MIDDLE COLUMBIA-HOOD (MILES CREEKS) SUBBASIN TMDL

DEQ

State of Oregon
Department of Environmental Quality

December 2008

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Acknowledgements: Thanks to the various contributors to this TMDL effort. DEQ had invaluable local assistance with data collection, review of model input and output, and document review. We appreciate the patience of the local stakeholders during the lengthy development of this TMDL. We particularly want to recognize the assistance of the Wasco County Soil and Water Conservation District. They played an important role in data collection, including the collection of in-stream temperature data and securing funding for the Thermal Infrared Radiometry used in the temperature modeling. We also appreciate the role that the SWCD played in outreach to the local community. We look forward to ongoing work in the Subbasin as TMDL implementation unfolds.

Major Contributors:

Wasco Soil and Water Conservation District
Oregon Department of Fish and Wildlife
Mt. Hood National Forest
Oregon Department of Forestry
Oregon Water Resources Department
City of The Dalles
City of Dufur
USDA Natural Resource Conservation Service
Community volunteers

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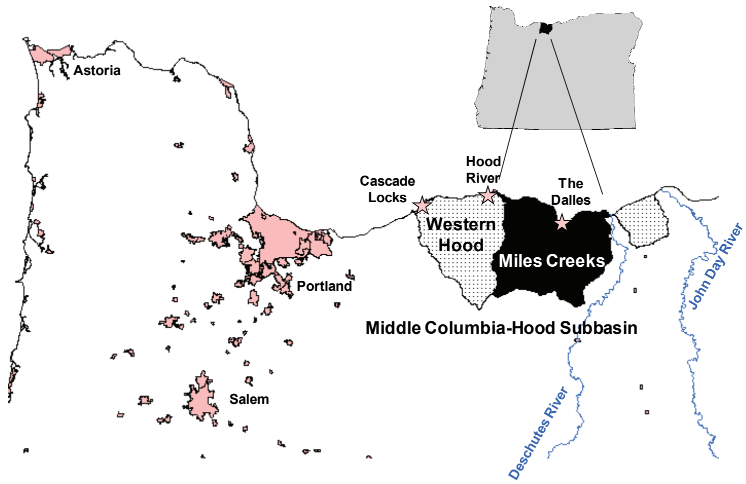
CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION



The Middle Columbia-Hood Subbasin (fourth field HUC 17070105) is in the north-central part of Oregon occupying approximately 1140 square miles (see adjacent map). The Subbasin is a collection of rivers and creeks that are tributaries to the Columbia River. These rivers and creeks enter the Columbia River in the area roughly between the community of Cascade Locks to the west and the John Day River to the east. This geographic area covers a wide diversity of landscapes, land uses, and water quality issues. Because of these differences, DEQ split the Middle Columbia-Hood Subbasin into three different geographic areas for TMDL development purposes. The TMDL presented in this document covers the Miles Creeks area (colored in black in the adjacent map). The three TMDL areas of the Middle Columbia-Hood Subbasin are:

- **Western Hood**. This is the most western portion of the Subbasin. A TMDL for temperature has already been completed for the Western Hood and was approved by EPA in January, 2002 (Oregon DEQ, 2001). Since that time, there have been new 303d listings for arsenic, beryllium, copper, chlorpyrifos, guthion, iron, manganese, pH, and zinc. These listings will be addressed at a later date when DEQ has available resources
- **Miles Creeks**. TMDLs for this area are covered in this document. The name “Miles Creeks” is used in this document because it is a locally recognized description of this area. This portion of the Subbasin covers streams discharging to the Columbia River from Rock Creek to the west and Fifteenmile Creek to the east. There are 303(d) listings for sedimentation and temperature in this Subbasin, as is discussed further below.
- **Tributaries between the Deschutes and John Day Rivers**. This third portion of the Middle Columbia-Hood Subbasin in Oregon covers tributaries to the Columbia River located between the Deschutes and John Day Rivers. The primary tributaries in this area are Fulton Canyon and Spanish Hollow. There are no 303(d) listings in this area so TMDLs do not need to be developed. It is expected that regional shade curves that are developed for either the Deschutes or John Day temperature TMDLs will cover this region if temperature impairments are identified at some point in the future.

The rest of this document will focus on TMDLs for the **Miles Creeks** portion of the Middle Columbia-Hood Subbasin, establishing water quality targets for streams in this area. In fulfilling Oregon's commitment to comply with State and Federal water quality laws, the State has determined current levels of pollutants and the degree to which these must be reduced to ensure compliance with water quality standards adopted to protect the beneficial uses of waters of the State. The pollutant reductions are the main component of the TMDL allocations. The data review and analysis contained in this document summarizes the varied information currently available for this Subbasin. Data from any source considered appropriate served as the basis of modeling and other analytical efforts resulting in the allocations in the TMDLs. These allocations will be used to directly set limits on point source discharges, and should become elements in other plans that address water quality protection and restoration (e.g., permits and implementation plans). A Water Quality Management Plan (WQMP) that describes existing regulations, programs, and plans is being submitted along with these TMDLs. Results in this document will be used as a benchmark of water quality, instream physical parameters and landscape conditions that currently exist. The results will also be used to assess future trends and the effectiveness of planned water quality improvement efforts.

TMDL development in the Miles Creeks area was guided by a local TMDL Technical Advisory Committee. This committee consisted of representation from the following interests: Oregon Departments of Forestry, Agriculture, Fish and Wildlife, Water Resources, and Transportation, Mt Hood National Forest, USDA Natural Resources Conservation Service, Wasco County Soil and Water Conservation District, Wasco County, Cities of The Dalles and Dufur, Fifteenmile Watershed Council, and the Lower Deschutes Local Advisory Committee for the Agricultural Water Quality Management Area Plan.

1.2 TOTAL MAXIMUM DAILY LOADS

1.2.1 What is a Total Maximum Daily Load?

The quality of Oregon's streams, lakes, estuaries and groundwater is monitored by the Oregon Department of Environmental Quality (DEQ) as well as other state, federal, and local organizations and groups. This information is used to determine whether water quality standards are being attained and, consequently, whether the beneficial uses of the waters are protected. Beneficial uses of waters in this Subbasin include fisheries, aquatic life, drinking water, recreation and irrigation. Section 303(d) of the Federal Clean Water Act requires the U.S Environmental Protection Agency (EPA), or delegated States such as Oregon, to set water quality standards that are protective of beneficial uses and to prepare a list of water bodies that do not meet these approved water quality standards. The resulting list (the "303(d) list") is a comprehensive catalog of all waterbodies in the state that fail to meet one or more water quality standards based on available data.

Waterbodies in the Middle Columbia-Hood (Miles Creeks) Subbasin have been listed as water quality limited for temperature and sedimentation (**Table 1-1**). The term *water quality limited* is applied to streams, lakes and estuaries where required treatment processes are being used, but violations of State water quality standards occur. With a few exceptions, such as in cases where violations are due solely to natural causes, the State must establish *a Total Maximum Daily Load* or *TMDL* for any waterbody designated as *water quality limited*. A TMDL defines the amount of a pollutant that can be present in a water body while meeting water quality standards. The total permissible pollutant load is allocated to point, nonpoint, background, and future sources of pollution, along with a margin of safety.

Wasteload Allocations are portions of the TMDL that are allotted to point sources of pollution, such as sewage treatment plants or industrial dischargers. The wasteload allocations are used to establish effluent limits in discharge permits. *Load Allocations* are portions of the TMDL that are attributed to either natural background sources or from nonpoint sources, such as urban, agriculture, transportation, or forestry activities. Allocations can also be set aside in reserve for future uses. The TMDL is the summation of all these developed wasteload and load allocations, along with a margin of safety.

Table 1-1. Waterbodies listed as "Water Quality Limited" on DEQ's 2004/2006 303(d) List.

Water Body	River Miles	Parameter	Season (Beneficial Use)	303(d) List Assessment Year
Eightmile Creek	*0 to 34.5*	Sedimentation	Undefined	1998
Fifteenmile Creek	*0 to 52.7*	Sedimentation	Undefined	1998
Fivemile Creek	*0 to 17.9*	Sedimentation	Undefined	1998
Ramsey Creek	*0 to 13.2*	Sedimentation	Undefined	1998
Chenoweth Creek	0 to 3.9	Temperature	October 15 - May 15 (Spawning)	2004
Chenoweth Creek	0 to 7.9	Temperature	Year Around (Rearing & migration)	2004
Dry Creek	0 to 16.6	Temperature	Year Around (Rearing & migration)	2004
Eightmile Creek	0 to 6	Temperature	January 1 - May 15 (Spawning)	2004
Eightmile Creek	6 to 8.2	Temperature	August 15 - May 15 (Spawning)	2004
Eightmile Creek	9.1 to 14.9	Temperature	August 15 - May 15 (Spawning)	2004
Eightmile Creek	17.1 to 21.9	Temperature	August 15 - May 15 (Spawning)	2004
Eightmile Creek	0 to 6	Temperature	Year Around (Rearing & migration)	2004
Eightmile Creek	6 to 34.6	Temperature	Year Around (Core cold water)	2004
Fifteenmile Creek	0.5 to 23.8	Temperature	January 1 - May 15 (Spawning)	2004
Fifteenmile Creek	23.8 to 26.3	Temperature	August 15 - May 15 (Spawning)	2004
Fifteenmile Creek	26.3 to 29.5	Temperature	August 15 - June 15 (Spawning)	2004
Fifteenmile Creek	29.5 to 31.2	Temperature	August 15 - May 15 (Spawning)	2004
Fifteenmile Creek	31.4 to 34.9	Temperature	August 15 - May 15 (Spawning)	2004
Fifteenmile Creek	34.9 to 36	Temperature	August 15 - June 15 (Spawning)	2004
Fifteenmile Creek	38.6 to 42.5	Temperature	August 15 - June 15 (Spawning)	2004
Fifteenmile Creek	0 to 23.8	Temperature	Year Around (Rearing & migration)	2004
Fifteenmile Creek	23.8 to 53.3	Temperature	Year Around (Core cold water)	2004
Fivemile Creek	0 to 18	Temperature	January 1 - May 15 (Spawning)	2004
Fivemile Creek	0 to 18	Temperature	Year Around (Rearing & migration)	2004
Mill Creek	0 to 7.7	Temperature	October 15 - May 15 (Spawning)	2004
Mill Creek	0 to 7.7	Temperature	Year Around (Rearing & migration)	2004
Mosier Creek	0 to 16.2	Temperature	Year Around (Rearing & migration)	2004
North Fork Mill Creek	0 to 3.8	Temperature	Year Around (Rearing & migration)	2004
Ramsey Creek	0 to 13.2	Temperature	January 1 - June 15 (Spawning)	2004
Ramsey Creek	0 to 13.2	Temperature	Year Around (Core cold water)	2004
Rock Creek	0 to 10.6	Temperature	Year Around (Rearing & migration)	2004
South Fork Mill Creek	0 to 10.6	Temperature	Year Around (Rearing & migration)	2004
Threemile Creek	0 to 14.7	Temperature	Year Around (Rearing & migration)	2004
West Fork Mosier Creek	0 to 7.9	Temperature	Year Around (Rearing & migration)	2002

Elements of a TMDL

DEQ must address the elements of a TMDL as described in OAR 340-042-0040 (4) (a – l) to meet the rule and receive approval from U.S. EPA. The elements are listed below:

- **Name and location** – describes the geographic area for which the TMDL is developed and includes maps as appropriate.
- **Pollutant identification** – identifies the pollutant(s) causing impairment to water quality being addressed by the TMDL.
- **Water quality standards and beneficial use identification** – identifies the relevant water quality standard and the most sensitive beneficial use(s) affected by the pollutant being addressed in the TMDL.

- **Loading capacity** – specifies the amount of a pollutant that a waterbody can receive and still meet water quality criteria.
- **Excess load** – evaluates, data allowing, the difference between the actual pollutant load in a waterbody and the loading capacity of the waterbody.
- **Sources or source categories** – identifies the pollutant sources and estimates, to the extent that data allow, the amount of actual pollutant loading from these sources.
- **Wasteload allocations** – determines the portions of the receiving water's loading capacity to be allocated to existing point sources of pollution.
- **Load allocations** – determines the portions of the receiving water's loading capacity to be allocated to existing non-point sources of pollution or to background sources.
- **Margin of safety** – accounts for uncertainty related to the TMDL and quantifies uncertainties associated with estimating pollutant loads, monitoring, and modeling water quality.
- **Seasonal variation** – accounts for temporal changes in critical conditions, stream flow, sensitive beneficial uses, pollutant loading and water quality parameters so that water quality criteria will be attained and maintained throughout the year.
- **Reserve capacity** – an allocation for increasing pollutant loads for future growth and new or expanded sources.
- **Water Quality Management Plan (WQMP)** – provides the framework of management strategies to attain and maintain water quality standards, working in conjunction with detailed plans and analyses provided in sector-specific or source-specific implementation plans.

The elements listed above are included in the Middle Columbia-Hood (Miles Creeks) Subbasin TMDL in **Chapters 3** and **4**, although the elements may not be presented in the order or by the specific heading described above. EPA has the responsibility under the Clean Water Act to approve or disapprove TMDLs that States submit. When a TMDL is officially submitted by a state to EPA, EPA has 30 days to take action on the TMDL. In the case where EPA disapproves a TMDL, EPA must establish the TMDL. EPA is not required to approve WQMPs developed for the TMDLs, however WQMPs are required by state rule (OAR 340-042-0040-(4)(l)).

1.2.2 TMDLs Addressed in this Report

This report contains a TMDL for ***temperature***. The stream segments addressed by this TMDL are summarized in **Table 1-2**. For each parameter, **Table 1-2** shows the number of listed miles and (number of listed segments). DEQ tracks completed TMDLs for reporting measures and the Middle Columbia-Hood (Miles Creeks) Subbasin TMDL represents the completion of 30 TMDLs. The Consent Decree between the US EPA and Northwest Environmental Defense Center, John R. Churchill, and Northwest Environmental Advocates (October 17, 2000) lists the cumulative number of TMDLs to be established through 2010. EPA reports the number of TMDLs completed to the plaintiff using a different counting method than DEQ. According to current EPA policy on counting TMDLs, this TMDL addresses 15 TMDLs.

Table 1-2. Middle Columbia-Hood (Miles Creeks) Subbasin streams on the 303(d) List addressed by 2008 TMDLs.

Parameter	River miles (# of listed segments)	Total
Temperature – Rearing & Migration	143.8 (12)	143.8 (12)
Temperature – Spawning		100.8 (15)
January 1 – May 15	47.3 (3)	
January 1 – June 15	13.2 (1)	
August 15 – May 15	20.5 (6)	
August 15 - June 15	8.2 (3)	
October 15 - May 15	11.6 (2)	
Temperature – Core Cold Water	71.3 (3)	71.3 (3)
Total Stream Miles with Listings*	215.10	
Total TMDLs (DEQ Method)		30

*Streams with more than one listing were counted only once in the total stream miles.

1.2.3 Parameters Not Being Addressed by a TMDL in this Report

TMDLs have not been developed to address the ***sedimentation*** listings on Eightmile Creek, Fivemile Creek, Fifteenmile Creek and Ramsey Creek. These listings were based on the assessment of desired conditions provided by the Mt. Hood National Forest in their Mile Creeks Watershed Analysis (USFS, 1994). The Analysis described desired sediment substrate conditions of <20% surface fines (6 mm weighted average in pool tail crests and riffles). The majority of sites monitored for the Analysis did not meet this desired condition.

DEQ is reviewing the sedimentation criteria assessment methodology for determination of water quality impairment. Currently, sedimentation lacks quantitative listing criteria. The TMDLs for the sedimentation listings will be developed at a future date once criteria are selected and TMDL approach determined. In the meantime, there is much restoration work that is already taking place in the Subbasin that will reduce sources of sediment to streams. For instance, a significant portion of local dryland wheat farming has already been converted to no-till operations, which greatly reduces the likelihood for field erosion. Improvements have also been made in riparian condition and bank stability, which should greatly reduce stream bank erosion. The improvement in riparian conditions will be addressed through implementation of the temperature TMDLs included in this document.

1.3 TMDL IMPLEMENTATION

1.3.1 Water Quality Management Plans (WQMPs)

A Water Quality Management Plan (WQMP) is developed by DEQ as a broad strategy for implementing TMDL allocations. TMDLs, WQMPs and associated planning work together to protect designated beneficial uses, such as aquatic life, drinking water supplies, and water contact recreation.

DEQ will submit a WQMP to EPA concurrently with submission of TMDLs even though EPA has no approval authority for the WQMP. Both the TMDLs and their associated WQMP will be submitted by DEQ to EPA as updates to the State's Water Quality Management Plan pursuant to 40 CFR 130.6. Such submissions will be a continuing update of the Continuing Planning Process (CPP).

Implementation of TMDLs is critical to the attainment of water quality standards. The support of Designated Management Agencies (DMAs) in implementing TMDLs is essential. In instances where DEQ has no direct authority for implementation, DEQ works with DMAs to ensure attainment of water quality standards. The DMAs in the Middle Columbia-Hood (Miles Creeks) Subbasin include: DEQ, U.S. Forest Service (USFS), Bureau of Land Management (BLM), Oregon Departments of Agriculture (ODA), Forestry (ODF), Transportation (ODOT), and State Lands (DSL), Wasco County, Hood River County, Northern Wasco County Parks and Recreation District, and the cities of The Dalles, Dufur, and Mosier. These agencies have developed or will be developing implementation plans for Department approval, and/or are operating under NPDES permits. Implementation Plans must be submitted to the DEQ no later than 18 months following issuance of this TMDL as a DEQ Order.

The required elements of WQMPs are defined in OAR 340-42 and are outlined below. The WQMP is included as **Chapter 4** in this report.

WQMP Elements

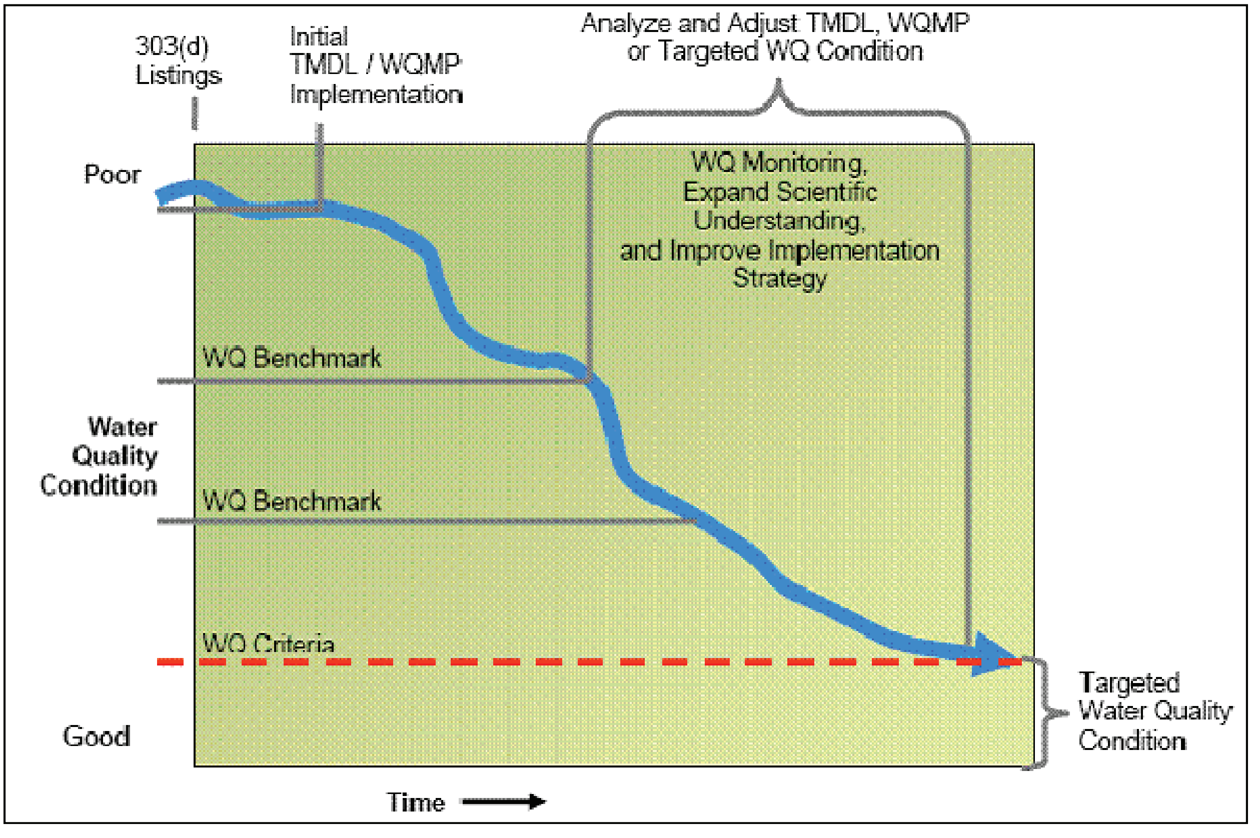
A. Condition assessment and problem description
B. Goals and objectives
C. Proposed management strategies
D. Timeline for implementing management strategies
E. Relationship of management strategies to attainment of water quality standards

F. Timeline for attainment of water quality standards
G. Identification of responsible participants or DMAs
H. Identification of sector-specific implementation plans
I. Schedule for preparation and submission of implementation plans
J. Reasonable assurance
K. Monitoring and evaluation
L. Public involvement
M. Planned efforts to maintain management strategies over time
N. Costs and funding
O. Citation to legal authorities

1.3.2 Adaptive Management

SInce the relationship between management actions and pollutant load reductions is often not precisely quantifiable. DEQ applies an *adaptive management* policy to implement TMDLs. Adaptive management can be defined as a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. **Figure 1-1** is a graphical representation of this adaptive management concept. The role of adaptive management in TMDL Implementation is described further in **Chapter 4**.

Figure 1-1. Adaptive Management - schematic diagram.



1.4 REFERENCES

Oregon Department of Environmental Quality. 2001. Western Hood Subbasin TMDL. http://www.deq.state.or.us/wq/TMDLs/docs/hoodbasin/tmdl.pdf

Oregon Department of Environmental Quality. 2007. Oregon's 2004/2006 Integrated Report. http://www.deq.state.or.us/wq/assessment/rpt0406/search.asp.

U.S. Forest Service. 1994. Watershed Analysis: Mile Creeks Watershed, Mt. Hood National Forest. 143 pp.

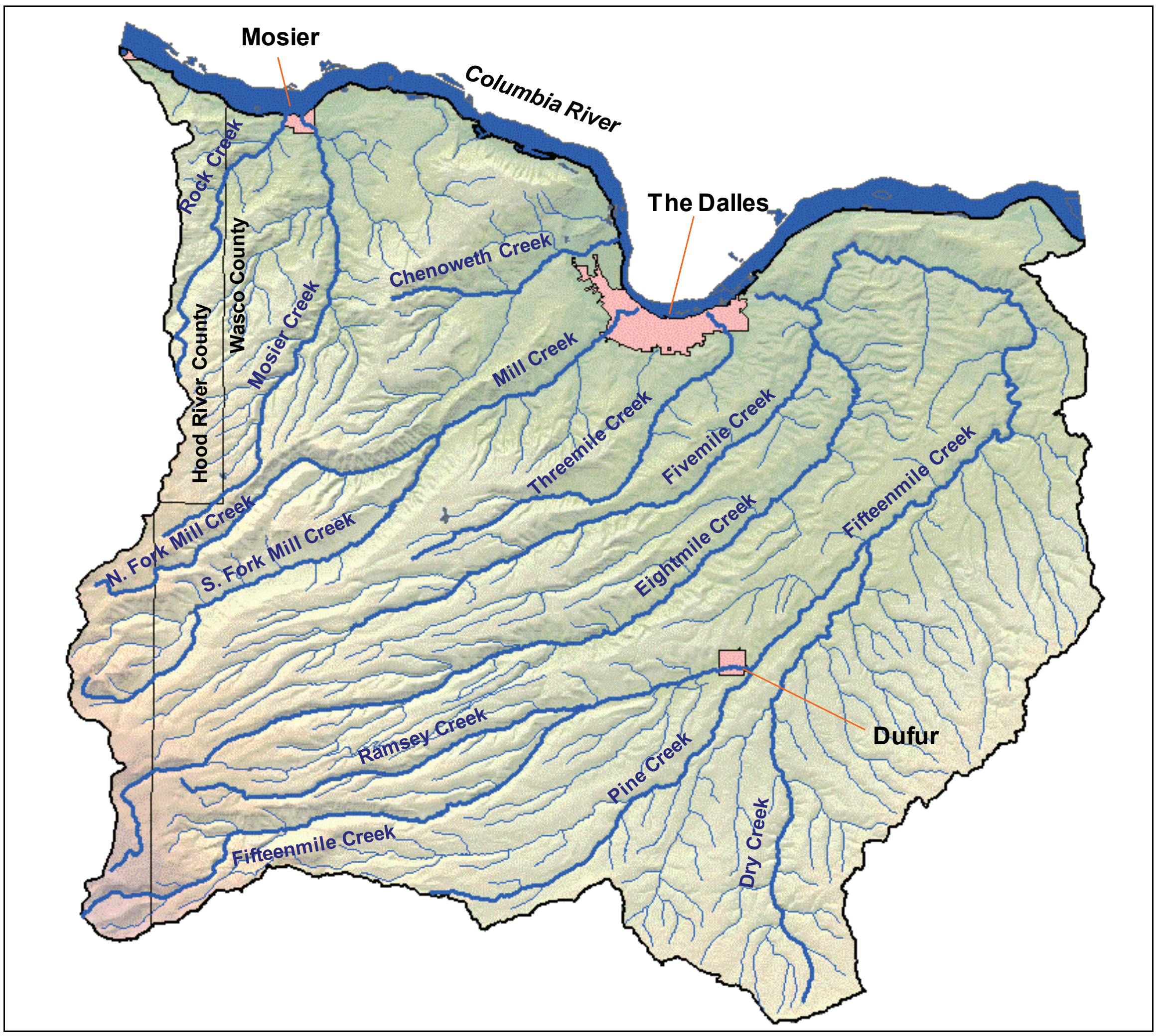
CHAPTER 2: DESCRIPTION OF THE SUBBASIN

2.1 OVERVIEW

The Middle Columbia-Hood (Miles Creeks) Subbasin encompasses an area of approximately 587 square miles located primarily in Wasco County, although the western edge of the Subbasin is in Hood River County. This area falls within the fifth field HUCs 1707010502, 1707010503, 1707010504, 1707010505, and 1707010512 (REO, 2002). The Miles Creeks area consists of several distinct watersheds draining to the Columbia River, all of which originate on the east slopes of the Hood River Range (a north-south mountain range which includes Lookout Mountain, Surveyor's Ridge and Fir Mountain). These watersheds are the Fifteenmile Creek, Threemile Creek, Mill Creek, Chenoweth Creek, Mosier Creek and Rock Creek Watersheds. Fifteenmile Creek originates within the Mount Hood National Forest near Lookout Mountain (6,525 feet) and flows to the northeast and then west before entering the Columbia River at an elevation of 78 feet above sea level. Mill Creek originates north of Fivemile Creek at an elevation of 4,900 feet. Mosier Creek originates north of Mill Creek at an elevation of 3,400 feet and Rock Creek originates at an elevation of 3,000 feet. Threemile Creek and Chenoweth Creek both originate at approximately 2,600 feet in elevation.

The three major population centers located in the Subbasin are the cities of The Dalles, Dufur and Mosier. **Figure 2-1** shows the physiographic features and cities, including the principal water bodies relevant to this document.

Figure 2-1. Major streams and cities of the Miles Creeks portion of the Middle Columbia-Hood Subbasin.



2.2 NATURAL FEATURES[1]

The geology of the Miles Creeks area 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 elevation declines 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 land surface around Mosier Valley and The Dalles fold downward (synclines), whereas Sevenmile Hill and Hood River Mountain (west of Mosier) fold upward (anticlines). The Rock Creek Watershed is an active fault line splitting the Hood River Mountain Anticline.

The Subbasin is further classified by the U.S. EPA into five different Level IV Ecoregions (Thorson, et.al., 2003). The descriptions below are taken from the general Ecoregion descriptions (Thorson et at., 2003) and from the Fifteenmile Subbasin Assessment (Wasco SWCD, 2004). The ecoregion boundaries were further modified by the TMDL Technical Advisory Committee based on local knowledge of the area. These modifications are described in further detail in **Appendix A**. The Level IV Ecoregions within the Miles Creeks portion of the Middle Columbia-Hood Subbasin are:

Cascade Crest Montane Forest. This ecoregion occurs in the highest elevation area in the southwest corner of the Subbasin. This area has glaciated geology and consists of an undulating plateau punctuated by volcanic buttes and cones. The ecoregion is extensively forested with mountain hemlock and Pacific silver fir.

Grand Fir Mixed Forest. This ecoregion is mostly outside of the limit of maritime climatic influence and is also located primarily in the southwest corner of the Subbasin at slightly lower elevations than the Cascade Crest Montane Forest. It is characterized by high, glaciated plateaus and mountains, and canyons containing high gradient streams and rivers. The primary vegetation is a mix of grand fir, Douglas-fir and ponderosa pine.

Oak/Conifer Eastern Cascades Foothills. The soil, climate and landforms in this ecoregion are highly variable and contribute to a mosaic of vegetation types. 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 dominates most of the western half of the Subbasin.

Umatilla Plateau and **Pleistocene Lake Basins**. The eastern portion of the Subbasin is part of the Columbia Plateau (Level III Ecoregion). This ecoregion is characterized by nearly level to rolling plateaus or lake plains. Many streams are characterized as ephemeral. Vegetation is characterized by bunchgrass prairie with mixed hardwood trees in the riparian zones.

2.3 CLIMATE[1]

The climate in the Miles Creeks portion of the Middle Columbia-Hood 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 Cascade Mountains produce a rain-shadow effect, drastically reducing the total precipitation in the eastern end of the Subbasin. According to the Natural Resource Conservation Service (NRCS) Water

1 Significant portions of the text in this section were taken from the Fifteenmile Subbasin Assessment (Wasco SWCD, 2004).

and Climate Center, average annual precipitation varies from 65-80 inches in the higher elevation headwaters in the west to 11 inches on the eastern border of the Subbasin (NRCS, 1998). The majority of the precipitation is generally brought by winter storms blowing east from the Pacific Ocean. The Hood River Range, 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. Winter snowpack is mostly confined to elevations above approximately 4,000 feet. Only 5-10% of the precipitation falls from June through August. At lower elevations, the tributaries are usually ephemeral because of both the seasonality of moisture and the low total precipitation.

In the review of Ecoregion boundaries mentioned above, the TMDL Technical Advisory Committee also evaluated the NRCS precipitation data. The Committee believed that the map fairly represented rainfall in the majority of the Subbasin (areas with less than 30 inches of average rainfall). However, based on local experience, they believed that precipitation was over-estimated at higher elevations, with the upper headwater elevations receiving only 30-40 inches rather than 60-80 inches. **Figure 2-2** illustrates both the NRCS and local modifications of annual precipitation in the Subbasin. The figure also shows sites where precipitation had been measured in rain gauges. The majority of these sites are located on farm properties and have been monitored for varying time periods in cooperation with the Wasco County Extension Service (http://extension.oregonstate.edu/wasco/Rainfall/Rainfall.php).

Charts of annual precipitation and temperature for the two active COOP weather stations in the Subbasin are shown in **Figure 2-3** for the period 1971-2000. This data comes from the Western Regional Climate Center (http://*www.wrcc.dri.edu/*). Monthly climate summaries for the same three sites are shown in **Table 2-1** for the period of record for each site.

Figure 2-2. Average annual precipitation.

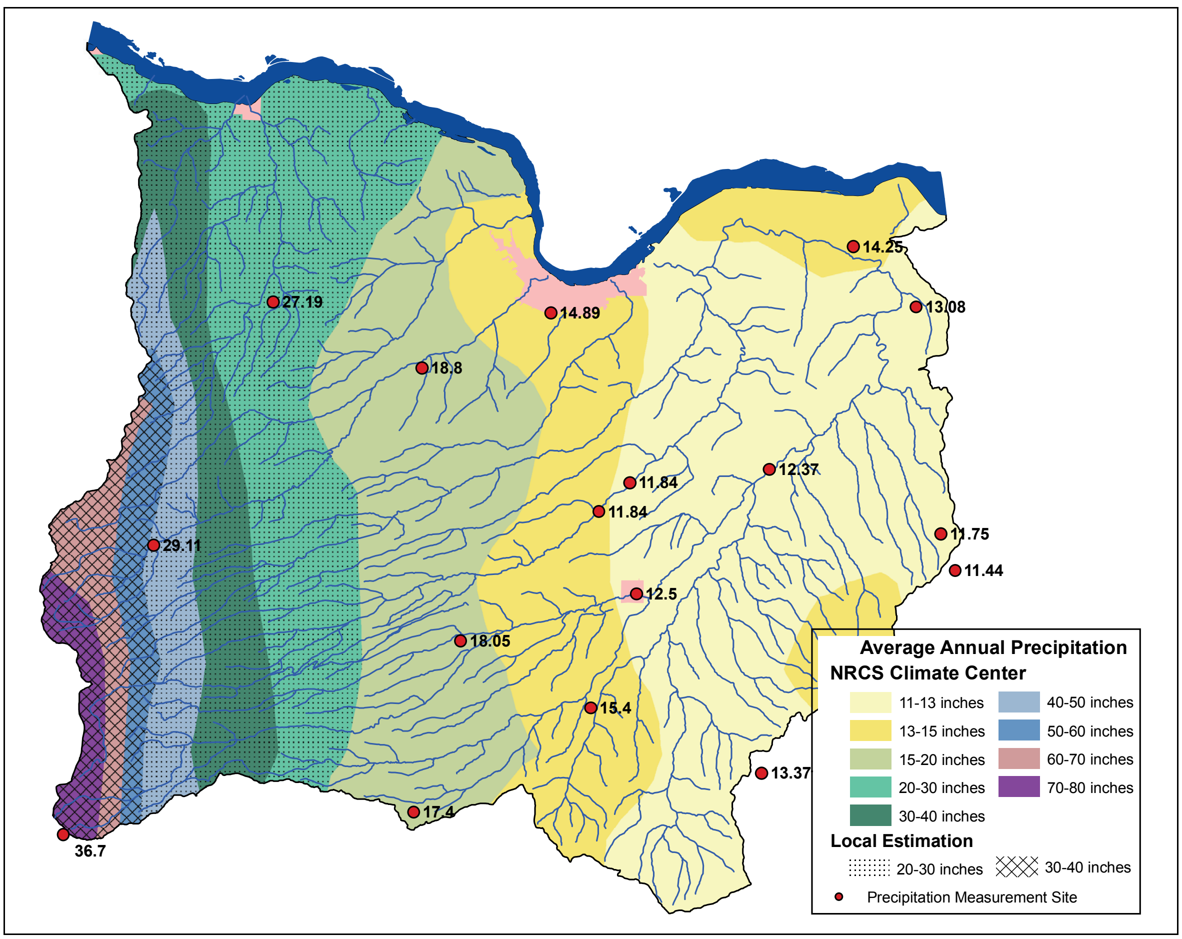


Figure 2-3. 1971-2000 average air temperature and precipitation at The Dalles (top) and at Dufur (below) (Western Regional Climate Center).

