-elevations. If average winter temperatures were to rise above freezing in the zone below 3400 feet, the area of the subbasin with a snowpack would be reduced by approximately 40%. Mosier Creek Watershed's winter snowpack would be completely eliminated. Summer stream flows in the affected watersheds would be reduced even further than current levels. Simultaneously, average winter flows are expected to be higher due to the combination of higher precipitation and higher proportion of rainfall to snowfall. The risk of winter/early spring flooding would therefore be intensified.

Long term planning should consider construction of off-channel reservoirs to replace the expected snowpack storage losses. These reservoirs might be used to store water during the winter months (November to February) and release it at a sustained rate during low flow summer months. The concept of constructing multiple reservoirs in the Fifteenmile Subbasin has been explored, potential sites identified, and found to be feasible as early as the 1960's.[18] Today's fish passage issues and the need to protect existing habitat would reasonably limit sites for such structures to ephemeral drainages with no fish presence. The local conservation partnership and subbasin stakeholders need to fully explore this concept over the next 2-3 years.

There are likely issues that would need to be worked out before there would be any appreciable benefits to fish and wildlife. Potential issues include:

1. Footprint of the reservoirs themselves compromising wildlife habitat.

2. Downstream nutrient loading following initial creation of reservoirs.

3. Degraded water quality: temperature, oxygen, nutrients.

4. Physical loss of upland fish/habitat.

[18] SCS et. al., 1964.

5. Alteration of the natural hydrology of subbasin (fewer peak flow events, which are important for channel forming events and fish habitat) will significantly alter natural hydrology of stream that delivers water downstream.

In a related activity, City of The Dalles is conducting feasibility studies on raising the dam at Crow Creek Reservoir. The City of The Dalles Water Quality Manager has noted that such an action would allow the City to increase the bypass flows at the fish screen on the City's municipal water intake structure. When implemented, the increased bypass flows would address the issue of low flow on the South Fork Mill Creek.

5.3.2. Protection Strategies

The Fifteenmile Subbasin Assessment revealed certain reaches that are currently supporting most or all of the steelhead production in the Fifteenmile Watershed. These reaches correspond to the highest elevations of the watershed. Many of them are on the National Forest and are managed in keeping with the Northwest Forest Plan. Others are on private lands.

The Subbasin Assessment also placed protection priorities on the forks of Mill Creek and on Rock Creek, each watersheds in which the combination of higher elevations and relatively fewer human impacts have led to better water quality.

Fifteenmile Watershed

As described in the gap analysis of the Subbasin Inventory of Existing Activities, 3.8 miles of Fivemile Creek and 2 miles of Eightmile Creek are in private ownerships and not enrolled in a riparian protection program. In Fifteenmile, approximately three miles are on private lands and not yet enrolled in a riparian protection program. A public outreach program will target these landowners to inform them of the importance of their portion of the creek to the health of focal fish species, and to encourage them to enroll in one or another of the existing programs aimed at riparian protection.

South Fork Mill Creek

Existing programs for protection of water quality and watershed function in the South Fork Mill Creek are outlined in the Subbasin Inventory under Management Plans and Programs. These existing plans provide as comprehensive of protection measures as exist any place in the Subbasin and should be sufficient to protect cutthroat trout upstream of Mill Creek Falls. However, samples of cutthroat trout taken from South Fork Mill Creek show the fish to be of small size and poor to fair condition. Monitoring is needed to ensure that the health of this population remains at or better than its current condition. See Research and Monitoring, section 5.6.

North Fork Mill Creek Watershed

As noted in the gap analysis of the Fifteenmile Subbasin Inventory, the upper 5 miles North Fork Mill Creek are on the Mount Hood National Forest, while the lower 6.5 miles

are on privates lands. None of the portion of North Fork Mill Creek on private lands is protected by any specific management. One landowner with approximately 0.2 miles of this reach has applied to enroll in CREP and is awaiting technical assistance.

This reach, while identified as a protection priority due to its low intensity of land use, is also in need of a number of restoration projects to address identified concerns. A dirt road parallels 5 miles of this reach. Undersized culverts constitute partial migration barriers and pose the risk of sedimentation during peak flow events. The roads in this canyon are used for illegal dumping of derelict vehicles and other equipment. Illegal dwellings have existed in the past and may still exist. Many of the identified culvert and road issues are on county roads. Wasco County Public Works is aware of these issues, but needs additional funding to address them in the near future. A private (?) road climbs the south side of the canyon, and contributes sediment at a number of known locations where culverts should have been installed, but were not.

A plan for the restoration and protection of North Fork Mill Creek would begin with a dialog between the public and private landowners and local natural resource managers. A number of projects could be accomplished through voluntary means, while law enforcement would be required to address some of the dumping issues and unpermitted activities currently occurring in this watershed.

Rock Creek

As noted in the gap analysis of the Subbasin Inventory of Existing Activities, protection of the upper six miles of Rock Creek currently relies entirely on effective enforcement of the standards in the Oregon Forest Practices Act for fish-bearing streams. Any further protection of this cutthroat and steelhead stream would require a cooperative agreement with some or all of the three commercial and one public landowner in the upper six miles of this stream.

5.4. Terrestrial Species

Conservation efforts for terrestrial species should focus first on preserving critical habitat types, and only thereafter turn to actions for specific species. This strategy will promote the health of the overall ecosystem and thereby benefit the greatest number of wildlife species, as well as providing benefits to associated streams. Therefore, this section will consider management strategies for Shrub-steppe habitat, East-slope Cascade Conifer Forests, and then look at recommendations for the particular focal species.

5.4.1. Conservation Recommendations for Shrub-steppe Habitat

Conservation of shrub-steppe habitat will support loggerhead shrike, Brewer's sparrow, mountain quail, beaver and other fish and wildlife species. The following objectives for conservation of shrub-steppe habitat are modified from Altman and Holmes (2000):

General:

- Institute policy of "no net loss" of shrub-steppe habitat (i.e. mitigate habitat conversions and natural losses with equal or greater restoration efforts).
- Maintain existing areas of moderate to high quality shrub-steppe vegetation and actively manage to promote their sustainability.
- Initiate actions to enhance the size and connectivity of existing shrub-steppe patches.
- Use native species and local seed sources in restoration.

Agricultural Operations:

- Minimize or avoid agricultural field operations and recreational activities (e.g. ATV's) during the breeding season (April 15-July 15).
- Delay mowing, haying, or harvesting of grass/legume fields as long as possible, preferably until after July 15.
- Space mowing or haying frequency as widely as possible to increase the probability of successful nesting.
- Where possible, use no-till practices or avoid tillage between April 15 and July 15. No-till will allow maximum nesting opportunities in stubble fields and also increase foraging opportunities by providing habitat for insect prey.

Grazing Lands Management:

- Better manage livestock grazing to avoid or minimize further degradation further degradation of shrub-steppe habitat.
- Maintain cryptogrammic crusts (soil lichen) where they occur, and restore properly functioning native vegetation at ecologically appropriate sites.
- Implement grazing practices that are consistent with growth of native plants and forbs. This may include increasing rest cycles in rest-rotation systems, and/or deferring grazing until bunchgrasses have begun to cure.

- Manage livestock numbers or time on rangeland to maintain ecological integrity of the plant community through fencing exclusions or time management.
- Minimize or exclude grazing in relatively pristine areas.

Weed and Pest Management:

- Prevent infestations of exotic vegetation.
- Practice Integrated Pest Management for reduced destruction of nontarget insect species.
- Encourage biological controls, rather than chemical controls wherever possible.
- Limit the application of herbicides to invasive non-native species and use in conjunction with habitat enhancement projects which include long-term solutions to control future infestations.
- Establish healthy stands of desirable native vegetation adjacent to irrigated fields to avoid the spread of noxious weeds.

Uncultivated Areas--Conservation Reserve Program (CRP) Fields, Field Borders, Buffer Strips:

- Provide uncultivated herbaceous areas (field buffers or filter strips) within or adjacent to cultivated fields.
- Encourage restoration of agricultural lands to native cover through Conservation Reserve Program (CRP), easements or incentive programs.
- Develop economic incentive programs for private landowners to certify their land as a Shrub-steppe Bird Conservation Area.
- Restore grassland diversity in fields that were seeded to crested wheatgrass.
- Develop criteria for NRCS incentive programs to maximize benefits to birds.

Education and Outreach:

- Develop brochures or other educational materials for private landowners describing shrub-steppe values and management strategies to incorporate with farming practices that will maintain forage value and provide habitat for birds and other wildlife.
- Support cooperative extension research, education, and workshops that demonstrate and promote the economic benefit of sustainable grazing and farming practices and also benefit landowners.

5.4.2. Conservation Recommendations for Pine-Oak Woodlands

Conservation of pine-oak woodlands will support western grey squirrel, mule deer, mountain quail, beaver and other fish and wildlife species. The following objectives for conservation of shrub-steppe habitat are modified from Altman (2000):

- Institute policy of “no net loss” of Pine-Oak Woodland habitat (i.e. mitigate habitat conversions and natural losses with equal or greater restoration efforts).

- Maintain existing moderate to high quality Oak-Pine Woodland stands, and actively manage to promote their sustainability, regardless of size.
- Emphasize conservation of large patches of Oak-Pine Woodland with large-diameter and open-form oaks.
- Retain all oak and ponderosa pine trees and snags >53 cm (20 in.) dbh, regardless of landscape context.
- Maintain or initiate actions to ensure <10% canopy cover of conifers in stands where pure oak woodland is appropriate.
- Maintain or initiate actions to provide young, subcanopy (i.e. recruitment) trees and native shrubs and herbaceous vegetation in the understory.
- Enhance size and connectivity of existing Pine-Oak Woodland patches.
- Maintain or provide high quality Oak-Pine Woodland habitat in tracts greater than 40 ha (100 acres) in a mosaic of habitat conditions.
- Use mechanical removal (e.g. girdling, manual removal) and/or fire to create/maintain appropriate species composition and growth form and cover amounts.
- Where safe and practical, use low-intensity prescribed burns to exclude Douglas fir encroachment, stimulate oak and pine sprouting, and contribute to multi-aged stands.
- Limit grazing periods with fewer animals for less impact.
- Allow but monitor low impact recreational activities if oak and pine regeneration is not compromised and activities are not likely to adversely affect wildlife.
- Develop incentive programs through city, county, state and/or federal agencies for enhancement of oak-pine forest for wildlife.
- Discourage clearing or conversion of large tracts of Pine-oak woodland.
- Develop educational materials to foster an appreciation of oak-pine forest and assist landowners in restoration.
- Develop economic incentive programs for private landowners to certify their land as an Oak-Pine Bird Conservation Areas.

5.4.3. Conservation Recommendations for Late Successional (old Growth) Mixed Conifer Forests

Conservation of Late Successional Mixed Conifer Forests will support spotted owls, mule deer, beaver and other fish and wildlife species. The following objectives for conservation of Late Successional Mixed Conifer Forest habitat are modified from Altman (2000):

General

- Institute policy of “no net loss” of Late Successional Mixed Conifer Forest habitat (i.e. mitigate habitat conversions and natural losses with equal or greater restoration efforts).

- Retain large diameter (>53 cm [22 inches]) trees and snags.
- Maintain existing moderate to high quality Mixed Conifer Forest stands, and actively manage to promote their sustainability.
- Enhance size and connectivity of existing Mixed Conifer Forest patches.
- Improve quality of degraded Mixed Conifer habitat through appropriate management, particularly the use of natural disturbance regimes, such as fire.
- By 2025, establish/maintain >25% of landscape units where Mixed Conifer is appropriate as moving towards late-successional conditions.
- Establish Mixed Conifer Bird Conservation areas and promote their proper management.
- Develop conservation agreements with private landowners to enhance the quality of Mixed Conifer habitat.

Burning

- Use understory prescribed burning and/or thinning when and where appropriate to reduce fuel loads and accelerate development of late-seral conditions.
- Permit stand-replacing wildfires to burn where possible.

Timber Management

- Retain large trees, especially ponderosa pine >43 cm (18 inches) dbh.
- Initiate snag creation and recruitment where necessary.
- Retain all existing snags and broken-top trees >24cm (10 inches) dbh in harvest units.
- Implement road closures and obliteration where necessary to limit access to snags.
- Minimize mechanized harvest activities that increase susceptibility to invasion of exotic and noxious weeds and soil erosion.
- Restrict fuelwood cutting to trees <38 cm (15 inches) where snag objectives are not being met.

Weed and Pest Management

- Use Integrated Pest Management (IPM) practices.
- Encourage biological controls rather than chemical controls wherever possible.
- Applications should be by hand if practical to target species.
- Applications on lands adjacent to riparian areas should avoid environmental conditions where riparian zone may be threatened.

Grazing Management

- Properly manage or eliminate grazing to ensure appropriate understory conditions.

- Consider retirement of grazing allotments when they come up for renewal, where habitat degradation is occurring and/or where cowbirds are common.

Recreation

- Minimize timing and extent of human recreation in important Mixed Conifer bird habitat during nesting season.

Education and Outreach

- Develop brochures and other educational materials for private landowners describing Mixed Conifer values and management strategies to provide habitat for land birds and other wildlife.

5.4.4. Conservation Recommendations for Focal Species

Mountain Quail – Mountain quail utilize shrub-openings within forested parts of the subbasin and riparian corridors in all habitat zones within the subbasin. Nest sites vary with open-shrub-dominated communities within the forested areas and grass or shrub areas within riparian areas.

Create or restore shrub-openings within the mixed conifer zone via timber harvest or prescribed fire. Restore the shrub component within the riparian areas and increase the amount of riparian habitat outside of residential areas.

Transplanting mountain quail into under utilized habitat such as Ramsey Creek (Three miles of riparian habitat restoration was completed in 2003) would improve the genetic diversity and increase numbers of quail in those areas.

Spotted Owl – The Northwest Forest Plan established a network of Late Successional Reserves (LSRs) to maintain spotted owls over the long term. There are currently 19 (17 pairs and two resident singles) spotted owl activity centers within the subbasin. The number of spotted owls is thought to be stable, as no significant change in the amount of habitat has occurred within the last 10 years.

The Surveyor's Ridge LSR Plan identifies some habitat areas of concern and some possible restoration and protection projects. Implementing the LSR Plan would help reduce the risk of a catastrophic loss of spotted owl habitat within the subbasin.

Reducing the crown fire potential within the fire ecosystems would potentially reduce spotted owl habitat in the upland but reduce the risk of habitat loss in the riparian areas (where most of the activity centers are located).

Loggerhead Shrike – These recommendations come from the "Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington" by Bob Altman, March 2000. This plan was prepared for the Oregon-Washington Partners In Flight.

Biological Objectives:

Habitat:

Where ecologically appropriate, initiate actions in steppe-shrubland habitat to maintain or provide the following conditions:

1. Late-seral big sagebrush or bitter brush with patches of tall shrubs (mean height of shrubs > 1 m (39 in).
2. <15% tall shrub cover (non-rabbitbrush).
3. Herbaceous cover < 20% and dominated by native species.
4. Mean open ground cover (includes bare and/or cryptogamic crusts) >30%.

Population:

Columbia Plateau BBS Region: In conjunction with conservation efforts described in the Idaho Landbird Conservation Plan (Ritter 2000) and Nevada Bird Conservation Plan (Neel 1999), reverse long-term declining trends to achieve stable populations (non-significant trends of <2%) or increasing populations in the next six years (by 2010).

Conservation Strategies:

1. Maintain sites with patches of tall shrubs and patches of open ground.
2. Avoid insecticide spraying during breeding season in shrike nesting habitat (March 21 –August 15).
3. Light to moderate grazing may provide open foraging habitat, but sustained grazing will reduce habitat suitability.
4. Where habitat degradation is extensive and cheatgrass cover is dominant, light grazing may provide open foraging habitat and reduce fuel loads at risk from fire, which would severely reduce sagebrush cover (Holmes and Geupel 1998).

Mule Deer – The population goal for the White River Management Unit is 9000 deer. The current population estimate was 8000 as of December 2003. Winter range loss is thought to be one of the major factors affecting the population (Keith Kohl, ODFW).

Improve winter range habitat on National Forest land by underburning and thinning dense tree stands (increase the amount of forage). Try to minimize the fragmentation of winter range habitat on private land by retaining current zoning laws, which limit fragmentation from 80 to 200 acres on agriculture and forestlands. Encourage restoration of shrub-steppe habitat on private land.

Western Gray Squirrel – The pine/oak habitat has been reduced by 14,263 acres from historic times. The squirrels utilize this habitat for food and nesting.

On National Forest land promote oaks where conifers have encroached into its' habitat zone. Restoring fire back into this ecosystem will also improve habitat in the long term by reducing tree densities, which may also increasing mast production.

On private lands, encourage the retention and restoration of pine/oak habitat.

Brewer's Sparrow – These recommendations come from the "Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington" by Bob Altman, March 2000. This plan was prepared for the Oregon-Washington Partners In Flight.

Biological Objectives:

Habitat:

Where ecologically appropriate, initiate actions in sagebrush habitat to maintain or provide the following conditions:

1. Mean cover sagebrush 10-30% and in patches rather than evenly distributed.
2. Mean height sagebrush >60 cm (24 in).
3. High foliage density in sagebrush shrubs.
4. Mean native herbaceous cover > 10% with <10% cover of non-natives annual grasses.
5. Mean open ground cover (includes bare and/or cryptogamic crust) >20%.

Where ecologically appropriate at the landscape level, provide suitable habitat conditions described above in patches >8 ha (20 ac).

Population:

Columbia Plateau BBS Region: In conjunction with conservation efforts described in the Idaho Landbird Conservation Plan (Ritter 2000) and Nevada Bird Conservation Plan (Neel 1999), reverse long-term declining trends to achieve stable populations (non-significant trends of <2%) or increasing populations in the next six years (by 2010).

Conservation Strategies:

1. Maintain conditions in areas relatively free from cheatgrass by minimizing soil disturbance from grazing.
2. Fire suppression should occur where there is potential loss of sagebrush.

Beaver – Beavers are found in all major drainages with perennial water within the subbasin. Riparian habitat has been reduced by an estimated 85% from presettlement time.

Restoring the riparian habitat on National Forest land (15% of subbasin) and restoring the riparian habitat on private land (85% of subbasin) would increase the amount of habitat available for beavers. The beaver population will continue to fluctuate depending on the fur market and social tolerance. Increasing the amount of habitat would allow for an increase in population up to the social limit. Educating the public as to the benefits of beavers to the ecosystem might increase social tolerance.

5.5. Consistency with ESA/CWA Requirements

5.5.1. Consistency with Endangered Species Act Biological Opinions

Bonneville Power Administration is funding subbasin planning in response to Reasonable and Prudent Alternative (RPA) #154 of the 2000 Federal Columbia River Power System (FCRPS) Biological Opinion. RPA 154 provides:

> "BPA shall work with the NWPPC to ensure development and updating of subbasin assessments and plans … The action agencies will work with other Federal agencies to ensure that subbasin and watershed assessments and plans are coordinated across non-Federal and Federal land ownerships and programs." [19]

The Fifteenmile Subbasin Plan also addresses at least three other RPA's in the **FCRPS BiOp**:

- RPA 150: "In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-Federal habitat, especially if at risk of being degraded…"[20]
- RPA 151: "BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows…"[21]
- RPA 152: "The Action Agencies shall coordinate their efforst and support offsite habitat enhancement measures by other Federal agencies, states, Tribes, and local governments…"[22]

NOAA Fisheries has issued at least four other Biological Opinions that specifically address various restoration activities and agricultural practices described in this plan. Consistency of each restoration strategy with these Biological Opinions will be reviewed after strategy is described. The relevant Biological Opinions are:

- Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Bonneville Power Administration Habitat Improvement Program (HIP) in the Columbia River Basin, August 1, 2003. This Biological Opinion will be referred to as the "**HIP BiOp.**" This programmatic BiOp covers a number of common tributary and upland restoration activities commonly funded by BPA. Many of the strategies in the Fifteenmile Subbasin Plan are described by the HIP BiOp. The

[19] NMFS 2000 (FCRPS BiOp)

[20] IBID

[21] IBID

[22] IBID

program described in the HIP BiOp was found to have long-term beneficial impact on steelhead and other listed fish species.

- Endangered Species Act—Section 7 Consultation, Biological Opinion, Oregon Conservation Reserve Enhancement Program. This Biological Opinion will be referred to as the "**CREP BiOp**." This programmatic consultation covers all activities undertaken as part of the Conservation Reserve Enhancement Program. Much of the riparian restoration undertaken through the Fifteenmile Subbasin Plan will be undertaken through the CREP, or will follow the same standards. The CREP Program was found to be "not likely to jeopardize the continued existence of the listed and proposed species."

- Endangered Species Act Section 7 Formal Consultation and Magnusen-Stevens Fishery and Conservation Management Act Essential Fish Habitat Consultation on Resource Management Systems for Dryland Cropland and Range and Pastureland in Gilliam, Sherman and Wasco Counties, Oregon, April 22, 2004. This Biological Opinion will be referred to as the "**RMS BiOp**." The RMS BiOp covers resource management systems developed under the 9-step Planning Process of the Natural Resources Conservation Service for dryland agriculture and rangelands in Wasco, Sherman and Gilliam Counties. NOAA Fisheries concluded that the action described in the RMS BiOp is "not likely to jeopardize the continued existence of the listed species, and is not likely to destroy or adversely modify designated critical habitat."

- Endangered Species Act Section 7 Consultation Biological Opinion and Magnusen-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation: Ten Categories of Forest Service and Bureau of Land Management Programmatic Activities in Northwest Oregon, February 25, 2003. The ten categories include road maintenance and stormproofing, road decommissioning and obliteration, aquatic and riparian habitat projects, and non-commercial vegetation treatments. Restoration projects either on- or off-Forest that used Forest Service funds would be tied to this document.

Riparian/Floodplain Enhancements

The Conservation Reserve Enhancement Program is covered by a programmatic biological opinion. In that Opinion, NOAA Fisheries and US Fish and Wildlife Service concluded that:

> "…the following CREP activities are **not likely to adversely affect** listed or proposed fish species because they will avoid the addition of significant amounts of sediment into fish habitats, they will not allow for the introduction of toxic pesticides or herbicides into these same habitats, and these actions are of low potential to cause other adverse impacts to listed or proposed fishes or their habitats:
>
> 1. The Riparian Forest Buffer Practice and Riparian Herbaceous Cover Practice when:

> a. planting is done by hand and is outside of bankfull edge;
>
> b. there is no grading or shaping of the streambank;
>
> c. chemical pesticides do not enter the stream (i.e., noxious weeds are removed by mechanical means or with chemicals applied with hand sprayers at a sufficient distance from the water body); and
>
> d. native species are utilized as described in the BA (BMP #15) and consistent with President Clinton's Executive Order 13112 (February 3, 1999)(see below). It is our opinion that use of the non-native hybrid poplar is not consistent with BMP #15.
>
> 2. The Filter Strip Practice when it is installed upslope of an installed Riparian Forest Buffer or Riparian Herbaceous Cover and consistent with the BMPs in the BA.
>
> 3. Installation of livestock exclusion fencing when it is installed outside of bankfull edge and requires no instream crossings."[23]

To avoid impacts on eagles, Farm Services Agency agreed that activities in the CREP program would "occur greater than ½ mile from any eagle nest. For any project within ¼ mile non-line-of-sight or ½ mile line-of-sight of an eagle nest identified by ODFW, no activities producing noise above ambient levels will occur at the site from January 1 to August 31. If a proposed activity is near a bald eagle nest and must occur during this restricted period, site-specific consultation with USFWS will be initiated to evaluate the potential for adverse effects and take."[24]

> "The Services have determined, based on the information, analysis, and assumptions described in this Opinion, that FSA's proposed Oregon Conservation Reserve Enhancement Program is not likely to jeopardize the continued existence of the listed and proposed species under the respective jurisdictions of NMFS and USFWS shown in Table 1... The Services have evaluated the proposed action and found that it would cause short-term adverse degradation of some environmental baseline indicators for listed and proposed fishes. However, the proposed action is not expected to result in further degradation of aquatic habitats over the long term. Thus, the effects of the proposed action would not reduce prespawning survival, egg-to-smolt survival, or upstream/downstream migration survival rates to a level that would appreciably diminish the likelihood of survival and recovery of proposed or listed fishes, nor is it likely to result in destruction or adverse modification of critical habitats."[25]

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[23] NMFS 1999 (CREP BiOp)

[24] IBID

[25] IBID

Outside of the CREP program, riparian and streambank activities will likely be consistent with the HIP BiOp, which describes effects and provides standards for the following riparian and wetland restoration activities:

- Removal of levees, dikes, berms, weirs or other water control structures (NOAA Fisheries 2003b).
- Setback of levees, dikes, and berms (NOAA Fisheries 2003b)
- Reshaping of streambanks as necessary to reestablish vegetation (NOAA Fisheries 2003b).
- Excavation and removal of artificial fill materials from former wetlands (NMFS 2002).
- Developing berms or impoundments in upland areas with or without installing water control structures, to create a geomorphic depression in conjunction with a water source.
- Reintroducing beavers in areas where they have been removed.
- Excavating pools and ponds to groundwater to create wetlands in uplands.
- Removing structural bank protections and other engineered or created structures that do not meet the description and conservation measures under Section 2.2.1.3.1 "Streambank Protection Using Bioengineering Methods."
- Recontouring offstream areas that have been leveled.

The HIP BiOp found that these activities had long-term beneficial effects for salmonid species. Some potential short-term negative effects were identified associated with soil disturbance during construction. The HIP BiOp specifies means of mitigating for these short-term effects.

Streambank Bioengineering

The HIP BiOp provides programmatic coverage for certain bioengineering projects.

Large Woody Debris (Habitat Forming Natural Material Instream Structures)

The HIP BiOp provides programmatic coverage for placement of large woody debris and boulders according to certain standards. Specifically, the BiOp covers:

> "engineered logjams and other cover structures designed with large woody debris and/or boulder materials.. in streambed gradients of 6% or less… designed to minimize the need for anchoring. However, dependent on site location and design criteria, some structures may be anchored. If anchored, a variety of methods may be used. These include buttressing the wood between riparian trees, cabling the structure to existing structures, and/or anchoring with boulders, concrete blocks or new log wedges… Biodegradable manila/sisal rope may be used to temporarily stabilize structures… Permanently anchored structures, engineered

> structures and deflectors, debris jam structures relying on large rock, rebar and cable, and other similar habitat construction activities are not included in this Opinion."[26]

To the extent practical, instream habitat structures will be constructed according to the standards described in the HIP BiOp. However, as described previously, on private lands with a high density of infrastructure, it may be necessary to use cable, rebar and large rock to anchor structures in place. Case-by-case consultation will be required in such cases.

Low Flow Restoration

The HIP BiOp provides programmatic coverage for several practices proposed for the purpose of restoring low flows:

- Conversion to Drip or Sprinkler Irrigation
- Convert Water Conveyance from Open Ditch to Pipeline or Line Leaking Ditches and Canals
- Convert from Instream Diversions to Groundwater Wells for Primary Water Source
- Water Rights Transfers
- Point of Diversion Transfers

The HIP BiOp is quoted below:

Conversion to Drip or Sprinkler Irrigation:

> "The following potential adverse effects to listed species and their habitats associated with irrigation conversion activities - minor removal and trampling of vegetation, negligible erosion and sedimentation, and possible use of heavy equipment in the riparian area - are addressed under the general construction section (2.2.1.1). The irrigation conversion activities will incorporate the conservation measures for general construction as applicable.
>
> "There would not be any additional direct effects on fish or their habitat from this activity. Drip and sprinkler irrigation system indirect effects include the conservation of water instream... The application of water via drip and sprinkler irrigation can also significantly reduce the amount of soil erosion and nutrient and pesticide runoff that is normally associated with furrow irrigation systems (Ebbert and Kim 1998)."[27]

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[26] NOAA Fisheries 2003 (HIP BiOp)

[27] NOAA Fisheries 2003 (HIP BiOp)

Convert Water Conveyance from Open Ditch to Pipeline or Line Leaking Ditches and Canals:

"The following potential effects to listed species and their habitats associated with irrigation conveyance activities - minor removal and trampling of vegetation, negligible erosion and sedimentation, and possible use of heavy equipment in the riparian area - are addressed under the general construction section (2.2.1.1). The irrigation conveyance activities will incorporate the conservation measures for general construction as applicable.

"There would not be any additional direct effects on fish or their habitat from this activity. The indirect effects include the conservation of water instream to improve fish habitat... The replacement of canals with pipelines will significantly reduce the amount of herbicides and fertilizers entering streams, as these substances can easily drain to streams through open ditch networks in agricultural fields (Louchart *et al.* 2001). The lining of leaking ditches will cover exposed soil, reducing the erosion of sediment from unlined ditch bottoms, sides, and berms. Lining of ditches will also decrease the colonization potential of invasive species, which typically establish on bare, disturbed sites."

Convert from Instream Diversions to Groundwater Wells for Primary Water Source:

"Water from the wells will be pumped into ponds or troughs for livestock, or used to irrigate agricultural fields. Instream diversion infrastructure will be removed or downsized, if feasible. The criteria, plans and specifications, and operation and maintenance protocols of the Natural Resources Conservation Service (NRCS) conservation practice standards for waterwell code (NRCS 1999c) will be employed. The purpose of this activity is to increase the amount of in-stream flow for fish and to increase riparian functions.

"The following potential effects to listed species and their habitats associated with conversion from instream diversion to groundwater well activities - minor removal and trampling of vegetation, negligible erosion and sedimentation, and possible use of heavy equipment in the riparian area - are addressed under the general construction section (2.2.1.1). The conversion from instream diversion to groundwater well activities will incorporate the conservation measures for general construction as applicable.

"There would not be any additional direct effects on fish or their habitat from this activity. The indirect effects include the conservation of water instream to improve fish habitat. The irrigation water would come from groundwater, leaving more water instream for fish habitat. However, if

> wells are not well regulated, pump rates can significantly reduce the level of the local water table and create a deficit in the groundwater budget. Other indirect effects include significantly reduced risks of fish passage problems, injury, or death if the instream diversion is removed, and eliminating the need to periodically maintain an instream diversion system over the long term, which reduces the risk of ongoing disturbance to listed fish habitat… All new wells installed under this activity will obtain applicable permits from the appropriate state agency (NMFS 2002)."[28]

Water Rights Transfers:

> **"**In overappropriated streams (*i.e.*, streams on which junior water users are sometimes precluded from diverting water due to lack of flow) with multiple water rights holders, the BPA should consider, especially with projects that would conserve more than 1 cfs of water, transferring the water rights to water saved to a state trust water system, or equivalent, for protection instream. Because many western streams are overappropriated in terms of water rights, another irrigator with a valid water right previously not being met can potentially take the water saved from proposed irrigation and water delivery/management actions. In order to counter this potential diminishment of the benefit to listed species, NOAA Fisheries is making this conservation recommendation."[29]

Point of Diversion Transfers:

> **"**The BPA should, when consolidating diversions, move the new combined diversion to the most downstream point possible."[30]

Mitigation of Upland Runoff and Sediment Sources

Conservation Farming on Drylands

Development of conservation plans (aka Resource Management Systems) for dry croplands is covered in two separate biological opinions—the RMS BiOp and the HIP BiOp.

The RMS BiOp states:

> "…an RMS that is properly designed using salmon quality criteria and fully carried out with careful attention to the response of riparian and

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[28] NOAA Fisheries 2003 (HIP BiOp)

[29] NOAA Fisheries 2003 (HIP BiOp)

[30] NOAA Fisheries 2003 (HIP BiOp)

> aquatic habitats will reduce upland erosion and runoff, promote riparian succession, and help create and maintain the kinds of chemical and physical conditions in riparian and aquatic habitats that are necessary to recover ESA-listed salmon and steelhead populations. Moreover, if cooperators voluntarily apply salmon quality criteria and indicators (as applicable) to complete an RMS plan on land upslope of the action area, the effects are likely to be wholly beneficial for listed species."[31]

The HIP BiOp states:

> "Most of the direct effects of these activities will be limited to upland agricultural land and therefore will have no or negligible impact on listed species habitat. These agricultural practices will result in periodic disturbances to upland soils, although the amount of disturbance will not increase from the existing (no lands will be converted to agricultural use under this activity). When these techniques are used on or near a slope adjacent to stream habitat, erosion can contribute to increased stream turbidity, and filling of gravels with fine sediment. The implementation of no-till or minimal-till farming often requires farmers to use more fertilizers and herbicides than normal till farming. Minimizing the amount of sediment and nutrients lost from agricultural lands and entering stream systems will not be fully accomplished unless riparian buffer systems are in place directly adjacent to listed fish habitat.
>
> "The following conservation measures address the adverse effects discussed above:
>
> "Employ conservation tillage and residue management practices that leave 30% or more of the previous crop residue on the soil surface after planting, as feasible, to reduce erosion potential.
>
> "Implement these activities in combination with a riparian forest buffer (NRCS measure 391) (NRCS 2000e) wherever trees and/or shrubs can grow, or a riparian herbaceous cover (NRCS measure 390) (NRCS 1998) where analysis of available information (*e.g.*, historical accounts, photographs, or USDA Plant Association Groups) indicates that no trees or shrubs, including willow (*Salix spp.*), existed on the site within historic times. Installation and management of the full range of field and landscape buffers will be encouraged… as necessary to address small but unavoidable pollutant discharges associated with active agricultural operations, catastrophic pollution-associated episodic storm events, and other landscape level concerns.

[31] NOAA Fisheries 2004 (RMS BiOp)

> "Employ nutrient management practices to increase the efficiency of fertilizer inputs and decrease the transport of nutrients to ground and surface water. Nutrients will be applied at an agronomic rate.
>
> "Employ vegetation management practices, including nonchemical vegetation control measures, that will reduce losses dues to herbicide contamination during transport, handling, and use, and nonpoint pollution losses after use.[32]
>
> "Beyond the short-term detrimental effects of ground disturbance to plant and rotate crops, the indirect long-term effects will be beneficial to the farmer, the agricultural land, and to adjacent riparian and stream habitat... The retention of soil in upland habitats minimizes erosion into streams improving water quality for listed species (Kuo *et al.* 2001)."[33]

Road Maintenance and Decommissioning

The HIP BiOp concluded that road maintenance and decommissioning would have long-term beneficial effects on listed fish species, as long as certain standards are met, which are outlined in detail in the HIP BiOp. Road maintenance and decommissioning activities included as part of the Fifteenmile Subbasin Plan will follow the guidelines described in the HIP BiOp. Extensive asphalt laying during wet periods is not included under the HIP BiOp.