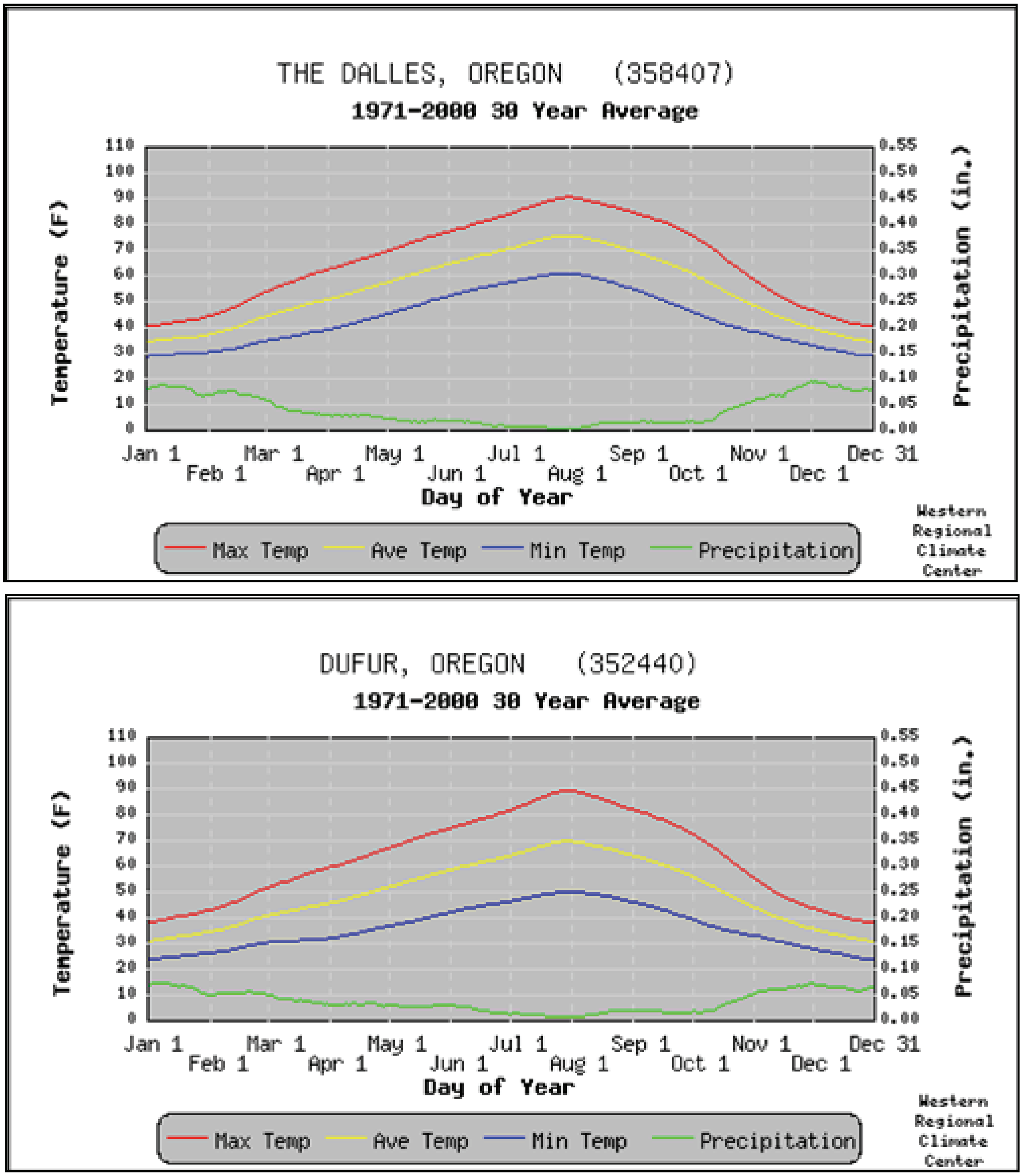


Table 2-1. Monthly climate summaries for the period of record (Western Regional Climate Center).

The Dalles
(COOP ID #358407)

Period of Record : 7/ 1/1948 to 4/30/2007

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	42.2	48.9	57.5	65.6	73.5	80.4	87.9	87.7	81.5	68	52	43.5	65.7
Average Min. Temperature (F)	29.3	32	36.3	41.7	48.6	55.1	59.6	58.8	51.3	42.3	35.9	31.4	43.5
Average Total Precipitation (in.)	2.64	1.85	1.33	0.74	0.59	0.44	0.14	0.32	0.44	1.05	2.19	2.64	14.39
Average Total SnowFall (in.)	8.2	2	0.9	0	0	0	0	0	0	0	1.2	2.9	15.1
Average Snow Depth (in.)	1	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.

Max. Temp.: 83.1% Min. Temp.: 83.1% Precipitation: 83.1% Snowfall: 82.6% Snow Depth: 79.8%

Dufur
(COOP ID #352440)

Period of Record : 7/18/1904 to 4/30/2007

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	39.7	46.7	55.3	63	71.5	78.2	86.6	85.8	78.3	64.8	49	41.1	63.3
Average Min. Temperature (F)	23.9	27.4	31.2	34.6	40	45.1	48.9	48.5	43.7	36.4	30.3	26.6	36.4
Average Total Precipitation (in.)	2.02	1.29	1.15	0.81	0.82	0.69	0.23	0.31	0.46	0.91	1.66	2.07	12.42
Average Total SnowFall (in.)	9.5	3.5	1	0	0	0	0	0	0	0.1	2.1	6.4	22.6
Average Snow Depth (in.)	2	1	0	0	0	0	0	0	0	0	0	1	0

Percent of possible observations for period of record.

Max. Temp.: 74.4% Min. Temp.: 74.4% Precipitation: 74.3% Snowfall: 74.3% Snow Depth: 74.3%

2.4 HUMAN POPULATION

The population of Wasco County has been gradually increasing over recent decades, with the city of Mosier showing the greatest increase in population (**Table 2-2**). The county statistics in **Table 2-2** represent the population in the entire county, not just the Miles Creeks watersheds. Population estimates come from the Population Research Center, Portland State University. Population statistics indicate that in 2006, approximately 57% of Wasco County residents lived in cities and 43% lived in the generally rural remainder of the county. The average population density of Wasco County is 12 people per square mile (Wasco SWCD, 2004).

Table 2-2. Population in Wasco County from 1990 through 2006.

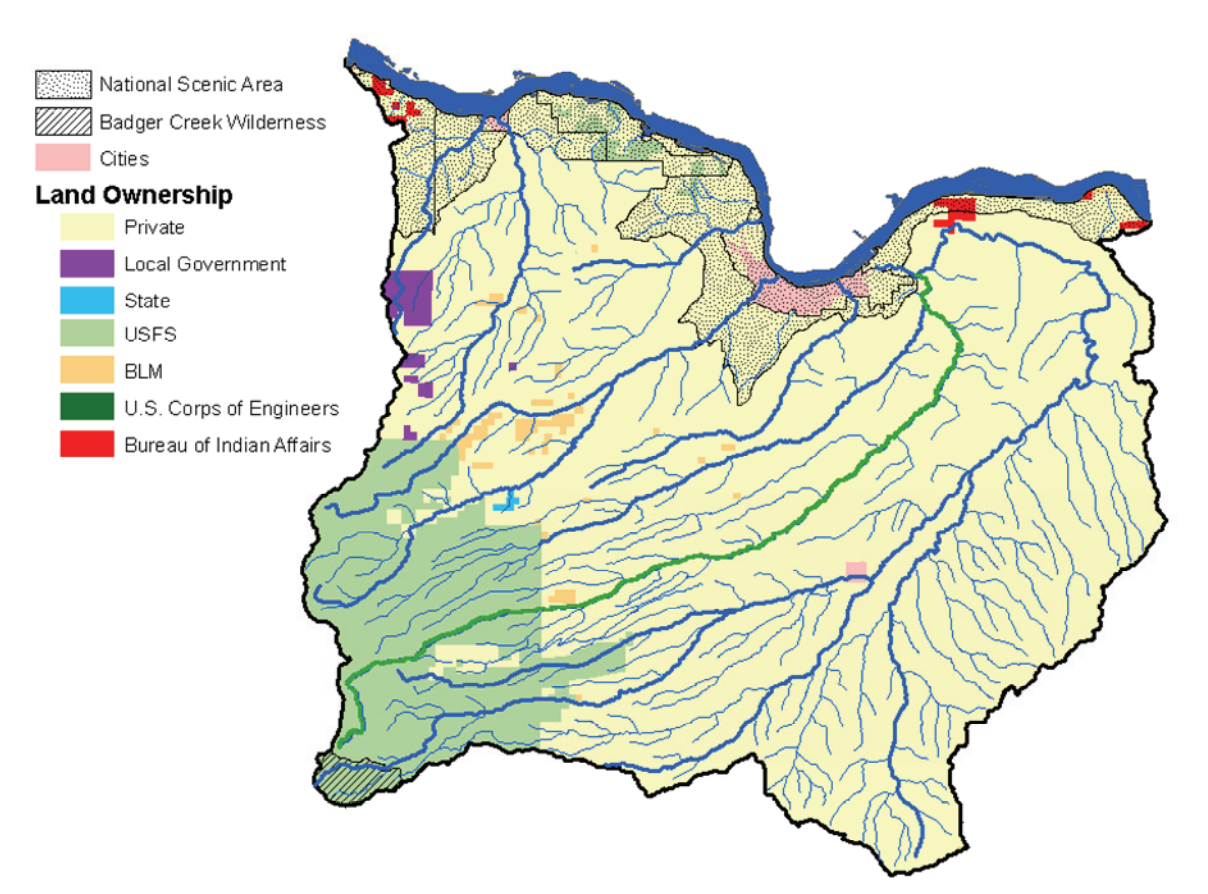
City/County	Percent Change*	Year		
		2006	2000	1990
Wasco County	+1.2%	24,070	23,791	21,683
The Dalles	+3.9%	12,625	12,156	11,021
Dufur	+7.1%	630	586	527
Mosier	+12.2%	460	410	244

*Percent change from 2001 census to 2006.

2.4.1 Land Ownership and Land Use[2]

The majority of the land (84%) in the Subbasin is privately owned (**Figure 2-4**). This includes approximately 20,000 acres (5%) owned by private timber companies and the Nature Conservancy. Approximately 15% of the land is owned and managed by the Federal Government – 14.6% (35,000 acres) by the Mt. Hood National Forest and 0.8% (2,770 acres) by the Bureau of Land Management. A small portion of the Subbasin (0.1%) is tribally owned.

Figure 2-4. Land ownership (Bureau of Land Management, 2008).

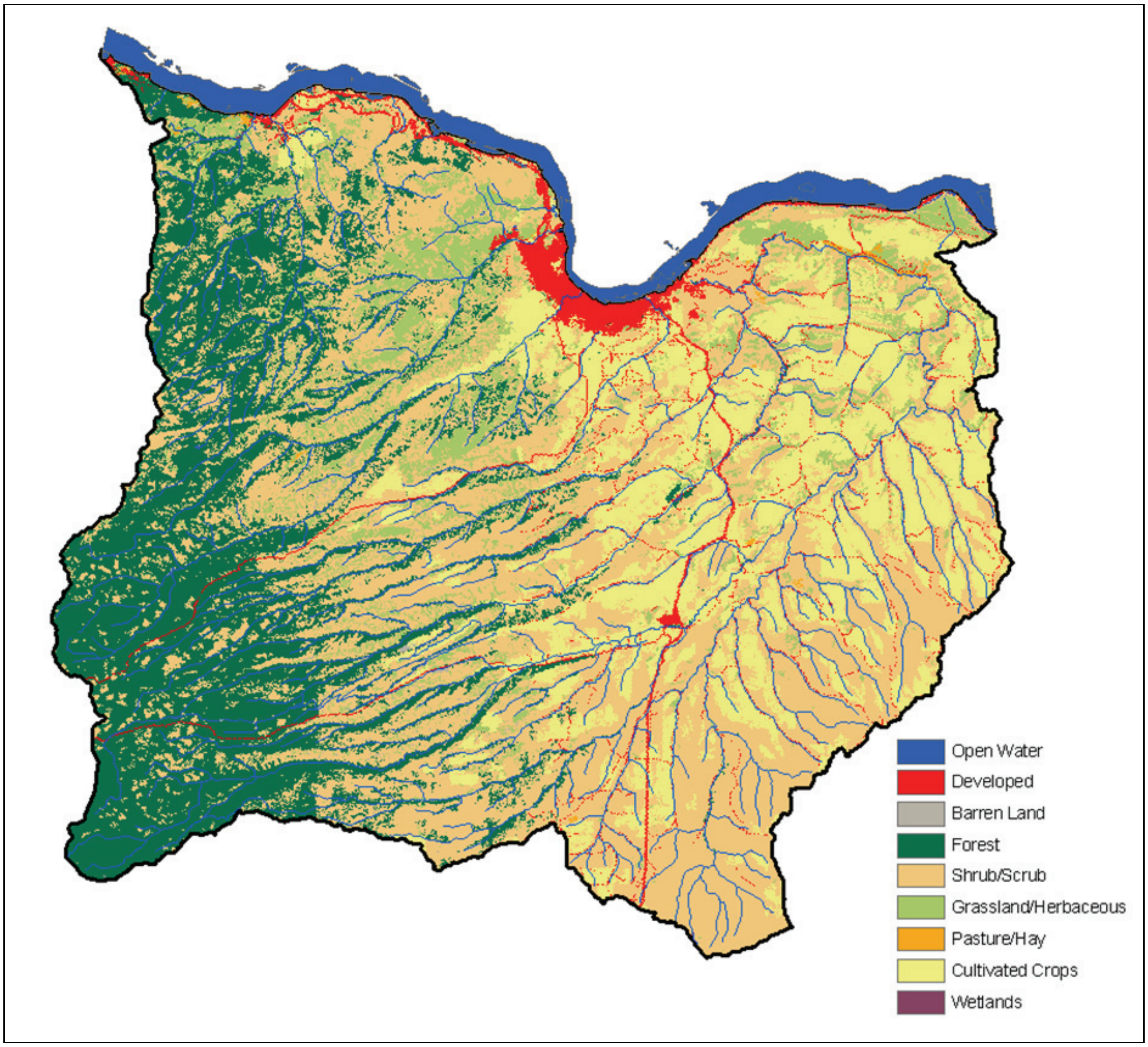


The eastern two-thirds of the Subbasin is dominated by agricultural/rangeland land uses (**Figure 2-5**), most of which is in private ownership. Of the cropland, less than 15,000 acres (approximately 4% of the Subbasin) is irrigated. The irrigated cropland consists mostly of orchards, vineyards, pasture and hay, with some irrigated wheat and other crops. The non-irrigated cropland is almost exclusively in wheat or other grain production.

Much of the western third of the Subbasin (approximately 38%), including the Mount Hood National Forest, supports commercial forestry. Outdoor recreation and tourism is concentrated on the National Forest and in the Columbia River Gorge. Urban areas constitute about 1.5% (5,500 acres) and another 2.5% (9,700 acres) is zoned for rural residential development.

2 Some of the information and text in this section was taken from the Fifteenmile Subbasin Assessment (Wasco SWCD, 2004).

Figure 2-5. Land cover (Homer et.al., 2004)).



2.4.2 Confederated Tribes of the Warm Springs Reservation of Oregon

The entire Miles Creeks portion of the Middle Columbia-Hood 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 (CTWSRO) are the legal successors to the Indian signatories to the treaty. The treaty reserved to the Tribes an exclusive right to fish within Indian reservation boundaries and the right to fish in common with citizens of the USA at all other usual and accustomed places, including ceded lands. Ceremonial, commercial and subsistence fishing remains an essential part of tribal culture and economy. Treaty fishing opportunities have become limited because of low abundance and the need to protect weak or threatened stocks. Tribal and non-tribal fishing is regulated or co-managed by CTWSRO and the Oregon Department of Fish and Wildlife (ODFW). The tribal co-management authority is derived from the 1855 Treaty and subsequent court rulings. As co-managers of surrounding watersheds, the CTWSRO is actively involved in habitat protection, restoration, fisheries enforcement, enhancement and research activities. The CTWSRO was invited to participate on the TMDL Technical Advisory Committee.

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CHAPTER 3: STREAM TEMPERATURE TMDL

3.1 OVERVIEW

Human activities and aquatic species that are to be protected by water quality standards are deemed beneficial uses. Water quality standards are developed to protect the most sensitive beneficial use within a waterbody of the State. **The stream temperature standard applied to this Subbasin is designed to protect cold water fish (salmonids) rearing and spawning as the most sensitive beneficial use**.

Oregon's stream temperature standard includes both numeric and narrative limits or criteria. Numeric criteria are based on temperatures that protect various salmonid life stages. Narrative criteria specify conditions that deserve special attention, such as protection of cold waters. Oregon's temperature standard also includes a natural conditions criterion where the Department determines that temperature criteria may not be met under natural conditions at a particular site. When this determination is made, a "natural thermal potential" temperature becomes the new criterion.

When stream temperature data demonstrate non-attainment of a criterion, the waterbody is designated water quality limited and placed on the 303(d) list. Total Maximum Daily Loads (TMDLs) must then be completed for the 303(d) listed waterbodies. This temperature TMDL applies to all perennial and intermittent streams within the Middle Columbia-Hood (Miles Creeks) Subbasin.

3.1.1 Summary of Stream Temperature TMDL Approach

Stream temperature TMDLs are generally scaled to a subbasin or basin and include all perennial and intermittent surface waters with either salmonid presence or that contribute to areas with salmonid presence. Since stream temperature results from cumulative interactions between upstream and local sources, the TMDL considers all surface waters that affect the temperatures of 303(d) listed waterbodies. Since all of the major tributaries to the Columbia River within the Miles Creeks area are water quality limited for temperature, the TMDL analysis applies to these streams and all of their tributaries. The TMDL targets apply throughout the entire stream network in the Subbasin. This broad approach is necessary to address the cumulative nature of stream temperature dynamics.

An important step in the TMDL is to perform a source assessment which quantifies the natural and anthropogenic contributions to stream heating. One anthropogenic contribution to solar radiation heat loading results from decreased stream surface shade. Decreased stream shade may be caused by near stream vegetation disturbance/removal and channel morphology changes. Other anthropogenic sources of stream warming may include stream flow reductions and warm water point source effluent discharges.

Heat is the identified pollutant. Anthropogenic nonpoint and point sources are not permitted to heat a waterbody more than 0.3°C above the applicable criteria, cumulatively at the point of maximum impact. This permitted amount of heating is called the Human Use Allowance (OAR 340-041-0028 12(b)). Allocated conditions are expressed as daily solar heat load and solar heat flux (megawatts, and watts per square meter, respectively). Nonpoint source heat allocations are translated into effective shade surrogate measures. Effective shade surrogate measures provide site-specific targets for land managers. Attainment of the surrogate measures ensures compliance with the nonpoint source allocations. Point source waste load allocations are based on the applicable numeric and/or narrative criteria. For the streams addressed in this TMDL, point sources on a given waterbody are not allowed to increase stream temperatures more than 0.2°C (a portion of the 0.3°C human use allowance) cumulatively at the point of maximum impact.

Table 3-1 summarizes the components of this TMDL. **Appendix A** describes the stream temperature analysis used to develop this TMDL in greater detail than is provided in this Chapter. The purpose of the stream temperature analysis used in this TMDL was to: (1) determine temperatures for various scenarios including natural thermal potential, (2) assess heat loading for the purpose of TMDL allocation, (3) compute readily measurable surrogates for the allocations, and (4) to better understand heat controls at the local and subbasin scale. Heat Source, version 7.0 (Boyd and Kasper, 2003) was the model used for TMDL development in this TMDL.

Table 3-1. Middle Columbia-Hood (Miles Creeks) Subbasin Temperature TMDL components.

Waterbodies **OAR 340-042-0040(4)(a)**	Perennial and intermittent streams (as identified in OAR 340-041-160, Figures 160A & 160B) in the Miles Creeks area of the Middle Columbia-Hood Subbasin, including fifth field HUCs 1707010502, 1707010503, 1707010504, 1707010505, and 1707010512 (REO, 2002).
Pollutant Identification **OAR 340-042-0040(4)(b)**	*Pollutants:* Human caused temperature increases from (1) solar radiation loading, (2) warm water discharge to surface waters and (3) flow modifications that affect natural thermal regimes.
Beneficial Uses **OAR 340-042-0040(4)(c)** **OAR 340-041-060, Table 160A**	Fish and aquatic life are the most sensitive beneficial uses in the Middle Columbia-Hood Subbasin.
Target Identification (Applicable Water Quality Standards) **OAR 340-042-0040(4)(c)** **OAR 340-041-0028(4)(a)** **OAR 340-041-0028(4)(b)** **OAR 340-041-0028(4)(c)** ***CWA §303(d)(1)***	OAR 340-041-0028 provides numeric and narrative temperature criteria. Maps and tables provided in OAR 340-041-160A and B specify where and when the criteria apply. Biologically based numeric criteria applicable to the Miles Creeks area, as measured using the seven-day average maximum stream temperature, include: 13.0°C during times and at locations of salmon and steelhead spawning. 16.0°C during times and at locations of core cold water habitat identification. 18.0°C during times and at locations of salmon and trout rearing and migration.
Seasonal Variation **OAR 340-042-0040(4)(j)** ***CWA §303(d)(1)***	Peak temperatures typically occur in July and August. Rearing/Migration and Core Cold Water Habitat temperature criteria can be exceeded from approximately May-September, depending on location along the stream.
Existing Sources **OAR 340-042-0040(4)(f)** ***CWA §303(d)(1)***	Nonpoint sources include excessive inputs of solar radiation because of streamside vegetation removal or reduction, anthropogenic channel degradation, and flow modifications. Point sources include municipal and industrial facilities that discharge warm water to receiving streams.
TMDL **Loading Capacity and Allocations** **OAR 340-042-0040(4)(d)** **OAR 340-042-0040(4)(e)** **OAR 340-042-0040(4)(g)** **OAR 340-042-0040(4)(h)** **OAR 340-042-0040(4)(k)** ***40 CFR 130.2(f)*** ***40 CFR 130.2(g)*** ***40 CFR 130.2(h)***	*Loading Capacity:* OAR 340-041-0028 (12)(b)(B) states all anthropogenic sources of heat may cumulatively increase stream temperature no more than 0.3°C (0.5°F) above the applicable criteria at the point of maximum impact. 0.3°C is considered an insignificant temperature increase and defined as the Human Use Allowance (HUA). Loading capacity for Fifteenmile Creek is the heat load that corresponds to the Natural Conditions Criteria plus the small increase in temperature of 0.3°C provided with the human use allowance. *Excess Load*: The difference between the current pollutant load and the loading capacity of the waterbody when the applicable temperature criteria are met is the excess heat load. *Wasteload Allocations (NPDES Point Sources)*: Waste load allocations are based on allowing no greater than a 0.2°C (portion of the human use allowance) increase in stream temperature above the applicable temperature criteria at the point of maximum impact. *Load Allocations (Nonpoint Sources)*: Natural background heat loads from solar radiation associated with system potential near-stream vegetation are the targeted load allocation. A portion (0.05°C) of the human use allowance has been allocated to nonpoint source activities to address anthropogenic heat loads in excess of background rates. This human use allowance is for anthropogenic heat loads in landscapes that are not likely to achieve a natural condition. *Reserve Capacity*: A portion (0.05°C) of the human use allowance is allocated to reserve capacity for future growth and new or expanded sources.
Surrogate Measures **OAR 340-042-0040(5)(b)** ***40 CFR 130.2(i)***	*Surrogate measures* are used throughout the temperature TMDL. Effective shade targets translate nonpoint source solar radiation loads into measurable riparian vegetation targets
Margins of Safety **OAR 340-042-0040(4)(i)** ***CWA §303(d)(1)***	*Margins of Safety* are demonstrated in critical condition assumptions for point source load calculations and are inherent in the methodology for determining nonpoint source loads.
Standards Attainment & Reasonable Assurance **OAR 340-042-0040(4)(l)(e) & (j)**	Analytical modeling of TMDL loading capacities (stream temperature modeling) demonstrates attainment of water quality standards. Reasonable Assurance is addressed in the Water Quality Management Plan (WQMP).
Water Quality Management Plan **OAR 340-042-0040(4)(l)** ***CWA §303(d)(1)***	The Water Quality Management Plan (WQMP) provides the framework of management strategies to attain and maintain water quality standards. The WQMP is designed to work in conjunction with detailed plans and analyses provided in sector-specific or source-specific implementation plans.

3.2 WATERBODIES

This temperature TMDL applies to all perennial and intermittent streams within the Miles Creeks portion of the Middle Columbia-Hood Subbasin, as identified in Figures 160A and 160B in OAR 340-041-160. These figures are adapted to the specific geographic region of the Miles Creeks area and are discussed in **Section 3.5**.

3.3 POLLUTANT IDENTIFICATION

Development of stream temperature TMDLs requires an understanding of the natural and human processes that contribute to stream warming. Temperature is the water quality parameter of concern, but heat, in particular heat from human activities or anthropogenic sources is the pollutant of concern in this TMDL. Specifically, water temperature change is an expression of heat energy exchange per unit volume:

$$\Delta Temperature \propto \frac{\Delta Heat \quad Energy}{Volume}$$

Stream temperature is influenced by natural factors such as climate, geomorphology, hydrology, and vegetation. Human or anthropogenic heat sources may include discharges of heated water to surface waters, increases in sunlight reaching the water's surface due to the removal of streamside vegetation and reductions in stream shading, changes to stream channel form, and reductions in natural stream flows and the reduction of cold water inputs from groundwater (see **Appendix A** for a more thorough discussion of stream heating processes). The pollutant targeted in this TMDL is heat from the following sources: (1) human-caused solar radiation loading increases to the stream network, as a result of alterations in near stream vegetation, channel morphology, and flow modifications; and (2) warm water of human origin, such as industrial outfalls and waste water treatment plants.

3.4 BENEFICIAL USE IDENTIFICATION

Water quality standards include designation of beneficial uses, numeric and narrative criteria for individual parameters to protect those uses, and antidegradation policies to protect overall water quality. Beneficial uses and the associated water quality criteria are generally determined by Basin and are applicable throughout the Basin (**Table 3-2**). In practice, water quality standards have been set at a level to protect the most sensitive beneficial uses and seasonal standards may be applied for uses that do not occur year-round.

Salmon and trout (salmonids) and other cold water species that inhabit most streams in the Miles Creeks area (part of the Hood Basin as identified in OAR 340-041) are considered the beneficial uses most sensitive to stream temperature. Biologically-based numeric criteria were developed that are specific to salmonid life stages such as spawning and rearing. Criteria were also developed for critical habitat areas that serve as the core for salmonid protection and restoration efforts. The complete Oregon temperature rule (OAR 340-041-0028) can be accessed at http://www.deq.state.or.us and is described further in **Section 3.5.1** below.

Table 3-2. Designated Beneficial Uses in the Hood Basin[1] (OAR 340-041-060, Table 160A).

Beneficial Uses	Hood River Basin Streams	Temperature Sensitive Beneficial Use
Public Domestic Water Supply[2]	X	
Private Domestic Water Supply[2]	X	
Industrial Water Supply	X	
Irrigation	X	
Livestock Watering	X	
Fish & Aquatic Life[3]	X	X
Wildlife & Hunting	X	
Fishing	X	
Boating	X	
Water Contact Recreation	X	
Aesthetic Quality	X	
Hydro Power	X	
Commercial Navigation & Transportation		

[1]The Hood Basin referred to in this OAR is the same geographic area as the Middle Columbia-Hood Subbasin.
[2]With adequate pretreatment (filtration & disinfection) and natural quality to meet drinking water standards.
[3]See also Figures 160A and 160B in OAR 340-041-160 for fish use designations for this basin. These figures are adapted to the specific geographic region of the Miles Creeks area and are provided in **Section 3.5**.

3.4.1 Salmonid Thermal Requirements

Oregon's water temperature standard employs a logic that relies on using sensitive species as indicators of water quality impairment. If temperatures are protective of these *indicator species*, other less sensitive species will share in protection as well. Cold water aquatic organisms, such as salmon and trout and some amphibians are very sensitive to temperature, and are used as indicators of temperature impairments. Numeric temperature criteria have been adopted in the temperature standard to protect specific life stages of salmon and trout.

If stream temperatures become too hot, fish may die almost instantaneously due to denaturing of critical enzyme systems in their bodies (Hogan, 1970). The *instantaneous lethal limit* occurs in high temperature ranges (upper-90^{o}F) that are rare or unknown in the Middle Columbia-Hood Subbasin.

More common and widespread within the Miles Creeks area are summertime stream temperatures in the 70^{o}F to 80°F range (mid- to high-20^{o}C range). These temperatures can cause death of cold-water fish species during exposure times lasting as little as a few hours. The exact temperature at which a cold water fish succumbs to such a thermal stress depends on the temperature that the fish is acclimated, as well as particular development life-stages. This cause of mortality, termed the *incipient lethal limit*, results from breakdown of physiological regulation of vital processes such as respiration and circulation (Heath and Hughes, 1973).

The most common and widespread cause of thermally induced fish mortality is attributed to interactive effects of decreased or lack of metabolic energy for feeding, growth or reproductive behavior, increased exposure and susceptibility to pathogens (viruses, bacteria and fungus), decreased food supply (impaired macroinvertebrate populations) and increased competition from warm-water-tolerant species. This mode of thermally induced mortality, termed indirect or *sub-lethal*, is delayed, and occurs weeks to months after the onset of elevated temperatures above 64°F, but less than incipient lethal limits. These conditions may hold fish in a weakened state until a short-term extreme event kills them. **Table 3-3** summarizes the modes of cold-water fish mortality.

Salmon and trout can survive excessive temperatures for short durations if there are cool places available in the stream offering refuge. These "refugia" must be common enough to allow recovery to fish during upstream migration or following excursions into warmer water.

Table 3-3. Modes of thermally induced cold water fish mortality (Brett, 1952; Bell, 1986, Hokanson et al., 1977).

Modes of Thermally Induced Fish Mortality	Temperature Range	Time to Death
Instantaneous Lethal Limit – Denaturing of bodily enzyme systems	> 90°F (> 32°C)	Instantaneous
Incipient Lethal Limit – Breakdown of physiological regulation of vital bodily processes, namely: respiration and circulation	70°F - 77°F (21°C - 25°C)	Hours to Days
Sub-Lethal Limit – Conditions that cause decreased or lack of metabolic energy for feeding, growth or reproductive behavior, encourage increased exposure to pathogens, decreased food supply and increased competition from warm water tolerant species	64°F - 74°F (20°C - 23°C)	Weeks to Months

3.5 TARGET IDENTIFICATION

3.5.1 Applicable Water Quality Standard

Oregon's water quality standard for temperature is contained in OAR 340-041-0028. The standard includes both narrative and numeric criteria designed to protect beneficial uses, such as cold-water salmon and trout species, based on requirements of specific life stages. Numeric stream temperature criteria are expressed as a seven-day average of daily maximum temperatures (7DADM). **Table 3-4** lists the numeric temperature criteria that are applicable in the Miles Creeks area. Designations of habitat use during non-spawning periods (salmon and trout rearing and migration and core cold water habitat) are illustrated in **Figure 3-1**. For subbasin waters where fish uses are not identified the applicable criteria are the same as the nearest downstream waterbody that is identified in fish use maps. Locations and timing of salmon and steelhead spawning through fry emergence are illustrated in **Figure 3-2.**

Oregon water quality standards include provisions for periods and locations where biologically-based numeric criteria may not be achieved. If biologically-based numeric criteria are not achievable when waters are in their natural condition, stream temperatures achieved under natural conditions (natural thermal potential) shall be the temperature criteria for that water body. This condition often occurs in low elevation streams in the basin during summer months. Unlike the biologically-based criteria such as the rearing criterion of 18°C, which is constant for the entire summer period, the natural thermal potential is site specific and varies over time. TMDLs attempt to quantify the natural thermal potential of major streams through computer modeling.

Oregon's temperature standard also contains provisions for human use. The human use allowance (HUA) limits cumulative anthropogenic heating of surface waters to no more than 0.3°C (0.5°F) above the applicable criteria after complete mixing in the water at the point of maximum impact. Oregon chose to include a 0.3°C HUA to accommodate insignificant additions of heat to waters that exceed applicable numeric criteria. The HUA is considered an insignificant amount of temperature increase in surface waters. The HUA includes heat from all human sources; point source discharges, nonpoint sources and a reserve capacity for future growth. In this TMDL, the HUA is divided between these three sources, with 2/3 going to point sources and 1/6 each to nonpoint sources and reserve capacity. The HUA typically does not significantly influence nonpoint source objectives (load allocations). The value is small enough to be masked by the uncertainty associated with instream measurement and modeling software. The HUA can be significant with regard to any existing or future point source discharges and most of the HUA is generally available for that purpose. In addition to the HUA, point sources must also comply with additional mixing zone requirements as set out in OAR 340-041-0053(2)(d).

Among the anti-degradation policies included in Oregon water quality standards are provisions to prevent the unnecessary degradation of high quality water and to ensure full protection of all existing beneficial uses. At a minimum, uses are considered attainable wherever feasible or wherever attained historically. Anti-degradation policies generally apply when ambient water temperatures are less than the numeric criteria and offer provisions that allow for some degradation in water quality provided that such degradation does not prevent attainment of standards or negatively impact beneficial uses.

Water quality standards for temperature, including the anti-degradation and mixing zone policies are available online from DEQ at http://www.deq.state.or.us/wq/standards/standards.htm. A more extensive analysis of water temperature related to aquatic life and supporting documentation for the temperature standard can be found in the 1992-1994 Water Quality Standards Review Final Issue Papers (ODEQ, 1995) and in EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards (USEPA, 2003).

Table 3-4. Oregon's numeric temperature criteria applicable in the Miles Creeks portion of the Middle Columbia-Hood Subbasin. Uses are defined for specific waterbodies in OAR 340-041-0028, Figures 160A and 160B.

Beneficial Use	Temperature Criteria [a]	Season
Salmon and Steelhead Spawning	13.0°C (55.4°F)	Varies by geography (refer to **Figure 3-2**)
Core Cold Water Habitat	16.0°C (60.8°F)	Year around[b]
Salmon and Trout Rearing and Migration	18.0°C (64.4 °F)	Year around[b]

a = Stream temperature is calculated using the average of seven consecutive daily maximum temperatures on a rolling basis (7-day average of the daily maximum).
b = Except during periods when superseded by spawning criteria.

Figure 3-1. Fish Use Designations (adapted from Figure 160A in OAR 340-041-0028).