> "Beneficial effects occur where road maintenance reduces the potential for catastrophic erosion and delivery of large amounts of sediment to stream channels. Severe erosion is almost inevitable if roads are not regularly maintained, and thus regular maintenance is a high priority (NMFS 1999f). Effects of proper road maintenance activities also include the reduction of human disturbance on unstable or sensitive sites…
>
> "The proposed road decommissioning activities will obliterate roads that are no longer needed, *e.g.*, logging roads. Water bars will be installed, road surfaces will be insloped or outsloped, asphalt and gravel will be removed from road surfaces, culverts and bridges will be altered or removed, streambanks will be recontoured at stream crossings, cross drains installed, fill or sidecast will be removed, road prism reshaped, sediment catch basins created, all surfaces will be revegetated to reduce surface erosion of bare soils, surface drainage patterns will be recreated, and dissipaters, chutes or rock will be placed at remaining culvert outlets.

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[32] Take of ESA-listed species caused by any aspect of pesticide use is not included in the HIP consultation and must be evaluated in an individual consultation if it is funded by BPA.

[33] NOAA Fisheries 2003 (HIP BiOp)

> Work may require the use of heavy equipment, power tools, and/or hand crews.
>
> "The following potential effects to listed species and their habitats associated with road decommissioning activities - compaction of soil and disturbance of streambeds resulting in sedimentation, increased water turbidity, and increased flows and stream energy; fuel and other contamination from spills or use of heavy equipment in water or riparian areas; sedimentation and contamination from discharge of construction water; stress to fish from capture and release from coffered areas during isolation of instream work areas, noise, and avoidance behavior; and changes in flows - are addressed under the general construction section (2.2.1.1). The road decommissioning activities will incorporate the conservation measures for general construction as applicable….
>
> "Road obliteration and decommissioning should be even more beneficial than road and culvert upgrades in that all or nearly all of the hydrologic and sediment regime effects of the roads would be removed. Long-term beneficial effects will result from these activities including rehabilitation of hydrologic functions, reduced risk of washouts and landslides, and reduction of sediment delivery to streams. In the long term, these projects will tend to rehabilitate habitat substrate by reducing the risk of sediment delivery to streams and restore fish passage by correcting fish barriers caused by roads. Road decommissioning projects will also tend to rehabilitate hydrology by reducing peak flows and reducing the drainage network. Watershed conditions will also be improved as road densities are reduced and riparian reserves are rehabilitated. These projects may also potentially improve floodplain connectivity (NMFS 1999d).
>
> "Additional effects of road decommissioning activities include reconnecting natural habitats and the exclusion of human disturbance. Decommissioning a road allows for the recolonization of native flora and fauna, increasing the total amount of space available for fish and wildlife, and decreasing the amount of human traffic originally responsible for habitat disturbances. Consequently, native plant communities can reestablish and move towards more properly functioning habitats for fish."[34]

Removal of Passage Barriers

Removal of passage barriers is addressed by the HIP BiOp.

> "The following potential effects to listed species and their habitats associated with bridge, culvert, and ford activities - exposure of bare soil

[34] NOAA Fisheries 2003 (HIP BiOp)

> and reduction or elimination of large woody debris, shade, slope and bank stability, and sediment filtering habitat functions due to removal of vegetation; compaction of soil and disturbance of streambeds resulting in sedimentation, increased water turbidity, and increased flows and stream energy; fuel and other contamination from spills or use of heavy equipment in water or spills of wet concrete; sedimentation and contamination from discharge of construction water; stress to fish from capture and release from coffered areas during isolation of instream work areas, noise, and avoidance behavior; and changes in flows - are addressed under the general construction section (2.2.1.1). The bridge, culvert, and ford activities will incorporate the conservation measures for general construction as applicable.
>
> "Installation of a new culvert, bridge, or ford will require a certain amount of fill material around the structure. Excess fill material can reduce stream width, resulting in channel constriction. Channel constriction can increase streamflow velocity, effectively blocking fish passage and potentially scouring redd habitat. Further increased streamflow can reduce the amount of holding pools."[35]

The potential negative effects described above can be mitigated using techniques described in detail in the HIP BiOp.

> "Beneficial effects of the proposed activities include habitat connectivity and increases in fish populations. Improved fish passage provides access to upstream spawning and rearing habitat for fish species. Access can lead to increased spawning and rearing success and can increase numbers and health of individual fish and populations (NMFS 2001i). Additionally, the removal of impassable barriers will enable the movement of fish and drift of aquatic insects, and greatly improve biotic linkages and increase genetic exchange (WDFW 1999, NMFS 2001).
>
> "The installation of properly designed culverts will increase the fluvial transport of sediment important in the formation of diverse habitats. Such culverts also will enable additional recruitment of debris to downstream reaches when compared to current conditions. Allowing debris (including plant material and substrate) to pass through culverts also encourages LWD recruitment and natural fluvial deposition at downstream locations (restoration of LWD and substrate indicators). These processes create rearing and spawning habitat that is essential to listed species. Additionally, the use of properly designed culverts will reduce the probability of catastrophic damage to aquatic habitats that is often associated with undersized culverts (*e.g.*, during extreme natural events,

[35] NOAA Fisheries 2003 (HIP BiOp)

> debris accumulation, beaver dams). The installation of such culverts also should increase the stability of the streambed (NMFS 2001).
>
> "Overall, the improvement in baseline passage conditions will contribute to increased survival and recovery of listed species. The improvement in passage conditions for salmonids provides an immediate benefit that is likely to increase the numbers of fish moving upstream and downstream from portions of stream that previously were inaccessible. The increased accessibility to diverse habitats fosters the development and maintenance of locally adapted subpopulations, and may reduce the likelihood of extinction for endangered species. When sufficient freshwater habitat diversity exists, single species of salmonids may exhibit wide variation in life history and morphometric traits (*e.g.,* Blair *et al.* 1993). These traits are often unique to a specific geographic location and are referred to as locally adapted traits. Locally adapted subpopulations maintain reserves of genetic information that allow salmonids to recolonize disturbed areas and adapt to environmental changes (Milner and Baily 1989)."[36]

The HIP BiOp does not cover the following:

- Culverts with widths less than bankfull width.
- Culverts with widths less than 6 feet in fish-bearing streams.
- Embedded culverts in a slope greater than 6%.
- Modifying an existing culvert in place.
- A new bridge pier or abutment below the bankfull elevation, or in an active channel migration zone.[37]
- A new bridge approach within the Federal Emergency Management Agency (FEMA) designated floodway that will require embankment fills that significantly impair floodplain function.
- Baffled culvert or fishway.

Irrigated Cropland and Orchards

At the request of the soil and water conservation districts of three counties in North Central Oregon, NRCS will initiate Section 7 consultation with NOAA Fisheries to develop a programmatic Biological Opinion regarding resource management systems in orchards and other irrigated agriculture in Wasco County, Sherman County and Gilliam County.

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[36] NOAA Fisheries 2003 (HIP BiOp)

[37] "Bankfull elevation" means the bank height inundated by an approximately 1.2 to 1.5 year (maximum) average recurrence interval.

Groundwater Conservation

If no action is taken to stabilize the aquifers in the Mosier Valley, then dropping aquifer levels may lead to reduced stream flows and warmer summer water temperatures in Mosier Creek. This will negatively affect cutthroat trout in Mosier Creek, as well as steelhead and coho in the mouth of Mosier Creek.

Alternatively, stabilizing the aquifers might have beneficial effects, depending on the specific actions proposed and on any mitigation actions proposed. Actions intended to save water, such as conversion to microsprinklers and drip systems are covered by the HIP BiOp and adequately described previously in this document. Other actions involving changing points of diversion or changing water sources will probably require consultation with NOAA Fisheries.

Off-channel Water Storage

Off-channel water storage is not covered by any programmatic biological opinion. Such projects would require case-by-case consultation with NOAA Fisheries and US Fish and Wildlife Service.

5.5.2. Consistency with the Clean Water Act, Total Maximum Daily Loads and Existing Water Quality Management Plans

Implementation of the Clean Water Act in Oregon is primarily the responsibility of Oregon Department of Environmental Quality. Development and implementation of water quality management plans for agriculture is delegated to the Oregon Department of Agriculture by Oregon Senate Bill 1010.

The following statement was provided by Bonnie Lamb, Oregon Department of Environmental Quality Natural Resources Specialist for Central Oregon:

> "In the Fifteenmile Subbasin the Federal Clean Water Act is implemented in large part through the State's preparation of water quality standards, Total Maximum Daily Loads (TMDLs) and TMDL implementation processes of designated management agencies. The Oregon Department of Environmental Quality (ODEQ) has identified stream segments in the Fifteenmile, Threemile, Mill, Chenowith, Mosier and Rock Creek Watersheds as water quality limited for temperature. In addition, stream segments in the Fifteenmile Creek Watershed have been identified as water quality limited for sedimentation. ODEQ plans to develop TMDLs for both temperature and sedimentation in the Fifteenmile Subbasin. Completion of TMDLs is slated for the end of 2004, although modeling is currently only in the early stages.
>
> "Based on temperature TMDLs done elsewhere in the state, it is anticipated that modeling will indicate that with human warming minimized, river temperatures will still exceed biologically-based

> temperature thresholds that are developed to protect salmonid rearing and/or spawning. In this situation, the standard defaults to a natural heating condition – i.e., minimization of human stressors, such as vegetation removal and channel modifications. It is likely that numeric goals for shading and possibly channel width will be produced and incorporated into the TMDL. Many of the riparian/floodplain restoration strategies described in the management plan appear to be the type of management activities which will likely address TMDL load allocations.
>
> "Based on sedimentation TMDLs done elsewhere in the state, such as the Umatilla Basin, it is anticipated that TMDL load allocations will target the reduction of erosion from upland and streambank conditions. Many of the restoration strategies identified in the Management Plan – such as riparian/floodplain restoration, streambank bioengineering, no-till conversion, and road maintenance or obliteration – appear to be the types of management activities which will likely address TDML load allocations.
>
> "The implementation of the TMDL process occurs through management planning - typically refinements of existing plans or programs, such as the Agricultural Water Quality Management Area Plans (SB 1010), the Oregon Forest Practices Act, County Comprehensive plans, and Federal policies/plans on Forest Service lands. These plans vary from voluntary to proscriptive (though all should have reasonable assurance of implementation), and management oversight is normally conducted through the local, state or federal land use authority. Initiative-based restoration/protection and public funding dovetails with TMDL implementation and is an important implementing mechanism. Subbasin Planning is recognized as a key effort that supports TMDL implementation, and will be recognized in the TMDL water quality management planning process.
>
> "This document recognizes that both the Subbasin Planning and TMDL processes are adaptive in nature. Once TMDLs are established for the Subbasin Planning area, the Plan will be re-evaluated on some designated time-frame to incorporate new findings and ensure consistency with TMDLs and/or new 303(d) listings. It should also be noted that the findings of the Subbasin Planning process will be utilized in the TMDL process."[38]

The following statement was provided by Ellen Hammond, Water Quality Planner for Oregon Department of Agriculture:

[38] Bonnie Lamb, Oregon DEQ, May 17th, 2004

> "The Lower Deschutes Agricultural Water Quality Management Area Plan (AgWQMAP) was developed to 'prevent or control water pollution from agricultural activities and to achieve applicable water quality standards.' "The AgWQMAP is expected to serve as ag's water quality management plan for sediment and temperature TMDL's being developed by DEQ for the Fifteenmile Subbasin.
>
> "The AgWQMAP has four objectives: 1) control soil erosion on uplands, 2) achieve stable streambanks, 3) keep sediment and other pollutants out of streams and 4) provide adequate riparian vegetation for streambank stability and stream shading. Oregon Administrative Rules OAR 603-095-0640 help implement these objectives.
>
> "The restoration strategies in this Subbasin Plan will help meet these objectives. Riparian buffers will help stabilize streambanks, filter out sediment from overland flows, and moderate solar heating of streams. Management activities, such as reduced tillage, that will help moderate peak flows will also reduce soil erosion and sediment transport to streams."[39]

[39] Ellen Hammond, Oregon Department of Agriculture Water Quality Planner, 5/14/04

5.6. Research, Monitoring and Evaluation

This section of the management plan will be split into five sections: Fifteenmile Watershed, Mill Creek, Mosier Creek, Other Streams and Wildlife. The watersheds are **addressed in their order of priority** for protection and restoration of the focal species. Wildlife is given its own section, because wildlife populations are not restricted by watershed lines. Therefore, wildlife monitoring applies to the entire watershed. Upland habitat conditions will be addressed by proposed wildlife monitoring methods.

5.6.1. Fifteenmile Watershed

Most of the research and monitoring that has been done in the Fifteenmile Subbasin has been done in Fifteenmile Watershed. Nevertheless, a number of unanswered questions remain, even regarding those subjects that have been studied in the past.

Water Quality

The critical water quality parameters identified in EDT are high and low flows, sedimentation, temperature, habitat quantity and quality and channel stability.

Flows

Flows are a critical factor in the restoration of Fifteenmile Watershed. Peak flows are linked to streambank erosion, bed scour, sedimentation, loss of riparian vegetation, loss of floodplain interaction, and other factors. Low flows a re linked to high temperatures, loss of habitat quantity and quality, concentration of pollutants, and other factors. A gain in low flows and a reduction of peak flows associated with a given level of precipitation will be one of the strongest indicators of improved overall watershed health, and will most likely correspond to increased smolt production.

Flows were monitored sporadically by the US Geological Survey from 1918 to 1984. Seven separate gauging stations were established and used at four points on Fifteenmile Creek, two points on Eightmile and one point on Fivemile Creek. The longest continuous record was from the station on Fifteenmile near Rice (RM 20), which was in use from 1946 to 1953 and again from 1970 to 1984.

Priority should be given to establishing flow monitoring on Fifteenmile Creek near the mouth and above Dufur, and on Ramsey Creek, Eightmile Creek and Fivemile Creek near their mouths. This can be done relatively inexpensively by taking advantage of the IFPnet weather stations. These stations are located throughout the subbasin. Their data is sent via telemetry to the offices of Wy'East Resource Conservation and Development Board, where it is made available to the public via the internet. These stations already collect rainfall and other weather data. Water depth sensors could be installed at newly establishing gauging stations and wired to the nearest weather station. With development of a rating curve based on the cross section of the channel, stream height can be converted to stream flow. Stream flow information could not only be logged

continuously through the year, but could be made available to researchers, regulators, fisheries managers and the public via the internet.

Sedimentation

Sediment is another environmental parameter linked to poor water quality and reduced spawning success. Sedimentation has long been considered a serious problem in Fifteenmile, based on observation of high turbidity following spring runoff events. The existing Aquatic Inventory Project used ocular estimates of the substrate. Ocular estimates are highly subjective, and tend to overestimate larger substrates, such as gravel and cobble that are easier to see. Based on these estimates, fine sediment would not be considered a problem in Fifteenmile Watershed. However, in 1994 and 2000, the Forest Service conducted Wolman Pebble Counts at 30 sites throughout Fifteenmile, Eightmile, Fivemile and Ramsey Creeks. Wolman pebble counts are more objective, but also tend to biased toward larger substrates. The Forest Service data showed that sediment of less than 6mm in size constituted more than 30% of the substrate at 10 sites in year 2000. Sediment varied considerably between adjacent sites. Data is lacking for Dry Creek and for the forks of Fivemile Creek.

With the adoption of no-till farming and the establishment of riparian buffers, sedimentation is expected to become less of a problem. Whereas in the past, sediment originated from the entire watershed, future sedimentation events are expected to be more of a point-source issue. This theory must be tested by regularly repeating Wolman pebble counts throughout the watershed. This work could be efficiently accomplished by combining the task with the ongoing stream temperature monitoring efforts of the Forest Service, ODFW and SWCD. This would yield annual pebble count data for 25 sites in Fifteenmile Creek, 5 sites on Ramsey Creek, 2 sites on Cedar Creek, 12 sites in Eightmile Creek, 4 sites in Fivemile and 3 sites in Dry Creek. These sites must be visited twice a year to install and collect temperature loggers. At the same time, agency personnel could conduct pebble counts.

Stream Temperature

Stream temperature is closely linked to stream flow, though it is also modified by riparian vegetation, floodplain and groundwater interactions. Like stream flows, summer water temperature is a strong indicator of the overall health of the watershed.

Summer stream temperatures have been extensively monitored in Fifteenmile Watershed, both with electronic data loggers and with an aerial infrared survey. Data loggers are installed annually at 25 sites in Fifteenmile Creek, 5 sites on Ramsey Creek, 2 sites on Cedar Creek, 12 sites in Eightmile Creek, 4 sites in Fivemile and 3 sites in Dry Creek. Trend analysis is tricky, as long-term trends are masked by annual variations in weather.

Temperature logging must continue to document any long-term year-to-year trends in the stream temperature in response to restoration. Priority should be given to continuing the cooperative efforts of the Forest Service, Soil and Water Conservation District and Oregon Department of Fish and Wildlife in monitoring stream temperatures throughout

the summer rearing/irrigation season. Within ten years, statistical analysis should be applied to the data to isolate any trends independent of air temperature or stream flow.

Habitat Quality and Quantity

Existing data regarding habitat quantity, quality and channel stability in the Fifteenmile Subbasin is mostly based on AIP and Forest Service habitat surveys. These surveys were all conducted in the last four years, providing relatively complete habitat information throughout the watershed. The only major geographic gaps are Fivemile Creek outside of the National Forest and Dry Creek. These gaps should be filled within the next three years in order to incorporate up-to-date information in the next round of subbasin planning.

Aquatic inventories should be conducted throughout the watershed in the next six to nine years in order to record any changes to habitat over that time and to document those changes in the 2013 iteration of the Fifteenmile Subbasin Plan. ODFW AIP methodology should be used, with the modification that Wolman pebble counts should be used in place of ocular estimates of substrate.