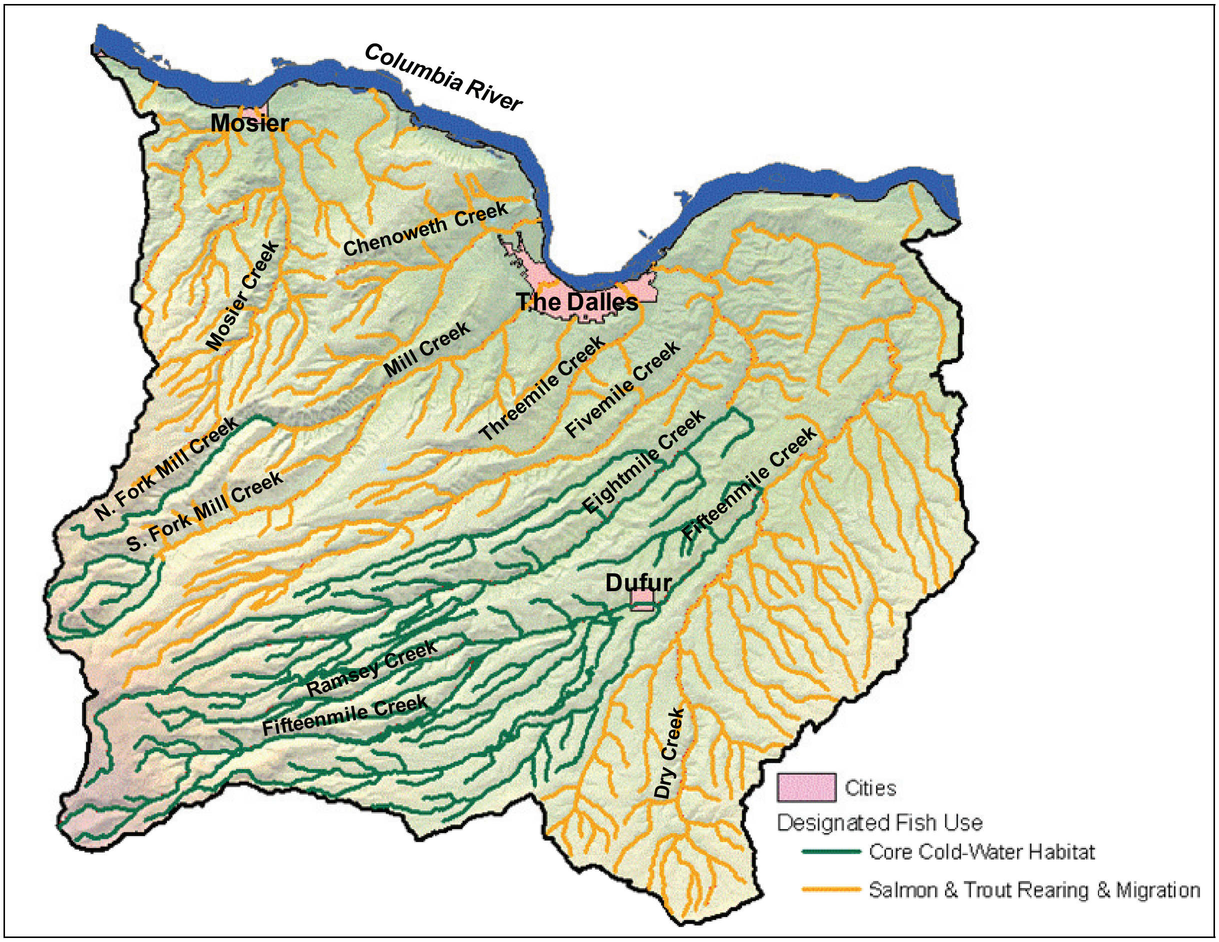
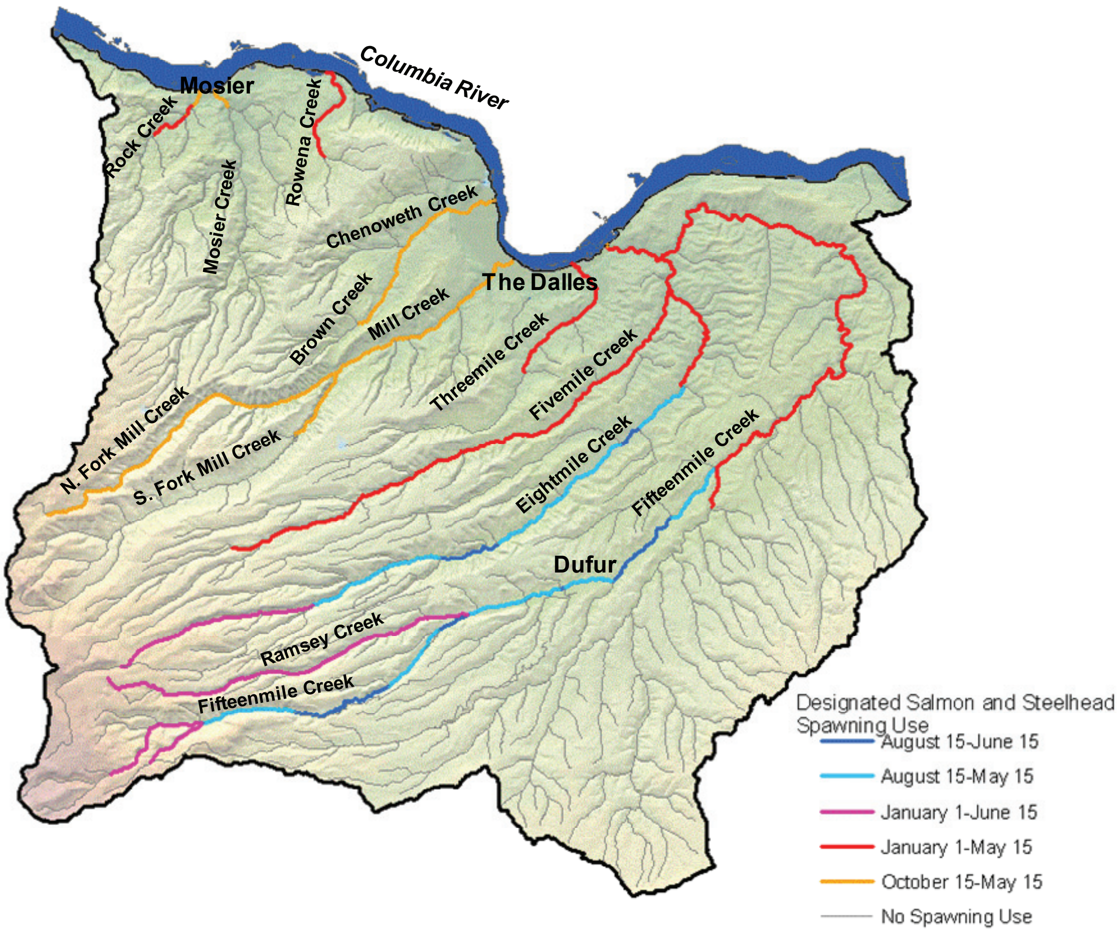


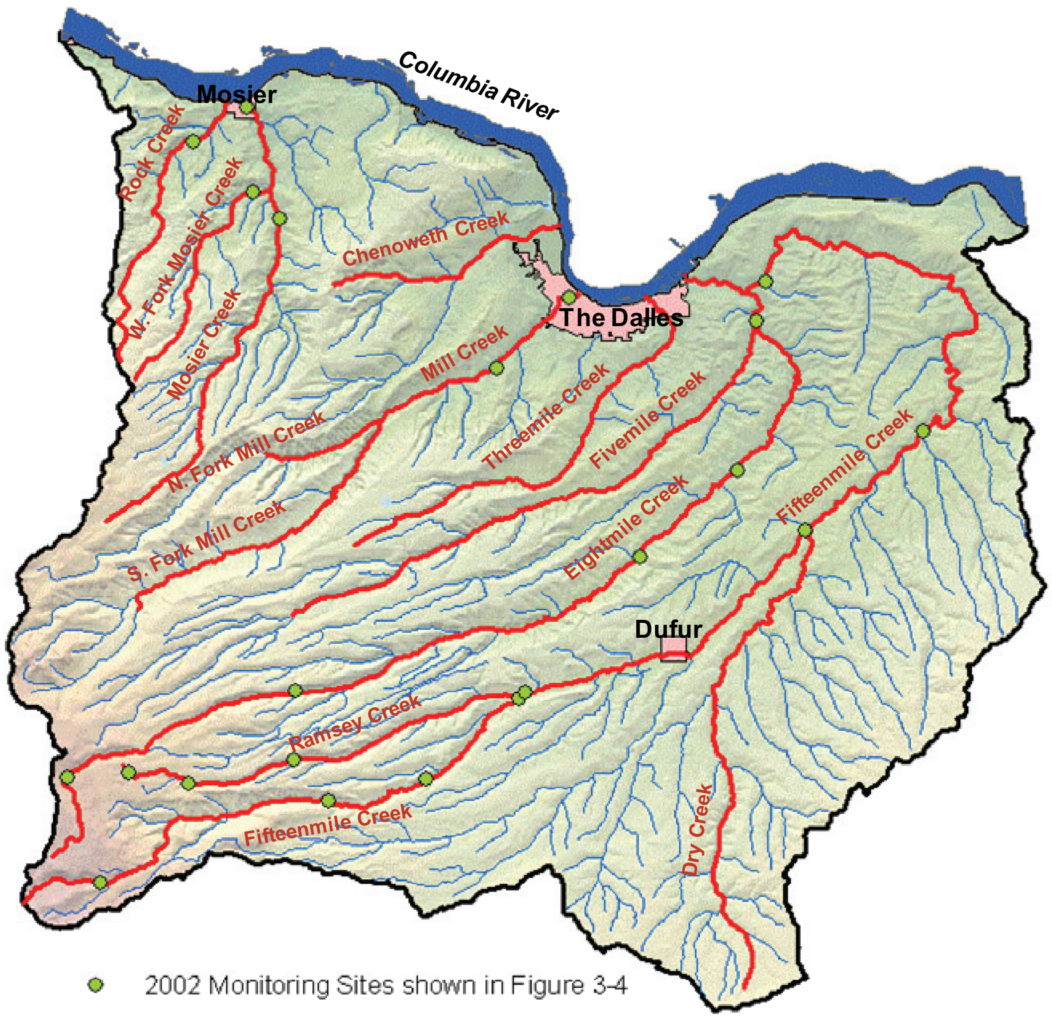
Figure 3-2. Waters designated as Salmon and Steelhead Trout Spawning Habitat (adapted from Figure 160B in OAR 340-041-0028).



3.5.2 Deviation from Water Quality Standard

The Miles Creek portion of the Middle Columbia-Hood Subbasin has 13 streams on the 2004/2006 303(d) list for not meeting the water quality criteria for temperature (**Figure 3-3**). Temperature data has been collected throughout the Subbasin consistently since 1999 by the Mt. Hood National Forest, ODFW, and the Wasco SWCD. DEQ also collected temperature data from 1999-2002 at locations not monitored by the other agencies. All of this data was evaluated for 303(d) listing purposes. For specific information regarding Oregon's 303(d) listing procedures, and to obtain more information regarding the Middle Columbia-Hood Subbasin 303(d) listed streams, visit the Department of Environmental Quality's web page at http://www.deq.state.or.us/wq/assessment/rpt0406/search.asp.

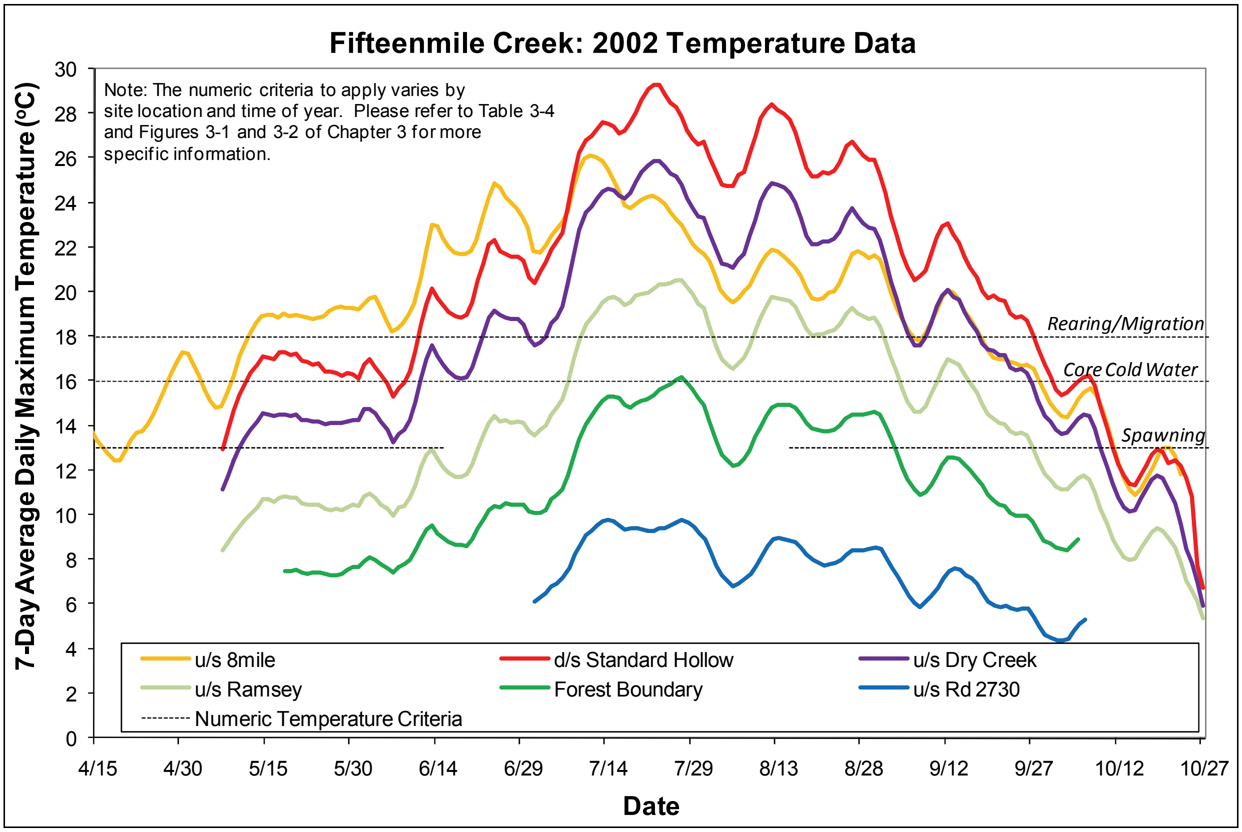
Figure 3-3. 2004/2006 303(d) listed streams for temperature (bolded red lines).



3.6 SEASONAL VARIATION

Most streams in the Miles Creeks area experience prolonged warming starting in late spring and extending into the fall. Maximum temperatures typically occur in July and August during warm weather and naturally low stream flow rates. This TMDL focuses the analysis during the late July-early August time period as a critical condition when stream temperatures are likely to be the warmest. Selected station profiles are provided to illustrate the seasonal pattern of stream temperature throughout the area using data collected in 2002 (**Figure 3-4**). In each of the legends in **Figure 3-4,** the sites are listed in longitudinal order starting at the most downstream location. The locations of these sites are shown in **Figure 3-3**. Miles Creeks streams are commonly above the 13°C numeric spawning criterion during the periods indicated on **Figure 3-2.**

Figure 3-4. Observed seasonal stream temperatures, 2002.



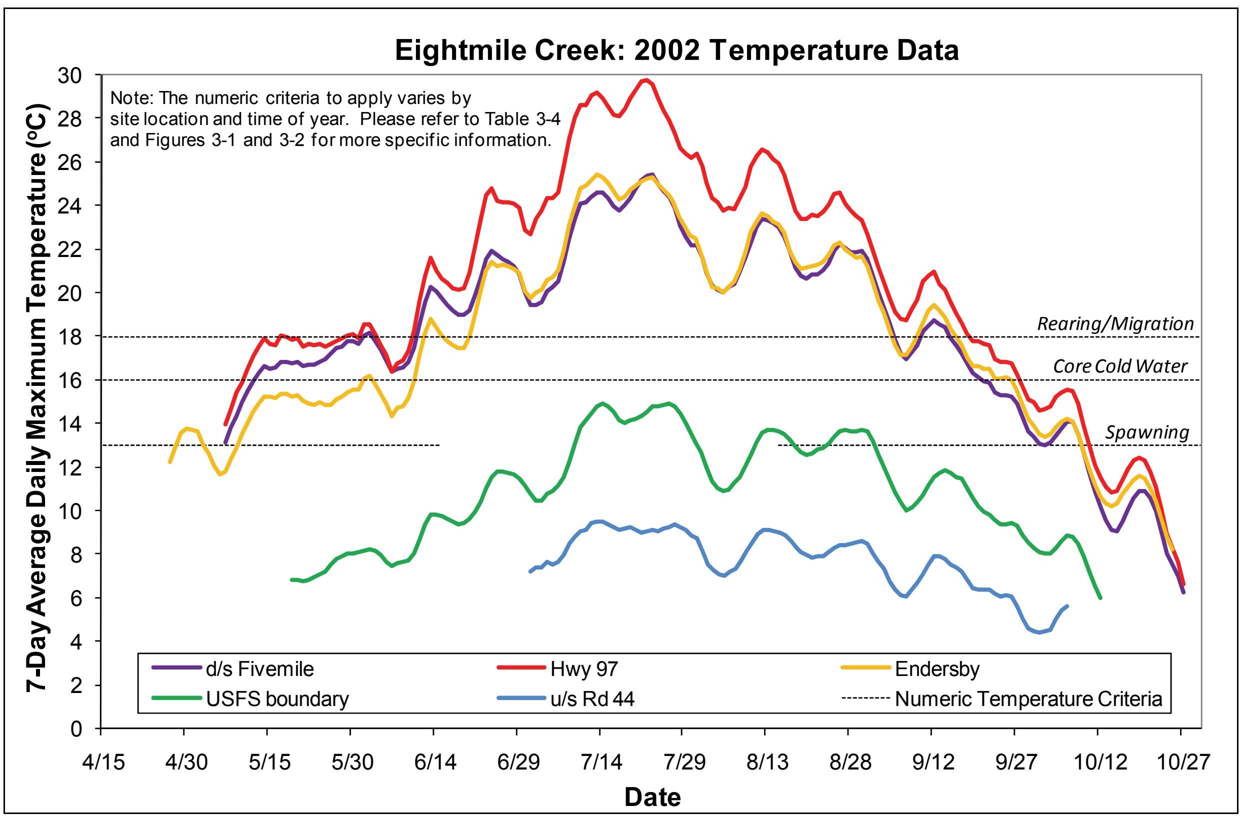
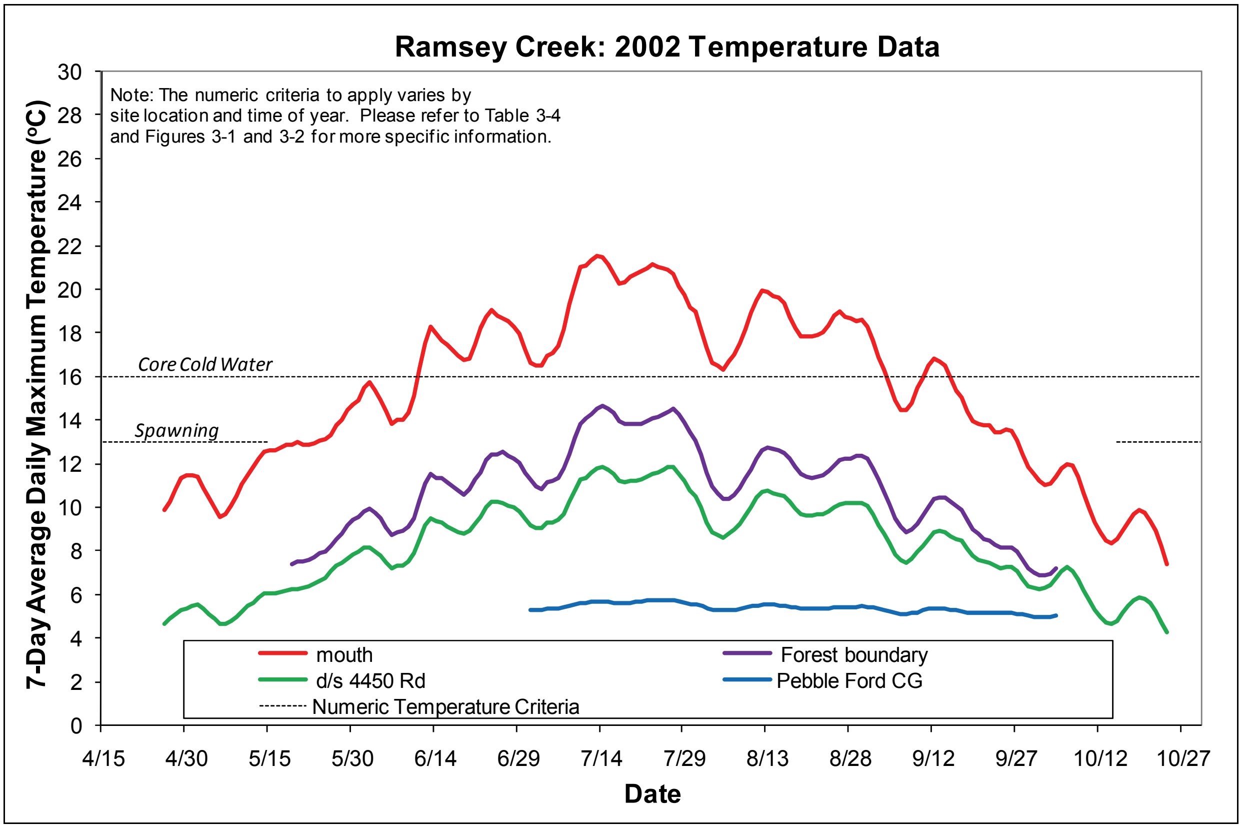
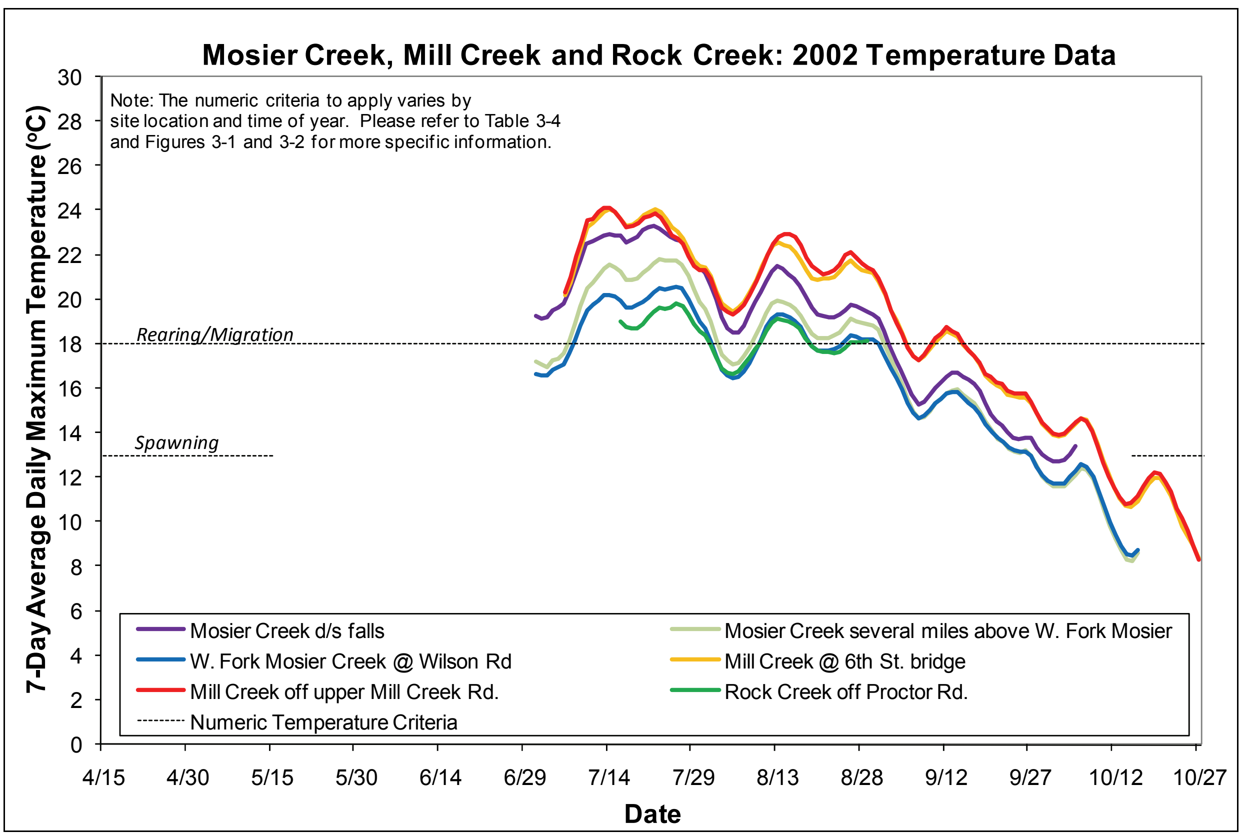


Figure 3-4 (continued). **Observed seasonal stream temperatures, 2002.**





The temperature assessment done for this TMDL used data collected in 2002. To assess how representative this year was of average conditions, stream temperatures and flows in 2002 were compared to sites with a longer record. **Figure 3-5** is a box plot of historical flow volumes on Fifteenmile Creek downstream of Dufur at gage 1410500. This gage represents the only long term flow data on Fifteenmile Creek. The median historical flow in July was 10 cfs. The median historical flow in August was 4 cfs. Flows at the same location in 2002 ranged from 3-5 cfs between July 17 and August 5 .

The range of instream temperatures over multiple years was evaluated at two sites – one on Fifteenmile Creek to represent lower elevation conditions and one on Ramsey Creek to represent the upper part of the watershed (**Figure 3-6**). At both sites, stream temperatures in 2002 appear to be fairly average over the course of the season, although stream temperatures in early August appear to be cooler than average. The data used for this inter-annual assessment was collected by ODFW.

Figure 3-5. Fiteenmile Creek flow downstream of Dufur (1946-1984) - Gage 14104500.

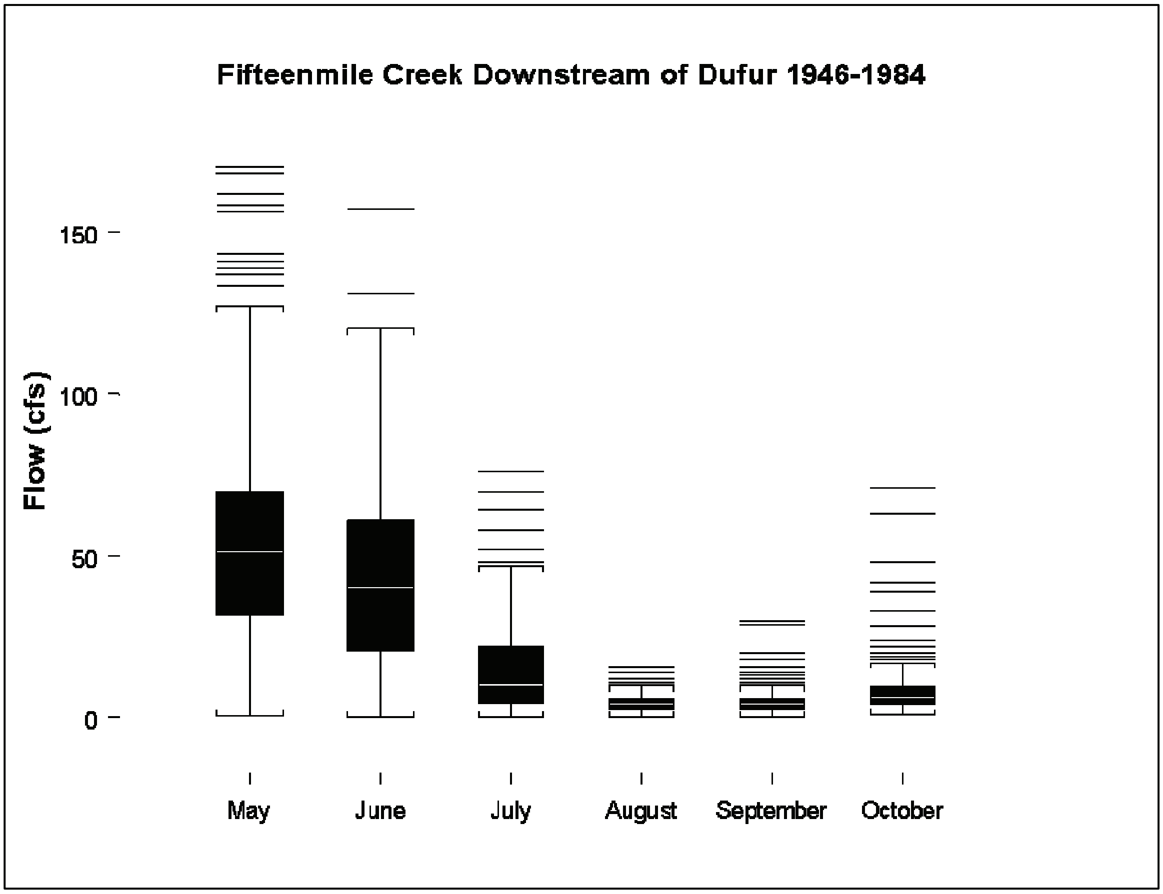
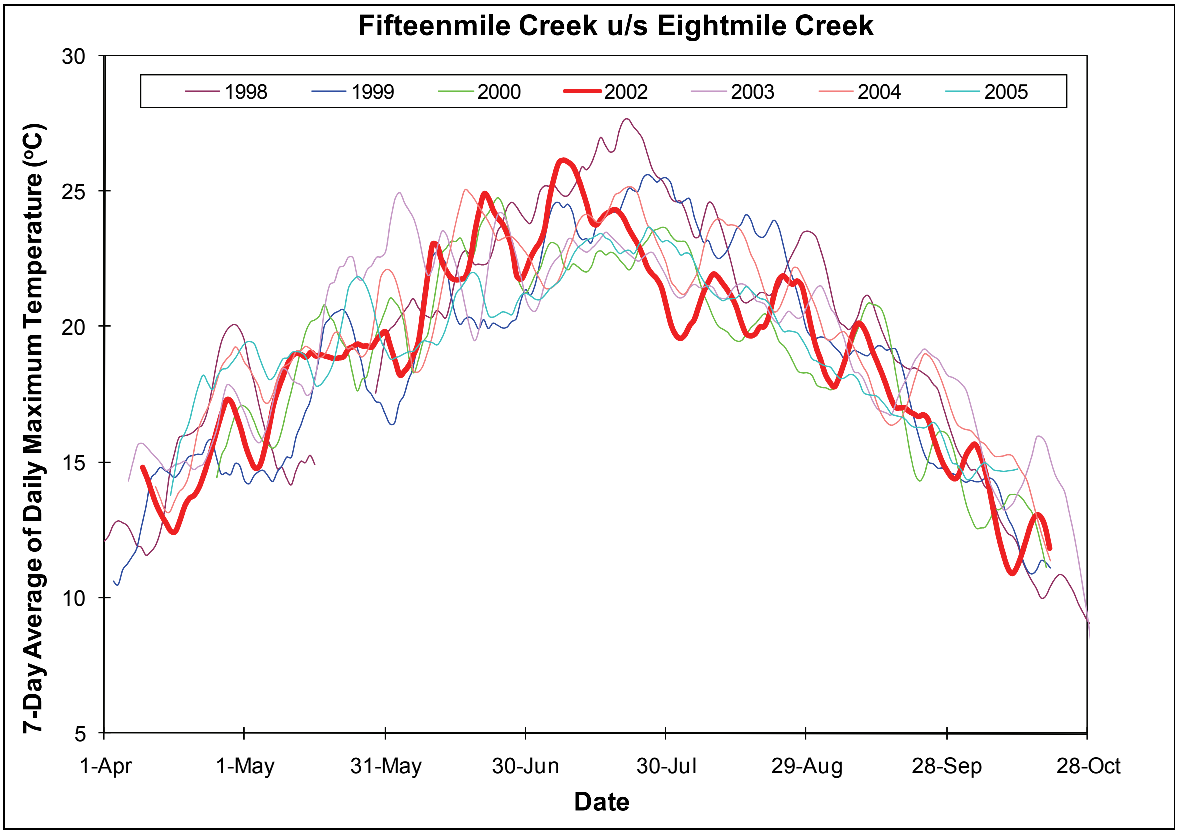
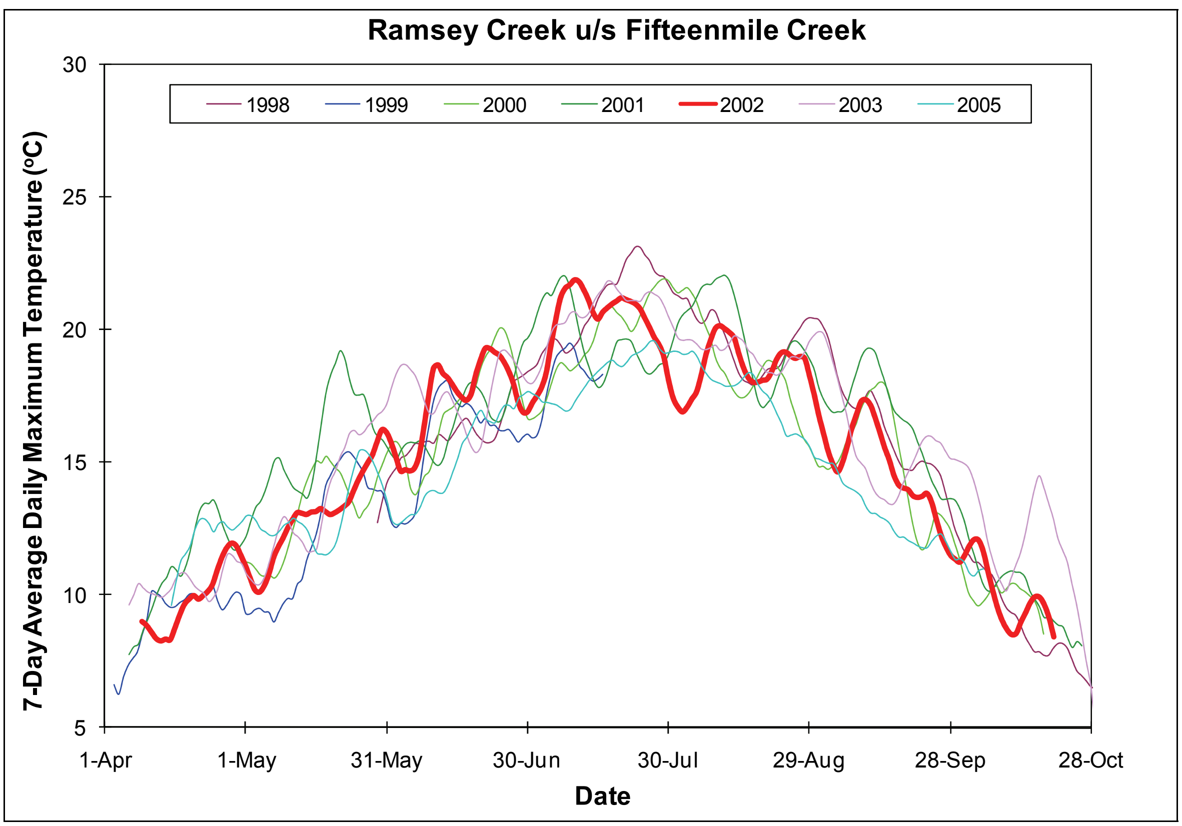


Figure 3-6. Interannual variability in stream temperatures.