Channel Stability

Channel stability was one of the major environmental factors affecting the modeled steelhead population in EDT. Of all the conclusions of the Fifteenmile Subbasin Assessment, the conclusions regarding channel stability are perhaps the most uncertain. EDT's estimates of channel stability are primarily driven by input regarding on bed scour. No data exists on bed scour in Fifteenmile Watershed. The estimates input to the model were based on consultation with Mark Kreiter, USFS Hydrologist. The Shear stress equation (62.4 x depth (ft) x slope) was applied to reaches to determine the size of substrate particles moved. Ratings were based on the size of particle that would move at peak flow. Assumptions were made that if only particles less than .02" would move at peak flow then little bedscour will occur and that boulder (>11.9") movement would likely result in a correspondingly high bedscour.

Based on the above assumptions, channel stability is a major mortality factor during egg incubation and remains a mortality factor all the way through age 2+ migration. This indicates a need to research bed scour in Fifteenmile Watershed and find out the true severity of this issue.

A literature search would reveal methods of studying bed scour. *Information Structure of EDT* lists two references used by Mobrand Biometrics to develop their bed scour ratings.[40]

[40] Mobrand Biometrics website: http://www.mobrand.com/MBI/library.html References listed are Gordon et. al. (1992) and Platts et. al (1983).

Pesticides and other Chemical Pollutants

Pesticides were not identified by EDT as a major factor affecting the steelhead population in Fifteenmile Creek. Organophosphate pesticides have been found in Mill Creek and Hood River at levels above the State acute toxicity standard. The acreage of orchards in the Fifteenmile Watershed is expanding. One sample was collected in Fifteenmile Creek in 2003. That sample tested positive for malathion. Therefore, a pesticide monitoring program in Fifteenmile Creek, Eightmile Creek and Fivemile Creek would be prudent. This program could be an expansion of the existing DEQ study on Mill Creek, and would follow the quality assurance/control protocol of that study.

Steelhead in Fifteenmile

The picture that we have of the current steelhead population in Fifteenmile Watershed is incomplete. Quantitative data on life history, abundance, and genetic structure of the population is lacking. While the Fifteenmile winter steelhead represent the easternmost edge of the winter steelhead range in the Columbia Basin, very little is known about their genetic structure, population, or their relationship to other Columbia Basin steelhead. Spawning surveys have been conducted for many years, but only beginning in 2003 was the entire watershed surveyed systematically. Juvenile migrant counts have been conducted sporadically since 1998. There has never been any attempt to count the number of returning adults. Consequently, the smolt-to-adult return ratio is unknown, as is the ratio of spawners to redds. In order to monitor progress toward both smolt production and escapement, it will be necessary to expand the current monitoring activities.

The ideal system would consist of the following elements:

- An adult fish trap set up between the mouth of Fifteenmile and the confluence with Eightmile. A subsample of fish captured at this site could be radio-tagged to further refine estimates of spawning distribution. Fixed station telemetry sites could be established throughout the basin to monitor fish distribution.
- Juvenile traps set up at the current site near the mouth of Fifteenmile, in Eightmile Creek near the mouth, and in Fifteenmile above Eightmile. Passive Integrated Transponder (PIT) tags could be inserted into a subsample of downstream migrant fish to better understand downstream travel times, survival to Bonneville, and aid in smolt-to-adult survival estimates.
- Continue redd counts using the 2003 protocol.
- Conduct genetic analysis of adult steelhead returning to Fifteenmile Creek. Results from this study would determine the genetic contribution from resident rainbow trout to anadromous steelhead. In addition, result could be used to examine the relationship between Fifteenmile Creek steelhead, and neighboring populations.

The system described above would allow a count of returning adults, wild steelhead versus hatchery strays, spawning ground escapement, adults-to-redds ratio, juvenile migration rates, smolt production from the two major tributaries, egg-to-smolt ratios, and

smolt-to-adult return ratios. This level of monitoring, sustained over a period of fifteen years, would provide a relatively complete picture of the Fifteenmile winter steelhead population.

Possible site for an adult fish trap are limited in the lower subbasin, due to the limited availability of public lands and suitable trapping sites. Potential trapping sites, however could be constructed at the fish ladder in Seufert Falls or at an exiting irrigation diversion upstream. A trapping facility would need to be constructed so that it could withstand the relatively high and variable flows that occur during the steelhead migration period, and capture all migrating fish without failure.

Juvenile monitoring in the tributaries could rely on 5' screw traps deployed at the potential sites in both Fifteenmile and Eightmile Creeks.

Lamprey in Fifteenmile

Lamprey are present in Fifteenmile Creek. However little is known about species composition, abundance and distribution. Tribal harvest occurs at Suefert Falls but harvest data is non-existent. Because lamprey numbers are declining throughout the Columbia Basin, Fifteenmile Creek may be an important spawning tributary for these fish. In order to obtain basic life-history information from which an effective management plan can be formulated for lamprey the following management / research actions are recommended:

1. Determine lamprey species composition and distribution within the watershed.
2. Determine adult escapement and harvest rate.
3. Determine critical spawning and over-wintering habitat.

The methods used in the Deschutes sub-basin by the CTWSRO through BPA funded project #2002-016-00 may be used in Fifteenmile Creek for priority research items 1 and 2. Adult lamprey should be fitted with radio tags to determine adult spawning areas and migration timing for research item 3.

Resident Rainbow-type Trout in Fifteenmile

Three questions remain a high priority regarding the resident rainbow-type trout in Fifteenmile:

- What is the ecological relationship between the steelhead and resident populations (i.e. competitive, correlated, independent…)?
- What is the genetic relationship between the steelhead and resident populations? Do these two populations interbreed?
- What is the range of resident rainbow-type trout? Are there reaches in Fifteenmile Watershed that steelhead do not use that should be managed for rainbow-type fish?

Each of these questions is relevant to the protection and recovery plans of the listed steelhead. Management goals for resident rainbow-type trout can not be set until the relationships between the resident and anadromous forms of *O. mykiss* are understood.

Existing genetic data suggests that the resident and anadromous populations may be genetically dissimilar.[41] Results are not yet conclusive. Implementing a study to examine the genetics structure of Fifteenmile Creek steelhead and resident trout, would provide needed information on the contribution of resident to the anadromous form.

5.6.2. Mill Creek Watershed

Mill Creek is the highest priority stream to research and monitor in The Dalles area. Steelhead spawn in this watershed as far as twenty miles upstream of the mouth. Mill Creek might contribute significantly to the genetic and life-history diversity of the Fifteenmile winter steelhead population. Coho and Chinook have also been noted in Mill Creek. Yet the habitat has not been characterized, spawning reaches have not been determined except on the National Forest, escapement, smolt production and spawning levels are all unknown. Similar monitoring studies as those described for Fifteenmile Creek should be deployed in Mill Creek to answer critical uncertainties regarding this segment of the population.

Water Quality

Current water quality monitoring in Mill Creek Watershed includes the DEQ pesticide monitoring conducted as part of the Integrated Fruit Production program, temperature monitoring by the SWCD, and drinking water quality monitoring at the Wick's Water Treatment Plan on South Fork Mill Creek.

The City of The Dalles monitors streamflow on South Fork Mill Creek at Wick's Water Treatment Plant. Stream flows have never been monitored on the North Fork or mainstem of Mill Creek.

To develop a good picture of habitat conditions for salmonids, the following studies are needed:

- Aquatic Habitat Inventories using ODFW protocols with Wolman pebble counts; Parts of South Fork Mill Creek are pristine enough to serve as reference reaches for other streams at the same elevation and in the same ecological zone.
- Continued pesticide monitoring using the DEQ Quality Assurance/Control Plan;
- Continued temperature monitoring at existing sites on the mainstem, and on South Fork and North Fork Mill Creek;

[41] IC-TRT 2003

- Establishment of streamflow gauges on mainstem Mill Creek and North Fork Mill Creek. As in Fifteenmile, with minor modifications, these sites can be electronically monitored using the existing IFPnet weather station network.

Steelhead in Mill Creek

No steelhead population data is available for Mill Creek—no counts of either adults, juveniles or redds. The upper distribution has been determined, but the extent of utilization of the lower watershed is still not known. The following monitoring plan components would provide quantitative estimates and qualitative information regarding the Mill Creek winter steelhead run:

- One 5' juvenile trap on lower mainstem Mill Creek;
- Redd counts following the sampling protocol currently in use in Fifteenmile Watershed;
- Adult trapping using a weir at an existing diversion on mainstem Mill Creek.
- Genetic sampling should be conducted to determine the genetic structure and relationship between Mill Creek, Fifteenmile and other nearby populations.

The adult trapping at the water treatment plant will allow the development of a spawner-to-redd ratio, which can be used to estimate the total adult abundance of the whole watershed.

Monitoring as outlined above would continue for a minimum of eight years in order to estimate smolt-to-adult returns for Mill Creek and determine if they are similar to Fifteenmile. Redd counts would continue beyond that in order to monitor year-to-year abundance.

When genetic sampling is conducted in Fifteenmile, it should also be conducted in Mill Creek to determine whether the two runs are a single population or are somewhat separate.

Cutthroat in Mill Creek

The South Fork Mill Creek watershed is inaccessible to steelhead and protected by the City of The Dalles and the US Forest Service for water quality. South Fork was identified through the Qualitative Habitat Analysis as a high priority for protection for resident cutthroat trout. Cutthroat have been sampled from Crow Creek Reservoir, and from the watershed above the dam. Body condition and size were small compared to cutthroats found in more productive waters. [42] Populations have not been estimated. Cutthroat are also present in unknown numbers in North Fork Mill Creek.

Monitoring of the cutthroat population in South Fork Mill Creek would aim to estimate the population density and spawning range. Establishing representative index reaches

[42] Wasco Co. SWCD 2002a.

that could be electrofished on a repeated interval would provide a method to study population structure, abundance and life history. PIT tags could be inserted in a representative sample of fish to monitor migration, growth and abundance.

5.6.3. Mosier Creek

Mosier Creek Watershed was identified by the Qualitative Habitat Analysis as the highest priority for restoration among resident fish streams in the Fifteenmile Subbasin. Mosier Creek is home to a resident cutthroat population. The issues of concern in the Mosier Watershed are:

Little information exist on the life history or abundance of Mosier Creek cutthroat. Establishing representative index reaches that could be electrofished on repeated interval, would provide a methodology to monitor population structure, abundance and obtain life history information. PIT tags could be inserted into a representative sample of fish to monitor, migration, growth, and abundance.

Likely pesticide contamination—Mosier Creek has not been tested for organophosphate pesticides. However, orchard management in Mosier Watershed is similar to that in Mill Creek. Therefore, it is likely that organophosphate pesticides will show up in the water at approximately the same times and same rates that they appear in Mill Creek. Mosier Creek should be included in the DEQ sampling program currently being implemented in Mill Creek.

Aquatic habitat inventories following the ODFW protocol would provide a baseline to identify and quantify future changes to the condition of the creek.

Sedimentation and erosion from the road network—Mosier Creek Road follows Mosier Creek for the lower ten miles of stream. West Fork Mosier Creek and Dry Creek are also paralleled and crossed by roads. Sedimentation may be an issue at localized points. Wolman pebble counts near road junctions would identify trouble spots.

Summer stream temperature—Mosier Creek is listed on the Oregon 303(d) list of Water Quality Limited Waterbodies for high summer stream temperatures. Restoration of stream temperature and stream flows will be closely related. Efforts to improve irrigation efficiency and stabilize groundwater levels may lead to improvements in flows and temperatures. Continued temperature monitoring will be necessary to document such results.

Groundwater Overdraft—The interaction between the falling aquifers and the stream is unknown. Further overdraft of the aquifers may pose a risk both the resident cutthroat and to the steelhead that spawn below Pocket Falls. Mosier Watershed Council has been considering proposals from the US Geological Survey and from private contractors to develop an overall water budget for the aquifers that describes the natural flows between the aquifers, the creek and the Columbia River, artificial flows between aquifers created by leaky well shafts, the annual recharge rate, and the rate of withdrawal through wells. The overall objective of the proposed study is to advance the scientific understanding of

the hydrology of the basin and use that understanding to develop a set of tools that can be used to evaluate the sustainable yield of the ground-water resource. Some of the key scientific questions to be addressed include:

- What are the boundaries to the ground-water system?
- What are the hydrologic inputs and outputs to and from the ground-water system and how have they changed since development began?
- What was the nature of flow between basalt aquifers under natural conditions and how has that been affected by pumping? By co-mingling wells?
- To what extent can water-level declines be attributed to pumping? Co-mingling wells? Climatic variations?

The major findings of the study, description of the data, and documentation of the model will be published in a USGS Scientific Investigations Report. A project web site will be created to disseminate information on the goals and approach of the study, as well as data and reports. Project staff will meet with the Mosier Watershed Council at regular intervals to convey progress, preliminary results, and plans. The study will take 2.5 to 3 years from inception to publication of the final report. Preliminary budget estimates are $400-$500,000. USGS will provide 50% of the project funds. Bonneville Power Administration is a potential source for the matching funds.

5.6.4. Other Streams in Fifteenmile Subbasin

The three remaining streams in the Fifteenmile Subbasin provide smaller amounts of habitat, but may have key roles to play in protection and restoration of focal species.

Rock Creek (west of Mosier) is identified as a protection priority for cutthroat above Rock Creek Falls. In addition, it provides potential steelhead habitat downstream of the Falls, some of which is in need of restoration. Rock Creek is listed on the Oregon 303(d) list of Water Quality Limited Waterbodies for high summer stream temperatures. Rock Creek runs subsurface in the summer due to heavy gravel inputs from a nearby gravel pit. Now that the gravel pit is no longer active, creek flows may be recovering slowly over time. Monitoring needed in Rock Creek to establish a baseline includes:

- Aquatic habitat inventory following the ODFW protocol, both above and below the Falls;
- Stream temperature logging, at least two sites;
- Flow monitoring, at least one site; plus monitoring of location where the stream goes to subsurface flow during the summer;
- Cutthroat density and distribution above the falls;
- steelhead redd surveys below the Falls.

Threemile Creek is identified as a restoration priority for steelhead. Issues in Threemile Creek include loss of aquatic habitat, passage issues, temperatures and pesticide contamination. Monitoring for these parameters should consist of:

- Passage—After the I84 culvert is replaced with a fish passable structure, observers should track the spawning steelhead to determine the extent of

utilization of Threemile Creek. Any passage barriers should be noted and prioritized for replacement;

- Aquatic habitat inventory following ODFW protocols but including Wolman pebble counts;
- Stream temperatures should be monitored with a single temperature logger in the lower reaches of the stream;
- Pesticides should be sampled following the DEQ protocol on Mill Creek

Chenowith Creek provides one to two miles of potential spawning habitat. It is unknown to what extent this habitat is used. At a minimum, Chenowith Creek should be monitored with the following techniques:

- Pesticide sampling following the DEQ protocol;
- Spawning surveys to determine the extent of use by steelhead.

5.6.5. Monitoring Terrestrial Habitat and Wildlife Populations

Terrestrial Habitat Monitoring

General Recommendations

The following monitoring strategies are excerpted from Altman and Homes (2000) and from Altman (2000). Some of these strategies could be implemented on an ecoregion or province scale, rather than individual subbasins.

- Study the role of fire, mowing, thinning and other management treatments to maintain/improve habitat quality.
- Establish permanent roadside and off-road census stations to monitor focal species population and habitat changes.
- Conduct community-level ecologic research.
- Develop "scorecards" for each habitat type for government and nongovernment use in prioritizing and evaluating habitat for landbirds. The scorecard should provide guidelines for rating the habitat at various scales (local, landscape). These could be used not only to evaluate conservation projects, but also for assessing the impacts of proposed development.
- Coordinate research activities between government and private entities.

Recommended Monitoring for Modifications of Critical Habitat

- Record the number of acres improved for the shrub-steppe, pine/oak and mixed conifer vegetation zones annually.
- Establish permanent photo points and vegetation transects within the shrub-steppe, pine/oak and mixed conifer zones. Use the National Resource Inventory (NRI) plots if located within each of these zones.
- Establish effectiveness monitoring for 10 percent of the habitat improvement projects.

Population Monitoring

Monitoring is currently conducted in the Fifteenmile Subbasin for deer, elk, antelope and upland game birds. Current monitoring efforts by ODFW regarding the seven focal species are summarized below:[43]

Mountain Quail:

- ODFW does annual upland brood counts
- All sightings and observations are recorded and reported to ODWF.

Spotted Owl:

- USFS records all sightings.
- USFS surveyed the subbasin for spotted owls in 1991-1996. Spotted owl activity centers were established in 1994.
- USFS does long term population monitoring and demographic studies within several designated areas throughout the spotted owls' range in Oregon, Washington and California.

Grey Squirrel:

- No surveys conducted

Brewer's Sparrow:

- No surveys conducted through The Dalles ODFW office.
- US Fish and Wildlife Service's Breeding Bird Survey routes (BBS) are run annually within the Columbia Basin Region.

Loggerhead Shrike:

- Upland brood counts
- Fall raptor counts
- Winter waterfowl surveys
- All individual staff sightings recorded
- US Fish and Wildlife Service's Breeding Bird Survey routes (BBS) are run annually within the Columbia Basin Region.

Blacktail and Mule deer monitoring:

- Fall herd composition- conducted by air from helicopter and from the ground.
- Spring trend counts- conducted by helicopter, fixed-wing, on foot and from vehicle.