3.7 EXISTING HEAT SOURCES

Riparian vegetation, stream morphology, hydrology, climate, and geographic location influence stream temperature. While climate and geographic location are outside of human control, riparian condition, channel morphology and hydrology are affected by land use activities. The following discussion of heat sources includes background sources as well as point and nonpoint sources. Load and wasteload allocations for these sources are described in **Section 3.8**.

3.7.1 Natural Background Sources of Heat

Streams in Oregon are generally warmest in summer when solar radiation inputs are greatest and stream flows are low. The amount of solar energy that actually reaches the surface of a stream is determined by many factors including the position of the sun in the sky, cloud cover, local topography, stream aspect, stream width, and streamside vegetation. Streams generally warm in a downstream direction as they become wider and streamside vegetation is less effective at shading the surface of the water. The cooling influences of smaller tributaries and of ground water inflow decrease as a stream becomes larger. Streams of greater volume and mass are less sensitive to natural and human sources of heat.

Historically, in the absence of human disturbance, many low elevation streams were likely warmer at times than is optimal for many aquatic species. These species may not have occupied these waters during the peak heat of the summer period. Channel complexity, cool water inflows, and hyporheic exchange (groundwater inflow) are thought to provide local but important thermal refuges in these inhospitable environments during the warmest months of the year.

Natural disturbance events are essential elements for healthy and productive salmonid streams. Flooding, fire, windstorms and other natural disturbances contribute to the complexity of the riverine environment. These disturbances often affect streamside vegetation and the riparian tree canopy, potentially decreasing stream shade for decades. However, in a functional riparian community, riparian canopy and shade will recover with time and the salmon, trout and other native species will benefit from the large wood and habitat complexity these disturbances provide. For the purposes of this plan, these disturbances are considered a natural part of the natural background thermal load.

3.7.2 Nonpoint Sources of Heat

European settlement in the Miles Creeks area, starting in the mid-1800s, brought about changes in the near stream vegetation and hydrologic characteristics of many of the rivers and streams in that watershed. Westward migrating American pioneers first arrived in numbers in the Fifteenmile Creek Watershed after establishment of the Barlow Road in 1846. Commercial fishing, livestock grazing, agriculture and logging were well established by 1900. Riparian areas were heavily used for wood, fuel, irrigation, cropland, roads, and livestock forage and water (Mt. Hood National Forest, 1994). Riparian corridors were often cleared of vegetation and fallen trees and stream channelization occurred in many areas. During this period, streams also began to be diverted into canals and ditches for irrigation. More recently, increases in population have resulted in urbanization of parts of the Subbasin. Conversion of forest or agricultural lands to residential development is occurring, which can result in reduced riparian vegetation and altered hydrology. The flood plains of some streams, such as Fifteenmile Creek, have also been affected by the development of transportation corridors.

These human-induced changes can cause streams to heat in the following manner:

1. ***Near stream vegetation disturbance or removal*** *reduces stream surface shading via decreased riparian vegetation height, width and/or density, thus increasing the amount of solar radiation reaching the stream surface (shade is commonly measured as percent effective shade or open sky percentage). Riparian vegetation also plays an important role in shaping the channel morphology, resisting erosive high flows and maintaining floodplain roughness. The loss of streamside vegetation was found to be the largest source of heating where temperature modeling was completed.*

2. ***Reduction of summertime flows*** *decrease the thermal assimilative capacity of streams, causing larger temperature increases in stream segments where flows are reduced.*
3. ***Channel modifications and widening*** *(increased width to depth ratios) increases the stream surface area exposed to energy processes, namely solar radiation. Channel widening decreases potential shading effectiveness of shade-producing near-stream vegetation. Loss of streamside vegetation and lack of large woody debris contribute to conditions that lead to channel widening.*

Crow Creek Dam

Crow Creek Dam on South Fork Mill Creek is owned by the City of the Dalles and is used by the city to store water for domestic consumption. The water treatment plant for the stored water (Wicks Water Treatment Plant) is located approximately nine miles below the reservoir and is described further in **Section 3.7.3**. The reservoir stores water from South Fork Mill Creek and Crow Creek, as well as water that is diverted from Dog River (tributary to the East Fork Hood River). The addition of flow volume from Dog River significantly increases the natural flow rate of South Fork Mill Creek.

DEQ evaluated the thermal affects of the dam on Mill Creek temperatures using data collected in 1999, 2000 and 2005. In 1999 and 2000, DEQ and the Mt. Hood National Forest collected instream temperature above and below the reservoir and at the mouth of South Fork Mill Creek above the confluence with North Fork Mill Creek (**Figures 3-7**and **3-8)**. In 1999, instream data was also collected at the mouth of North Fork Mill Creek. In both 1999 and 2000, temperatures below the reservoir appeared to approximate upstream temperatures until mid to late August, although with much less diel variation. After mid to late August, dam operations released water that was warmer than either Crow Creek or South Fork Mill Creek coming into the reservoir, although the stream temperatures were still well below the biological criterion of 18^{o}C. By mid to late August, stream temperatures in Mill Creek appear to naturally drop. In 1999, the 7DADM temperatures at the mouth of South Fork Mill Creek were below the numeric criterion of 18^{o}C for the entire period when temperatures downstream of the reservoir exceeded upstream temperatures (**Figure 3-8)**. In 2000, there were several warmer periods where the temperature at the mouth of South Fork Mill Creek exceeded the numeric criterion of 18^{o}C during late August and mid-September.

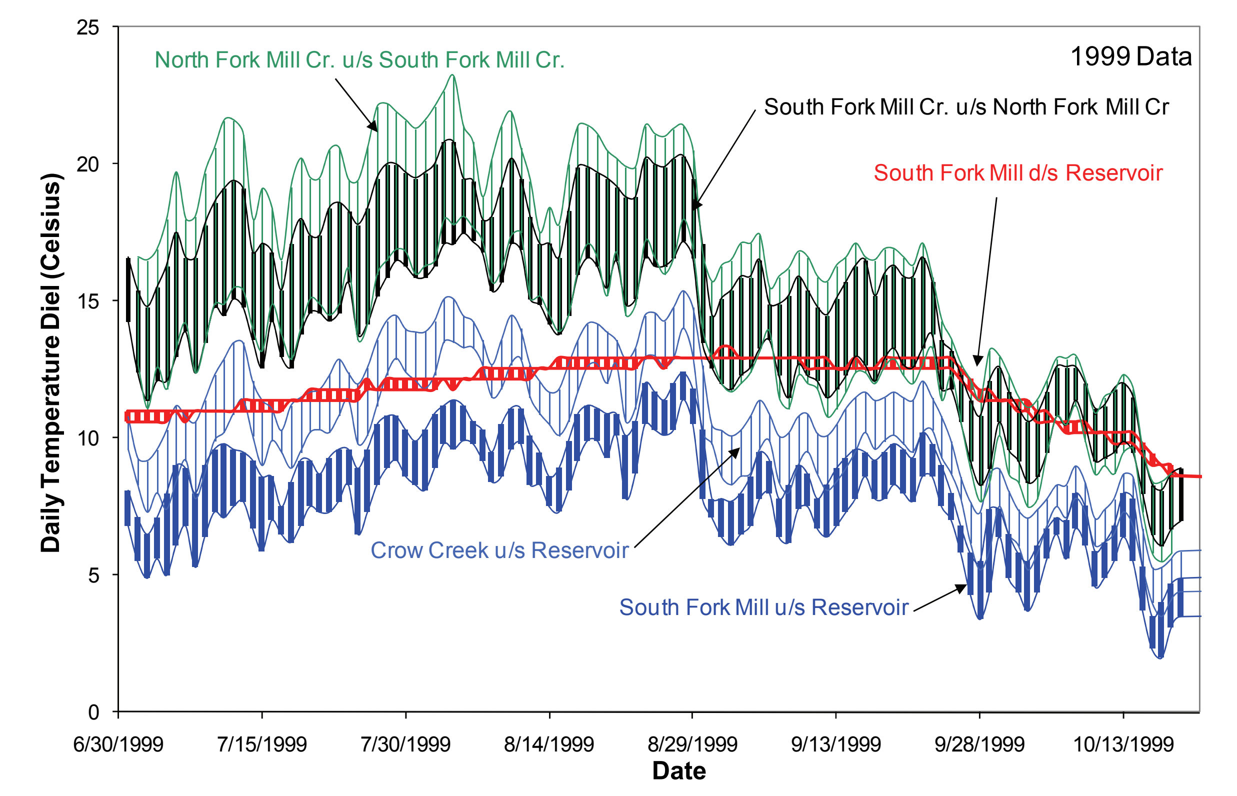
In 2005, data was collected at multiple locations around the diversion and discharge for the Wicks Water Treatment Plant (**Figure 3-9**). The Plant is located approximately one mile upstream of the confluence with North Fork Mill Creek. Based on the data collected in 2005, it appears that South Fork Mill Creek temperatures increase by 2-3^{o}C between the point of diversion and the confluence with North Fork Mill Creek. Assuming this same relationship in 1999 and 2000, any anthropogenic heating that might occur as a result of the dam beginning in mid to late August would still not cause South Fork Mill Creek temperatures at the Wicks diversion to exceed the 18^{o}C biological criterion.

In a comparison of stream temperatures above the reservoir and those at the mouth of South Fork Mill Creek in 1999, 2000, and 2005, the increase in temperatures below the reservoir late in the season does not appear to be reflected in a related increase in downstream temperatures which causes the numeric criterion to be exceeded above the Wicks Treatment Plant diversion. The riparian condition along the creek between the reservoir and the treatment plant is largely at site potential vegetation conditions. The diversion and discharge of water associated with the Wicks Water Treatment Plant do appear to result in violations of the temperature criteria and are discussed further in **Section 3.7.3**.

Data collected at the mouth of North Fork Mill Creek was also evaluated to see if it could be use to represent “natural” conditions in South Fork Mill Creek. Temperatures at the mouths of the North Fork and South Fork of Mill Creek have similar diel patterns, with daily maximum temperatures in the North Fork slightly elevated above temperatures in the South Fork. This is reflected in higher 7DADM temperatures in the North Fork for most of the season (**Figure 3-8**). Flow measurements were not taken in both creeks during 1999 and 2000 to enable a stream flow comparison. Based on the OWRD water availability calculations the natural flows in North Fork Mill Creek would probably be lower than those in South Fork Mill Creek (http://www.wrd.state.or.us/OWRD/SW/index.shtml). Average monthly August flows at the mouth of North Fork Mill Creek are estimated to be 1.56 cfs, compared to 7.5 cfs in South Fork Mill Creek using OWRD calculations. Based on the limited data available, the comparison of South Fork and North Fork data was not evaluated further.

While natural conditions modeling has not been done on Mill Creek to simulate the thermal impacts of Crow Creek dam, the available data does not indicate that the operation of the dam causes or contributes to violations of the temperature standard. As part of TMDL implementation, DEQ will work with the City to develop a monitoring strategy to further assess the impacts of the reservoir. Load allocations for the dam will be discussed further in **Section 3.8.3**.

Figure 3-7. Daily diel temperatures in the Mill Creek watershed, 1999 and 2000.



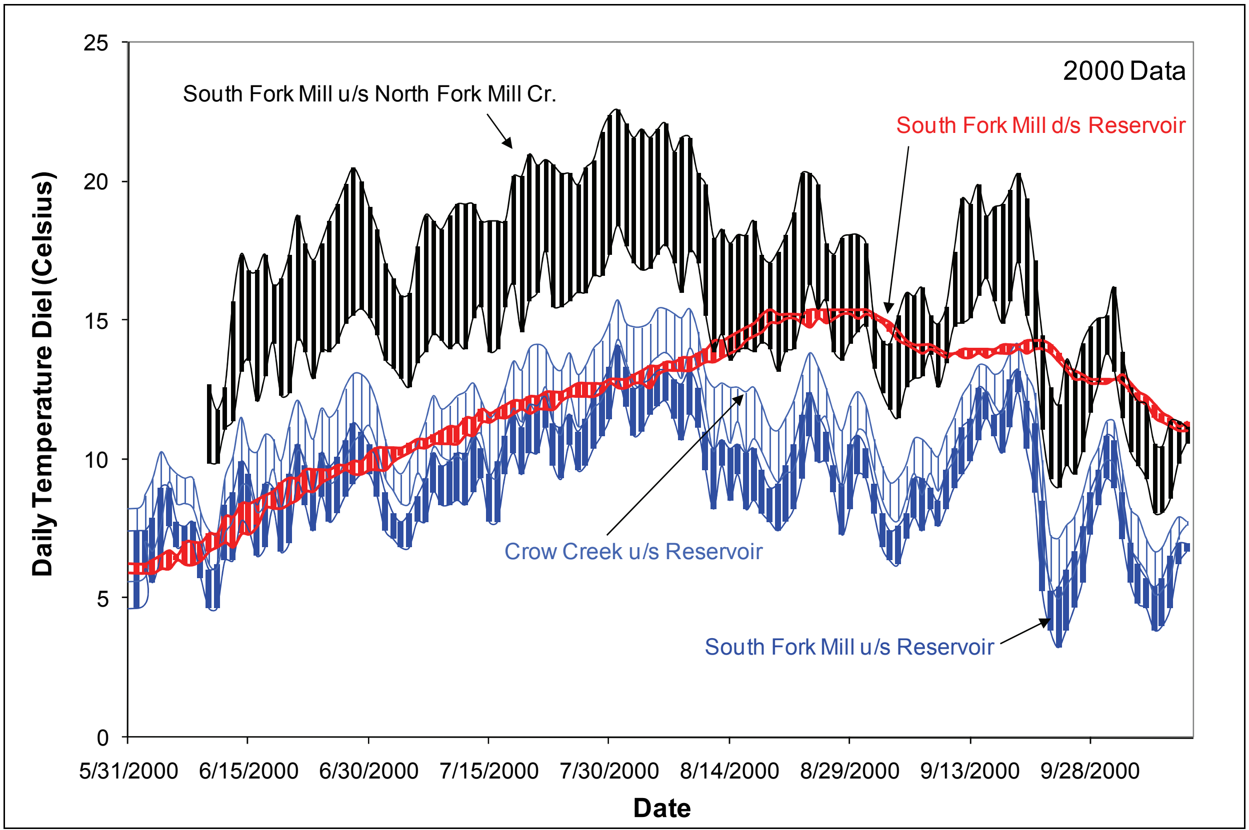
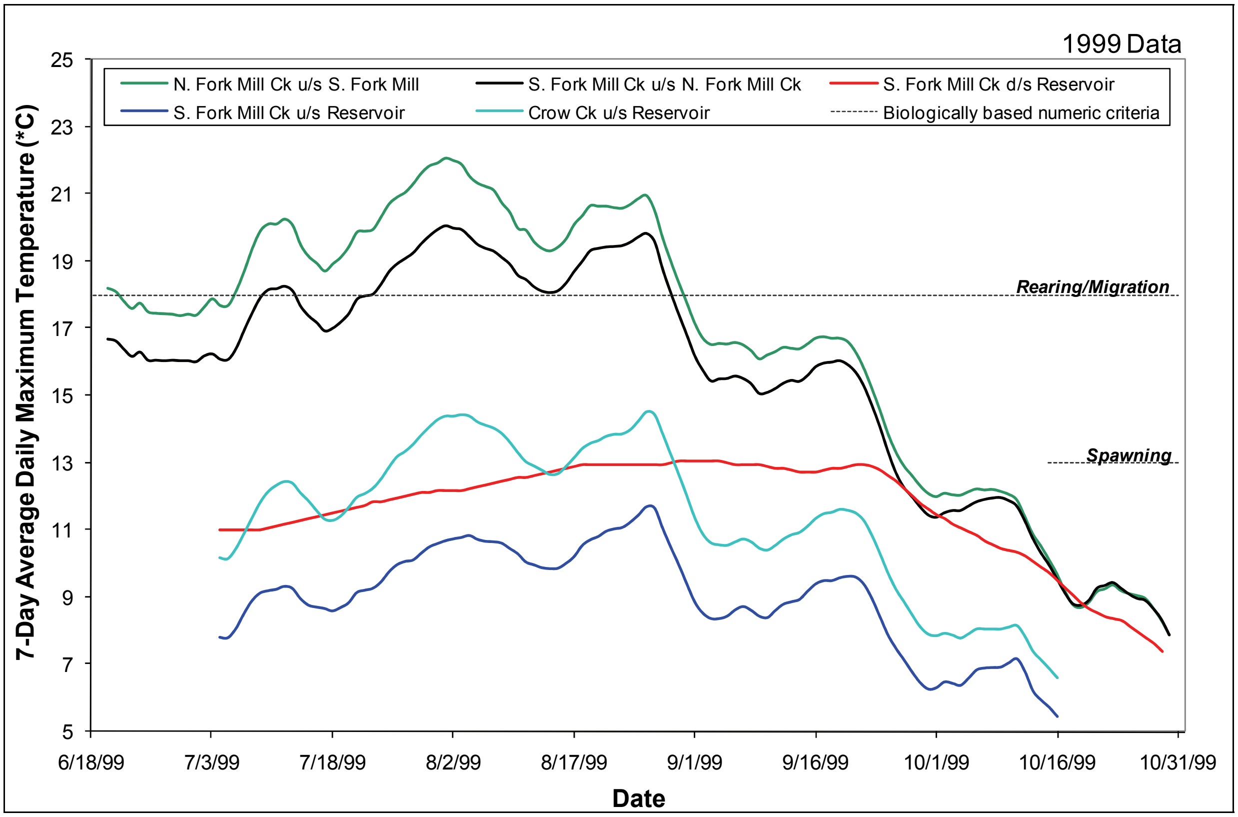


Figure 3-8 . Comparison of 7DADM temperatures above and below Crow Creek Reservoir, 1999 and 2000.



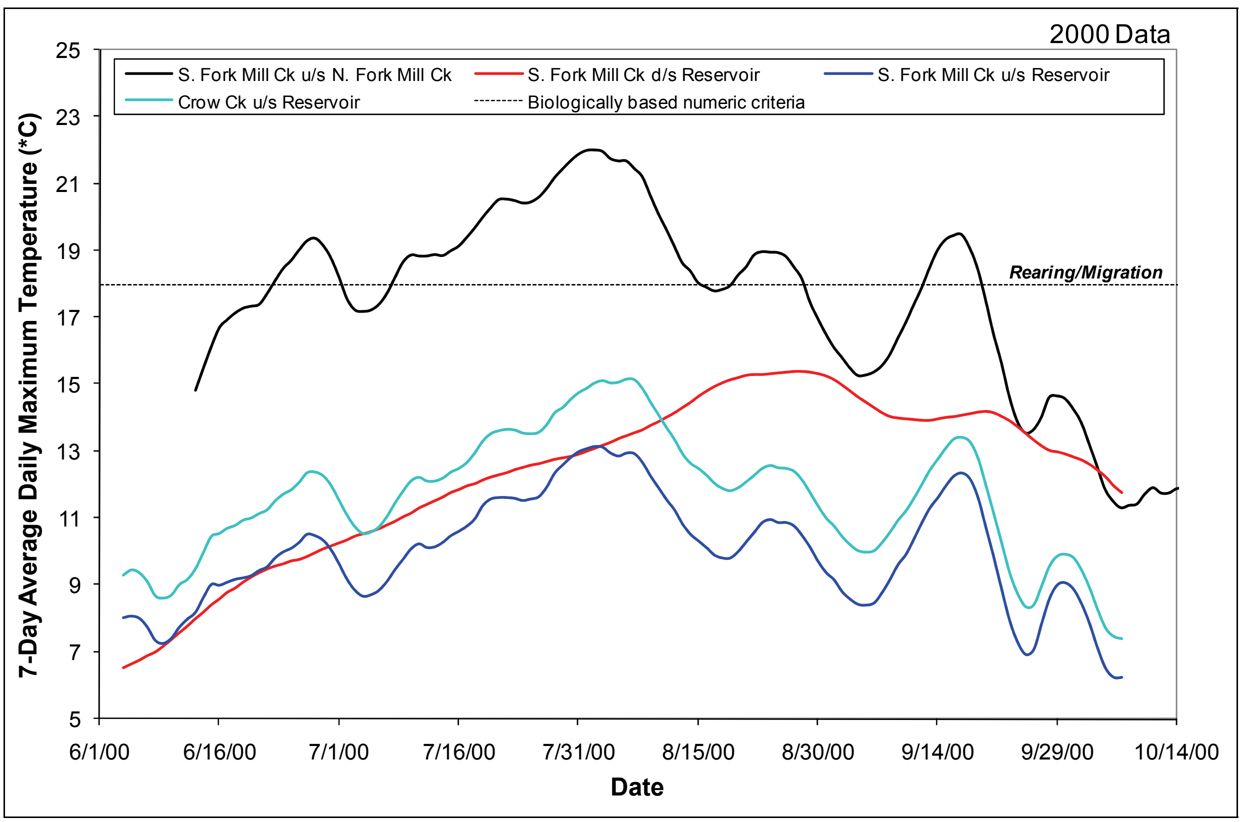
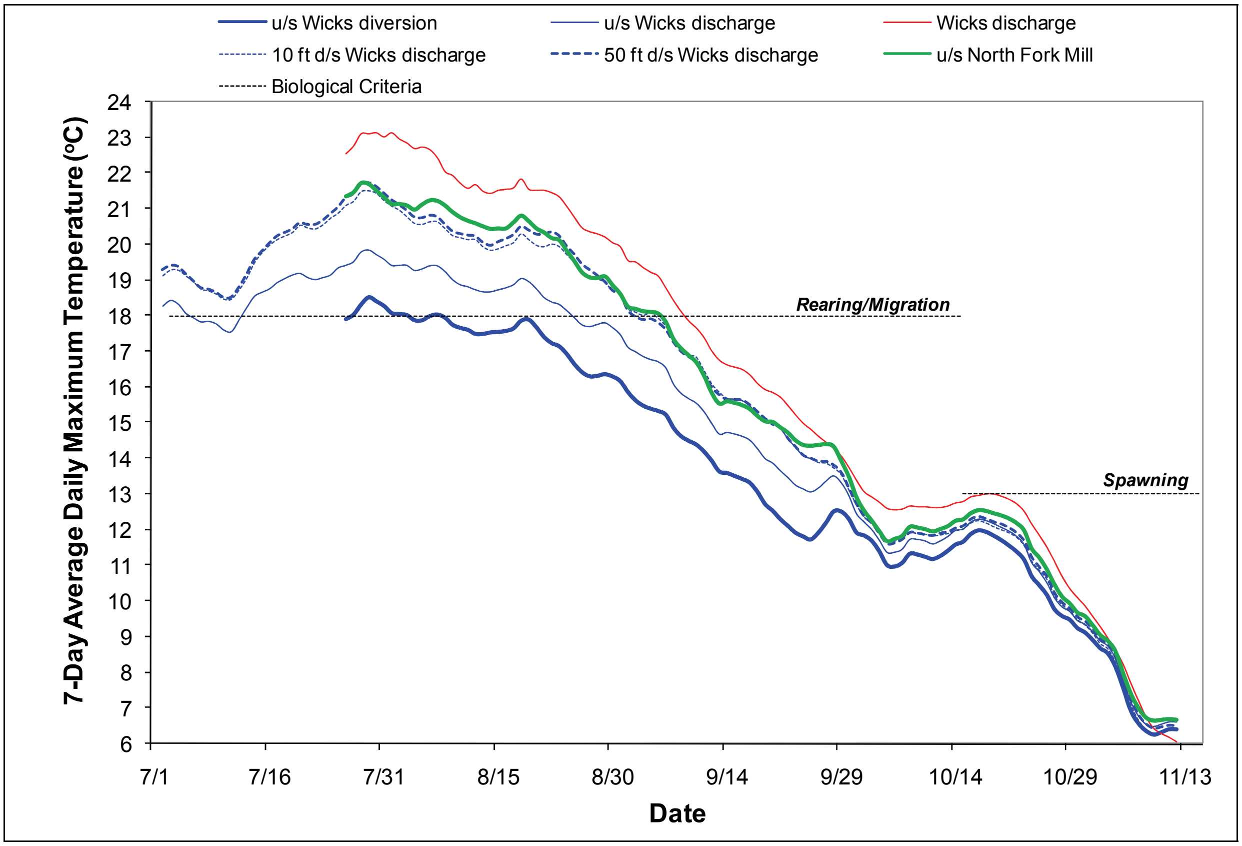


Figure 3-9. South Fork Mill Creek and Wick's discharge 7DADM temperatures, 2005.



3.7.3 Point Sources of Heat

Point source discharges can be sources of stream heating in the Miles Creeks portion of the Middle Columbia-Hood Subbasin. Excluding point-source discharges into the Columbia River, there are two domestic or individual point-source discharges to waters within the Miles Creeks Subbasin and five general stormwater permits (**Table 3-5)**.

Stormwater discharges likely do not to contribute to exceedances of the temperature standard. This determination was based on the amount of summer rainfall in **Table 2-1** (June – September), and the frequency of rain during the same period for the entire data record. Ninety-five percent of the summer 7-day periods had less than three consecutive days of rain while 80% of the 7-day periods had less than one consecutive day of rain.

Table 3-5. NPDES Discharges in the Miles Creek portion of the Middle Columbia-Hood Subbasin.

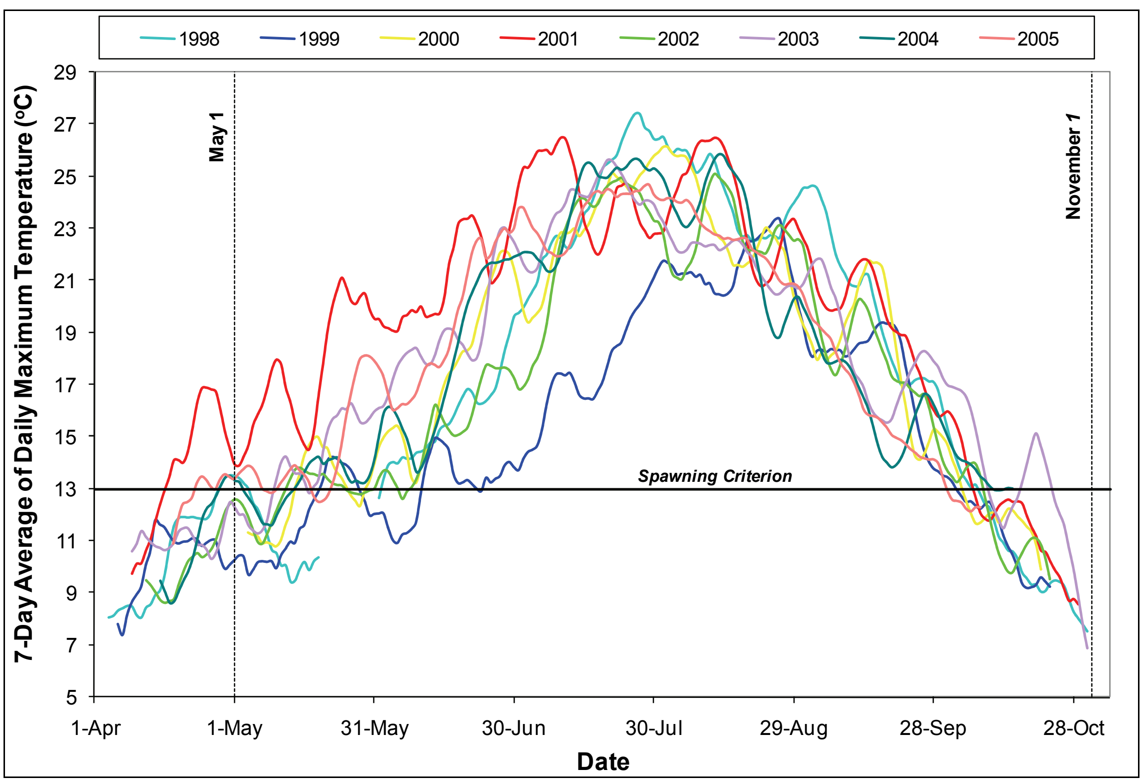
File Number	Legal Name	Category	Class	Permit Type	Receiving Stream
25491	City of Dufur	Domestic	Minor	NPDES-DOM-Db	Fifteenmile Creek
87831	City of The Dalles	Individual	Minor	GEN02	S. Fork Mill Creek
115017	Design Structures, LLC	Stormwater	Minor	GEN1200C	Mill Creek
115056	Mosier Bluffs	Stormwater	Minor	GEN1200C	Mosier Creek
117142	City of The Dalles	Stormwater	Minor	GEN1200C	N. Fork Mill Creek
107101	Wasco County Public Works	Stormwater	Minor	GEN1200CA	Multiple locations
108113	Wasco County Landfill	Stormwater	Minor	GEN1200Z	Fivemile Creek

Dufur Wastewater Treatment Plant. The City of Dufur has an individual NPDES permit to discharge treated domestic wastewater into Fifteenmile Creek at Rivermile 30.3 in Dufur. The City recently upgraded their wastewater treatment facility to include a storage pond and irrigation site, which allowed them to eliminate the discharge to Fifteenmile Creek during the summer months. According to the terms of their current permit, the City is not allowed to discharge any wastewater to the creek from May 1 - October 31. During this time, the wastewater is stored and/or land applied. The City's system also includes two waste stabilization lagoons and a de-chlorination system to prevent chlorine toxicity in the creek. The current dry weather design flow is 0.085 million gallon per day (MGD). The current permit was issued on March 26, 2002, and expired on February 28, 2007. The City submitted a renewal application on August 28, 2006. Because a renewal application was submitted in a timely manner, the permit has been administratively extended.

Because the plant does not discharge in the summer, the Dufur WWTP does not affect Fifteenmile Creek stream temperatures during the critical summer conditions. As part of this TMDL process, stream temperature data collected by the Wasco SWCD and ODFW was also evaluated during the November 1-April 30 period to assess stream temperatures when the numeric spawning criterion applies (August 15-May 15) and when the City is allowed to discharge to the creek. Data was evaluated from 1998-2005 for two sites on Fifteenmile Creek – one at the upstream end of Dufur and one at the downstream end. Data for the more upstream site is presented in **Figure 3-10**. In the fall, the 7-day average of daily maximum temperatures (7DADM) was less than 13°C (the numeric criterion for spawning) starting in early to mid October in all years evaluated. When the City begins discharging on November 1, stream temperatures are well below the numeric criterion.

During the other shoulder season in the spring, the 7DADM temperatures prior to April 30th were not less than 13°C in all years evaluated. In four of the eight years, 7DADM temperatures were between 13°C and 14°C during the last two weeks of April, and in one year they reached as high as 16.9°C during this time (**Figure 3-10**). Stream temperatures were less than 13°C in all years evaluated prior to April 15th. This spawning season information will need to be incorporated into the next NPDES permit for the WWTP, as will be discussed further in **Section 3.8.2**.

Figure 3-10. Stream temperatures in Fifteenmile Creek in Dufur (ODFW data).



The Dalles Wicks Water Treatment Plant. The City of The Dalles operates a water treatment plant to provide drinking water for city residents. DEQ has issued a general NPDES permit (200-J) to the City that allows them to discharge adequately treated filter backwash, settling basin and reservoir cleaning water. Under the current terms of the 200J permit, there are no restrictions placed on the City relative to the thermal impacts of the discharge on the creek. The current general permit expired on July 31, 2002 and has been administratively extended.

As described in **Section 3.7.2**, the City operates Crow Creek Reservoir on South Fork Mill Creek as a source of drinking water approximately nine miles above the treatment plant. The City diverts water from South Fork Mill Creek just above their treatment plant and treats the water prior to using it for drinking water for The Dalles. Their discharge back into the creek is primarily filter backwash which has been de-chlorinated and passed through settling ponds before being returned to the creek. The discharge point is approximately 0.5 miles downstream from the point of diversion. The discharge is released back to the creek anywhere from two to eight times per day, with each discharge event lasting approximately two hours.

Temperature and flow data were collected in the summer of 2005 by DEQ and the City of The Dalles to assess the thermal effects of this discharge. Based on the flow data, the City diverts between 45% and 98% of stream flow. The volume of effluent discharged into the stream sometimes exceeds stream flows at the discharge point (**Figure 3-11**). Instream temperature data was collected at 15-minute intervals because the discharge does not occur on a continuous basis. The seven day average maximum temperatures were calculated from the continuous data and station profiles were shown in **Figure 3-9**. Based on an analysis of this data, the Wicks treatment plant discharge appears to have a significant effect on South Fork Mill Creek temperature, with the biggest impact seen from approximately mid-July through mid-September.

To better evaluate the impact of the discharge, a mass balance analysis was completed using the flow and temperature data to remove influences of warming or cooling that may occur between the data site upstream of the discharge and the data sites downstream of the discharge. The increase in temperature calculated from the mass balance and calculated from the difference between upstream and downstream temperature data (labeled as “raw”) is shown in **Figure 3-12**. The estimates of the maximum increase in stream temperature were comparable, with a maximum of 2°C observed with the raw data calculation and 1.5°C with the mass balance calculation. During most of August and September, both the raw and mass balance calculated 7-day temperatures were significantly above the Human Use Allowance allocation of 0.2°C (as will be discussed further in **Section 3.8.2**).

Based on an assessment of the available data, the operation of the Wicks Water Treatment Plant clearly causes a significant impact on Mill Creek stream temperatures due to the diversion and discharge that occurs at the Plant. Wasteload allocations for point sources discharges will be discussed in **Section 3.8.2**.

Figure 3-11. South Fork Mill Creek flow rates and effluent discharge from Wicks Water Treatment Plant, 2005.