Beaver:

- No surveys conducted, given reports through damage complaint process.
- Annual trapping survey records for Wasco County are available.

Recommended Monitoring for Mountain Quail

- Continue current monitoring.

[43] Jeremy Thompson, ODFW, pers. comm.. 5/18/2004

- Establish photo points and vegetation transects within riparian areas that have been rehabilitated. Record shrub species, amount and utilization by quail.
- Establish population survey routes in areas that have quail re-introductions.

Recommended Monitoring for Spotted Owl

- Resurvey spotted owl locations within the subbasin over the next 5-10 years.
- Record spotted owl habitat changes over the next ten years.
- Record all barred owl sites within the subbasin.

Recommended Monitoring for Grey Squirrel

- Establish some long term photo points and vegetation transects within the pine/oak vegetation zone.
- Establish several long-term nest site areas using the Washington Department of Fish and Wildlife protocol within the subbasin.

Recommended Monitoring for Brewer's Sparrow

- Establish photo points and vegetation transects within riparian areas that have been rehabilitated.
- Establish a BBS route within the shrub-steppe habitat in the subbasin.

Recommended Monitoring for Loggerhead Shrike

- Establish photo points and vegetation transects within riparian areas that have been rehabilitated.
- Establish a BBS route within the shrub-steppe habitat in the subbasin.

Recommended Monitoring for Deer

- Continue fall herd composition- conducted by air from helicopter and from the ground.
- Continue spring trend counts- conducted by helicopter, fixed-wing, on foot and from vehicle.

Recommended Monitoring for Beaver

- Count the number of beaver dams/by reach while doing fish spawning surveys to use as a population indicator.
- Establish photo points and vegetation transects within riparian areas that have been rehabilitated. Record shrub species, tree species and utilization by beavers.

Data and Information Archive

Quality Assurance/Quality Control

Each of the agencies participating in the Fifteenmile Coordinating Group has their own set of stringent quality assurance and control measures. Each agency also has its own set

of standards against which the condition of the natural resources is measured. The challenge has always been in translating between these standards. The challenge in the future should be to choose by consensus the most appropriate standards for measuring the health of the Fifteenmile Subbasin. One approach might be to specifically focus on collecting information in a format compatible with EDT. This would provide standardization and would make it easier to complete a future subbasin assessment using that tool. Using EDT again in three years would make it easier to compare overall progress over the three year period. Greater focus should be placed on this challenge when the Fifteenmile Subbasin Plan is updated in three years.

In order to meet the requirements of the Clean Water Act, all water quality monitoring should meet Oregon DEQ standards for quality assurance and control.

Data Management and Analysis

Much of the information used to complete the Fifteenmile Subbasin Assessment was gathered from unpublished reports that were tracked down through personal contact with local managers. Had it not been for the Subbasin Planning Process, this information would have been unknown to most of the natural resource managers in the subbasin.

In order to make best use of the information gathered under this plan, it should be a requirement that the results of all monitoring projects undertaken in the Fifteenmile Subbasin and funded by BPA should be made readily available to the partners involved in the development of this program (as listed in section 2.2.—List of Participants). This includes most of the local management agencies, as well as NOAA Fisheries and US Fish and Wildlife Service. These reports will be stored on the Streamnet website, in the Fifteenmile Subbasin folder: (ftp://ftp.streamnet.org/pub/streamnet/SubPlanning/ColumbiaGorge/Fifteenmile/).

Agencies will be encouraged to file reports from monitoring efforts not funded by BPA on the Streamnet website as well. For instance, TMDL monitoring efforts by Oregon DEQ will be invaluable to updating the Fifteenmile Subbasin Plan in 3-5 years. Wildlife population data collected by ODFW or Forest Service will be necessary to provide more in depth wildlife planning in future subbasin plans.

Reports with text and graphics should be stored as .pdf files for easy download. More in-depth geographic databases should be stored as ArcView shapefiles.

5.6.3. Evaluation

Scientific Evaluation—Strengths and Weaknesses of Available Information

The Fifteenmile Subbasin Plan is intended to be reviewed and updated every three years as part of the Northwest Power and Conservation Council's Rolling Review Process. Therefore, research and monitoring results will be reviewed with every round by the Independent Scientific Review Team, as well as other agencies, such as NOAA Fisheries

and the Columbia Basin Fish and Wildlife Authority. This will provide the independent review—the view from a distance—needed for objective evaluation of the scientific strengths and weaknesses.

Decision-making Evaluation—Who should respond and What is the response to changes in ecological indicators?

When it comes to natural resource management, Fifteenmile Subbasin is divided into many overlapping jurisdictions. Less than half of the subbasin could be assigned to a single responsible lead agency. Responsibility for reacting to changes in ecological indicators could be broken roughly into three geographic areas:

1. The Mount Hood National Forest is clearly under the jurisdiction of the US Forest Service. Many of the priority protection reaches are located on the National Forest. Other agencies may provide support for certain projects. For instance, Wasco Co. SWCD and NRCS might provide engineering assistance for ditch piping efforts, regardless of whether the ditch is on public or private lands.

2. South Fork Mill Creek serves as the municipal watershed for the City of The Dalles. The Dalles Public Works Department, in cooperation with the US Forest Service, and the few private landowners, manages this land. South Fork Mill Creek is a priority protection area.

3. The rest of the subbasin is mostly privately owned. The exceptions are some tracts of BLM land, some Special Management Areas in the Columbia Gorge National Scenic Area, which are managed by the US Forest Service, and a few parcels owned by the State, Tribes, County and City. Most of the priority restoration reaches are located in this part of the subbasin. Responses to changes in ecological indicators in this part of the subbasin will require a coordinated response by ODFW, Wasco Co. SWCD, Oregon Department of Environmental Quality, Oregon Department of Agriculture, Oregon Department of Forestry and others.

Public Evaluation—Review and Comment Plan

The three watershed councils of the Fifteenmile Subbasin—Fifteenmile Watershed Council, The Dalles Area Watershed Council and Mosier Watershed Council—provide the forums necessary for public review and comment on the Fifteenmile Subbasin Plan. As these forums have performed this function in the development of the subbasin plan, so they can provide the same level of pubic review to the implementation and evaluation of the Subbasin Plan.

Fifteenmile and Mosier Watershed Councils meet quarterly, while The Dalles Area Watershed Council meets seven times per year. Each of these councils can meet more often when an issue becomes urgent or needs more discussion. All members of the public are welcome to attend and participate in watershed council discussions. Agendas

and minutes are circulated through direct mail to over 120 individuals. Meetings and agenda items are announced ahead of time through local media.

Typically, results of water quality monitoring have been reported to the watershed councils on an annual basis by DEQ, Wasco Co. SWCD, ODFW and USFS. In preparation for future rounds of subbasin planning, the watershed councils will look at all water quality and population monitoring as a whole every three years, one year in advance of future subbasin plan updates. The watershed councils will consider the questions, "Has the Subbasin Plan been effective, according to the monitoring data, and how can we be more effective in the future?" Their response will be collected by the SWCD and will help provide a direction for subbasin plan updates.

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6. Appendices

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A. How to Access Ecosystem Diagnosis and Treatment (EDT) Input and Output via the Internet.

The full set of inputs and products from the Ecosystem Diagnostic and Treatment are available on the internet from Mobrand Biometrics Inc.
Specifically, the following products can be downloaded:

- Stream Reach Editor, with input data for Fifteenmile Subbasin;
- Baseline Report;
- Diagnostic Report;
- Scenario Report.

One can also download the various tools used to model the stream system, fish population and to create restoration scenarios and thus experiment with modified input assumptions and alternate restoration scenarios.
To access EDT for the Fifteenmile Creek Subbasin:

1. Navigate to http://www.mobrand.com/edt/NWPCC/index.htm
2. Select Columbia Gorge Province.
3. Log in or register yourself.
4. After you are logged in, select Fifteenmile Creek Subbasin.
5. Follow directions for various downloads. Mobrand Biometrics provides detailed instructions in Adobe Acrobat format.

Information on the EDT model itself, such as the information structure, is available in the Mobrand online library at http://www.mobrand.com/MBI/library.html .

B. Reach Definitions used in the EDT Model.

Reach code	No.	Reach location/description	Length (meters)
Fifteenmile Cr-1	1	From mouth at Columbia R to Seufert's Falls #51409, called Cushing Falls on Quad map	483
Fifteenmile Cr-2	2	Seufert Falls #51409, called Cushing Falls on Quad map	0
Fifteenmile Cr-3	3	From Seufert Falls #51409, called Cushing Falls on Quad map to Eightmile Cr	2,896
Eightmile Cr-1	4	From mouth at Fifteenmile Cr to Fivemile Cr	2,203
Fivemile Cr-1	5	From mouth at Eightmile Cr to trib at 640 ft level	7,036
Fivemile Cr-2	6	From trib at 640 ft level to the gravel pit just below 800 ft level	1,876
Fivemile Cr-3	7	From gravel pit just below 800 ft level to NF Fivemile Cr	13,828
Fivemile Cr-4	8	From NF to MF/SF confluence	6,179
Fivemile Cr SF-1	9	From confluence with MF/mainstem Fivemile Cr to Forest 4440-160 road crossing just above the mouth	611
Fivemile Cr MF-1	10	From confluence with SF/mainstem Fivemile Cr to culvert at Forest Road 4430 at 3200 ft level	7,717
Fivemile Cr MF-2	11	Culvert - Forest Road 4430 at 3200 ft level	0
Fivemile Cr MF-3	12	From culvert at Forest Road 4430 at 3200 ft level to 3360 ft level	75
Eightmile Cr-2	13	From Fivemile Cr to unnamed trib just above 400 ft level	2,405
Eightmile Cr-3	14	From unnamed trib just above 400 ft level to bridge at Lower Eightmile Road	2,907

Reach Code	No.	Description	Length (m)
Eightmile Cr-4	15	From bridge at Lower Eightmile Road to trib just below the 720 ft level in section 28	2,161
Eightmile Cr-5	16	From trib just below the 720 ft level in section 28 to Japanese Hollow	5,001
Eightmile Cr-6	17	From Japanese Hollow to Wolf Run	12,798
Eightmile Cr-7	18	From Wolf Run to Rail Hollow	5,305
Eightmile Cr-8	19	From Rail Hollow to road crossing at Lower Eightmile Campground	12,523
Eightmile Cr-9	20	From road crossing at Lower Eightmile Campground to Wolf Run Ditch	1,231
Eightmile Cr-10	21	From Wolf Run Ditch to culvert at Forest Road 4400-120 at Bottle Prairie	3,858
Eightmile Cr-11	22	Culvert - Forest Road 4400-120 at Bottle Prairie	0
Eightmile Cr-12	23	From culvert at Forest Road 4400-120 at Bottle Prairie to culvert at Forest Road 4400	68
Eightmile Cr-13	24	Culvert- Forest Road 4400	0
Eightmile Cr-14	25	From culvert at Forest Road 4400 to 5240 ft level	4,323
Fifteenmile Cr-4	26	From Eightmile Cr to Company Hollow	8,924
Fifteenmile Cr-5	27	From Company Hollow to Davis Cr	17,277
Fifteenmile Cr-6	28	From Davis Cr to Dry Cr	7,902
Dry Cr-1	29	From mouth at Fifteenmile Cr to Mays Canyon Cr	10,870

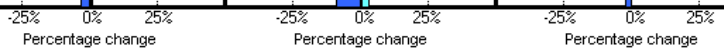
Reach Code	No.	Description	Length (m)
Dry Cr-2	30	From Mays Canyon Cr to trib at 2160 ft level	11,496
Fifteenmile Cr-7	31	From Dry Cr to Pine Cr	9,129
Fifteenmile Cr-8	32	From Pine Cr to Ramsey Cr	8,676
Ramsey Cr-1	33	From mouth at Fifteenmile Cr to Olson's Diversion at road crossing in section 2	4,571
Ramsey Cr-2	34	From Olson's Diversion at road crossing in section 2 to new Mt Hood NF boundary at section line 10/3	2,010
Ramsey Cr-3	35	From new Mt Hood NF boundary at section line 10/3 to trib at 2440 ft level	4,056
Ramsey Cr-4	36	From trib at 2440 ft level to culvert at Forest Road 4450 at 3360 ft level	6,954
Ramsey Cr-5	37	Culvert - Forest Road 4450 at 3360 ft level	0
Ramsey Cr-6	38	From culvert at Forest Road 4450 at 3360 ft level to concrete weir #51386 at pond in section 16	637
Ramsey Cr-7	39	Concrete weir #51386 at pond in section 16	0
Ramsey Cr-8	40	From concrete weir #51386 at pond in section 16 to boulder cascade near 3840 ft level	1,720
Fifteenmile Cr-9	41	From Ramsey Cr to Dufur City Rsv Dam in section 15	6,579
Fifteenmile Cr-10	42	From Dufur City Rsv Dam in section 15 to entrance of canyon reach at 2000 ft level	1,144
Fifteenmile Cr-11	43	From entrance of canyon reach at 2000 ft level to Orcharoad Ridge Diversion just below Forest Road 4421 at section line 19/20	4,550
Fifteenmile Cr-12	44	From Orchard Ridge Diversion just below Forest Road 4421 at section line 19/20 to upper end of valley at 2560 ft level	3,282

Reach Code	No.	Description	Length (m)
Fifteenmile Cr-13	45	From upper end of valley at 2560 ft level to Cedar Cr	1,807
Cedar Cr	46	From mouth at Fifteenmile Cr to Frailey Point Trail in section 28	2,841
Fifteenmile Cr-14	47	From Cedar Cr to Deadman Gulch	2,372
Fifteenmile Cr-15	48	From Deadman Gulch to Unnamed Trib at 3080 ft level	545
Fifteenmile Cr-16	49	From Unnamed Trib at 3080 ft level to cascade barrier at 3460 ft level	1,371

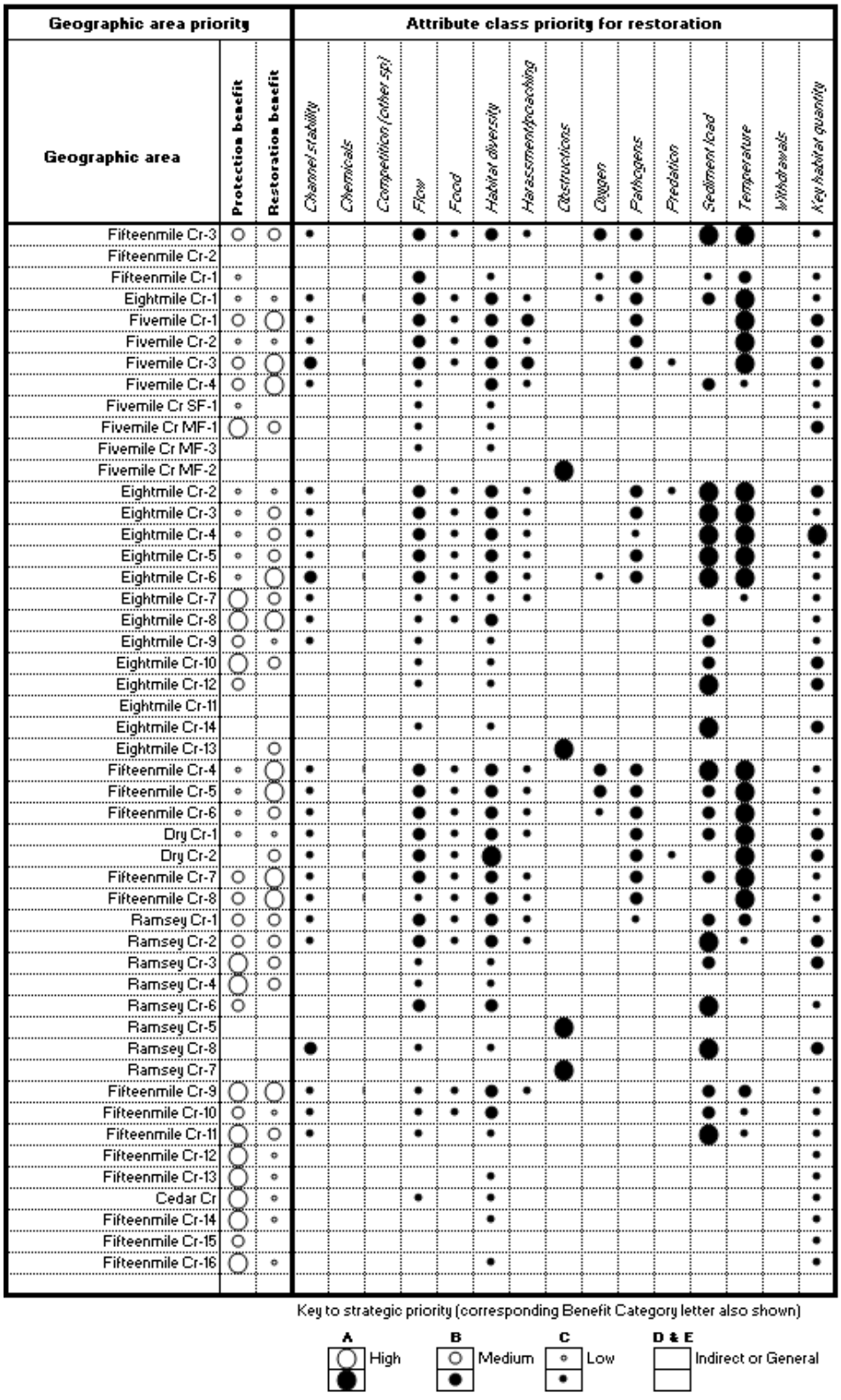
C. Relative Importance of Geographic Areas for Protection and Restoration Measures

The table shown below is the "Tornado Diagram" from EDT Report 2, showing the relative changes in abundance, productivity and life history diversity from the presettlement condition to the current condition.

Geographic Area	Protection rank	Restoration rank	Change in Abundance with		Change in Productivity with		Change in Diversity Index with	
			Degradation	Restoration	Degradation	Restoration	Degradation	Restoration
Fifteenmile Cr-3	18	14						
Fifteenmile Cr-2	32	38						
Fifteenmile Cr-1	21	35						
Eightmile Cr-1	27	25						
Fivemile Cr-1	20	10						
Fivemile Cr-2	23	23						
Fivemile Cr-3	18	2						
Fivemile Cr-4	12	5						
Fivemile Cr SF-1	22	37						
Fivemile Cr MF-1	7	17						
Fivemile Cr MF-3	32	38						
Fivemile Cr MF-2	32	33						
Eightmile Cr-2	29	22						
Eightmile Cr-3	26	13						
Eightmile Cr-4	21	19						
Eightmile Cr-5	28	19						
Eightmile Cr-6	25	3						
Eightmile Cr-7	5	15						
Eightmile Cr-8	4	4						
Eightmile Cr-9	11	21						
Eightmile Cr-10	3	18						
Eightmile Cr-12	20	34						
Eightmile Cr-11	32	38						
Eightmile Cr-14	32	38						
Eightmile Cr-13	32	16						
Fifteenmile Cr-4	27	9						
Fifteenmile Cr-5	21	1						
Fifteenmile Cr-6	24	11						
Dry Cr-1	30	27						
Dry Cr-2	31	20						
Fifteenmile Cr-7	16	8						
Fifteenmile Cr-8	14	6						
Ramsey Cr-1	17	17						
Ramsey Cr-2	15	20						
Ramsey Cr-3	8	13						
Ramsey Cr-4	1	16						
Ramsey Cr-6	19	35						
Ramsey Cr-5	32	36						
Ramsey Cr-8	32	38						
Ramsey Cr-7	32	31						
Fifteenmile Cr-9	9	7						
Fifteenmile Cr-10	13	29						
Fifteenmile Cr-11	6	12						
Fifteenmile Cr-12	2	24						
Fifteenmile Cr-13	7	28						
Cedar Cr	10	30						
Fifteenmile Cr-14	3	26						
Fifteenmile Cr-15	11	32						
Fifteenmile Cr-16	8	30						



D. Fifteenmile Creek Winter Steelhead Protection and Restoration Priorities



E. Sample Diagnostic for Two Reaches in the Fifteenmile Subbasin

The two images shown below are samples of the reach diagnostic pages in EDT Report 2. The full set of diagnostic pages is available from the EDT website, as described in appendix A.

Fifteenmile Reach 5 (From Company Hollow to Davis Cr) was ranked by EDT as the highest restoration priority in Fifteenmile Watershed.

Species/Component:	Winter Steelhead
Restoration Potential:	Current Conditions versus Historic Potential
Restoration Emphasis:	Restoration or maintenance/improvement of historic life histories

Fifteenmile Winter Steelhead

Geographic Area:	Fifteenmile Cr-5			**Stream:**	
Reach:	From Company Hollow to Davis Cr			**Reach Length (mi):**	10.74
				Reach Code:	Fifteenmile Cr-5
Restoration Benefit Category:1/	A	**Productivity Rank:1/**	8	**Potential % change in productivity:2/**	9.0%
Overall Restoration Potential Rank:1/	1	**Average Abundance (Neq) Rank:1/**	2	**Potential % change in Neq:2/**	11.9%
(lowest rank possible - with ties)1/	38	**Life History Diversity Rank:1/**	1	**Potential % change in diversity:2/**	26.8%
Preservation Benefit Category:1/	C	**Productivity Rank:1/**	22	**oss in productivity with degradation:2/**	0.0%
Overall Preservation Rank:1/	21	**Average Abundance (Neq) Rank:1/**	27	**% loss in Neq with degradation:2/**	-0.2%
(lowest rank possible - with ties)1/	32	**Life History Diversity Rank:1/**	22	**% loss in diversity with degradation:2/**	-0.3%

Life stage	Relevant months	% of life history trajectories affected	Productivity change (%)	Life Stage Rank	Change in attribute impact on survival: Channel stability	Chemicals	Competition (w/ hatch)	Competition (other sp)	Flow	Food	Habitat diversity	Harassment/poaching	Obstructions	Oxygen	Pathogens	Predation	Sediment load	Temperature	Wthdrawals	Key habitat quantity
Spawning	Mar-Jun	4.0%	-16.3%	9							●	•		•			●	•		•
Egg incubation	Mar-Jul	4.0%	-74.8%	3	•				•					•			●	●		•
Fry colonization	May-Jul	4.0%	-46.6%	4	•			•	●	•	●			●		•	•	●		•
0-age active rearing	May-Jul	4.0%	-85.4%	1	•		•	•	●	•	●			•	●		•	●		○
0,1-age inactive	Oct-Mar	5.3%	-36.4%	6	•				●	•	•						●			
1-age migrant	Mar-Jun	33.8%	-2.9%	11							•			•			●	•		•
1-age active rearing	Mar-Oct	5.1%	-42.6%	2	•		•	•	●	•	•			•			•	●		
2+-age active rearing	Mar-Oct	1.0%	-14.9%	8	•		•		●		•						•	•		•
2+-age migrant	Mar-Jun	9.3%	-1.5%	13							•						●			•
2+-age transient rearing																				
Prespawning migrant	Nov-Apr	43.3%	-1.9%	10							•	•					●			•
Prespawning holding	Dec-May	4.0%	-17.8%	7							●	•					●			•
All Stages Combined		43.3%																		

1/ Ranking based on effect over entire geographic area. 2/ Value shown is for overall population performance.

Notes: Changes in key habitat can be caused by either a change in percent key habitat or in stream width.
Potential % changes in performance measures for reaches upstream of dams were computed with full passage allowed at dams (though reservoir effects still in place).

KEY

NA = Not applicable

	Loss	Gain
None		
Small	•	○
Moderate	●	○
High	●	◯
Extreme	●	◯

Ramsey Creek 4 (from tributary at 2440 ft level to culvert at Forest Road 4450 at 3360 ft level) was ranked by EDT as the highest protection priority.

Species/Component:	Winter Steelhead
Restoration Potential:	Current Conditions versus Historic Potential
Restoration Emphasis:	Restoration or maintenance/improvement of historic life histories

Fifteenmile Winter Steelhead

Geographic Area:	Ramsey Cr-4			**Stream:**	
Reach:	From trib at 2440 ft level to culvert at Forest Road 4450 at 3360 ft level			**Reach Length (mi):**	4.32
				Reach Code:	Ramsey Cr-4
Restoration Benefit Category:1/	B	**Productivity Rank:1/**	10	**Potential % change in productivity:2/**	7.9%
Overall Restoration Potential Rank:1/	16	**Average Abundance (Neq) Rank:1/**	22	**Potential % change in Neq:2/**	2.3%
(lowest rank possible - with ties)1/	38	**Life History Diversity Rank:1/**	26	**Potential % change in diversity:2/**	0.1%
Preservation Benefit Category:1/	A	**Productivity Rank:1/**	6	**oss in productivity with degradation:2/**	-4.3%
Overall Preservation Rank:1/	1	**Average Abundance (Neq) Rank:1/**	2	**% loss in Neq with degradation:2/**	-7.6%
(lowest rank possible - with ties)1/	32	**Life History Diversity Rank:1/**	3	**% loss in diversity with degradation:2/**	-9.3%

Life stage	Relevant months	% of life history trajectories affected	Productivity change (%)	Life Stage Rank	Change in attribute impact on survival: Channel stability	Chemicals	Competition (w/ hatch)	Competition (other sp)	Flow	Food	Habitat diversity	Harassment/poaching	Obstructions	Oxygen	Pathogens	Predation	Sediment load	Temperature	Withdrawals	Key habitat quantity
Spawning	Mar-Jun	4.0%	-1.1%	7							●									○
Egg incubation	Mar-Jul	4.0%	-1.1%	6														•		○
Fry colonization	May-Jul	4.5%	-7.6%	3	•				●	•	●					•				○
0-age active rearing	May-Jul	4.4%	-12.9%	1					●	•	●									◦
0,1-age inactive	Oct-Mar	4.3%	-11.2%	3					•		●									○
1-age migrant	Mar-Jun	2.8%	-0.1%	13							•									○
1-age active rearing	Mar-Oct	3.2%	-6.1%	4					•		●									○
2+age active rearing	Mar-Oct	1.2%	-3.1%	8					•		•									○
2+age migrant	Mar-Jun	1.3%	-0.1%	14							•									○
2+age transient rearing																				
Prespawning migrant	Nov-Apr	5.8%	0.0%	12							•									○
Prespawning holding	Dec-May	4.0%	-0.5%	11							•									
All Stages Combined		5.8%																		

Loss Gain

1/ Ranking based on effect over entire geographic area. 2/ Value shown is for overall population performance.

Notes: Changes in key habitat can be caused by either a change in percent key habitat or in stream width.
Potential % changes in performance measures for reaches upstream of dams were computed with full passage allowed at dams (though reservoir effects still in place).

KEY

NA = Not applicable

	Loss	Gain
None		
Small	•	◦
Moderate	●	○
High	●	○
Extreme	●	○

F. Life History Viabilities by Reach

The following tables were provided by Mobrand Biometrics by contract with Wasco County SWCD.

Table F.1. Percentage of Viable Life Histories in the Template Condition by Smolt Age and Migrant or Resident Life History Pattern

	Migrant Life Histories			Resident Life Histories			
	Age 1 Smolts	Age 2 Smolts	Age 3+ Smolts	Age 1 Smolts	Age 2 Smolts	Age 3+ Smolts	AVERAGE
Fifteenmile Cr-3	50%	30%	0%	100%	95%	100%	62%
Eightmile Cr-1	42%	57%	0%	100%	100%	100%	66%
Fivemile Cr-1	95%	68%	100%	100%	100%	100%	94%
Fivemile Cr-2	100%	93%	100%	100%	100%	100%	99%
Fivemile Cr-3	100%	92%	91%	100%	100%	100%	97%
Fivemile Cr-4	100%	100%		100%	100%	100%	100%
Fivemile Cr SF-1	100%	100%		100%	100%	100%	100%
Fivemile Cr MF-1	100%	100%	100%	100%	100%	100%	100%
Fivemile Cr MF-3	100%	100%	100%	100%	100%	100%	100%
Eightmile Cr-2	100%	75%		100%	100%	100%	95%
Eightmile Cr-3	100%	85%	75%	100%	100%	100%	93%
Eightmile Cr-4	100%	93%	50%	100%	100%	100%	91%
Eightmile Cr-5	80%	90%	100%	100%	100%	100%	95%
Eightmile Cr-6	97%	95%	94%	100%	100%	100%	98%
Eightmile Cr-7	100%	100%	100%	100%	100%	100%	100%
Eightmile Cr-8	100%	100%	100%	100%	100%	100%	100%
Eightmile Cr-9	100%	100%	100%	100%	100%	100%	100%
Eightmile Cr-10	100%	100%	100%	100%	100%	100%	100%
Eightmile Cr-12	100%	100%	100%	100%	100%		100%
Eightmile Cr-14	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-4	67%	63%	40%	100%	100%	100%	78%
Fifteenmile Cr-5	93%	95%	96%	100%	100%	100%	97%
Fifteenmile Cr-6	95%	100%	100%	100%	100%	100%	99%
Dry Cr-1	100%	100%	100%	100%	100%	100%	100%
Dry Cr-2	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-7	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-8	100%	100%	100%	100%	100%	100%	100%
Ramsey Cr-1	100%	100%	100%	100%	100%	100%	100%
Ramsey Cr-2	100%	100%	100%	100%	100%	100%	100%
Ramsey Cr-3	100%	100%	100%	100%	100%	100%	100%
Ramsey Cr-4	100%	100%	100%	100%	100%	100%	100%
Ramsey Cr-6	100%	100%		100%	100%	100%	100%
Ramsey Cr-8	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-9	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-10	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-11	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-12	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-13	100%	100%	100%	100%	100%	100%	100%
Cedar Cr	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-14	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-15	100%	100%			100%	100%	100%
Fifteenmile Cr-16	100%	100%	100%	100%	100%	100%	100%

Red indicates less than 40% viable life histories.
Orange indicates 41%-79% viable life histories.
Green indicates 80% or more viable life histories.

Table F2. Percentage of Viable Life Histories in the Current Condition by Smolt Age and Migrant or Resident Life History Pattern

	Migrant Life Histories			Resident Life Histories			
	Age 1 Smolts	Age 2 Smolts	Age 3+ Smolts	Age 1 Smolts	Age 2 Smolts	Age 3+ Smolts	AVERAGE
Fifteenmile Cr-3	0%	0%	0%	0%	0%	0%	0%
Eightmile Cr-1	0%			0%	0%	0%	0%
Fivemile Cr-1	0%	0%	0%	0%	0%	0%	0%
Fivemile Cr-2	0%	0%	0%	0%	0%	0%	0%
Fivemile Cr-3	0%	0%	0%	0%	0%	0%	0%
Fivemile Cr-4	89%	33%		100%	52%	0%	55%
Fivemile Cr SF-1	100%	88%		100%	90%	0%	76%
Fivemile Cr MF-1	100%	98%	63%	100%	96%	100%	93%
Fivemile Cr MF-3	0%	0%	0%	0%	0%	0%	0%
Eightmile Cr-2	0%	0%	0%	0%	0%	0%	0%
Eightmile Cr-3	0%	0%	0%	0%	0%	0%	0%
Eightmile Cr-4	0%	0%	0%	0%	0%	0%	0%
Eightmile Cr-5	0%	0%	0%	0%	0%	0%	0%
Eightmile Cr-6	0%	0%	0%	0%	0%	0%	0%
Eightmile Cr-7	100%	83%	28%	100%	77%	100%	81%
Eightmile Cr-8	100%	99%	44%	100%	89%	100%	89%
Eightmile Cr-9	100%	100%	0%	100%	87%	100%	81%
Eightmile Cr-10	100%	100%	83%	100%	98%	100%	97%
Eightmile Cr-12	100%	100%	50%	100%			88%
Eightmile Cr-14	0%	0%	0%	0%	0%	0%	0%
Fifteenmile Cr-4	0%	0%	0%	0%	0%	0%	0%
Fifteenmile Cr-5	0%	0%	0%	0%	0%	0%	0%
Fifteenmile Cr-6	0%	0%	0%	0%	0%	0%	0%
Dry Cr-1	0%	0%	0%	0%	0%	0%	0%
Dry Cr-2	0%	0%	0%	0%	0%	0%	0%
Fifteenmile Cr-7	10%	0%	0%	0%	3%	0%	2%
Fifteenmile Cr-8	30%	0%	0%	47%	7%	0%	14%
Ramsey Cr-1	100%	5%	0%	63%	25%	0%	32%
Ramsey Cr-2	100%	13%	0%	100%	32%	50%	49%
Ramsey Cr-3	100%	100%	0%	100%	85%	100%	81%
Ramsey Cr-4	100%	100%	75%	100%	93%	100%	95%
Ramsey Cr-6	100%	80%		100%	80%	100%	92%
Ramsey Cr-8	0%	0%	0%	0%	0%	0%	0%
Fifteenmile Cr-9	95%	72%	0%	100%	63%	92%	70%
Fifteenmile Cr-10	100%	100%	100%	100%		100%	100%
Fifteenmile Cr-11	100%	90%	0%	100%	82%	100%	79%
Fifteenmile Cr-12	100%	100%	88%	100%	95%	100%	97%
Fifteenmile Cr-13	100%	100%	50%	100%	91%	100%	90%
Cedar Cr	100%	100%	100%	100%	100%	100%	100%
Fifteenmile Cr-14	100%	100%	50%	100%	96%	100%	91%
Fifteenmile Cr-15	100%	100%				100%	100%
Fifteenmile Cr-16	100%	100%	100%	100%	100%	100%	100%

Red indicates less than 40% viable life histories.
Orange indicates 41%-79% viable life histories.
Green indicates 80% or more viable life histories.

G. Assumptions used in Restoration Scenarios

As described in the Fifteenmile Subbasin Assessment, a series of restoration scenarios were used to model the effects of restoring habitat in the Fifteenmile Subbasin. These scenarios were based on fourteen separate actions, each of them described using the EDT Scenario Builder.

The Scenario Builder starts by comparing the template (presettlement) and current conditions for each of the 46 environmental attributes that serve as input for EDT. When modeling a particular restoration action, the modeler makes an assumption regarding the extent to which that action will RESTORE each environmental attribute from the current to the template condition. For example: A particular reach has an irrigation diversion that withdraws 80% of the flow. The template condition for "Changes to Low Flows" is rated as "2", meaning natural flow, whereas the current condition is rated as "4", meaning significant withdrawal of water. If the modeler wants to model the effect of reducing a water withdrawal by 30% through irrigation conveyance efficiency, then she would input "30%" to the "Changes in Low Flows" parameter. The scenario condition would then become "3.4"—i.e. 30% recovered from current toward template. Negative values imply degradation of a resource.