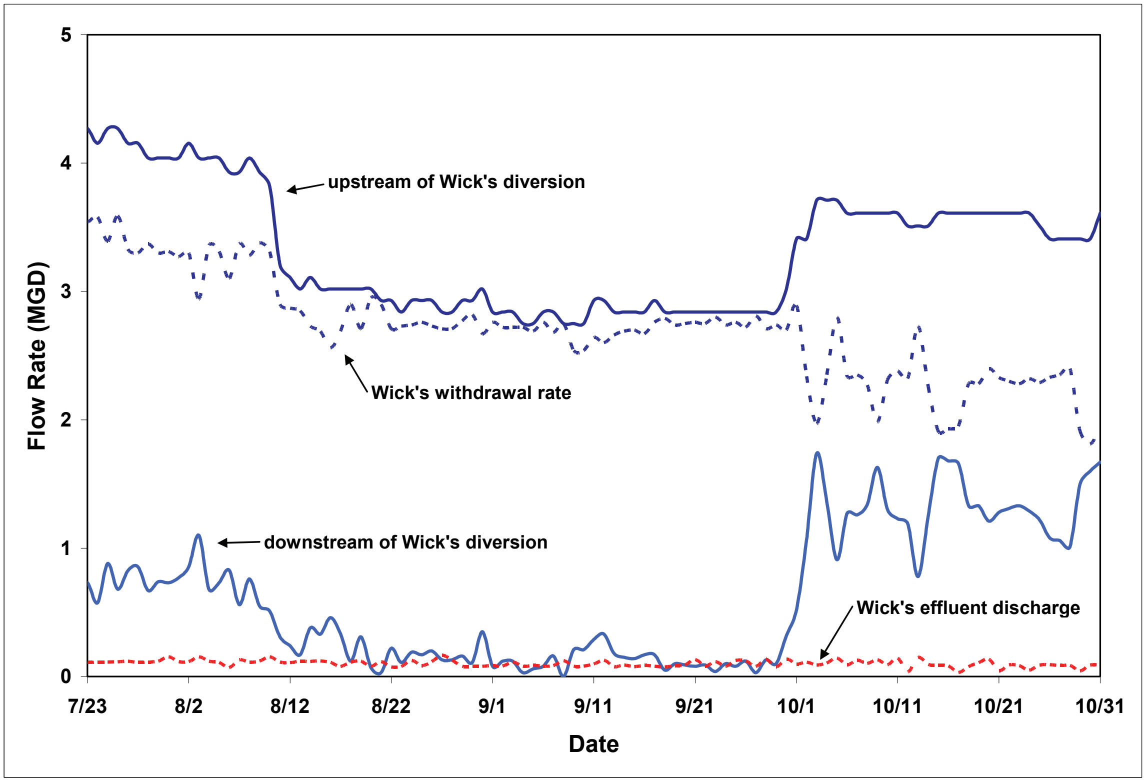
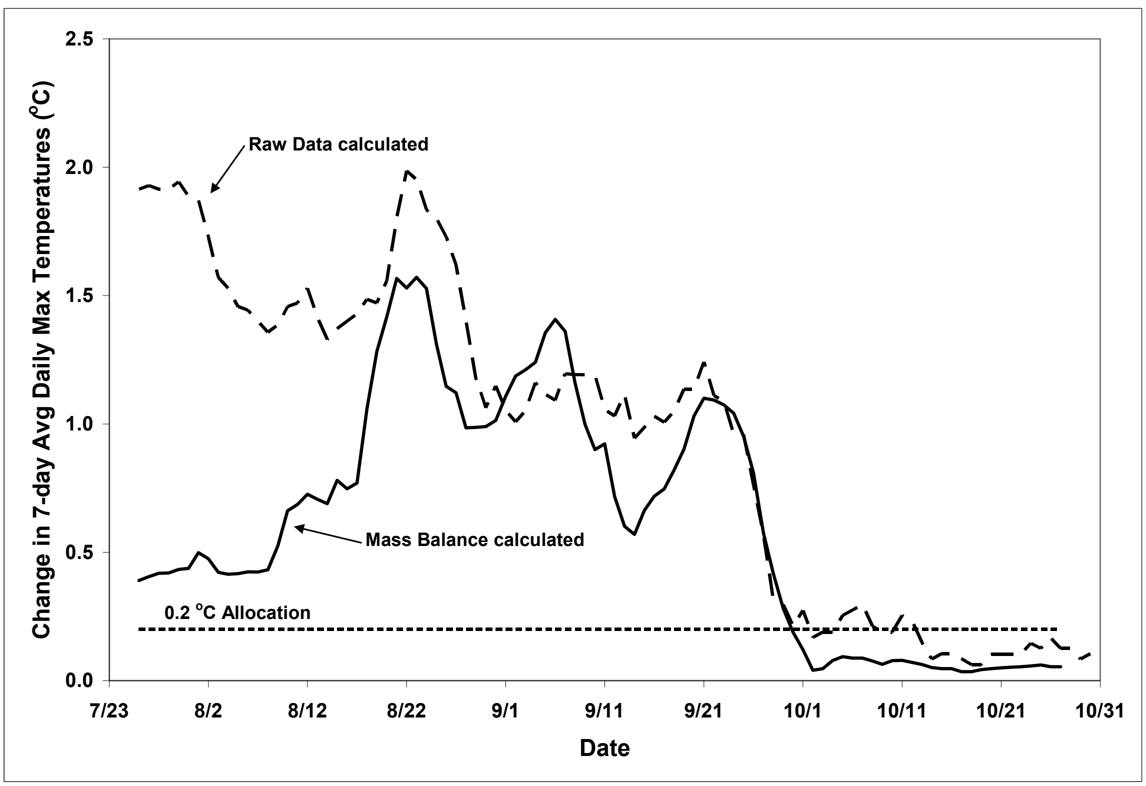


Figure 3-12. Mass balance and data calculated temperature impact from Wicks Water Treatment Plant.



3.8 LOADING CAPACITY AND ALLOCATIONS

This section first describes the loading capacity, followed by load allocations for nonpoint sources and wasteload allocations for point sources. A summary of the allocations is presented in **Section 3.8.3**.

EPA's current regulation defines loading capacity as "*the greatest amount of loading that a water can receive without violating water quality standards*." (40 CFR § 130.2(f)). It provides a reference for calculating the amount of pollutant reduction needed to bring water into compliance with water quality standards. Loading capacity can be quantified and allocated as the sum of natural background heat load and allowable heat loads from nonpoint source and point source sectors. Portions of the loading capacity may also be reserved to accommodate future growth and as an explicit margin of safety. The established loading capacity must ensure that water quality standards are met regardless of seasonal variation and foreseeable increases in pollutant loads from point or nonpoint source activities.

The loading capacity can be described as follows:

$$LC = WLA + LA_{nps} + LA_{bkgd} + MOS + RC$$

Where:
LC = Loading Capacity
WLA = Wasteload Allocation (WLA)[3]
LA_{nps} = Load Allocation (LA)[3] from human nonpoint sources
LA_{bkgd} = Load Allocation[3] from natural background
MOS = Margin of Safety
RC = Reserve Capacity, for such as population growth or increased human loading

Thermal modeling done on Fifteenmile Creek indicated that there is no available assimilative capacity during the critical period of July-August. The natural thermal potential temperatures (based on natural background heat loads) exceed the biologically based numeric criteria at certain locations during the summertime critical period (see **Section 3.11**). Thus, the allowable anthropogenic heat load for Fifteenmile Creek and its tributaries (e.g., Fivemile, Eightmile and Ramsey Creeks) is limited to the equivalent of a temperature increase of no more than 0.3°C (the HUA) above the lowest natural thermal potential temperature. For tributaries to the Columbia River (e.g., Mosier, Mill, and Threemile Creeks), because the natural thermal potential was not determined, the biological criteria apply and the heat load equivalent to a temperature increase of no more than 0.3°C above the biological criteria defines the loading capacity for these streams. The division of the HUA within this TMDL is summarized in **Section 3.8.3**.

3.8.1 Nonpoint Source Load Allocations

A loading capacity for radiant heat energy (i.e., incoming solar radiation) was developed for streams in the Miles Creeks portion of the Middle Columbia-Hood Subbasin. Site-specific nonpoint source solar radiation heat *flux* was derived for Fifteenmile Creek, Eightmile Creek and Ramsey Creek. Flux is a measurement of heat reaching the stream expressed as the amount of heat per unit area (e.g. watts per square meter) measured at the stream surface. Flux was determined for both current conditions and natural background (the methodology is presented in detail in **Appendix A**). The current condition solar heat flux was calculated by simulating current stream and vegetation conditions. Natural background flux was calculated by simulating the solar radiation flux that resulted with potential near stream vegetation.

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3 *Wasteload Allocation* is defined as "The portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution" (40 CFR 130.2(h)). *Load allocation* is defined as "The portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources (nps) or to natural background sources (bkgd)" (40 CFR 130.2(g)). "Sources" means *sources of pollutants*, in this case excess heat.

Flux was then used to determine nonpoint heat loads, which are expressed in three different ways in this TMDL:

1) Using effective shade and site potential vegetation as surrogate measures for heat flux (**Section 3.8.1.1**)
2) As a daily load of solar heat energy in megawatts (Fifteenmile Creek only, **Section 3.8.1.2**)
3) As an equivalent temperature increase (ΔT) above the applicable criteria (the Human Use Allowance, see **Section 3.8.3**)

3.8.1.1 Surrogate Measures

As allowed under EPA regulations (40 CFR 130.2(i)), this TMDL allocates "*other appropriate measures*" (or surrogate measures) in addition to heat energy loads. Although a daily loading capacity for heat energy was derived (watts/m^2), it is of limited value in guiding management activities needed to solve identified water quality problems. In order for the TMDL to be more meaningful to the public and guide implementation efforts, load allocations for nonpoint source heat limits are expressed in terms of percent effective shade.

Water temperature warms as a result of increased solar radiation loads. A loading capacity for radiant heat energy (i.e., incoming solar radiation) can be used to define a reduction target that forms the basis for identifying a surrogate. The specific surrogate used is percent effective shade (expressed as the percent reduction in potential solar radiation load delivered to the water surface). The solar radiation loading capacity is translated directly (linearly) by effective solar loading. The definition of effective shade allows direct measurement of the solar radiation loading capacity.

Because factors that affect water temperature are interrelated, the surrogate measure (percent effective shade) relies on restoring or protecting riparian vegetation to increase stream surface shade levels, reducing stream bank erosion, stabilizing channels, minimizing stormwater runoff, and reducing the surface area of the stream exposed to radiant processes. Highly shaded streams often experience cooler stream temperatures due to reduced input of solar energy (Brown, 1969; Beschta et al., 1987; Holaday, 1992; Li et al., 1994, Johnson and Jones 2000, Johnson 2004).

Historically, the term 'shade' has been used in several contexts, including its components such as shade angle or shade density. For purposes of this TMDL, *effective shade* is defined as the percent reduction of potential daily solar radiation load delivered to the water surface. The role of effective shade in this TMDL is to prevent or reduce heating by solar radiation and serve as a translator to the loading capacities.

This TMDL contains two types of surrogate nonpoint source load allocations:

1. ***Site-specific effective shade*** allocations apply to Fifteenmile Creek, Eightmile Creek and Ramsey Creek where site-specific flux was simulated.

2. ***Effective shade curves*** are generalized allocations that apply to all other Miles Creeks Subbasin streams covered by this TMDL, but that have not been simulated.

Site Specific Effective Shade

Site-specific effective shade surrogates were developed for Fifteenmile Creek, Eightmile Creek and Ramsey Creek to help translate the nonpoint source solar radiation heat loading allocations. Attainment of the effective shade surrogate measures is equivalent to attainment of the nonpoint source load allocation.

Figure 3-13 displays the percent effective shade values that correspond to the loading capacities for Fifteenmile Creek, Eightmile Creek and Ramsey Creek. The *Current Condition* is the actual effective shade at the stream surface. It includes the shading effects of near-stream vegetation and topography. The *System Potential* is the amount of effective shade at the stream surface under potential near-stream vegetation conditions. This condition is the solar loading capacity for stream. The *Natural Disturbance*

Range indicates the shade levels that could potentially occur in the event of natural disturbances. The lower end of that range represents that amount of shade that the stream would receive if topography was the only shade-producing feature (i.e., in the absence of vegetation). **Appendix A** contains detailed descriptions of the methodology used to develop potential near-stream vegetation and the temperature TMDL.

Caution should be used when interpreting **Figure 3-13**. This TMDL recognizes that is impossible for an entire stream to be at its maximum potential effective shade everywhere, all the time. In reality, natural disturbance will create a variety of tree heights and densities and effective shade levels in many reaches will be lower than the “System Potential”, and be somewhere within the “Natural Disturbance Range”. Reductions in effective shade caused by natural disturbance are not considered a violation of the TMDL. It should be noted that the affects of natural disturbance on stream temperatures was evaluated in this TMDL. A stream temperature analysis was done for Fifteenmile Creek to evaluate the thermal impacts on the creek of different management scenarios. One of the scenarios included a natural disturbance simulation. The results of this analysis are discussed in **Section 3.11** and **Appendix A**.

Figure 3-13. Effective Shade – Current Condition and System Potential.

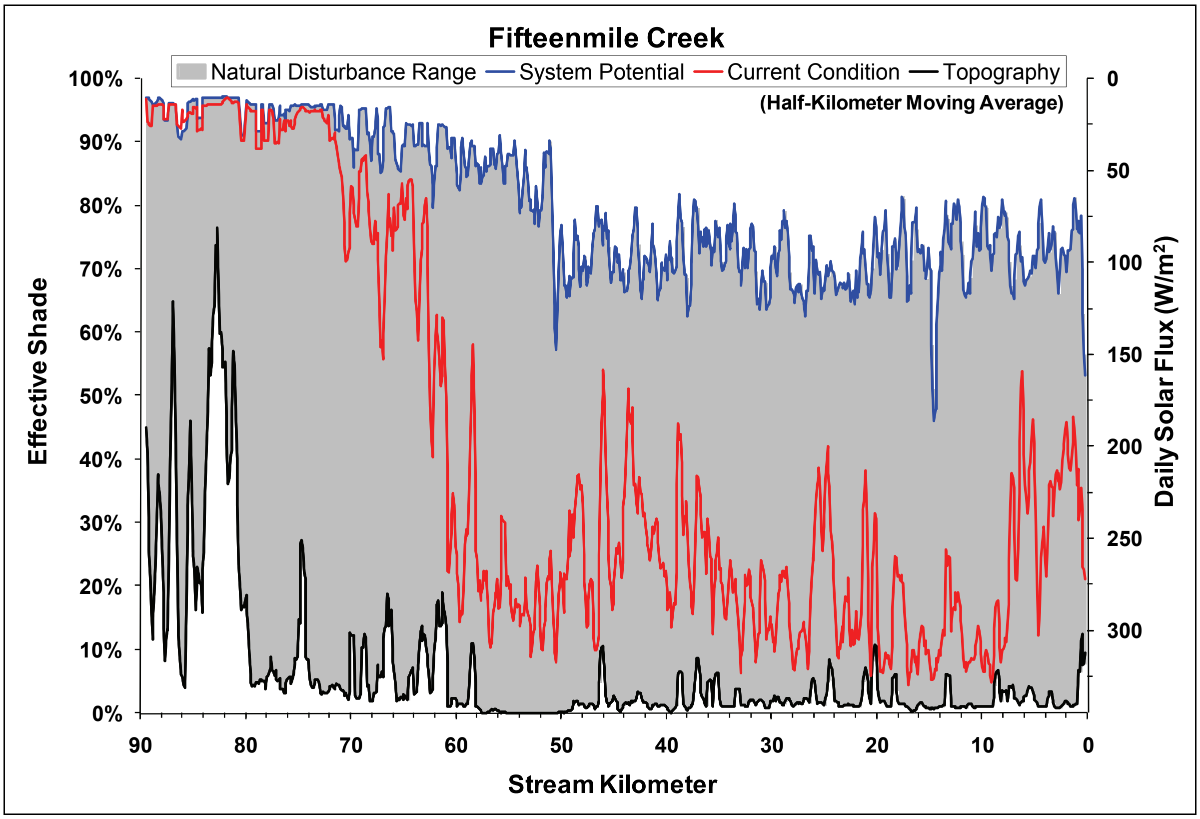
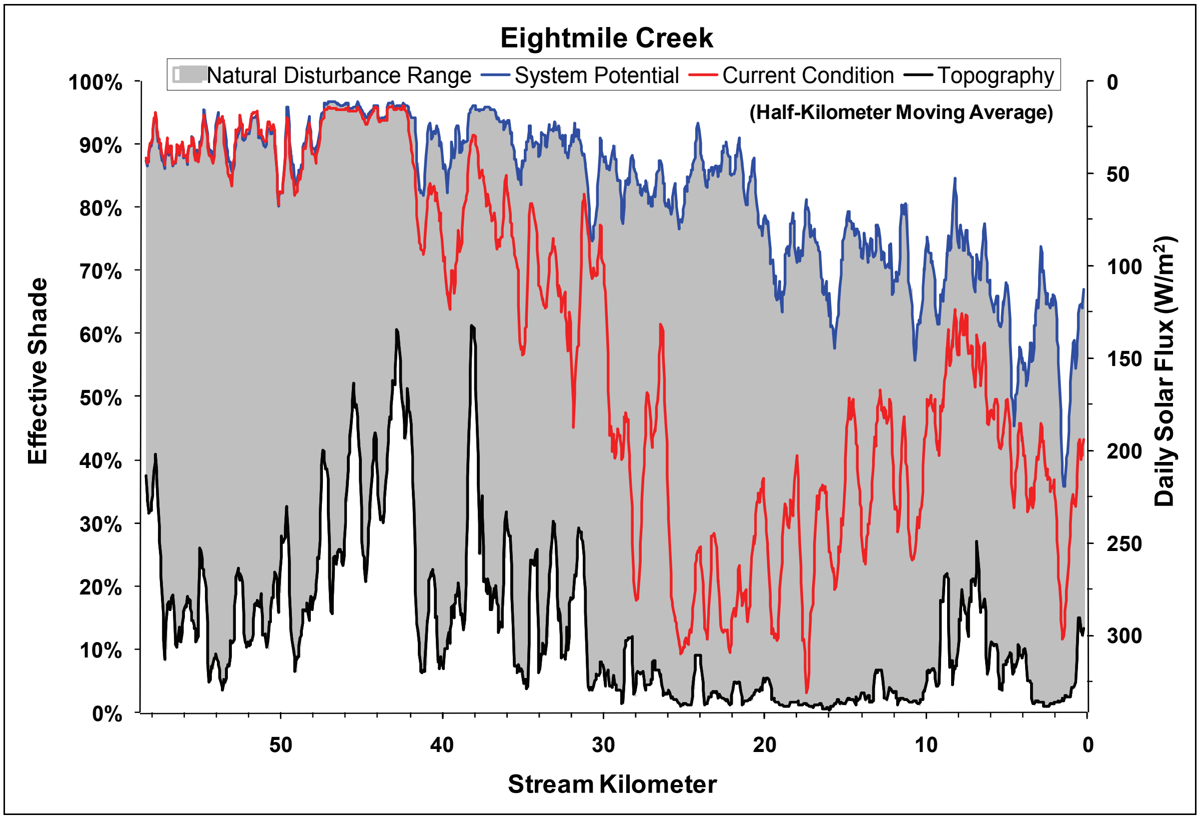
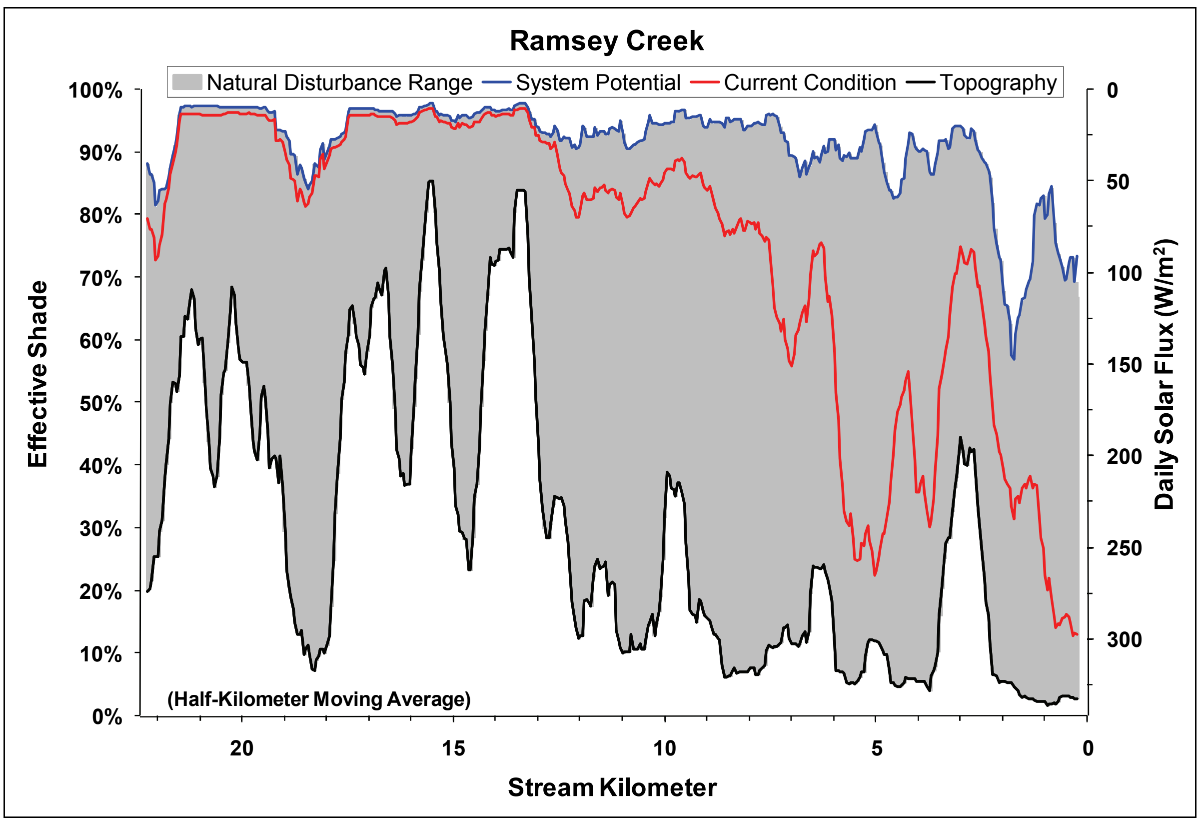


Figure 3-13 (continued). **Effective Shade – Current Condition and System Potential.**





For all three streams, the difference between current condition and system potential effective shade is the least in the headwater reaches (the upper 15-18 kilometers in Fifteenmile and Eightmile Creeks and the upper 9-10 kilometers in Ramsey Creek). These are forested reaches in all three streams, with narrower stream channels, and these reaches could be considered to be very near their potential. The difference between current conditions and system potential conditions increases moving downstream.

Another observation is that the lower stream reaches generally have less shade than upper reaches, even under system potential conditions. This results from a combination of larger channel widths, different topographic effect, and different potential vegetation types. Wider channels, combined with shorter vegetation, (i.e., deciduous hardwoods or shrubs often dominate lower elevation flood plains near the stream) limit the amount of shade on the stream surface. Topographic shade appears to play a larger role in providing shade in the higher elevation, upper reaches of each stream.

The effective shade simulations for one day in August are summarized in **Figure 3-14** and **Figure 3-15**. **Figure 3-14** shows average effective shade values for each of the creeks simulated and **Figure 3-15** summarizes the relative differences between the current and potential average effective shade values for each creek. Ramsey Creek displays the smallest difference in effective shade levels (17%) when comparing the current condition to the potential shade effective conditions, and topographic shade contributes a larger percentage of shade under potential conditions than the other two creeks.

Figure 3-14. Average simulated effective shade data .

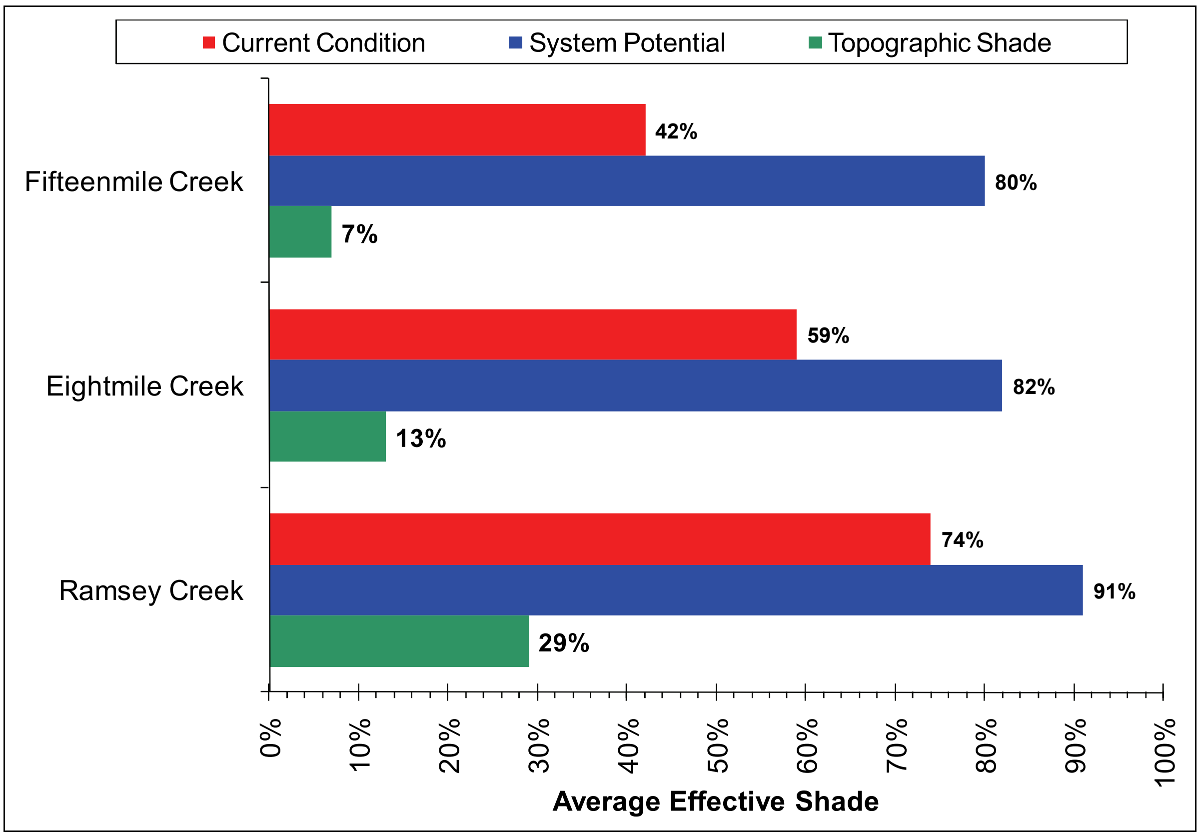
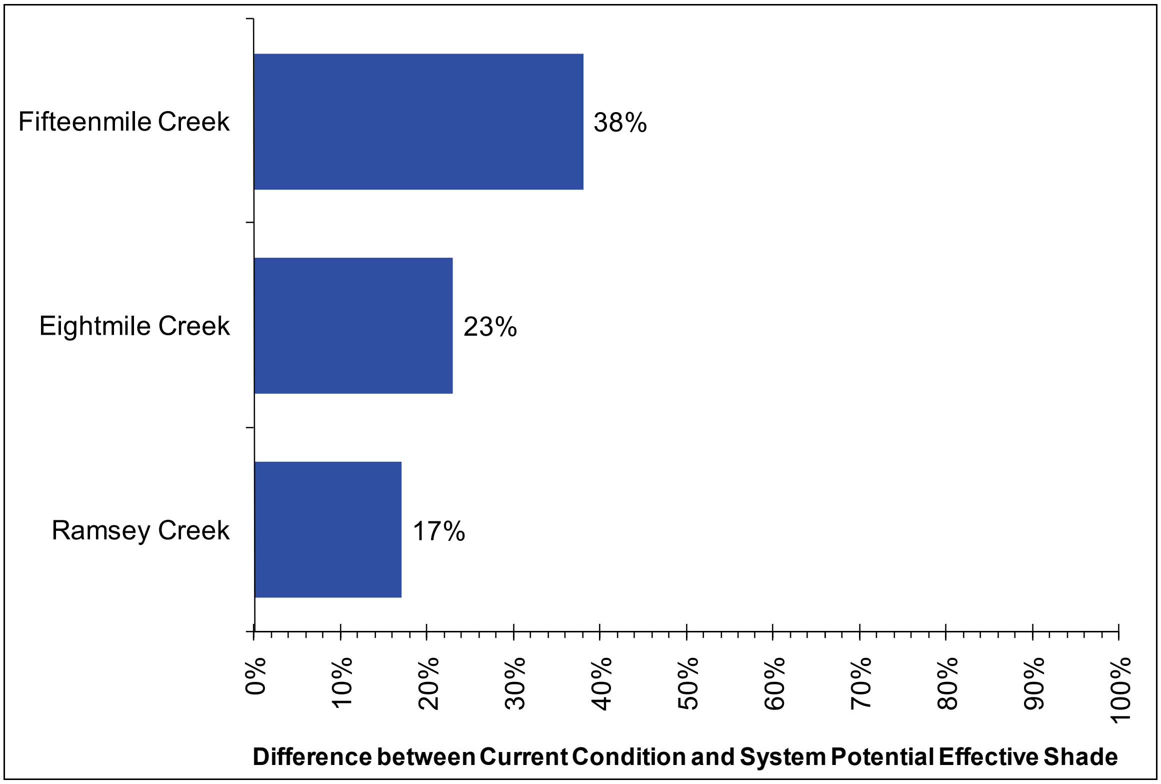


Figure 3-15. The difference between the current condition and system potential condition effective shade levels.



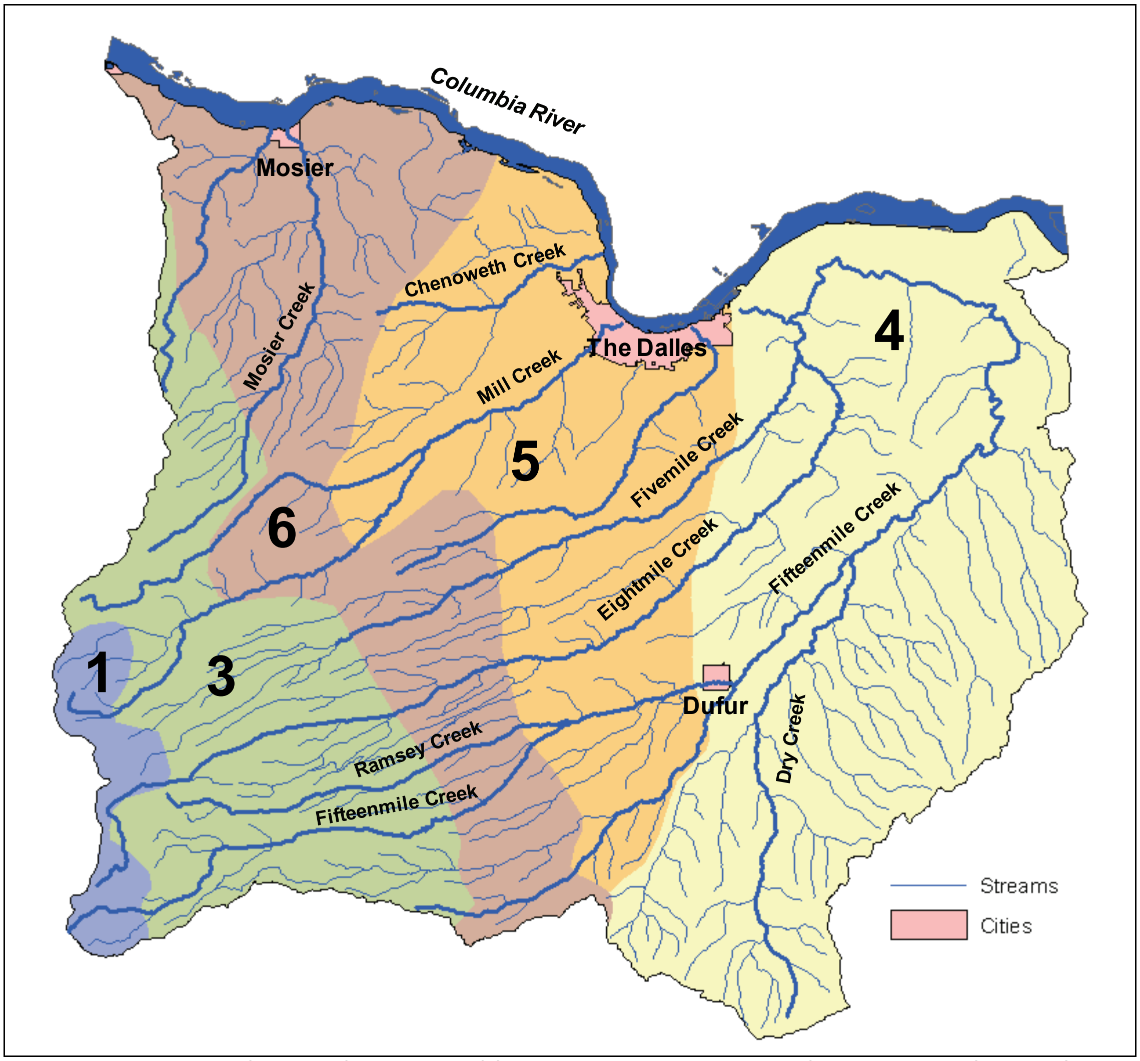
Generalized Effective Shade Curves

Generalized effective shade curves are general heat load allocations applicable to any stream that was not specifically simulated for solar radiation flux and shade. Effective shade curves show the total heat flux (or the amount of solar radiation) that a stream can receive based on the stated potential vegetation height and density for any particular channel width for that vegetation zone. The effective shade curves account for latitude, critical summertime period (July/August), elevation and stream aspect. Stream aspect is based on coordinate directions, such as North-South, East-West, and Northeast-Northwest**.**

Potential vegetation zones were developed for the Miles Creeks Subbasin (**Figure 3-16**) and effective shade curves were developed for each zone (**Figure 3-17**). These zones were developed from Ecoregions of Oregon (Thorson et.al., 2003), with further modification based on a consensus process using the local expertise of staff from ODF, Wasco SWCD, ODFW, the Mt. Hood National Forest and the City of The Dalles. Refer to **Section A2.3.5** of **Appendix A** for more detailed information regarding the potential land cover types and tree heights associated with each zone.

Effective shade curves represent the *maximum* possible effective shade for a given vegetation zone. The values presented within the effective shade curves represent the effective shade that would be attained if the vegetation were at its stated potential height and density. Local geology, geography, soils, climate, legacy impacts, natural disturbance rates, and other factors may prevent effective shade from reaching the values presented in the effective shade curves. The goal of this Temperature TMDL is to minimize anthropogenic impacts on effective shade. Natural conditions or natural disturbances (non-anthropogenic) that result in effective shade below the maximum potential will not be considered out of compliance with the TMDL. This TMDL recognizes that unpredictable natural disturbances may result in effective shade well below the levels presented in the effective shade curves.

Figure 3-16. TMDL Potential Vegetation Zones.

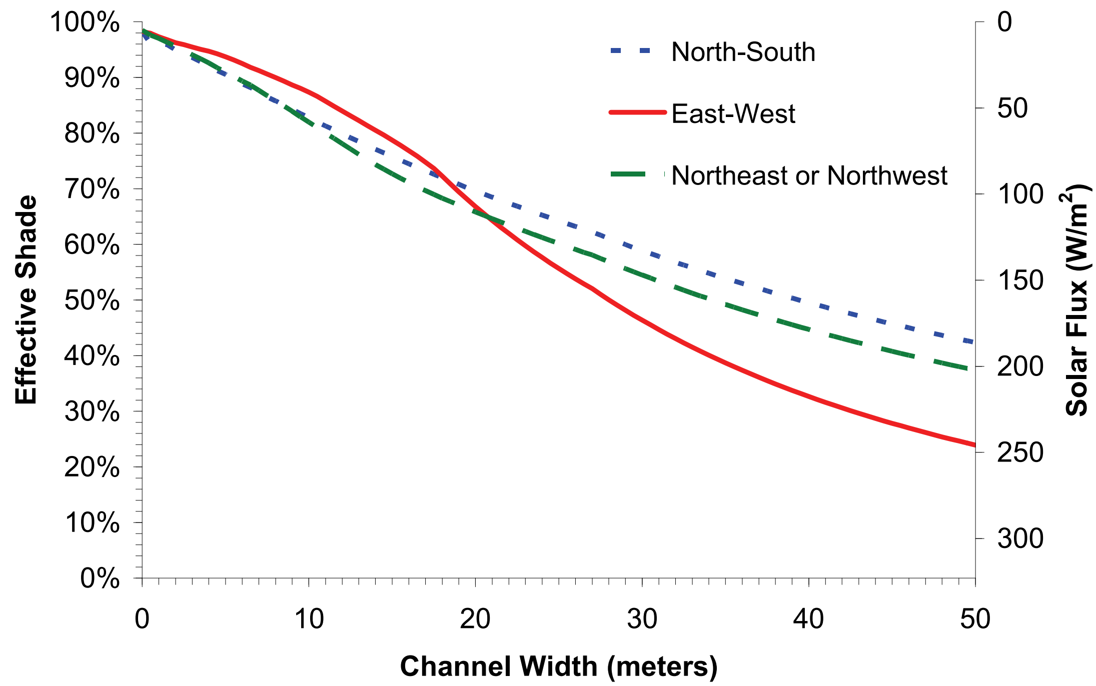


Zones are based on modifications of Ecoregions of Oregon (Thorson et.al., 2003) as follows: Zone 1 - Cascade Crest Montane Forest; Zone 3 - Grand Fir Mixed Forest; Zones 5 & 6 - Oak/Conifer East Cascade Columbia Foothills; Zone 4 - Pleistocene Lake Basin and Umatilla Plateau. The zone numbers are not sequential because of revisions to the map as the TMDL was developed. Changing the numbers after each revision would have been difficult and labor-intensive because the modeling setup and the zones are intricately linked.

Figure 3-17. Effective Shade Curves for the Miles Creeks portion of the Middle Coumbia-Hood Subbasin (North-South, East-West, and Northeast-Northwest refer to stream aspect).

TMDL Vegetation Zone 1

Forest



Wet Meadows

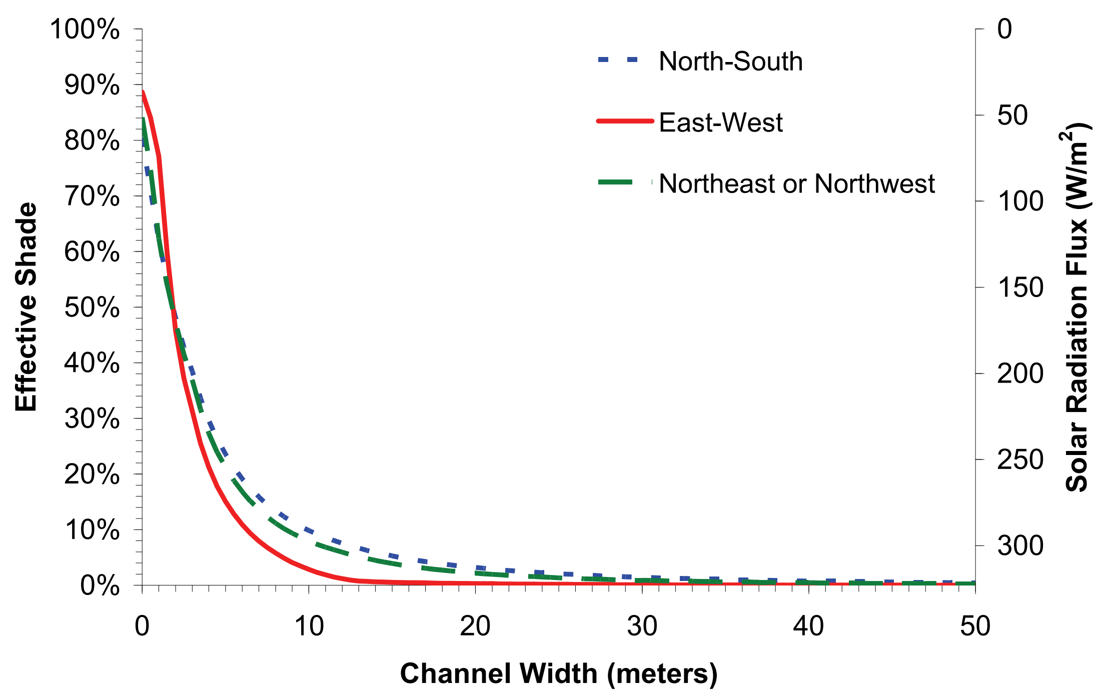


Figure 3-17 (continued). Effective Shade Curves for the Miles Creeks portion of the Middle Coumbia-Hood Subbasin (North-South, East-West, and Northeast-Northwest refer to stream aspect).

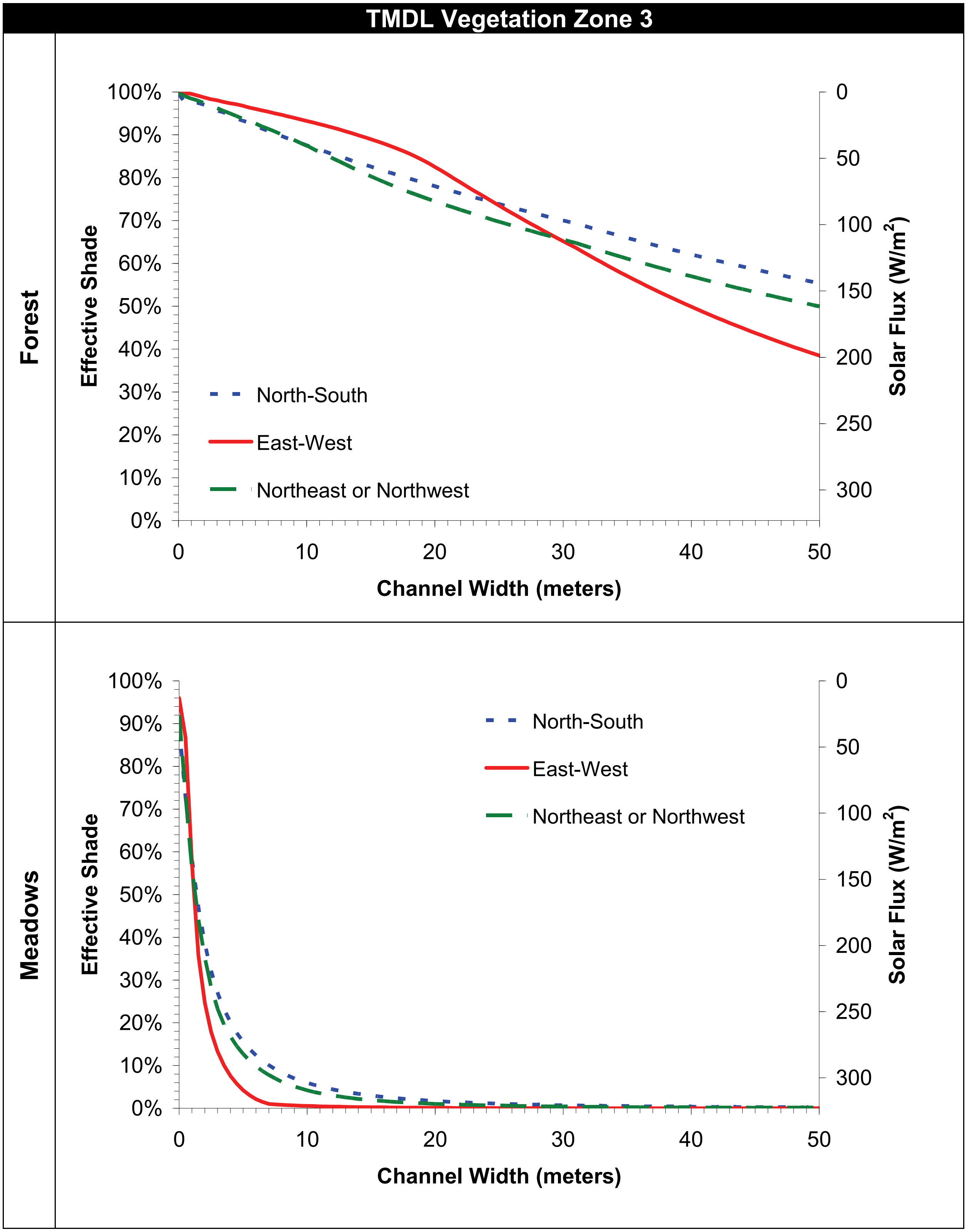
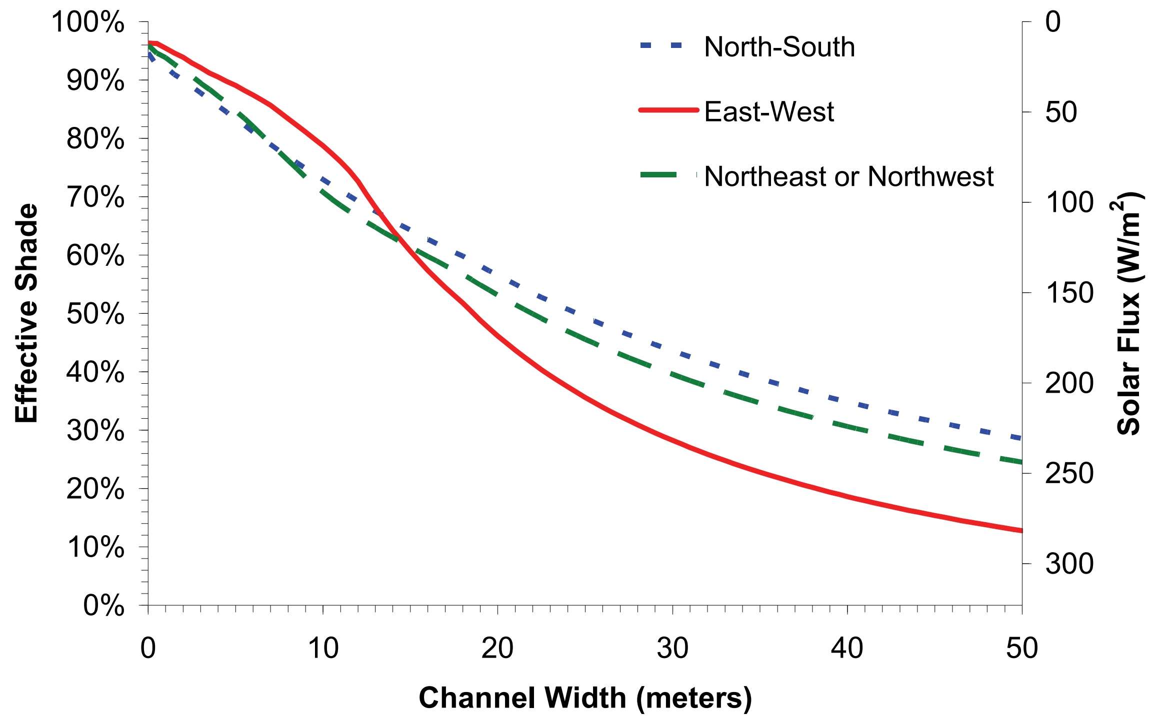


Figure 3-17 (continued). Effective Shade Curves for the Miles Creeks portion of the Middle Coumbia-Hood Subbasin (North-South, East-West, and Northeast-Northwest refer to stream aspect).

TMDL Vegetation Zone 5



TMDL Vegetation Zone 6

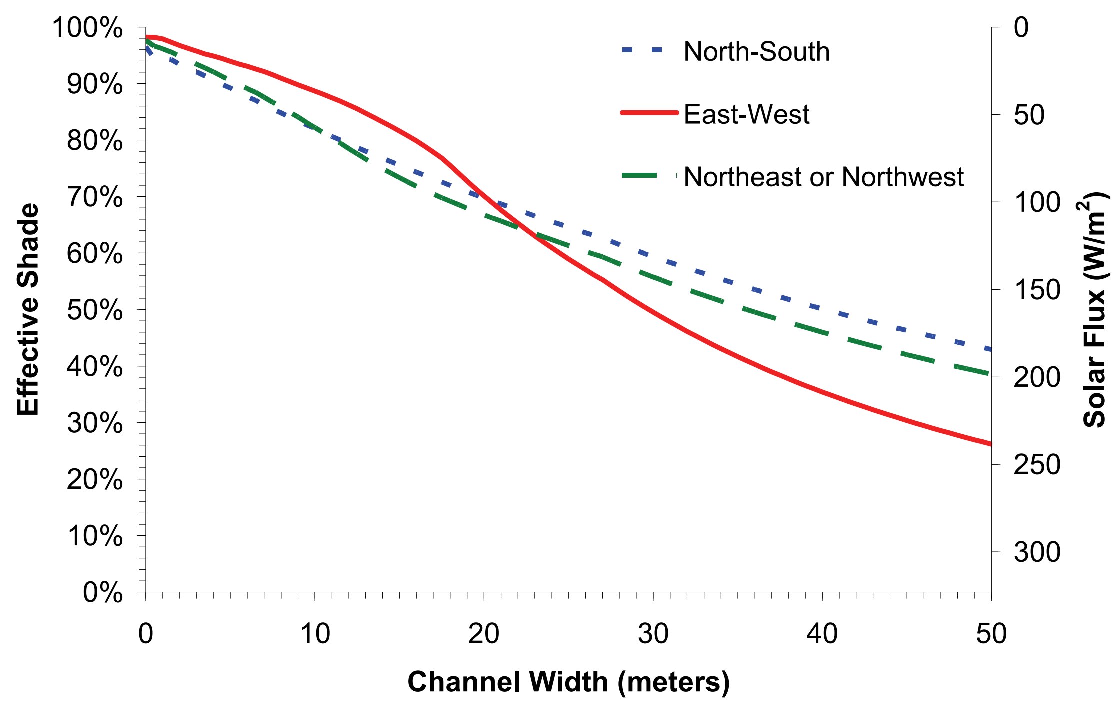
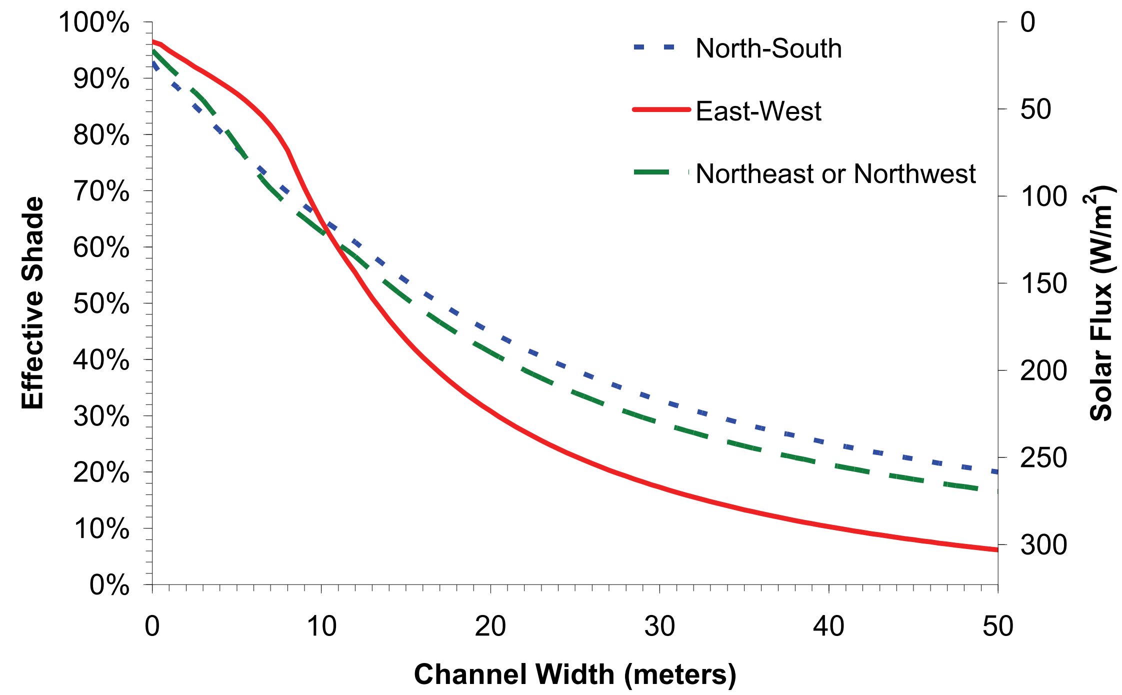


Figure 3-17 (continued). Effective Shade Curves for the Miles Creeks portion of the Middle Coumbia-Hood Subbasin (North-South, East-West, and Northeast-Northwest refer to stream aspect).

TMDL Vegetation Zone 4



3.8.1.2 Total Daily Solar Heat Load

The *total solar heat load* (expressed in megawatts) was determined for Fifteenmile Creek by multiplying the daily solar heat flux (shown in **Figure 3-13**) by the current condition wetted stream surface area for the lower 70.5 kilometers of the creek. This type of total daily heat load could only be calculated on FIfteenmile Creek because the hydrology simulation was needed to determine the wetted surface area (see **Appendix A** for additional information) and hydrology simulation was only done on Fifteenmile Creek. The solar heat load was calculated for both current conditions and background conditions (**Table 3-6**).

For the purposes of this analysis, current conditions represent the total daily solar heat load being received by the stream. Background loading (the non point source load allocation) was calculated by simulating the solar radiation heat load that resulted with system potential near stream vegetation. Anthropogenic nonpoint source load is the difference between the current total daily solar load and the background daily solar heat load.

Table 3-6. Nonpoint source daily solar radiation heat loading for Fifteenmile Creek.

$H_{Total\ NPS}$	$H_{SP\ NPS}$	$H_{Anthro\ NPS}$	$(H_{Total\ NPS}-H_{SP\ NPS}/H_{Total\ NPS})$ x 100
Current Condition Solar Radiation Heat Load (Megawatts)	**Load Allocation - Background** System Potential Solar Radiation Heat Load (Megawatts)	**Anthropogenic Nonpoint Source** Solar Radiation Heat Load (Megawatts)	Excess Load - Portion of Current Solar Radiation Load from Anthropogenic Nonpoint Sources
103.3	36.7	66.7	65%

3.8.1.3 Crow Creek Dam

Based on the analysis presented in **Section 3.7.2**, Crow Creek dam did not contribute to exceedances of the temperature standard downstream of the reservoir. As such, the dam will need to fall within the nonpoint source HUA of 0.05°C. If data collected at a later date determines that the dam does contribute a heat load beyond the HUA, additional modeling will be done, as resources allow, to determine a specific allocation for the dam. Additional monitoring and/or modeling would also be required if the dam is altered beyond its current condition in the future.

3.8.2 Point Source Wasteload Allocations

A Wasteload Allocation (WLA) is the amount of pollutant that a point source can contribute to the stream without violating water quality criteria. There are only two NPDES point source discharges in the Middle Columbia-Hood (Miles Creeks) Subbasin that were determined to have the potential to impact stream temperatures. **Equations 3-1** and **3-2** should be used to calculate permit limits when the two NPDES permits are renewed. Source specific wasteload allocations are described below.

As discussed in **Section 2.4.2**, it was determined that facilities with a general stormwater permit did not have a reasonable potential to impact stream temperatures. Therefore, these facilities are allocated their current heat load. The facilities' impact is expected to be negligible but may utilize the 0.2 °C point source human use allowance should future analysis indicate otherwise. In addition, when existing facilities renew their stormwater permit, or if a new facility applies for a stormwater permit, DEQ will evaluate the stormwater management plan to ensure consistency with this TMDL.

Waste load allocations in this TMDL are expressed as thermal load limits (TLL). **Equation 3-1** is used to calculate the thermal load limit for all point sources waste load allocations.

$$TLL = 3.78541 \cdot Q_e \cdot S \cdot \Delta T_{all} \cdot \rho$$ **(Equation 3-1)**

Equation 3-2 is used to calculate the change in temperature (ΔT_{mz}) at edge of the Mixing Zone to determine compliance with **Equation 3-1**.

$$\Delta T_{mz} = \frac{T_e + (S-1) \cdot T_c}{S} - T_c$$ **(Equation 3-2)**

Where:

TLL = Waste load allocation thermal load limit (million-kcal/day)
Qe = Effluent Flow (mgd)
Qr = upstream river flow (mgd)
S =Dilution = (Qe + Qr / Qe)
ΔT_{all} = Allowable HUA temperature increase at edge of MZ
ΔT_{mz} = Temperature increase at edge of MZ
ρ = Density of Water (1 g/cm^3)
3.78541 = Conversion from mgd to m^3/day (3,785.41), Specific Heat of Water (1000 kg/m^3) and from kcal to million-kcal (1/1000000)
T*e* = Effluent temperature (°C)
T*c* = Applicable temperature standard (°C)

When natural thermal potential temperatures are the applicable criteria, permit writers should use estimates of natural thermal potential temperatures that include natural disturbance.

Dufur Wastewater Treatment Plant.

The wasteload allocations for the Dufur Wastewater Treatment Plant are summarized in **Table 3-7**. The City of Dufur is allowed to discharge to Fifteenmile Creek from November 1st through April 30th. Because the WWTP does not discharge into Fifteenmile Creek during the summer, the WLA during the summer (May 1 to October 31) is 0 million-kcal/day.

Table 3-7. Wasteload allocations for the Dufur Wastewater Treatment Plant.

Time Period	Waste Load Allocation	HUA (ΔT)	Applicable Temperature Criteria (T*a*)
May 1 – October 31	0.0 million-kcal/day	n/a	n/a
November 1 – April 30	See **Equation 3-1**	0.2 °C	13°C

Thermal modeling and allocations in this TMDL were done to protect aquatic life during the critical summer conditions. To ensure the WWTP discharge is also protective of aquatic life during non-summer conditions, an evaluation of data collected during the spawning season was also done. The designated spawning period for the reach of Fifteenmile Creek into which the WWTP discharges is August 15th through May 15th. During this time, the biologically based temperature criterion of 13°C applies. The City's design effluent flow is 0.085 MGD or 0.13 cfs. The 7Q10 flow for Fifteenmile Creek was estimated as 11 cfs.

Using **Equations 3-1** and **3-2**, it was determined in the evaluation report for the current permit that the discharge from the wastewater treatment facility increased the temperature of Fifteenmile Creek by 0.05°C at the edge of the mixing zone with 100% of the stream flow during the spawning season when stream temperatures are less than 13°C. The portion of the HUA allocated to this point source is 0.2°C. Based on this analysis, there appears to be no reasonable potential that this facility will cause or contribute to temperature criteria exceedances in the creek during the spawning season when stream temperatures are less than 13°C. For this analysis, the point of maximum impact was considered to be at the point of discharge for the WWTP.

The data evaluation provided in the Source Assessment for this TMDL (**Section 3.7.3**) indicated that stream temperatures are not always below 13°C during the last two weeks of April. During the next permit revision for the WWTP, the evaluation report and permit conditions will need to address the discharge during this two week period to ensure that the HUA of 0.2°C will still be met during this time.

The Dalles Wicks Water Treatment Plant.

The wasteload allocations for The Dalles Wicks Water Treatment Plant are summarized in **Table 3-8**. Heat Source modeling was not done on South Fork Mill Creek because the Wicks Water Treatment Plant is the only point source on the stream and there was significant instream data collected at the point of discharge to characterize this source's temperature impact. As was shown by the temperature data collected in 2005 and with a mass balance analysis, the treatment plant discharge at that time increased the stream temperatures by as much as 2°C during the summer. Since this far exceeds the amount of heat allowed under the HUA (0.2°C), the wasteload allocation for Wicks water treatment plant is calculated using **Equation 3-1**.

Table 3-8. Wasteload allocations for the Wicks Water Treatment Plant.

Time Period	Waste Load Allocation	HUA (ΔT)	Applicable Temperature Criteria (T*a*)
May 16 – October 14	See **Equation 3-1**	0.2 °C	18°C
October 15 – May 15	See **Equation 3-1**	0.2 °C	13°C

DEQ will work with the City of The Dalles as they determine the best way to meet this wasteload allocation as it is implemented through their NPDES permit. DEQ will very likely require the city to apply for an individual permit for this facility. The City will also be named a designated management agency responsible for meeting load allocations in areas of their jurisdiction. This will require development of an implementation plan for how their operations will meet water quality standards and this TMDL. This plan will be discussed further in **Chapter 4** (Water Quality Management Plan).

3.8.3 Summary of Load and Wasteload Allocations

Table 3-9 summarizes the load and wasteload allocations for Fifteenmile Creek. Rather than specifically allocating loads to nonpoint sources, point sources and reserve capacity, the anthropogenic allocations are based on portions of the human use allowance of 0.3°C (0.54°F) (**Table 3-10**). This allocation of the HUA applies throughout the Middle Columbia-Hood (Miles Creeks) Subbasin.

Table 3-9. Heat Allocation Summary for Fifteenmile Creek.

Source	Allocations
Background (LA_{bkgd})	**36.7 MW/day** (see Section 3.8.1)
Anthropogenic Nonpoint Sources (LA_{anthro})	**0.05°C** (not specifically allocated, 1/6 of the HUA) Surrogate measure - site potential effective shade
Point Source Wasteload Allocation (WLA)	**0.2°C** (not specifically allocated, 2/3 of the HUA)
Margin of Safety (MOS)	**Implicit** (see Section 3.10)
Reserve Capacity (RC)	**0.05°C** (not specifically allocated, 1/6 of the HUA)

Table 3-10. Allocation of the Human Use Allowance (0.54°F or 0.3°C).

Source	Human Use Allowance
Nonpoint Source and Background	Equivalent to 1/6 of the Human Use Allowance (0.09°F or 0.05°C)
NPDES Point Source	Equivalent to 2/3 of the Human Use Allowance (0.36°F or 0.2°C)
Reserve Capacity	Equivalent to 1/6 of the Human Use Allowance (0.09°F or 0.05°C)

While one-sixth (0.05°C) of the HUA was set-aside for nonpoint sources, anthropogenic nonpoint sources (agriculture, forestry, urban, and transportation land uses) have not been assigned individual numeric load allocations. Due to the diffuse nature of nonpoint source pollution and seasonal variability, the nonpoint source load allocation will vary longitudinally and temporally. (For example, the same amount of heat will have a larger temperature effect on a small stream than it will on a large stream, so allocations are location-dependent.) Therefore, a quantified nonpoint source load allocation is not feasible and no specific load allocations have been given to individual nonpoint sources. While Crow Creek dam also received a portion of the nonpoint source HUA, an individual allocation might be determined for Crow Creek Dam if sufficient data were available. Since this data does not currently exist, the Dam allocation falls within the nonpoint source HUA.

Surrogate measures (system potential effective shade) are used to translate nonpoint source load allocations. Site specific effective shade targets were shown in **Section 3.8.2.** Achieving system potential conditions will ensure these nonpoint source land uses will meet the 0.05°C non point source human use allowance. DEQ also considers the conservative methodology that bases nonpoint source load allocations on system potential conditions to be part of the implicit margin of safety. Moreover, any allocation to nonpoint sources would occur only after restoration efforts have reduced solar radiation and morphology conditions to near system potential conditions: a matter of decades in most cases.

Although the current nonpoint source allocation scheme does not specifically address loading rates during spawning periods, allocation of the potential effective shade surrogate protects water quality to the greatest extent throughout the year. Moreover, the allocation of site potential vegetation in general allows for adjustment of expectations through time as more information regarding site-specific conditions becomes available.

3.8.4 Excess Load

Excess load is the difference between the current pollutant load and the loading capacity of a water body. A total daily heat load (in megawatts) was developed for Fifteenmile Creek. Because there are no point sources that discharge to Fifteenmile Creek during the critical summer period, the wasteload allocation is zero. Load allocations for nonpoint sources are based on site potential vegetation. As described in **Section 3.8.1,** Fifteenmile Creek showed an excess load of 66.7 MW per day (the anthropogenic load in **Table 3-6**). This amounts to a 181% increase in solar radiation loading above site potential shade conditions (36.7 MW per day). In other words, nonpoint source loading along Fifteenmile Creek must decrease by 65% in order to achieve the TMDL.

3.9 MARGIN OF SAFETY

The Clean Water Act requires that each TMDL be established with a margin of safety (MOS). The statutory requirement that TMDLs incorporate a MOS is intended to account for uncertainty in available data or in the actual effect controls will have on loading reductions and receiving water quality. A MOS is expressed as unallocated assimilative capacity or conservative analytical assumptions used in establishing the TMDL (e.g., derivation of numeric targets, modeling assumptions or effectiveness of proposed management actions).

The MOS may be implicit, as in conservative assumptions used in calculating the loading capacity, Wasteload Allocation, and Load Allocations. The MOS may also be explicitly stated as an added, separate quantity in the TMDL calculation. In any case, assumptions should be stated and the basis behind the MOS documented. The MOS is not meant to compensate for a failure to consider known sources. **Table 3-11** presents six approaches for incorporating a MOS into TMDLs.

Table 3-11. Approaches for incorporating a Margin of Safety into a TMDL.

Type of Margin of Safety	*Available Approaches*
Explicit	1. Set numeric targets at more conservative levels than analytical results indicate. 2. Add a safety factor to pollutant loading estimates. 3. Do not allocate a portion of available loading capacity; reserve for MOS.
Implicit	1. Conservative assumptions in derivation of numeric targets. 2. Conservative assumptions when developing numeric model applications. 3. Conservative assumptions when analyzing prospective feasibility of practices and restoration activities.

The MOS for the Middle Columbia-Hood (Miles Creeks) Subbasin TMDL is implicit, based on conservative analytical assumptions and numeric targets. These conservative assumptions include:

- Conservatively low estimates for groundwater inflow were used in stream temperature calibrations. Specifically, unless measured or inferred from a mass balance analysis, groundwater inflow was assumed to be zero. Generally, groundwater has a cooling influence on stream temperatures via mass transfer/mixing. These underestimates of groundwater influence are considered a margin of safety.
- Conservatively low estimates of wind speed were used in stream temperature calibrations. Simulations were performed with wind speeds at zero or at low levels of recorded data. Wind speeds influence evaporation, a cooling influence on stream temperatures. The underestimation of wind speed is considered a margin of safety.

- Cooler microclimates associated with mature natural near-stream land cover were not accounted for in the simulation methodology.
- DEQ allocated one-sixth of the human use allowance to non point sources but is basing the load allocation on system potential conditions. DEQ considers this conservative methodology to be part of the implicit margin of safety.

3.10 RESERVE CAPACITY

DEQ will hold 0.05°C (0.09°F) of the 0.3°C (0.54°F) Human Use Allowance as reserve capacity to be used for future growth by point sources or other unidentified point sources on Fifteenmile Creek and other tributaries in the Miles Creeks portion of the Middle Columbia-Hood Subbasin. Nonpoint sources of heat are limited to the load allocation. Reserve capacity may be granted to sources that have demonstrated a need for additional allocations, despite attempts to offset this need through technological improvements or water quality trading options.

3.11 WATER QUALITY STANDARD ATTAINMENT ANALYSIS & REASONABLE ASSURANCES

The temperature TMDL and the temperature water quality standards are achieved when (1) nonpoint source solar radiation loading is at a natural level and (2) point source discharges cause no measurable temperature increases in surface waters or are within the allotted temperature targets and Human Use Allowance.

Heat Source simulations were done on Fifteenmile Creek for the period July 17, 2002 through August 5, 2002. These temperatures represent the summertime critical period for the Fifteenmile Creek. The analysis extended from the boundary of the Mt. Hood National Forest to the mouth (confluence with the Columbia River). Simulations were performed to estimate the natural thermal potential stream temperatures. The natural thermal potential stream temperatures were simulated using the following:

- Potential vegetation heights and densities
- Natural flow conditions – no dams, no withdrawals, no point sources
- Reduced tributary temperatures[4]
- Natural disturbance

The natural thermal potential conditions for this TMDL are represented by Scenario 6 with natural disturbance as described in **Appendix A**. Further discussion about the simulation methodology is included within **Appendix A**.

Figure 3-18 compares the current stream temperatures with the potential conditions for Fifteenmile Creek. Because each simulation was run over a 20-day period, the moving seven-day average of the daily maximums (7DADM) could be calculated. The peak values of the 7DADM were then selected for the simulation period and plotted in **Figure 3-18**. The results are intended to represent the critical summer time period when stream temperatures reach their yearly maximums and aquatic life is at the greatest risk of thermal impairment. For reference purposes, the applicable Oregon state water quality criteria are included on the chart.

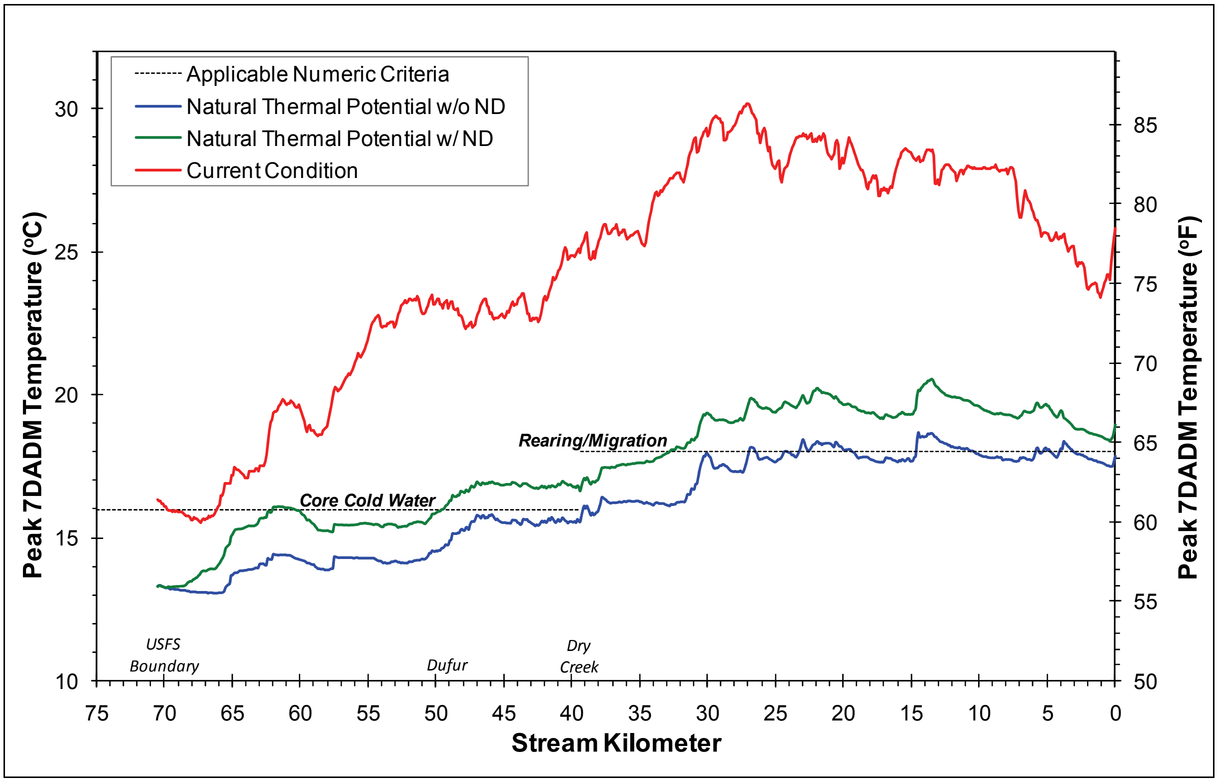
Based on the results of the seven different simulations discussed in **Appendix A**, the differences between current conditions and natural thermal potential conditions in this watershed appear to be due to

[4]Tributary temperatures were set to their estimated Natural Thermal Potential conditions. See Section A3.2.2 in Appendix A for more information about the methodology for making this estimation.

differences in effective shade, tributary temperatures and flows. On average, natural disturbance increases natural thermal potential temperatures by about 1.4°C. Improvements in effective shade seem to play the greatest role in improving stream temperatures, however. Anthropogenic activities that could affect stream temperatures along Fifteenmile Creek include livestock grazing, agricultural activities, location of roads and buildings, logging activities, and manipulation of instream flows through instream diversions and impoundments; and irrigation return flows.