Modeled Restoration Action	**Effectiveness Assumptions**	**Affects These Reaches**
1) 100% Restoration—thought experiment only	ALL PARAMETERS: 100%	ALL REACHES
2) No-till—Convert all cropland acres to no-till	High Flows: 40% Low Flows: 10% Intra-annual Flow Pattern: 50% Embeddedness: 50% Fine Sediment: 50% Turbidity: 50% Nutrient Enrichment: 20% Max Temp: 10% Temp—spatial variation: 10%	Fifteenmile 1-9 Eightmile 1-7 Fivemile 1-3 Dry Creek 1-2 Ramsey Creek 1-3
3) Restore Low Flows to Presettlement condition—thought experiment only	Low Flows: 100% Dissolved oxygen: 100% Metals in sediments: 100% Misc. toxics: 80% Max Temp: 90% Temp—spatial variation: 90%	ALL REACHES

Modeled Restoration Action	**Effectiveness Assumptions**	**Affects These Reaches**
4) Riparian Buffers-put all private streams in buffer system wide enough to restore floodplain function	Intra-annual Flow Pattern: 20% Channel Length: 70% Channel Max Width: 100% Gradient: 70% Confinement Hydromodifications: 70% Riparian Function: 100% Wood: 80% Embeddedness: 50% Fine Sediment: 20% Turbidity: 60% Dissolved Oxygen: 40% Metals in water: 60% Metals in sediment: 60% Misc. Toxics: 60% Nutrient Enrichment: 50% Max Temp: 40% Temp—spatial variation: 40% Harassment: 20%	Fifteenmile 3-9 Eightmile 1-9 Fivemile 1-4 Dry Creek 1-2 Ramsey Creek 1-3
5) Riverkeeper: Restore Fifteenmile 9-11 with large wood, fix up ditch	Low Flows: 50% Channel Length: 100% Channel Width Max: 100% Gradient: 100% Confinement—hydromodifications: 100% Habitat types: 100% Riparian Function: 100% Wood: 100%	Fifteenmile 9-11
6) Strategic Large Wood Placements: Place large wood in stream in priority reaches	Channel Length: 70% Channel Width Max: 70% Gradient: 70% Confinement—hydromodifications: 70% Habitat types: 100% Riparian Function: 70% Wood: 100%	Fifteenmile 4-9 Eightmile 6, 8 Fivemile 1, 3, 4
7) 50% Low Flow Restoration	Low Flows: 50% Dissolved Oxygen: 50% Metals in sediments: 40% Misc. Toxics: 40% Nutrient Enrichment: 40% Max Temp: 45% Temp—spatial variation: 45%	ALL REACHES
8) Remove obstruction at Fivemile MF2	Improve passage survival by 100%	Fivemile MF-2

Modeled Restoration Action	**Effectiveness Assumptions**	**Affects These Reaches**
9) Remove obstruction at Eightmile 11	Improve passage survival by 100%	Eightmile 11
10) Remove obstruction at Eightmile 13	Improve passage survival by 100%	Eightmile 13
11) Remove obstruction at Ramsey 5	Improve passage survival by 100%	Ramsey 5
12) Remove Ramsey 7	Improve passage survival by 100%	Ramsey 7
13) Orchard Ridge Ditch Blowout: Streambank erosion undercuts Orchard Ridge Ditch, causing diverted water to flow back into creek over steep cutbank.	Low Flows: 90% Embeddedness: -100% Fine Sediment: -100% Turbidity: -100% Max Temp: 90%	Fifteenmile 9-11

H. Reach Definitions used in the Qualitative Habitat Assessment

Watershed	Reach name	Comment	Length
Chenowith	Chenoweth Cr.-1	from top of Bonneville Pool to the animal control shelter--this reach is wetland area braided channels. Jennifer Clark has seen steelhead spawning at low pool. Beaver activity.	155.111
Chenowith	Chenoweth Cr.-2	from top of wetland at Animal Control Shelter to HWY 84 crossing (concrete box culvert--not a passage problem--low gradient)	393.218
Chenowith	Chenoweth Cr.-3	from HWY 84 box culvert to HWY 30 crossing (bridge). This reach is heavily impacted by grazing and organic contaminants. Creek is recently fenced (2003).	393.218
Chenowith	Chenoweth Cr.-4	from HWY 30 crossing to 10th Street crossing (bridge). This is an urban reach residential on south side pasture on north. Channelized moderately constrained.	1129.695
Chenowith	Chenoweth Cr.-5	from 10th Street bridge to Brown's Creek. Creek is seasonally dry above this tributary.	3526.008
Fifteenmile	Deadman Gulch	from mouth at Fifteenmile Cr. to 3200' contour	894.341
Fifteenmile	Fivemile North Fork 1		87.155
Fifteenmile	Fivemile North Fork 2		1.598
Fifteenmile	Fivemile North Fork 3		6805.387
Fifteenmile	Japanese Hollow	from mouth at Eightmile Cr. to springs at trib on south border of section 9 (1200' contour)	7153.727
Fifteenmile	Pine Cr.-1	from mouth at Fifteenmile Cr. to Hwy 197 crossing (bridge)	1490.708
Fifteenmile	Pine Cr.-2	from Hwy 197 bridge to point where Pine Creek turns southwest from road at 1480' contour.	2644.599
Fifteenmile	Pine Cr.-3	from point where Pine Cr. turns southwest from Hwy 197 to Larch Creek	5498.658
Fifteenmile	Rail Hollow	from mouth at Eightmile Creek to first trib junction (.2 miles upstream from mouth)	328.708

Watershed	Reach name	Comment	Length
Mill	Alder Cr.	from confluence with Crow Cr. to upper end of cutthroat distribution at 3280' contour	2982.74
Mill	Crow Cr.-1	reach inside Crow Creek reservoir from confluence with SF Mill Creek to edge of reservoir. (this stream called Alder Cr. in GIS 100K hydro layer)	312.611
Mill	Crow Cr.-2	from edge of Crow Cr. reservoir to Alder Cr. (this stream called 'Alder Creek' in 100k Gis hydro layer)	625.24
Mill	Crow Cr.-3	from Alder Creek to end of cutthroat distribution	5938.011
Mill	Mill Cr. NF unnamed trib #1	from mouth at NF Mill Creek to elevation between 3840' and 3880' contours at section 14 boundary (24K reach)	1045.01
Mill	Mill Cr. NF unnamed trib #2	from mouth at NF Mill Creek near headwaters to elevation just below the 3840' contour at Gibson Prairie in section 14 (24K reach)	400.317
Mill	Mill Cr. NF-01	Mouth at Mill Creek to 1560' contour (based on downstream end of confined reach)	5902.79
Mill	Mill Cr. NF-02	From 1560' contour line to 1680' contour line (reach confined by hillslope and road).	610.734
Mill	Mill Cr. NF-03	From 1680' contour to 1880-ish' contour line (in section 35 upper road crossing)	1893.442
Mill	Mill Cr. NF-04	From 1880'-ish contour to FS Rd 1711-630 at culvert barrier (close to the end of anadromous distribution)	7365.895
Mill	Mill Cr. NF-05	culvert barrier at FS Rd 1711-630	1.611
Mill	Mill Cr. NF-06	from culvert barrier at FS Rd 1711-630 to partial barrier culvert near unnamed trib just below the 3800' contour	3948.022
Mill	Mill Cr. NF-07	partial barrier--seasonal--culvert in section 14 just below southern-most unnamed trib	1.611
Mill	Mill Cr. NF-08	from partial barrier culvert just below southern-most unnamed trib to southern-most unnamed trib just below 3800' contour	35.452
Mill	Mill Cr. NF-09	from unnamed trib just below 3800' contour to culvert barrier between the two unnamed tribs at the headwaters at Gibson Prairie	264.276

Watershed	Reach name	Comment	Length
Mill	Mill Cr. NF-10	culvert barrier--no fish passage--between unnamed tribs at N Fk Mill Creek headwaters	1.611
Mill	Mill Cr. NF-11	from culvert barrier to unnamed trib at headwaters to Gibson Prairie (Gary Asbridge has observed cutthroat here)	402.858
Mill	Mill Cr. NF-12	from unnamed trib near N Fk Mill headwaters to absolute headwaters of N Fk Mill (Gary Asbridge has observed cutthroat here)	611.116
Mill	Mill Cr. SF unnamed trib #1		359.963
Mill	Mill Cr. SF unnamed trib #2	from mouth at SF Mill Cr. to end of cutthroat distribution near 3560' contour	389.946
Mill	Mill Cr. SF unnamed trib #3		837.863
Mill	Mill Cr. SF unnamed trib #4	from mouth at SF Mill Cr. to end of cutthroat distribution at headwaters (100k)	1400.329
Mill	Mill Cr. SF-01	from mouth at fork with mainstem Mill Cr. to Wicks Water Treatment Plant (diversion with ladder and screen)	1408.451
Mill	Mill Cr. SF-02	Wicks Water Treatment Plant diversion with screen and ladder	1.612
Mill	Mill Cr. SF-03	from Wicks Water Treatment Plant to Mill Creek Falls	3424.44
Mill	Mill Cr. SF-04	Mill Creek Falls #53171--barrier to anadromy	1.611
Mill	Mill Cr. SF-05	from Mill Creek Falls to trib in section 12 where SF Mill Creek flows into the canyon.	4031.91
Mill	Mill Cr. SF-06	from canyon entrance to Crow Creek Reservoir Dam.	7480.228
Mill	Mill Cr. SF-07	Crow Creek Reservoir Dam #50277	1.611
Mill	Mill Cr. SF-08	reach inside Crow Creek Reservoir--from dam to Crow Cr. trib	327.103
Mill	Mill Cr. SF-09	reach through Crow Creek reservoir from confluence with Crow Creek to edge of reservoir at 2560' contour.	285.228

Watershed	Reach name	Comment	Length
Mill	Mill Cr. SF-10	from edge of Crow Creek reservoir at 2560' contour to unnamed 24k trib in section 36 near 3360' contour	4797.263
Mill	Mill Cr. SF-11	from unnamed 24k trib at 3360' to unnamed 100K trib at contour near 3440' contour	457.648
Mill	Mill Cr. SF-12	from unnamed trib #2 at 3440' contour to unnamed trib at 3560' contour	578.488
Mill	Mill Cr. SF-13	from unnamed trib #3 to unnamed trib #4 at 3600' contour.	338.392
Mill	Mill Cr. SF-14	from unnamed trib #4 to end of cutthroat distribution.	1055.47
Mill	Mill Cr. -01	800 foot culvert from mouth to west 2nd street	265.511
Mill	Mill Cr.-02	from box culvert (24K) to Honnald diversion at southwest edge to Ericksen's Addition.	2573.681
Mill	Mill Cr.-03	from Honnald diversion at southewest edge of Ericksen's Addition to North/South Mill creek forks.	9712.548
Mosier	Honeysuckle Cr.-1	from mouth at Mosier Creek to Lucky Canyon. Moderately low gradient great habitat (Steve Pribyl). Perennial.	1228.206
Mosier	Honeysuckle Cr.-2	from Lucky Canyon to end of fish at road crossing near southern boundary of section 6. (100K hydro calls this creek Ladore).	538.222
Mosier	Indian Cr.-1	from mouth at Mosier Creek to first road crossing (logging road) culvert. Steep narrowly confined channel. Perennial.	1941.797
Mosier	Lucky Canyon-1	from confluence with Honeysuckle to end of fish/perennial water at southern boundary of section 6.	815.426
Mosier	McVey Spring-1	from mouth at Mosier Creek to first tributary. Fish bearing (cutt most likely).	199.821
Mosier	Mosier Cr. unnamed trib-1	from mouth at Mosier Creek to gradient break at 2800' contour in section 27. Moderately steep gradient (4-8%) very confined.	1742
Mosier	Mosier Cr. unnamed trib-2	from gradient break at 2800' contour to lower end of wetland/marsh near border of sections 32/33. Moderate gradient (2-4%).	2679.877

Watershed	Reach name	Comment	Length
Mosier	Mosier Cr. unnamed trib-3	reach through wetland/marsh at headwaters of unnamed trib to Mosier Creek in section 32	934.694
Mosier	Mosier Cr. WF-01	from confluence with mainstem to unnamed trib in center of section 26. Gradient levels out here.	4033.493
Mosier	Mosier Cr. WF-02	from unnamed trib at center of section 26 to Snyder Canyon. This reach is moderately constrained with 2-4% gradient (channel steep below this reach). Best habitat above falls.	625.243
Mosier	Mosier Cr. WF-03	from Snyder Canyon to Baker Canyon. Constrained 2-4% gradient.	1316.569
Mosier	Mosier Cr. WF-04	from Baker Canyon to end of cutthroat distribution at unnamed trib in center of section 10.	3727.327
Mosier	Mosier Cr.-01	from mouth at Columbia R. to HWY 30 high bridge. This reach is single channel beaver activity somewhat impacted by Bonneville Pool (sediment) coho and steelhead spawning.	167.588
Mosier	Mosier Cr.-02	from HWY 30 bridge to first bend near the cemetery. This reach is braided channel wetland active beaver population unconstrained wide flood plain.	162.754
Mosier	Mosier Cr.-03	from bend near cemetery to Pocket Falls. This reach is semi-constrained--narrow canyon with good vegetation in bottom.	293.28
Mosier	Mosier Cr.-04	Pocket Falls--about 50' in height anadromy ends here cutthroat above falls.	1.611
Mosier	Mosier Cr.-05	from Pocket Falls to confluence with West Fork Mosier. This reach dominated by gravel and bedrock generally medium gradient. Cutthroat distribution.	4450.895
Mosier	Mosier Cr.-06	from confluence with West Fork Mosier to Mosier Creek Road crossing (bridge) at section 30/31 boundary. moderate gradient moderately confined hydric soils in flood plain.	3248.737
Mosier	Mosier Cr.-07	From bridge crossing at Mosier Creek Road at section 30/31 boundary to Honeysuckle Creek. moderate gradient confined.	1937.042

Watershed	Reach name	Comment	Length
Mosier	Mosier Cr.-08	from Honeysuckle Creek to culvert at Mosier Creek road crossing in section 1.	773.524
Mosier	Mosier Cr.-09	partial jump barrier culvert at Mosier Creek Road crossing in section 1.	1.611
Mosier	Mosier Cr.-10	from culvert at Mosier Creek road crossing in section 1 to Indian Creek. Moderate gradient some confined some unconfined.	3803.068
Mosier	Mosier Cr.-11	from Indian Creek to McVey Spring.	1173.152
Mosier	Mosier Cr.-12	from McVey Spring to unnamed trib at west side of section 23. moderately steep gradient (4-8%) V-shaped channel.	1364.962
Mosier	Mosier Cr.-13	from unnamed trib in section 23 to seasonally dry ford/subterranean flow where four section corners meet, 27-26-34-35	2436.55
Mosier	Mosier Cr.-14	from seasonally dry ford at four corners to Ketchum Reservoir Road crossing. Doug Thiesies ODF has information on this road crossing.	1651.728
Mosier	Mosier Cr.-15	from road crossing at Ketchum Reservoir Road to Mt Hood NF boundary at south boundary of section 33. Verified no fish above this point on Mosier Creek.	1044.214
Rock	Campbell Cr.-1	from mouth at Rock Creek to Proctor Road crossing (small culvert).	388.354
Rock	Rock Cr.-1	from mouth at Columbia River to quarry just above the Historic HWY 30. This reach is subterranean due to quarry activity but is under rehab currently (2003--riparian project).	328.741
Rock	Rock Cr.-2	Through quarry. Stream highly channelized and rip-rapped	680.864
Rock	Rock Cr.-2.5	from upper end of quarry to Campbell Creek. Moderately-to-tightly confined 2-4% gradient.	774.249
Rock	Rock Cr.-3	from Campbell Creek to falls barrier at approximate center of section 10.	1443.871
Rock	Rock Cr.-4	Falls barrier approximately 2.5 mi from mouth in section 10. The definite location of this anadromous barrier is unknown.	1.611
Rock	Rock Cr.-5	from falls barrier in section 10 to gradient change in section 28 near the 1560' contour. Gradient is from 4-8%.	5912.445

Watershed	Reach name	Comment	Length
Rock	Rock Cr.-6	from gradient change at 1560' contour in section 28 to forks with unnamed trib in section 5 at the 2000' contour. Gradient is 2-4%.	3313.197
Threemile	Threemile Cr.-01	from mouth at Columbia to HWY 84 crossing--2 6'x6' concrete box culverts may be partial barriers at times (high flow). Wetland reach.	147.884
Threemile	Threemile Cr.-02	2 culverts--6' x 6' concrete boxes at HWY 84 crossing partial barriers especially at high flow. Downstream end has been excavated. ODOT plans to excavate upstream as well--ongoing maintenance issue. Juvenile coho above culvert (Steve Pribyl).	1.612
Threemile	Threemile Cr.-03	from HWY 84 double culvert to old highway crossing culvert. No passage information on this culvert.	299.755
Threemile	Threemile Cr.-04	from old highway crossing to HWY 197 interchange. This reach is channelized--paved parking lots on either side.	117.646
Threemile	Threemile Cr.-05	culvert barrier at HWY 197 interchange--currently being upgraded (summer 2003); replacing both culverts with open-bottom arch.	1.612
Threemile	Threemile Cr.-06	from HWY 197 interchange to HWY 197 culvert--reach is confined by highway	257.854
Threemile	Threemile Cr.-07	first HWY 197 culvert--concrete box most likely gradient barrier	1.612
Threemile	Threemile Cr.-08	from first HWY 197 culvert to second HWY 197 culvert--reach constrained by highway	322.318
Threemile	Threemile Cr.-09	second HWY 197 culvert--concrete box culvert gradient barrier	1.611
Threemile	Threemile Cr.-10	from second HWY 197 culvert to Old Dufur Highway crossing (slope break)--culvert here unknown passage	900.881
Threemile	Threemile Cr.-11	from Old Dufur Highway crossing to Haener's driveway crossing in section 45	4535.005
Threemile	Threemile Cr.-12	Haener's driveway crossing--passage barrier since 1996 flood. Stabilized headcut with rock 10-20' jump (?)	1.611

I. Qualitative Habitat Assessment for Resident Trout (Cutthroat and Rainbow)

Qualitative Habitat Assessment (QHA) was used to rank the restoration and protection priorities of the resident fish streams in the Fifteenmile Subbasin.