The natural thermal potential temperature exceeds the biologically-based numeric criteria at several locations along the creek so there is no assimilative capacity for Fifteenmile Creek and there are no allocations beyond the human use allowance provided by the temperature standard. The natural thermal potential temperatures become the temperature criteria for Fifteenmile Creek when they exceed the biological criteria.

Figure 3-18. Fifteenmile Creek temperature simulation results (ND=natural disturbance).



The distributions of peak 7DADM data are presented in **Figure 3-19**. The two graphs presented here assess the temperature distributions over the entire 70.5 kilometers simulated. For the stream reach modeled, the core cold water criterion applies on the upper 31.1 kilometers while the rearing/migration criterion applies on the lower 39.4 kilometers. The graphs in **Figure 3-19** show that all simulated stream temperatures greater than 22°C (71.6°F) were eliminated under natural thermal potential conditions. The graphs clearly show the shift in overall temperature regime from warmer to cooler conditions in the system potential scenario (i.e., the line has shifted to the left, which correlates to cooler temperatures).

Figure 3-20 maps the spatial distributions of current stream temperatures and natural thermal potential stream temperatures on Fifteenmile Creek, which also clearly shows the shift to cooler temperatures. **Figure 3-21** maps the spatial distributions of the current effective shade levels and the loading capacity shade levels for Fifteenmile Creek, Eightmile Creek and Ramsey Creek.

Figure 3-19. Distributions of peak 7DADM temperatures during the simulation period in Fifteenmile Creek for current and natural thermal potential conditions (ND=natural disturbance).

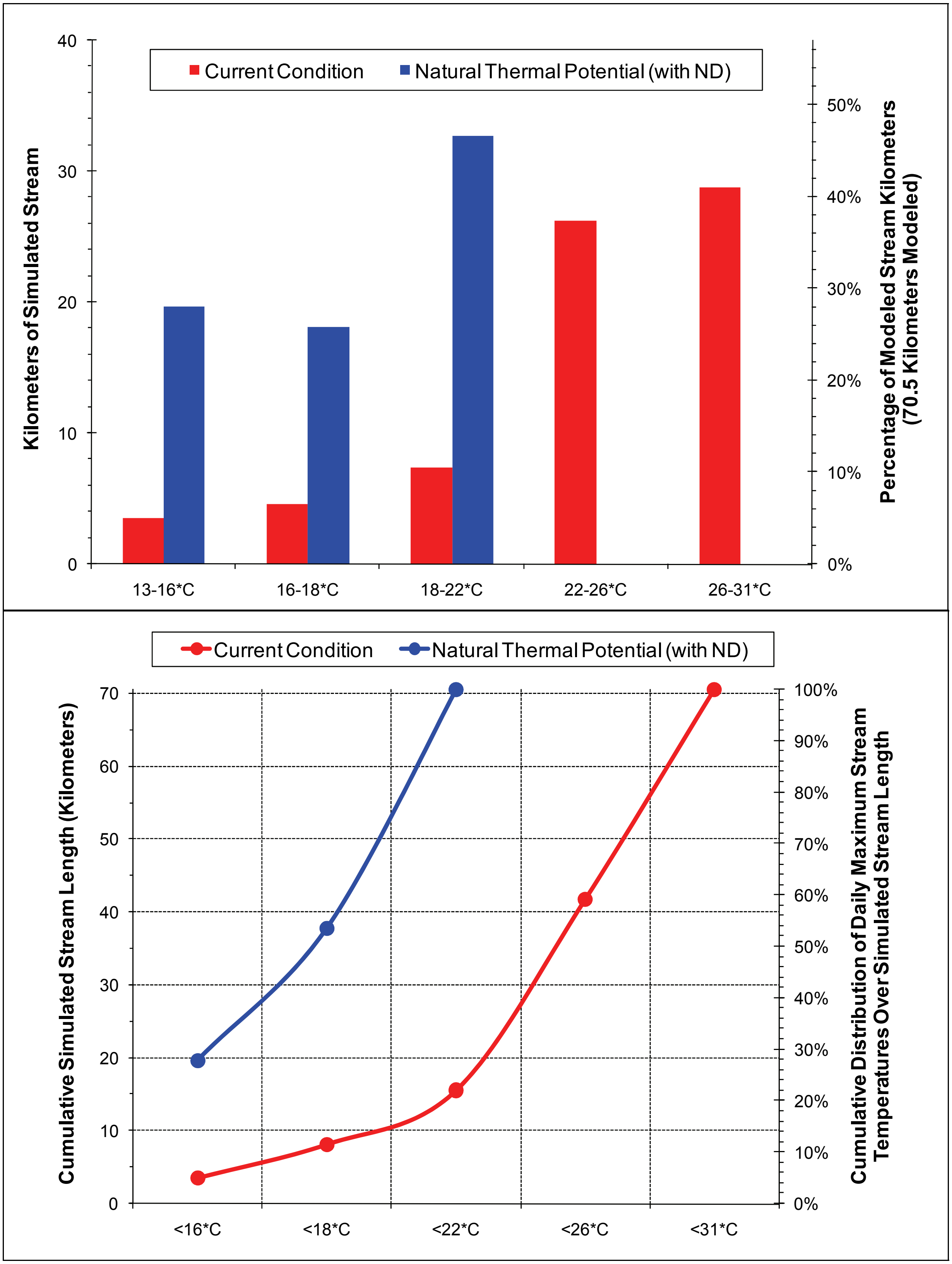


Figure 3-20. Peak 7DADM temperatures for current and natural thermal potential conditions during the simulation period.

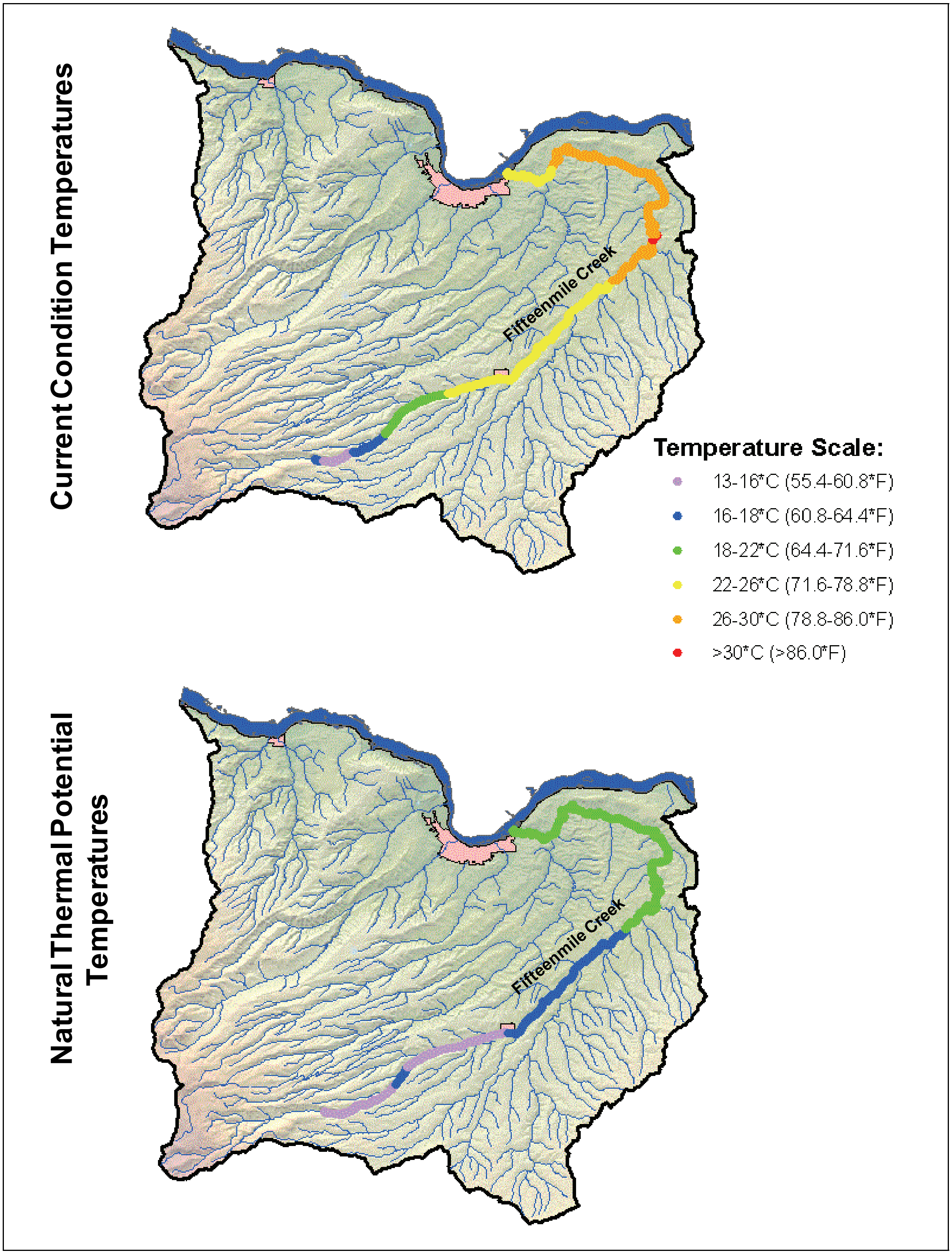
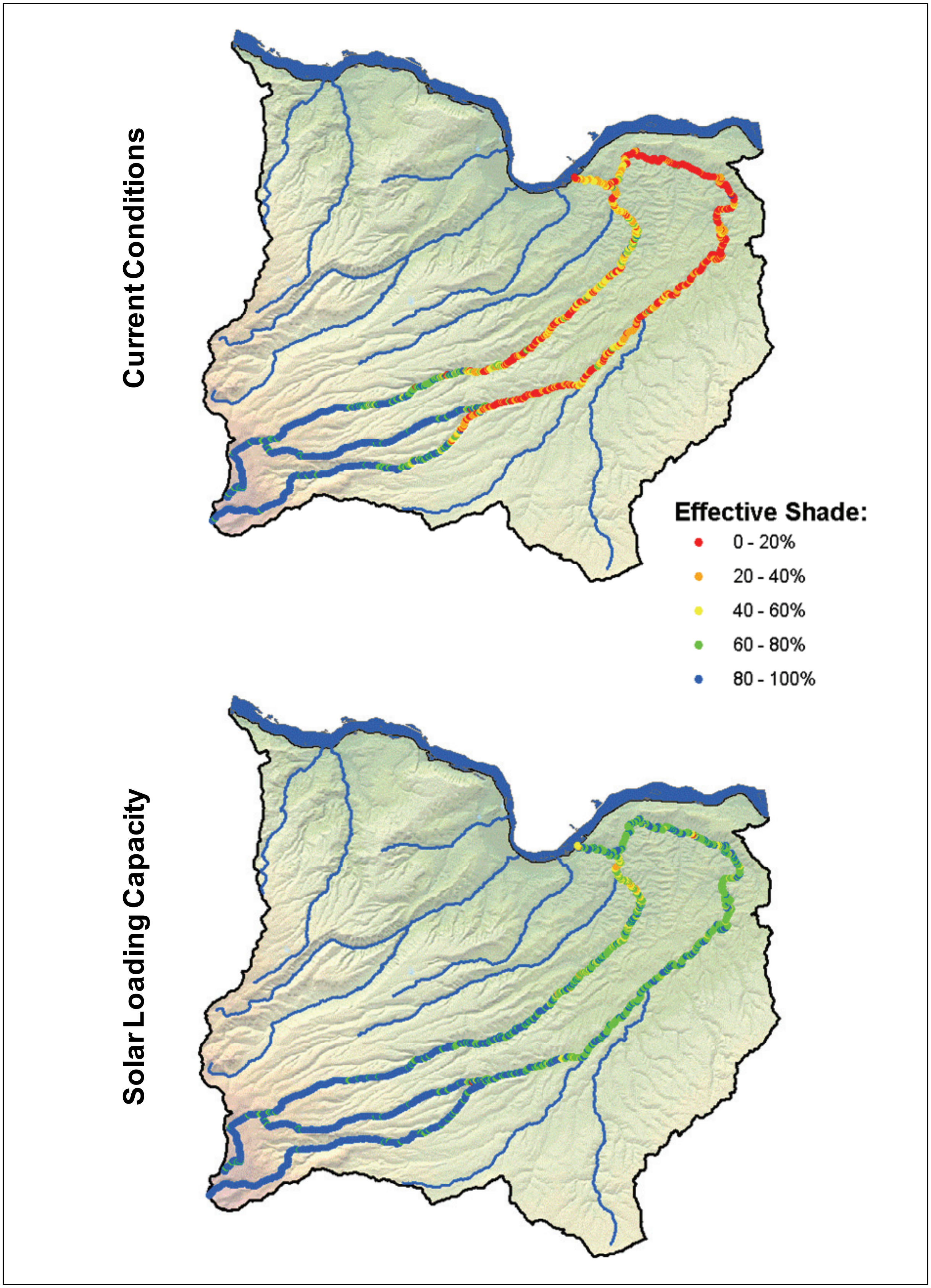


Figure 3-21. Effective shade for current conditions and TMDL allocations for an average summer day.



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CHAPTER 4: WATER QUALITY MANAGEMENT PLAN

4.1 INTRODUCTION

A Total Maximum Daily Load (TMDL) defines the amount of a pollutant that can be present in a water body while meeting water quality standards. A Water Quality Management Plan (WQMP) is developed by DEQ as a broad strategy for implementing TMDL allocations. TMDLs, WQMPs and associated planning work together to protect designated beneficial uses, such as aquatic life, drinking water supplies, and water contact recreation.

In December of 2002, the State of Oregon's Environmental Quality Commission (EQC) adopted a rule commonly referred to as the "TMDL rule" (OAR 340-042). The TMDL rule defines DEQ's responsibilities for developing, issuing, and implementing TMDLs as required by the federal Clean Water Act (CWA). The WQMP is one of the twelve TMDL elements called for in the TMDL rule. Oregon Administrative Rule 340-042-0040-(4)(l) states the following:

> *(l) Water quality management plan (WQMP). This element provides the framework of management strategies to attain and maintain water quality standards. The framework is designed to work in conjunction with detailed plans and analyses provided in sector-specific or source-specific Implementation Plans.*

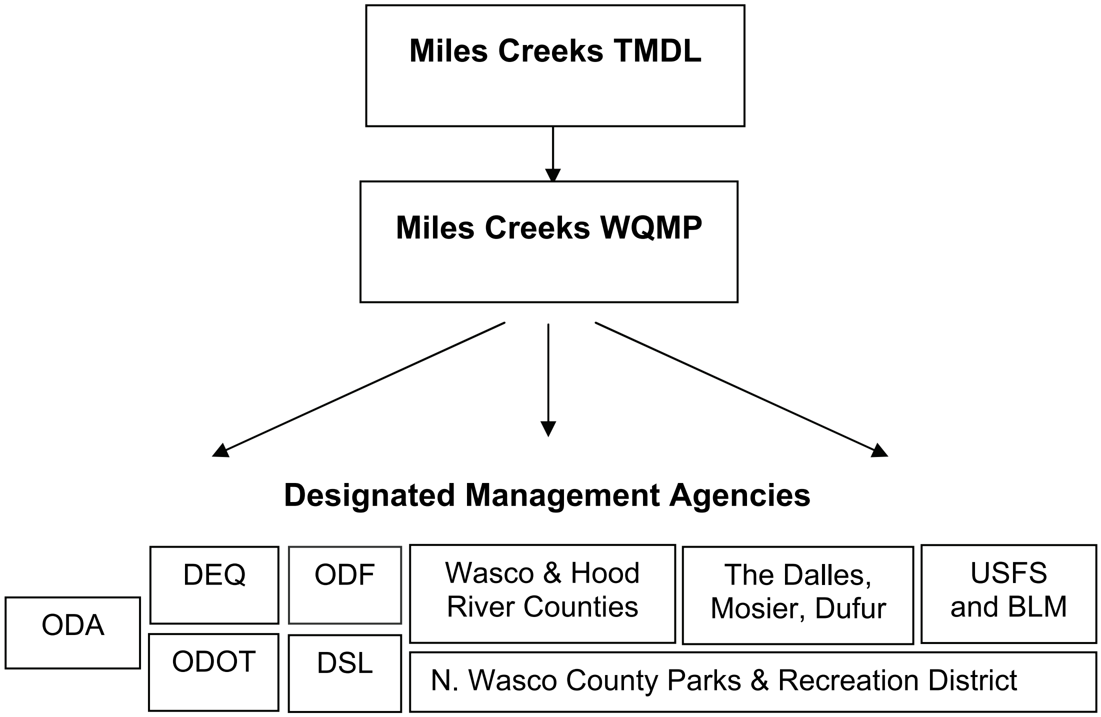
DEQ developed this WQMP to describe the overall framework for implementing the Middle Columbia-Hood (Miles Creek) Subbasin Temperature TMDL. This TMDL and WQMP address the entire area included in the Subbasin, with the exception of the Columbia River. Activities which affect the Columbia River directly, such as point source discharges directly to the Columbia River, will be covered under a TMDL and WQMP for the Columbia River.

Implementation of this TMDL is addressed through two different scales of planning. The WQMP itself serves as a multi-sector framework plan for the area covered by the TMDL. It describes and references various plans and programs that are specific to a given land use or management sector. Sector-specific plans, or *TMDL Implementation Plans*, comprise a second tier of planning prepared by the local land use or water quality authority (Designated Management Agencies). A Designated Management Agency (DMA) is defined in the TMDL Rule as "a federal, state or local governmental agency that has legal authority over a sector or source contributing pollutants, and is identified as such by the Department of Environmental Quality in a TMDL." This organizational process is represented schematically in **Figure 4-1**. The TMDL Implementation Plans, when complete, are expected to fully describe the efforts of the DMAs to achieve their applicable TMDL allocations. Because the DMAs will require some time to fully develop these Implementation Plans once the TMDLs are finalized, the first iterations of the Implementation Plans are not expected to completely describe management efforts.

This WQMP establishes timelines to develop Implementation Plans. DEQ and the DMAs will work collaboratively to assure that the WQMP and TMDL Implementation Plans collectively address the elements described below under **Section 4.2**. In short, this document is a starting point and foundation for the WQMP elements being developed by DEQ and the DMAs. If the Department identifies other responsible DMAs at a later time, then the DMA list will be revised. ***It should be noted that individual Implementation Plans are only referenced in this document; they are not attached as appendices.***

In other TMDLs recently developed in Oregon, the Oregon Department of Geology and Mine Industries (DOGAMI) and the Oregon Parks and Recreation Department (OPRD) have also been named as DMAs. As of the writing of this TMDL, DEQ did not know of any mines permitted by DOGAMI or lands managed by OPRD in the Subbasin. These agencies are therefore not named as DMAs at this time. If they are later determined to have land management authority over activities that could contribute heat to Subbasin streams, they will be named DMAs at that point and be required to submit an Implementation Plan.

Figure 4-1. TMDL/WQMP/Implementation Plan schematic.



Agency abbreviations are for: Oregon Departments of Agriculture, Environmental Quality, Forestry, Transportation, and State Lands, US Forest Service and Bureau of Land Management.

Confederated Tribes of the Warm Springs Reservation of Oregon. The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) is not designated as a DMA in this WQMP. Tribal responsibility on ceded lands throughout the Middle Columbia-Hood Subbasin is defined through their role as co-manager of the fisheries resource which has been determined through treaty rights and federal court decisions. As a co-manager of these resources, the Tribe plays a role in development and implementation of plans and projects designed to protect and enhance treaty-reserved resources, including salmon, steelhead, and other aquatic resources. Consultation and continued coordination with the CTWSRO will enhance the effective implementation of the TMDL

In 1995 CRITFC and the 4 Columbia Basin treaty-tribes (the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes) took the initiative to develop and implement, *Wy-Kan-Ush-Mi Wa-Kish-Wit*, a cooperative plan to restore the fisheries resource in the Columbia River Basin above Bonneville Dam (CRITFC, 1995). This Restoration Plan stresses the importance of healthy connected riparian habitat for restoration of anadromous fish populations. *Wy-Kan-Ush-Mi Wa-Kish-Wit* identifies the watershed needs for 23 subbasins including Fifteenmile Creek. The Fifteenmile Creek plan states that fish production is limited by various land practices (including agriculture and logging) which have lowered summer flows, eliminated and/or degraded riparian zones, elevated stream temperatures, increased soil erosion, and curtailed the system's ability to store water and regulate runoff. Some of the actions that are called for include: protect and enhance aquatic and riparian habitat; encourage exceedance of the State Forest Practices Act guidelines; and increase streambank cover, decrease water temperatures and increase streamflows during the summer.

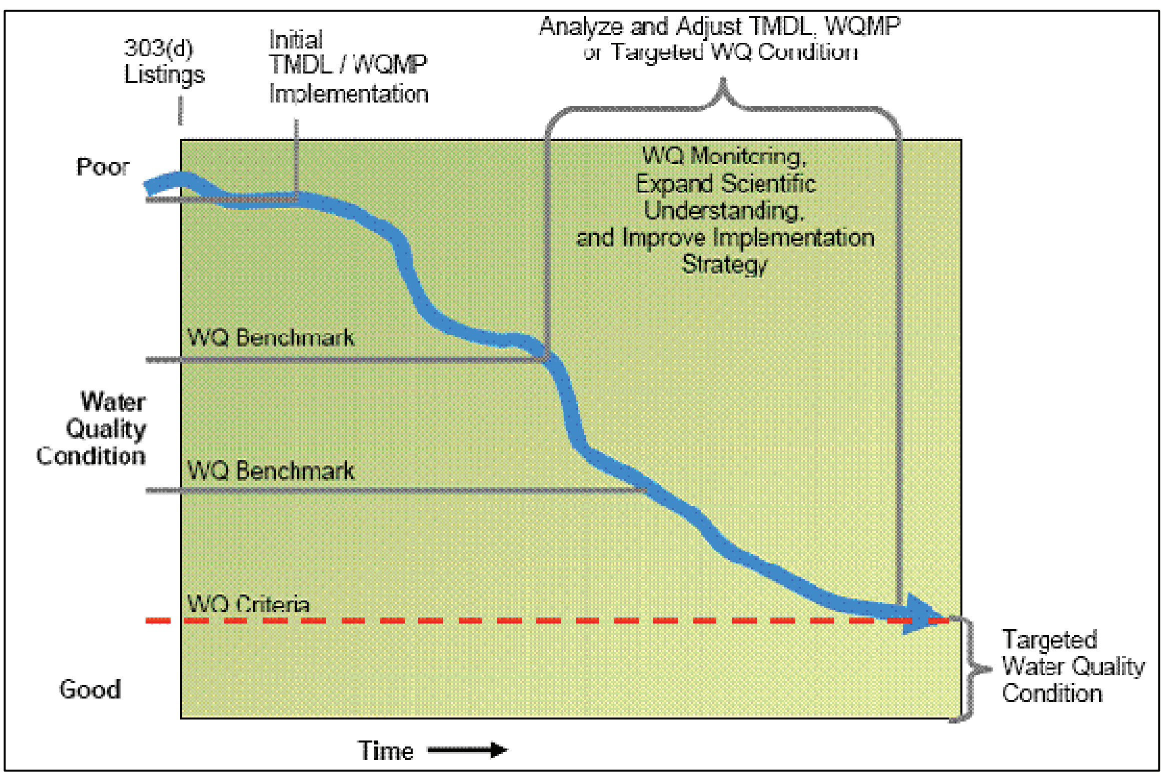
4.1.1 Adaptive Management

DEQ recognizes that the relationship between management actions and pollutant load reductions is often not precisely quantifiable. DEQ applies an *adaptive management* policy to implement TMDLs. *Adaptive management can be defined as a systematic process for continually improving management policies and* *practices by learning from the outcomes of operational programs.* In employing an adaptive management approach to the TMDL and the WQMP, DEQ has the following expectations and intentions:

- In the short term, the DEQ anticipates reviewing TMDL and WQMP progress on an "as needed" basis. DEQ resources are currently concentrating efforts on completing TMDL development throughout the state. Moreover, DEQ needs to develop policy on the logistics for reviewing TMDL implementation.
- In conducting its review DEQ will evaluate progress towards achieving the TMDL (and water quality standards) and the success of implementing the WQMP.
- DEQ expects that each DMA will also monitor and document its progress in implementing the provisions of its implementation plan. This information will be provided to DEQ for its use in reviewing the TMDL.
- As implementation of the WQMP and the associated implementation plans proceeds, DEQ expects that DMAs will develop benchmarks for attainment of TMDL surrogates that can then be used to measure progress.
- Where performance of the implementation plans or effectiveness of management techniques is found to be inadequate, DEQ expects the DMAs to revise their plan components to address the deficiencies.
- When DEQ in consultation with the DMAs, concludes that all feasible steps have been taken to meet the TMDL, its associated surrogates and water quality standards, and that the TMDL or the associated surrogates and standards are not practicable, the TMDL may be reopened and revised as appropriate.
- DEQ will consider reopening the TMDL should new information become available indicating that the TMDL or its associated surrogates need revision.

Figure 4-2 is a graphical representation of this adaptive management concept.

Figure 4-2. Adaptive management - schematic diagram.



4.1.2 TMDL Implementation Discussion

The Clean Water Act and related Oregon Administrative Rules (OARs) target water quality standards attainment or that all feasible steps will be taken towards achieving the highest quality water possible. The Middle Columbia-Hood (Miles Creeks) Subbasin TMDL establishes numerical loadings to limit pollutant levels in order to achieve water quality standards.

Existing water quality conditions in the Subbasin are expressions of hundreds of years of prior human activities. Reversing these conditions may take decades of concerted stakeholder efforts before approaching the desired TMDL goals. In order to achieve the desired water quality conditions as quickly as possible, implementation strategies need to commence as quickly as possible. Some of the factors to be considered for the lengthy recovery time are:

- Complex natural systems (ecology, stream hydrology, channel morphology) recover slowly.
- Despite the best and most sincere efforts, natural disturbance events beyond the control of humans may interfere with or delay attainment of the TMDL and/or its associated surrogates. Such events may include: floods, fire, insect infestations, and drought. DMAs will not be considered out of compliance with the TMDL due to the effects of natural disturbances.
- System loadings are calculated using mathematical models and other analytical techniques designed to simulate and/or predict extremely complex physical, chemical and biological processes. DEQ uses the best data and pollutant loading estimates that are currently available to predict best estimates of how waterways in the Subbasin will respond to WQMP implementation measures.
- Building stakeholder acceptance and program support through education and outreach programs takes time.
- Technological controls for nonpoint source pollution are evolving. It may take one or more iterations to develop effective pollution abatement techniques.
- New information or analytical techniques may trigger the need to revise the TMDL and/or water quality goals.
- It is possible that after executing all reasonable best management practices, some TMDLs cannot be met.

Where nonpoint sources are given a zero load allocation, it does not necessarily mean that human-related land management activities are prohibited. For example, the TMDL establishes a maximum thermal loading capacity at which the temperature standard will be met. DEQ's analysis indicates that the numeric temperature criteria may not be achieved at all times, even after all anthropogenic influences have been eliminated. This means that only a heat load equivalent to a portion of the human use allowance is allocated to anthropogenic activities and that the natural thermal condition is the appropriate target. Implementation of a TMDL with zero allocations to nonpoint sources beyond the equivalent head load allowed by the human use allowance should not be construed to mean that human activity must be removed from riparian or other areas that might impact water quality. It does mean that anthropogenic activities that might increase heat discharges to the water body must be managed to prevent further warming to the maximum practicable extent. DEQ expects that management activities to reduce and minimize stream heating will be specified in approved TMDL implementation plans. Specified management activities should allow riparian vegetative communities to grow and propagate, and natural fluvial processes such as flood plain formation and bank stabilization to occur.

TMDL Implementation Compliance and Enforcement:

TMDL implementation is generally enforceable by DEQ, other state and federal agencies, and by local government. However, it is envisioned that sufficient initiative exists to achieve water quality goals with minimal enforcement. Should the need for additional effort emerge, it is expected that the responsible agency will work with land managers using education, technical support or enforcement. Instances of inadequate action towards progress may necessitate the need for enforcement. If needed, enforcement could occur first through direct intervention from land management agencies (e.g. ODF, ODA, counties, and cities), and secondarily from DEQ. The latter may be based on Department orders to implement management goals leading to water quality standards.

It is important to note that:

- *The DEQ considers a nonpoint source found to be in compliance with its approved implementation plan to be in compliance with the TMDL. Nonpoint sources will not be considered out of compliance with the TMDL due to the effects of natural disturbances.*
- *If the WQMP has been fully implemented, all feasible management practices have yielded maximum expected effects, and the TMDL or its interim targets have not been achieved, then the Department will reopen the TMDL and adjust it or its interim targets and the associated water quality standard(s) as necessary.*

4.2 TMDL WATER QUALITY MANAGEMENT PLAN AND IMPLEMENTATION PLAN GUIDANCE

On December 12, 2002, the State of Oregon's Environmental Quality Commission (EQC) adopted rules (Oregon Administrative Rules (OAR) Chapter 340, Division 42) establishing procedures for developing, issuing and implementing TMDLs as required by the Federal Clean Water Act. The rules include a list of the required WQMP elements. These elements serve as the framework for this WQMP and are listed below.

Water Quality Management Plan Elements per OAR 340-042 0040(4)(l)

A. Condition assessment and problem description
B. Goals and objectives
C. Proposed management strategies
D. Timeline for implementing management strategies
E. Relationship of management measures to attainment of water quality standards
F. Timeline for attainment of water quality standards
G. Identification of responsible participants, including DMAs
H. Identification of sector-specific implementation plans
I. Schedule for preparation and submission of implementation plans
J. Reasonable assurance
K. Monitoring and evaluation
L. Public involvement
M. Planned efforts to maintain management efforts over time
N. Costs and funding
O. Citation to legal authorities

The following sections A-O provide a further discussion of each of these WQMP elements.

TMDL Implementation Plan – Expected Components

Some of the elements listed above are sufficiently addressed in the WQMP and others are partly or largely deferred to the DMA programs. The Oregon Administrative Rules in OAR 340-042 clarify DEQ's expectation of TMDL Implementation Plan content, as follows:

> 340-042-0080(2): "The Oregon Department of Forestry will develop and enforce Implementation Plans addressing state and private forestry sources as authorized by ORS 527.610 through 527.992 and according to OAR chapter 629, divisions 600 through 665. The Oregon Department of Agriculture will develop Implementation Plans for agricultural activities and soil erosion and enforce associated rules as authorized by ORS 568.900 through 568.933 and according to OAR chapter 603, divisions 90 and 95."

340-042-0080(3): "Persons, including DMAs other than the Oregon Department of Forestry or the Oregon Department of Agriculture, identified in a WQMP as responsible for developing and revising sector-specific or source-specific Implementation Plans must:

(a) Prepare an Implementation Plan and submit the plan to DEQ for review and approval according to the schedule specified in the WQMP. The Implementation Plan must:

(A) Identify the management strategies the DMA or other responsible person will use to achieve load allocations and reduce pollutant loading;

(B) Provide a timeline for implementing management strategies and a schedule for completing measurable milestones;

(C) Provide for performance monitoring with a plan for periodic review and revision of the Implementation Plan;

(D) To the extent required by ORS 197.180 and OAR chapter 340, division 18, provide evidence of compliance with applicable statewide land use requirements; and

(E) Provide any other analyses or information specified in the WQMP.

(b) Implement and revise the plan as needed.

General discussion of the expected content of TMDL Implementation Plans can be found in *TMDL Implementation Plan Guidance* (ODEQ, 2007a). DEQ also has a portion of its website devoted to TMDL Implementation Guidelines and Tools (http://www.deq.state.or.us/wq/TMDLs/implementation.htm). There are numerous guidance documents provided here, such as the *Water Quality Model Code and Guide Book* (DEQ and Oregon Department of Land Conservation and Development, 2000), as well as examples of TMDL Implementation Plans. DEQ expects Implementation Plans to be submitted within 18 months of the issuance of the TMDL.

(A) Condition Assessment and Problem Description

A detailed condition assessment and problem description are provided in the preceding chapters of this document. In brief, the primary issue of concern is that temperature standards are not being met in perennial and intermittent streams throughout the Miles Creeks portion of the Middle Columbia-Hood Subbasin. **Table 4.1** summarizes the status of 303(d) listings in the Subbasin.

Table 4-1. Middle Columbia-Hood (Miles Creeks) Subbasin streams on the 2004/2006 303(d) List (ODEQ, 2007b) addressed by 2008 TMDLs.

Parameter	River miles (# of listed segments)	Total
Temperature – Rearing & Migration	143.8 (12)	143.8 (12)
Temperature – Spawning		100.8 (15)
January 1 – May 15	47.3 (3)	
January 1 – June 15	13.2 (1)	
August 15 – May 15	20.5 (6)	
August 15 - June 15	8.2 (3)	
October 15 - May 15	11.6 (2)	
Temperature – Core Cold Water	71.3 (3)	71.3 (3)
Total Stream Miles with One or More Listings*	215.10	

For each parameter, the table shows # of listed miles and (number of listed segments).
*Streams with more than one listing were counted only once in the total stream miles.