Table I.1. Input values for streams above anadromous barriers

	Scoring		Describe the natural physical condition of the stream										
	Confidence Rating	Attribute Rating	Stream Name:	0									
	0 = Specu	0 = 0% of normative	Describe the current condition for this stream in regard to the **physical conditions** relative to t										
	1 = Expert	1 = 25% of normative	in this ecological province.										
	2 = Well D	2 = 50% of normative											
		3 = 75% of normative											
	Definitions	normative											
	ttribute Confidence		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Attribute Toggle		1	1	1	1	1	1	1	1	1	1	1
Reach Name	escriptio	Not Rated	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
Mosier Cr-5			2.0	2.0	1.5	2.0	3.0	2.0	4.0	4.0	2.5	2.0	3.0
Mosier Cr WF-1			3.0	3.0	3.0	3.0	3.5	3.0	4.0	4.0	3.5	3.5	3.5
Mosier Cr WF-2			3.5	3.5	3.5	3.0	3.5	3.5	4.0	4.0	3.5	3.5	4.0
Mosier Cr WF-3			3.5	3.5	3.5	3.5	3.5	3.5	4.0	4.0	3.5	3.5	4.0
Mosier Cr WF-4			3.5	3.5	3.5	3.5	3.5	3.5	4.0	4.0	3.5	3.5	3.5
Mosier Cr-6			2.5	2.0	2.5	2.5	3.0	2.0	4.0	4.0	3.0	3.0	3.0
Mosier Cr-7			3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	3.5	3.5
Honeysuckle Cr-1			2.5	3.0	2.5	2.5	3.0	3.0	4.0	4.0	3.0	3.5	4.0
Lucky Canyon			2.5	2.0	2.0	2.0	3.0	3.0	4.0	4.0	3.0	3.5	4.0
Honeysuckle Cr-2			2.5	3.0	2.5	2.5	3.0	3.0	4.0	4.0	3.0	3.5	4.0
Mosier Cr-8			3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	3.5	3.5
Mosier Cr-9													1.0
Mosier Cr-10			2.5	2.5	2.0	2.5	3.0	3.0	4.0	4.0	3.0	3.5	3.5
Indian Cr			3.0	3.0	3.0	2.5	3.0	3.0	4.0	4.0	3.5	3.5	2.0
Mosier Cr-11			3.0	3.0	3.0	2.5	3.0	3.0	4.0	4.0	3.5	3.5	2.0
McVey Spring			2.5	3.0	2.5	2.5	3.0	3.0	4.0	4.0	3.5	3.5	4.0
Mosier Cr-12			3.0	3.0	3.0	2.5	3.0	3.0	4.0	4.0	3.5	3.5	4.0
Mosier Cr unnamed trib 1			3.0	3.0	3.0	2.5	3.0	3.0	4.0	4.0	3.5	3.5	4.0
Mosier Cr Unnamed trib 2			2.0	2.0	2.0	2.5	2.5	3.0	4.0	4.0	3.0	3.5	2.0
Mosier Cr unnamed trib 3			3.5	3.5	3.0	3.0	3.0	3.0	4.0	4.0	3.5	3.5	4.0
Mosier Cr-13			2.5	2.5	2.5	3.0	3.0	3.0	4.0	4.0	3.5	3.5	4.0
Mosier Cr-14			2.5	2.5	2.5	3.0	3.0	3.0	4.0	4.0	3.5	3.5	2.0
Mosier Cr-15			2.5	2.5	2.5	3.0	3.0	3.0	4.0	4.0	3.5	3.5	4.0
Rock Cr-5			3.5	4.0	4.0	4.0	4.0	3.5	4.0	4.0	3.5	4.0	3.5
Rock Cr-6			3.0	4.0	4.0	4.0	4.0	2.5	4.0	4.0	3.5	4.0	3.5
Mill Cr SF-5			4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr SF-6			4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Crow Cr-2			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Alder Cr			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
Crow Cr-3			3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr SF-10			3.5	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr SF unnamed tributary #1			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
Mill Cr SF-11			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
Mill Cr SF unnamed tributary #2			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr SF-12			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr SF unnamed tributary #3			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr SF-13			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr SF unnamed tributary #4			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr SF-14			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

Table I.2. Restoration and Protection Priorities for Steelhead in Fifteenmile Subbasin outside of Fifteenmile Watershed.

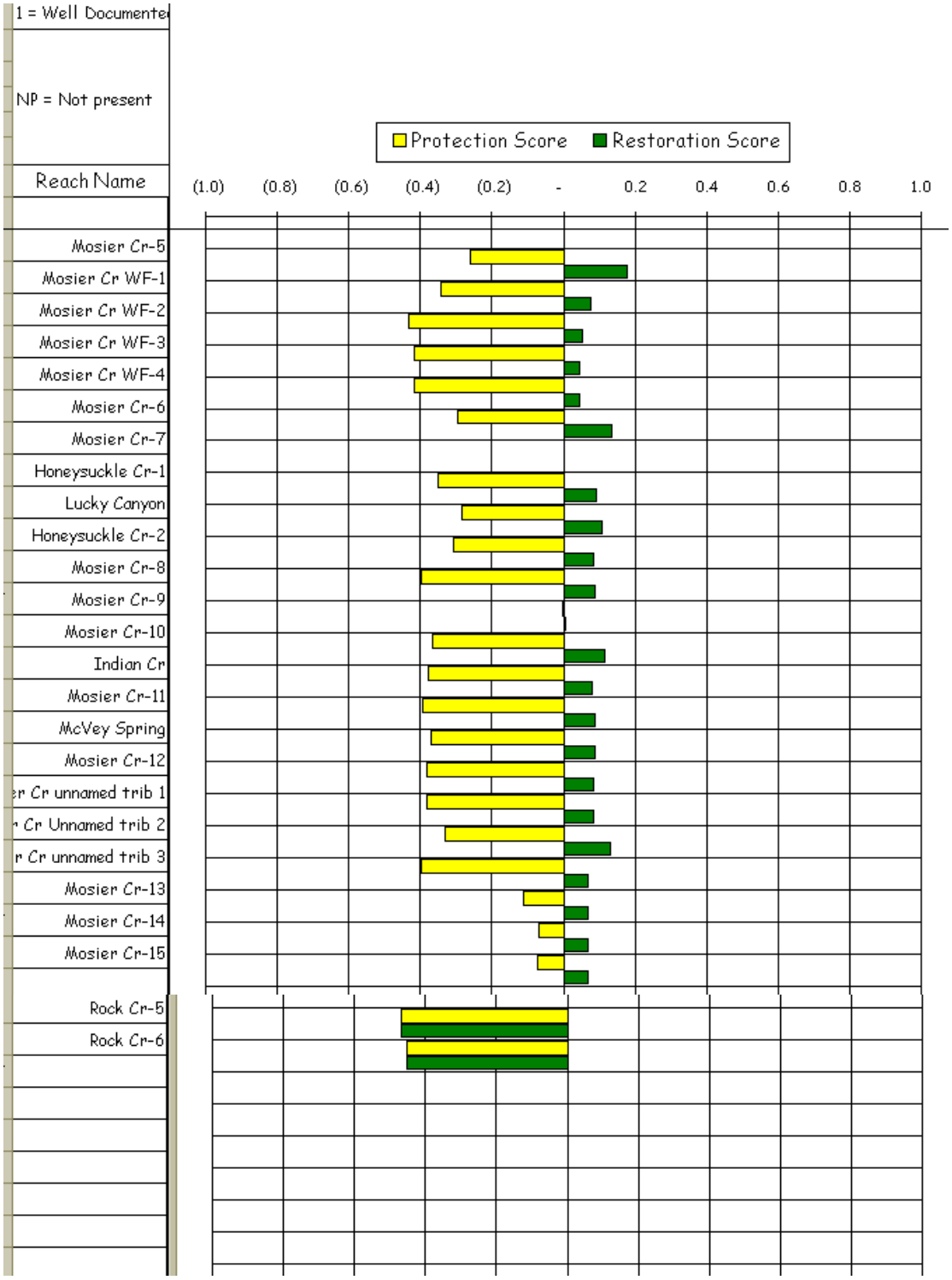
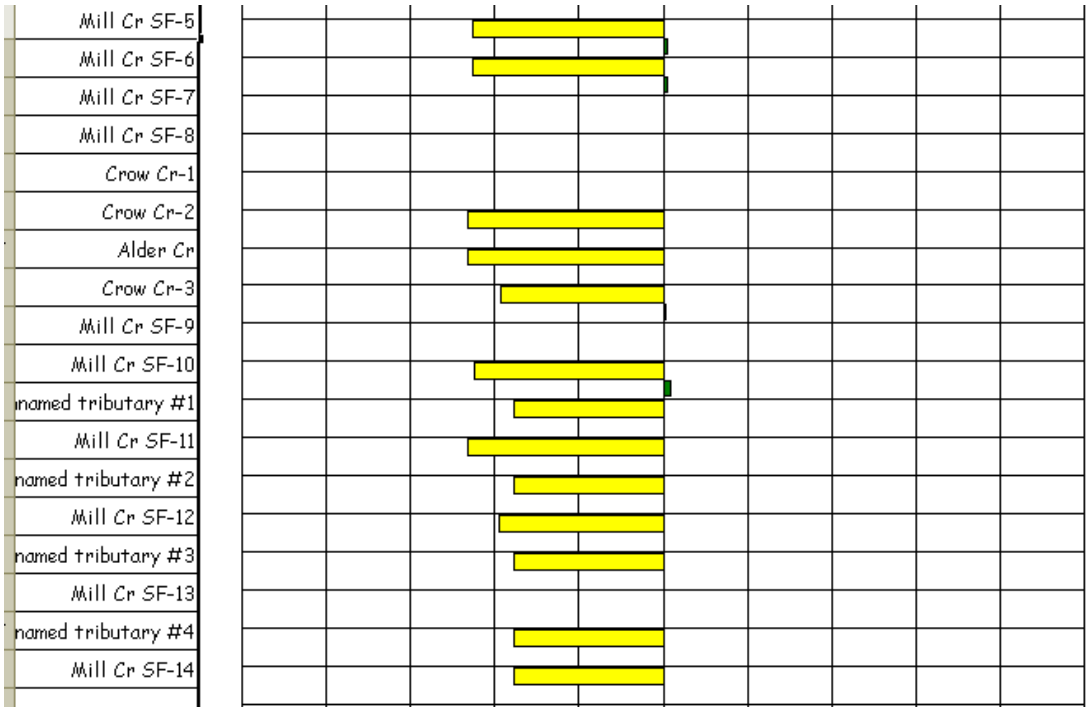


Table I.2. cont.



J. Qualitative Habitat Assessment: Steelhead

Qualitative Habitat Assessment (QHA) was used to rank the restoration and protection priorities of the steelhead streams in the Fifteenmile Subbasin outside of the Fifteenmile Watershed.

Table J.1. Input values for steelhead streams

	Scoring		Describe the natural physical condition of the stream										
	Confidence Rating	Attribute Rating	Stream Name:	Steelhead									
	0 = Specu	0 = 0% of normative	Describe the current condition for this stream in regard to the **physical conditions** relative to the opt										
	1 = Expert	1 = 25% of normative	in this ecological province.										
	2 = Well D	2 = 50% of normative											
		3 = 75% of normative											
	Definitions	normative											
	ttribute Confidence		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Attribute Toggle		1	1	1	1	1	1	1	1	1	1	1
Reach Name	escriptio	Not Rated	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
Mosier Cr-1			1.5	3.0	1.5	2.0	3.0	2.0	4.0	4.0	2.5	2.0	4.0
Mosier Cr-2			2.5	3.0	2.0	2.5	3.0	2.0	4.0	4.0	2.5	2.0	4.0
Mosier Cr-3			3.0	4.0	3.0	2.5	3.0	2.0	4.0	4.0	2.5	2.0	4.0
Mosier Cr-4													
Rock Cr-1			0.5	0.5	0.5	4.0	4.0	0.5	4.0	4.0	3.0	3.5	2.0
Rock Cr-2			0.5	0.5	0.5	4.0	4.0	1.0	4.0	4.0	3.0	4.0	2.0
Rock Cr-2.5			3.0	3.0	3.0	4.0	4.0	3.5	4.0	4.0	3.0	4.0	4.0
Campbell Cr			4.0	3.5	3.5	3.0	4.0	2.0	4.0	4.0	3.0	4.0	4.0
Rock Cr-3			3.5	4.0	4.0	4.0	4.0	3.5	4.0	4.0	3.5	4.0	4.0
Rock Cr-4													0.0
Threemile Cr-1			2.5	2.5	2.5	0.5	0.5	1.0	4.0	4.0	1.0	3.0	4.0
Threemile Cr-2													1.0
Threemile Cr-3			2.5	2.5	2.5	0.5	3.5	1.0	4.0	4.0	1.0	3.0	4.0
Threemile Cr-4			0.5	0.5	0.5	2.0	3.5	1.0	4.0	4.0	1.0	3.0	4.0
Threemile Cr-5													3.5
Threemile Cr-6			2.5	2.0	2.5	2.0	3.5	1.0	4.0	4.0	1.0	3.5	3.5
Threemile Cr-7													2.0
Threemile Cr-8			2.5	2.0	2.5	2.0	3.5	1.0	4.0	4.0	1.0	3.5	3.5
Threemile Cr-9													2.0
Threemile Cr-10			2.5	2.0	2.5	2.0	3.5	1.0	4.0	4.0	1.0	3.5	3.5
Threemile Cr-11			1.5	1.5	1.5	2.5	3.5	1.0	4.0	4.0	1.0	3.0	2.5
Threemile Cr-12													0.0
Chenowith Cr-1			3.0	3.5	3.0	3.5	4.0	3.0	4.0	4.0	2.0	3.0	4.0
Chenowith Cr-2			3.0	3.5	3.0	3.5	4.0	3.0	4.0	4.0	2.0	3.0	4.0
Chenowith Cr-3			2.5	2.5	3.0	3.5	4.0	3.0	4.0	4.0	2.0	3.0	4.0
Chenowith Cr-4			2.5	2.5	2.5	3.5	4.0	3.0	4.0	4.0	2.0	3.0	4.0
Chenowith Cr-5			3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0	2.0	3.0	4.0
Mill Cr-1			0.0	0.0	0.0	3.0	3.0	2.5	4.0	4.0	2.0	2.0	2.5
Mill Cr-2			1.0	1.5	1.5	3.0	3.0	2.5	4.0	4.0	2.0	2.0	1.5

Table J.1. continued.

Mill Cr-3			1.5	1.5	1.5	3.0	3.5	2.5	4.0	4.0	2.0	2.0	3.0
Mill Cr SF-1			2.5	2.0	2.0	3.5	3.0	1.5	4.0	4.0	2.0	4.0	3.5
Mill Cr SF-2													3.5
Mill Cr SF-3			3.5	3.5	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr SF-4													
Mill Cr NF-1			3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5
Mill Cr NF-2			1.5	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	3.5	4.0
Mill Cr NF-3			3.0	3.5	3.5	1.5	4.0	4.0	4.0	4.0	4.0	3.5	4.0
Mill Cr NF-4			4.0	4.0	4.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0	3.0
Mill Cr NF-5													1.0
Mill Cr NF-6			3.0	4.0	3.5	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr NF-7													2.0
Mill Cr NF-8			2.5	3.0	3.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr NF unnamed tributary #1			2.5	3.0	3.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr NF-9			2.5	2.5	2.5	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr NF-10													0.0
Mill Cr NF-11			2.5	2.5	2.5	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr NF unnamed tributary #2			2.5	2.5	2.5	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Mill Cr NF-12			2.5	2.5	2.5	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Pine Cr-1			0.5	1.0	1.0	2.0	3.5	2.0	4.0	4.0	2.0	3.0	4.0
Pine Cr-2			0.5	1.0	1.0	2.0	3.5	2.0	4.0	4.0	2.0	3.0	3.5
Pine Cr-3			3.0	3.0	2.0	3.0	3.5	2.0	4.0	4.0	2.0	4.0	4.0
Japanese Hollow			0.5	1.0	1.0	1.0	1.5	1.5	4.0	4.0	1.5	3.5	4.0
Fivemile Cr NF-1			2.0	3.0	1.5	3.0	4.0	1.5	4.0	4.0	3.0	4.0	4.0
Fivemile Cr NF-2													1.0
Fivemile Cr NF-3			2.0	3.0	1.5	3.0	4.0	1.5	4.0	4.0	3.0	4.0	4.0
Rail Hollow			1.5	2.0	1.0	1.0	1.5	1.5	4.0	4.0	1.5	3.5	4.0
Deadman Gulch			3.0	3.0	3.0	3.0	4.0	2.0	4.0	4.0	4.0	4.0	4.0

Table J.2. Restoration and Protection Priorities for Steelhead in Fifteenmile Subbasin outside of Fifteenmile Watershed.