A description of the Subbasin is provided in **Chapter 2** of this document. **Chapter 3** provides a condition assessment for temperature. The temperature standard is exceeded during the summer throughout much of the stream network in the Subbasin. Surface water temperatures are heavily influenced by human activities. Specifically, elevated summertime stream temperatures attributed to human activities may result from the following conditions:

- Riparian vegetation disturbance that reduces stream surface shading, riparian vegetation height, and riparian vegetation density (shade is commonly measured as percent effective shade);
- Channel widening (increased width to depth ratios) due to factors such as loss of riparian vegetation that increases the stream surface area exposed to energy processes, namely solar radiation;
- Reduced flow volumes (from irrigation, industrial, and municipal withdrawals) or increased high temperature discharges; and
- Disconnected floodplains which prevent/reduce groundwater discharge into the river.

(B) Goals and Objectives

The overall goal of this WQMP is to reduce nonpoint source pollution in the form of solar heating and in doing so to address the 303(d) temperature listings in the Subbasin. This will be achieved by improving riparian and channel conditions until the load allocations outlined in **Chapter 3**, or their surrogates, are met. Instream flow restoration is encouraged as well, where flow regimes have been artificially modified. The improvement in riparian conditions is also expected to reduce sediment sources, which will partially, if not completely, also address 303(d) listings for sedimentation.

(C) Proposed Management Strategies

DEQ acknowledges that restoration and conservation planning and implementation has already commenced, in a manner supportive of TMDL attainment. And, in much of the Subbasin, more restoration is needed and long term planning should provide for maintenance of effort over time, including areas where the load allocations are currently being met. As described previously, DEQ is reliant on the DMAs for programs and projects providing strategies to minimize stream heating. Management strategies should include outreach, effectiveness monitoring and inventory and tracking of water quality management practices. Implementation Plans should identify targeted TMDL allocations and the sources of water quality impairment addressed by proposed measures.

A list of conditions for management agencies to target is described below, although this list is not exhaustive. Many of these restoration strategies are identified in the Management Plan portion of the Fifteenmile Subbasin Plan (Wasco SWCD et. al., 2004). The subbasin planning process was initiated by the Northwest Power and Conservation Council's 2000 Fish and Wildlife Program and will 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 Fifteenmile Plan was developed locally by the Fifteenmile Coordinating Group, which included representation from all of the local natural resource agencies and organizations.

- <u>Riparian Restoration</u>. Healthy riparian vegetation is needed, including shade producing types. There is potential for continuous stands of riparian trees and herbaceous vegetation along most of the Subbasin's perennial streams, though in some situations this will require considerable evolution in channel shape. DEQ recognizes that this could take decades. Potential shade producing vegetation is described and referenced in **Section A2.73.5** of **Appendix A**. Although DEQ does not specify required vegetation types, for overall ecological benefits and consistency with programs directed to fish and wildlife habitat restoration, native vegetation is generally optimal. Passive or active restoration of riparian vegetation could be applied. In some cases, the necessary riparian vegetation may already be present, but more time is needed for the vegetation to mature. In other cases, active vegetation planting and/or stream fencing may be required.

Riparian/floodplain restoration was identified in the Subbasin Plan as the number one restoration strategy for restoring steelhead abundance, productivity and capacity in Fifteenmile Creek.

- Channel Condition. A stable and natural channel form will typically be narrower and/or more complex than the existing state in many places. Passive or active restoration could be applied. Increased sinuosity will lead to attainment of a more natural channel width/depth, as will restoration of the length and complexity of the stream channel. Removal of levees, dikes, berms, weirs or other water control structures could be helpful for naturalizing channels, as could removing structural bank protections.

- Stream Flow. Increased instream flow, where depleted, will ultimately be needed to achieve the water quality standard for temperature. Increasing stream flow can be achieved by a variety of specific management measures, including: improving irrigation efficiency and allowing conserved water to be used for instream purposes, leasing instream water during minimum flow times, and reducing diversions. Restoration of stream flows (both high and low) was identified as the third most important restoration strategy in the Subbasin Plan for increasing steelhead capacity and abundance in Fifteenmile Creek. Note that the TMDL calls for heat reduction, and although restored flow levels will help achieve this goal, increased flow is not required by the TMDL.

- Upland Management. Upland management that reduces erosion and sediment runoff, such as continued adoption of no-till farming or road closures, will support attainment of a more natural channel form. Retaining adequate watershed vegetation can also reduce rapid surface runoff and promote infiltration and aquifer recharge which can increase spring flows into some streams. Finally, maintaining healthy watershed conditions by reducing fuel loads can help provide an optimal, sustainable supply of water.

- Irrigation Return Flows. Limiting irrigation return flows of warm water can also help meet the heat reduction called for in the TMDL.

(D) Timeline for Implementing Management Strategies

Individual DMA-specific Implementation Plans will address timelines for completing measurable milestones as appropriate. Timelines should be as specific as possible and should include a schedule for BMP installation and/or evaluation, monitoring schedules, reporting dates and milestones for evaluating progress. Time frames for TMDL attainment and Implementation Plan submittal are addressed in **Elements F** and **I** below. NPDES permits are scheduled for re-evaluation/issuance every five years. New and renewed permits will incorporate TMDL wasteload allocations for temperature.

DEQ recognizes that natural resource organizations, local jurisdictions and landowners have been active in watershed restoration both directly and through outreach. This report does not attempt a timeline addressing the many ongoing and voluntary efforts.

(E) Relationship of Management Measures to Attainment of Water Quality Standards

For point sources of pollution, DEQ will issue permits that include specific discharge limitations and compliance schedules that ensure water quality standards are met or will be attained within a reasonable timeline. Permits are reviewed and renewed on a 5-year cycle.

For nonpoint sources of pollution, DMA-specific Implementation Plans will include specific management strategies and timelines. It is expected that the management measures within each Implementation Plan will be directly linked to the reduction of pollutant loading and attainment of water quality standards. DMAs are expected to prepare an annual report and undertake an evaluation of the effectiveness of their plans every five years to gauge progress toward attaining water quality standards. If it is determined that an Implementation Plan is not sufficient to achieve the load allocation, the DMA will be required to revise the plan accordingly. All of these actions, taken together, will target attainment of water quality standards.

The objective of the Temperature TMDL is the attainment of natural thermal potential conditions that will result when solar heating is reduced to the level of the load allocations, as accomplished by improving vegetation, channel and flow conditions. **Chapter 3** of this document (Temperature TMDL) and **Appendix A** provide a discussion on the relationship among riparian vegetation, channel morphology, and flow management measures and their affect on temperature. Management strategies should be clearly linked to the load allocations and their surrogates.

(F) Timeline for Attainment of Water Quality Standards

The timeline for attainment will vary substantially across the Subbasin. In the upper portions of the Fifteenmile, Eightmile and Ramsey Creek watersheds, natural shade conditions are currently close to being achieved. Although not specifically modeled, it is likely that this is the case in the upper portions of the Mill and Mosier Creek watersheds as well. DEQ recognizes that where implementation involves significant riparian habitat restoration, such as in lower portions of the Miles Creeks watersheds, water quality standards may not be met for decades. Attainment of the natural condition criteria for temperature relies on reductions in nonpoint source heat input. Modeling indicates that both vegetation and flow can have dramatic effects on heat reduction. For vegetation, once passive or active restoration is underway and larger vegetation begins to establish, substantial improvement could take place in one to three decades. For flow, substantial improvements could be seen within a single year's time with the restoration of instream flows to a natural condition

DMAs are expected to provide time-lines for TMDL implementation efforts, to the extent feasible. In subsequent TMDL and Implementation Plan review, this should enable further estimation of time frames for water quality standard attainment.

(G) Identification of Responsible Participants, including DMAs

While all inhabitants of the Subbasin share responsibility for preventing water pollution, certain entities are recognized under this TMDL as having specific responsibilities for implementing this TMDL and are required to take necessary actions to meet their assigned load and wasteload allocations. This section identifies the DMAs responsible for implementing management strategies and developing and revising sector-specific or source-specific implementation plans to accomplish that. Implementation Plans are expected to cover all lands and activities which impact stream heating within the geographic area covered by the TMDL. A more detailed discussion of each organization's responsibilities is provided in **Element H**. DMAs are not responsible for controlling pollution arising from land use activities occurring outside of their area of jurisdictional authority. Nor are they responsible for controlling stream heating that occurs as the result of natural disturbances.

Oregon Department of Environmental Quality (DEQ)

- NPDES permitting and enforcement
- WPCF permitting and enforcement
- 401 dredge and fill certifications
- Nonpoint Source TMDL Implementation Program
- Technical assistance
- Financial assistance

Oregon Department of Agriculture (ODA)

- Agricultural Water Quality Management Area Plan (AWQMAP) development, implementation, enforcement, and revision
- Confined Animal Feeding Operation (CAFO) permitting and enforcement
- Technical assistance

- Rules under Senate Bill (SB) 1010 to clearly address TMDL and load allocations as necessary
- Riparian area management
- Oregon Conservation Reserve Enhancement Program

Oregon Department of Forestry (ODF)

- Forest Practices Act (FPA) implementation
- Revise statewide FPA rules and/or adopt subbasin specific rules as necessary.
- Riparian area and wetlands management

Oregon Department of Transportation (ODOT)

- Implementation of Stormwater Pollution Prevention and Control Plan and Erosion and Sedimentation Control Plan
- Design, construction, operation and maintenance of state highways and state highway storm systems

Oregon Department of State Lands (DSL)

- Public land and waterway management
- Removal-fill activities
- Wetland management
- Land leasing and mining activities

Federal Land Management Agencies (BLM and Forest Service)

- Following standards and guides
- Implementation of Northwest Forest Plan
- Development and implementation of Water Quality Restoration Plans

Wasco and Hood River Counties

- Construction, operation and maintenance of County roads
- Land use planning/permitting
- Maintenance, construction and operation of parks and other county owned facilities and infrastructure
- On-site septic system permitting and enforcement
- Riparian area management

City of The Dalles

- Construction, operation and maintenance of a drinking water treatment system
- Construction, operation and maintenance of city roads
- Land use planning/permitting
- Maintenance, construction and operation of city owned facilities and infrastructure
- Riparian area management

City of Dufur

- Construction, operation and maintenance of a wastewater treatment plant and sanitary sewer system
- Construction, operation and maintenance of city roads
- Land use planning/permitting
- Maintenance, construction and operation of parks and other city owned facilities and infrastructure
- Riparian area management

City of Mosier

- Construction, operation and maintenance of city roads

- Land use planning/permitting
- Maintenance, construction and operation of parks and other city owned facilities and infrastructure
- Riparian area management

Northern Wasco County Parks and Recreation District

- Maintenance, construction and operation of parks and other district owned facilities and infrastructure
- Riparian area management

(H) Identification of Implementation Plans

The planning efforts described in this Element provide for TMDL implementation in the Subbasin. DEQ expects that Implementation Plans will be updated as needed to lay out all feasible steps toward meeting the TMDL. Expected elements of TMDL Implementation Plans are listed previously in **Section 4.2**. DEQ has developed a guidance document, entitled *TMDL Implementation Plan Guidance* (DEQ, 2007), to help DMAs draft TMDL Implementation Plans and identify strategies that can be used to meet wasteload and load allocations. This document can be downloaded from: http://www.deq.state.or.us/wq/TMDLs/implementation.htm. This website also provides examples of Implementation Plans developed in other parts of the state which can also be used as a source of information for DMAs. DEQ expects Implementation Plans to be submitted within 18 months of the issuance of the TMDL.

The following identifies the status of sector-specific or source specific implementation plans as of the writing of this document.

Point Sources – NPDES Permits

DEQ administers the National Pollutant Discharge Elimination System (NPDES) permits for surface water discharge and is delegated to do so by EPA. The NPDES permit is a federal permit, required under the Clean Water Act for discharge of waste into waters of the United States.

Individual-facility NPDES permits are unique to a discharge facility. General NPDES permits address categories of facilities or aggregate pollutant sources, such as filter backwash. As described in **Section 3.7.3** of the TMDL, excluding point-source discharges into the Columbia River, there are two domestic or individual point-source discharges to waters within the Miles Creeks portion of the Middle Columbia-Hood Subbasin and five general stormwater permits. The TMDL focuses on the two domestic or individual discharges as possible sources of heat. These are the City of Dufur wastewater treatment plant discharge to Fifteenmile Creek and the City of The Dalles water treatment plant discharge to Mill Creek. During the TMDL analysis, it was determined that stormwater discharges are not likely to contribute to exceedances of the temperature standard. Nonetheless, stormwater discharges can contribute other pollutants to Subbasin streams and DEQ is supportive of DMA efforts to improve the function of their stormwater systems. Any future NPDES permits must address this TMDL as appropriate given their location and season of discharge.

Current Status and DEQ Expectations.
City of Dufur. The City of Dufur has an individual-facility permit to discharge treated domestic wastewater into Fifteenmile Creek. The current permit was issued on March 26, 2002, and expired on February 28, 2007. The City submitted a renewal application on August 28, 2006. Because a renewal application was submitted in a timely manner, the permit has been administratively extended. It is DEQ's expectations that the City of Dufur will continue to operate the wastewater treatment plant in accordance with the terms of their existing permit.

Under the terms of their current permit, the City is allowed to discharge to Fifteenmile Creek from November 1st through April 30th. Because the WWTP does not discharge into Fifteenmile Creek during the summer, the WLA during the summer is 0 MW. Thermal modeling and allocations in this TMDL were done to protect aquatic life during the critical summer conditions. To ensure the WWTP discharge is also protective of aquatic life during non-summer conditions, an evaluation of data collected during the spawning season was also done and is included in **Section 3.8.2**. It is DEQ's expectations that the additional analysis identified in this section shall be done prior to permit renewal.

City of The Dalles. The City of The Dalles has a general NPDES permit (200-J) which allows them to discharge filter backwash, settling basin and reservoir cleaning water which has been adequately treated prior to discharge. Under the current terms of the 200J permit, there are no restrictions placed on the discharge relative to the thermal impacts of the discharge on the creek. The current general permit expired on July 31, 2002 and has been administratively extended.

The wasteload allocation for the Wicks Water Treatment Plan is a flow-based allocation determined by using **Equations 3-1** and **3-2** provided in **Section 3.8.2** of the TMDL. Because the Wicks Water Treatment Plant is the only point source discharge located on Mill Creek, the facility has the full HUA allocation for point sources of 0.2^{o}C.

As was shown by temperature data collected in 2005, the treatment plant discharge increases stream temperatures by as much as 2^{o}C during the summer. Since this far exceeds the amount of heat allowed under the HUA, DEQ will work with the City of The Dalles to determine feasible strategies for achieving compliance with the TMDL. It is likely that as part of TMDL implementation, DEQ will require the City to apply for an individual permit for this facility. Based on early conversations with the City, it appears that reducing the temperature of the discharge is going to be difficult to achieve.

Nonpoint Sources

Agriculture

The Oregon Department of Agriculture (ODA) is the DMA responsible for regulating agricultural activities that affect water quality through the Agricultural Water Quality Management Act (Senate Bill 1010) and Senate Bill 502. TMDL implementation for agriculture will therefore be carried out through existing regulatory and non-regulatory programs. ODA has the ability to assess civil penalties when local operators do not follow their local Agricultural Water Quality Management Area rules.

SB1010 directs ODA to work with local communities, including farmers, ranchers, and environmental representatives, to develop Agricultural Water Quality Management Area Plans (AgWQMAP) and rules throughout the State. SB502 stipulates that ODA "shall develop and implement any program or rules that directly regulate farming practices that are for the purpose of protecting water quality and that are applicable to areas of the state designated as exclusive farm use zones or other agricultural lands." Further, ODA policy states that plans and rules will be "reviewed on a biennial basis and ODA in consultation with ODEQ will assess whether the plan and rules are sufficient to meet and address water quality concerns established under the 303(d) or TMDL process or other triggering mechanisms". Progress reports, which are submitted to the Board of Agriculture after the biennial review process, are developed based on data collected by Local Management Agencies and ODA on progress of implementation of the plans and rules. Reports to the Board of Agriculture and Director will include statistics on numbers of farm plans developed and types of management practices being employed. These reports will be available to ODEQ for review in assessing implementation progress.

Local Management Agencies are funded to conduct outreach and education, develop individual farm plans for operations in the planning area, work with landowners to implement management practices, and help landowners secure funding to cost-share water quality improvement practices. The Local Management Agency for the Miles Creeks portion of the Middle Columbia-Hood Subbasin is the Wasco County Soil and Water Conservation District working under contract to ODA.

Current Status. The Miles Creeks area is included in the Lower Deschutes AgWQMAP. ODA adopted the first Lower Deschutes AgWQMPA and rules in June, 2000. Since that time, the AgWQMAP and rules have gone through three biennial reviews and a fourth is scheduled to occur during the winter of 2008/2009. The latest review report (Lower Deschutes Local Advisory Committee, 2006) concludes that

"*The Lower Deschutes Area Plan and Rules have been effective in protecting and enhancing water quality. Both the number and severity of observed agricultural land management conditions with potential to degrade water quality have been low. Producers and rural residents continue to implement water quality improvement practices in cooperation with the SWCDs and other partners…*". Specific objectives identified in the Plan for improving water quality include: (1) acceptable rates of upland erosion; (2) streambank erosion within acceptable levels; (3) eliminate placement, delivery, or sloughing of wastes into streams; and (4) adequate riparian vegetation for bank stability and stream shading consistent with vegetative site capability. The Rules (ODA, 2000) require agricultural landowners to: (1) control soil erosion on uplands; (2) prevent active streambank erosion beyond that expected as a result of natural conditions; (3) prevent runoff of manure, fertilizer, or other wastes from reaching waterways; and (4) enable development of vegetative cover along streams sufficient for bank stability and shading, consistent with site capability. The AgWQMAP and Rules are available from ODA's website at: http://oregon.gov/ODA/NRD/water_agplans.shtml.

DEQ Expectations. DEQ expects that, once this temperature TMDL is completed and approved by EPA, that the next biennial review will address the TMDL - including identifying how progress toward achievement of the surrogate measures for load allocations will be approached.

Non Federal Forest Lands

The Oregon Department of Forestry (ODF) is the DMA, by statute, for water quality protection from nonpoint source discharges or pollutants resulting from forest operations on non federal forestlands in Oregon. ODF's water quality authority is provided through the Forest Practices Act (FPA). TMDL implementation for forestry will therefore be carried out through existing regulatory and non-regulatory programs.

By statute, forest operators conducting operations in accordance with the FPA are considered to be in compliance with Oregon's water quality standards. The FPA does have provisions for both criminal and civil penalties if forest operators do not comply with water protection regulations. Additionally, whenever a violation occurs, the responsible party is obligated to repair the damage.

Examples of forestland water protection best management practices include:

- Roads not located in riparian management areas, flood plains, or wetlands;
- Stream crossing structures designed for 50 year flows;
- Maintain riparian vegetation with a 20-foot no harvest zone of trees and a 10-foot zone no disturbance of all understory vegetation that is near the high water level of the stream or river (except all intermittent streams which have no protections);
- And minimize disturbance to beds and banks of streams, lakes, and all wetlands more than ¼ acre in size; and
- Minimize slash that may enter waters of the state during felling, bucking, limbing or yarding.

Additional information about the requirements of the Forest Practices Act can be found at the Oregon Department Forestry website: http://www.oregon.gov/ODF/lawsrules.shtml.

Coordination between ODF and DEQ is guided by a Memorandum of Understanding (MOU) signed in April of 1998. This MOU was designed to improve the coordination between the ODF and DEQ in evaluating and proposing possible changes to the forest practice rules as part of the TMDL process. ODF and DEQ are involved in several statewide efforts to analyze the existing FPA measures and to better define the relationship between the TMDL load allocations and the FPA measures designed to protect water quality.

An evaluation of rule adequacy has been conducted (also referred to as the "Sufficiency Analysis") through the analysis of water quality parameters that can potentially be affected by forest practices. This statewide demonstration of forest practices rule effectiveness in the protection of water quality addressed the following specific parameters:

1) Temperature
2) Sediment
3) Turbidity
4) Aquatic habitat modification
5) Bio-criteria

The Sufficiency Analysis report (ODF and DEQ, 2002) has been externally reviewed by peers and other interested parties. The report is available for viewing at: http://www.deq.state.or.us/wq/nonpoint/links.htm. The report provides background information and assessments of BMP effectiveness in meeting water quality standards. The report concludes overall FPA adequacy at the statewide scale with due consideration to regional and local variation in effects. Achieving the goals and objectives of the FPA will ensure the achievement and maintenance of water quality goals. The report offers recommendations to highlight general areas where current practices could be improved in order to better meet the FPA goals and objectives and in turn provide added assurance of meeting water quality standards.

Current Status. The Forest Practice Rules apply in non-federal forest areas in the Middle Columbia-Hood Subbasin. Watershed-specific rules have not been established in the Subbasin.

DEQ Expectations. DEQ has not identified water quality impairment that is specific to forest management in the Subbasin. DEQ expects ongoing implementation of the Forest Practices Act.

Transportation

The Oregon Department of Transportation (ODOT) is the DMA for the regulation of water quality related to roads, highways and bridges under their jurisdiction. ODOT has worked with DEQ to develop a statewide TMDL program focused on managing TMDL pollutants associated with the operation, construction, and maintenance of ODOT roads, highways, and bridges. A Memorandum Of Understanding (MOU) is currently being developed that will formalize a proactive, collaborative, and adaptive manner whereby the TMDL management goals and requirements as defined in Oregon Administrative Rules (OAR, Division 42, TMDLs) will be met. The MOU should be in place by December 2008.

ODOT has developed a single TMDL management plan that is implemented statewide rather than individual TMDL management plans for multiple water quality limited waterbodies across the state. By developing a single, statewide, management plan, ODOT:

- Streamlines the evaluation and approval process for TMDL watershed management plans.
- Provides consistency to ODOT highway management practices in all TMDL watersheds.
- Eliminates duplicative paperwork and staff time developing and participating in numerous TMDL management plans.

The ODOT TMDL management plan addresses management of all TMDL pollutants associated with ODOT facilities. Of TMDL pollutants, ODOT considers sediment and temperature to be the primary pollutants of concern associated with ODOT owned and maintained facilities, properties located within the highway right-of-way, and maintenance facilities. DEQ is still in the process of identifying TMDL pollutants that limit beneficial uses of waterways across Oregon. TMDL allocations are established by watershed. Because of this, some individual watersheds may have unique pollutant management needs that require special consideration under the ODOT watershed management plan. ODOT will work with DEQ or local watershed management agencies (e.g. County and Municipal Road Departments), to address local transportation related watershed concerns as needs arise.

Major components of a Statewide Implementation Plan will be executed through the core regulatory programs that ODOT is already required to comply with. These regulatory programs are: NPDES Municipal Separate Storm Sewer System (MS4) Phase I and 1200CA permits, 401 Dredge & Fill

Certification, and the Underground Injection Control (UIC) programs. These programs are the core elements of their statewide Implementation Plan, however the MOU also describes the process that will be used to identify any gaps relative to meeting the TMDL requirements in a given basin or sub-basin. This process will allow an efficient use of both ODOT and DEQ staff in implementing specific actions and goals and identifying appropriate effectiveness monitoring to gauge how its actions are contributing to achieving TMDLs goals in each basin and across the state.

Current Status and DEQ Expectations: Continued participation in MOU development and on-going implementation of ODOT's TMDL Implementation Plan.

State Lands

The Department of State Lands (DSL) administers the state´s removal-fill permits and is responsible for leasing range and agricultural land and waterways for a variety of business activities. Many of the elements required in an implementation plan will likely be addressed through the implementation of existing regulatory programs and activities.

Current Status and DEQ Expectations: DSL does not presently have an Implementation Plan. DEQ expects that a Plan will be developed and suggests that DSL may work with DEQ to develop a statewide implementation plan, as has been done by other State agencies.

Federal Lands

The U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) are the DMAs for federal lands in the Subbasin. In July 2003, both agencies signed memoranda of agreement with DEQ defining how water quality rules and regulations regarding TMDLs will be met. The agencies will develop Water Quality Restoration Plans (WQRPs) which will be the equivalent of TMDL Implementation Plans. In addition, BLM and USFS developed *the Northwest Forest Plan (NWFP) Temperature TMDL Implementation Strategies: Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy (ACS) and Associated Tools* (the Strategy) (2005). DEQ conditionally approved the Strategy in September 2005 as the temperature TMDL implementation mechanism under the Clean Water Act.

The USFS manages lands in the upper part of the Subbasin, along its western boundary. This area is administered by the Mt. Hood National Forest, through the Supervisor's Office in Sandy and the District Office in Dufur. Management activities are guided by the Northwest Forest Plan (USDA, 1994) and the Mt. Hood National Forest Land and Resource Management Plan (USDA 1990). A Reconciliation Document was drafted in 1995 (USDA, 1995). This document indicates that all standards and guidelines in the Mt. Hood Forest Plan apply unless superceded by the Northwest Forest Plan standards and guidelines. When standards and guidelines from both documents apply, the one with controls is the one more restrictive or which provides greater benefits to late-successional forest related species. The Mt. Hood National Forest has developed the Mile Creeks Watershed Analysis (1994) which provides specific management guidelines for federal lands in the Fifteenmile Watershed.

The BLM manages approximately 2,770 acres in the Subbasin (refer back to **Figure 2-4**), most of which does not include streams or riparian habitat. The majority of the tracts are considered "unalloted", (e.g. there are no grazing allotments or the land is not currently managed for grazing). Two allotments (the K and P allotment and the Ketchum allotment) have been grazed most recently. However, the K and P allotment does not have a current permittee and has not been grazed for many years. The Ketchum allotment is currently grazed and contains riparian habitat in the headwaters of Browns Creek. BLM currently manages this allotment according to standards and guides for Riparian Habitat Conservation Areas as described in PACFISH/INFISH (USDA & USDI, 1995; USDA, 1995) and monitors designated management areas according to *R6/BLM, PACFISH/INFISH Biological Opinion – Clarification of Riparian Monitoring and Assessment Protocols and Implementation* (USDI, 2005).

Current Status: WQRPs have not yet been developed for any Federal lands within the Subbasin. The Mt. Hood National Forest is presently in the process of updating the Miles Creeks Watershed Analysis. It is possible that this Analysis update will follow the WQRP Framework described in the Strategy mentioned above, so that the one document can fulfill two purposes. BLM follows standards and guides as described in PACFISH/INFISH for protection of riparian areas from grazing impacts.

DEQ Expectations:
Mt Hood National Forest. DEQ expects WQRP development and implementation, with submittal of the WQRP within 18 months of EPA approval of the TMDL.

BLM. Given the limited riparian land managed by BLM in the Subbasin, DEQ will rely on continued BLM adherence to standards and guides as outlined in PACFISH/INFISH for protection of riparian corridors. In addition, BLM is in the process of developing an Implementation Monitoring Program for PACFISH/INFISH which guides monitoring of grazing allotments (e.g., designated monitoring areas). If monitoring identifies that standards and guides are not being adhered to on BLM lands in the Subbasin, or if additional BLM lands in the Subbasin are grazed, DEQ will expect BLM to develop a WQRP describing the specific strategies which will be used to ensure continued riparian protections.

Urban and Rural Sources

Responsible participants for implementing DMA-specific water quality management plans for urban and rural sources were identified in **Element G** above. These include: Wasco County, Hood River County, the cities of The Dalles, Dufur and Mosier, and the Northern Wasco County Parks and Recreation District. *TMDL Implementation Plan Components* (DEQ, 2007a), provides useful guidance to assist urban and rural sources in developing Implementation Plans. This document can be downloaded from the DEQ website: http://www.deq.state.or.us/wq/TMDLs/implementation.htm.

Oregon cities and counties regulate land use activities through local comprehensive plans and related development regulations. This authority begins with a broad charge given to them by the Oregon constitution and the Oregon legislature to protect public health, safety, and general welfare. Oregon's land use planning system, administered through the Oregon Department of Land Conservation and Development (DLCD), provides a unique opportunity for local jurisdictions to address water quality protection and enhancement. Many of the land use goals have direct links to water quality, particularly Goals 5 (Natural Resources, scenic, and historic areas and open spaces, OAR 660-015-0000(5)), Goal 6 (Air, water, and land resources quality, 660-015-0000(6)), and Goal 7 (Areas subject to natural hazards). In the case of Goal 5, there is a specific rule that requires local jurisdictions to protect significant riparian areas and wetlands from development. Goal 6 has no LCDC developed guidance or rule about how local jurisdictions should protect and enhance water quality, but provides a sound framework for new ordinances that address a wide variety of water quality objectives, based on state or federal regulations, including this TMDL.

Urban, residential, and rural sources contribute significant amounts of pollution to waterways. Counties, municipalities and special districts can play an important role in pollution prevention and water quality improvement by:

- Raising public awareness of the impacts of urban, residential, and commercial runoff on surface water quality
- Providing public education and oversight of riparian area management

Hood River County. Hood River County has already developed a TMDL Implementation Plan. This Plan was developed in response to the Western Hood Subbasin TMDL (approved by EPA in 2002) and was approved by DEQ on December 30, 2004. The Implementation Plan includes all lands in Hood River County, including the small portion of Hood River County which lies along the western edge of the Miles Creeks portion of the Middle Columbia-Hood Subbasin.

Current Status and DEQ Expectations: DEQ expects continued implementation of the Hood River County Western Hood Subbasin Total Maximum Daily Load Implementation Plan (2005). Upon approval of the Middle Columbia-Hood (Miles Creeks) Subbasin TMDL, DEQ and Hood River County will officially acknowledge that their existing Implementation Plan also meets the County's requirements under this WQMP for the Miles Creeks area.

Wasco County, Municipalities. Wasco County, the Northern Wasco County Parks and Recreation District, and the municipalities of The Dalles, Dufur and Mosier will be responsible for developing and submitting Implementation Plans. The scope and scale of the Plans will likely be different due to the size and jurisdiction of the different DMAs.

Current Status: Wasco County, the Northern Wasco County Parks and Recreation District, The Dalles, Dufur and Mosier do not currently have a TMDL Implementation Plan. Upon approval of the Middle Columbia-Hood (Miles Creeks) Subbasin TMDL it is DEQ's expectation that they will each develop and submit an Implementation Plan that will achieve the load allocations established by the TMDL. It is expected that the Plans will incorporate existing management strategies, as well as include an assessment of ways in which County/City/District operations could be modified to better meet TMDL load allocations. Management strategies could include: education about riparian protection, evaluation of roads located along perennial streams for impediments to load allocation attainment, restoration of river shading and/or channel condition on County/City/District owned properties, and consideration of riparian protection ordinances and low impact development (LID) building practices. In addition, The Dalles Implementation Plan will include a Temperature Management Plan which evaluates the thermal impacts of the current operation of Crow Creek Reservoir. The Plan would also include an also assessment of the thermal impacts of any proposed changes to the dam.

(I) Schedule for Preparation and Submission of Implementation Plans

This element specifies a timeline for the preparation and submission of Implementation Plans by DMAs. In accordance with OAR 340-042-0060, TMDLs are issued as a DEQ order, effective on the date signed by the Director. DEQ will notify all affected NPDES permittees and DMAs identified in this document and persons who provided formal comment on the draft TMDL within 20 business days of TMDL issuance. DEQ expects that DSL, the USFS, Wasco County, the Northern Wasco Parks and Recreation District, The Dalles, Dufur and Mosier will fulfill the planning and evaluation expectations of **Element H** within 18 months of the date of receipt of their notification letter. ODA follows a two year timeline from the last AgWQMAP review as specified by rule.

OAR 340-042-0080(3) defines the required elements of a TMDL implementation plans. The main elements are as follows:

- Management strategies the DMA will use to achieve load allocation(s) and reduce pollutant loading;
- A timeline for implementing management strategies and a schedule for completing measurable milestones;
- Performance monitoring with a plan for periodic review and revision of the implementation plan;
- Evidence of compliance with applicable statewide land use requirements; and
- Any other required elements if specified in this WQMP.

DEQ review and approval of TMDL Implementation Plans is called for in OAR 340-042. Following approval of the TMDL implementation plan, DMAs will be expected to submit to ODEQ an annual status report briefly describing the status of management strategies that implement TMDL pollutant allocations or reductions. Every fifth year DMAs will need to submit an evaluation report. The report will describe the effectiveness of the management strategies identified in the TMDL Implementation Plan and put into place during the preceding four years. The report will indicate whether implementation of their plan is adequately meeting the pollutant reduction goals. If they determine it does not, the report will describe the steps they will take to modify their plan. In addition, DMAs may be required to review and revise their TMDL implementation plan as needed following DEQ's reevaluation or revision of the TMDL.

(J) Reasonable Assurance

This element of the WQMP is intended to provide reasonable assurance that the WQMP (along with the associated DMA-specific Implementation Plans) will be implemented and that the TMDL and associated allocations will be met.

There are several programs that are either already in place or will be put in place to help assure that this WQMP will be implemented. Some of these are traditional regulatory programs such as specific requirements under NPDES discharge permits. Other programs address nonpoint sources under the auspices of state law (for forested and agricultural lands) and voluntary efforts. The status of these different programs in the Subbasin was summarized in **Element H** above.

Should any responsible participant fail to comply with their obligations under this WQMP, DEQ will take all necessary action to seek compliance. Such action will first include negotiation, but could evolve to issuance of DEQ or Commission Orders and other enforcement mechanisms.

(K) Monitoring and Evaluation

Monitoring and evaluation has three basic components: 1) monitoring the implementation of TMDL Implementation Plans and activities as identified in this document; 2) evaluating the effectiveness of management practices; and 3) tracking water quality trends to ensure TMDL wasteload and load allocations are being achieved and water quality criteria are being met. DEQ generally expects that city, county and district DMAs will monitor implementation efforts and that DEQ and various natural resource organizations including DMAs will participate in effectiveness and water quality monitoring.

The information generated by each of the agencies/entities gathering data in the Subbasin will be pooled and used to determine whether management actions are having the desired effects or if changes in management actions and/or TMDLs are needed. This detailed evaluation (refer to **Element M**) will be planned, as feasible, roughly on a five year cycle. If progress is insufficient, then the appropriate management agency will be contacted with a request for additional action. This monitoring and feedback mechanism is a major component of the “reasonable assurance of implementation” for this WQMP.

Although collaborative monitoring capabilities and plans have not yet been developed in response to an approved TMDL, it is anticipated that monitoring efforts will consist of some of the following types of activities:

- Reports on the numbers, types and locations of projects, BMPs and educational activities completed
- BMP efficacy evaluation
- In-stream monitoring to track progress towards achieving water quality numeric criteria
- Monitoring riparian vegetation communities and shade to assess progress towards achieving NTP targets established in the temperature TMDL

Ongoing in-stream monitoring of water quality and quantity, riparian vegetation, channel shape and fish is taking place largely through the efforts of the Wasco County Soil and Water Conservation District, the Mt. Hood National Forest, the Oregon Department of Fish and Wildlife, and the Oregon Department of Agriculture. DEQ recognizes that such coordinated local efforts are important and encourages them accordingly. As available, DEQ will contribute resources and training to such efforts.

(L) Public Involvement

DEQ believes that public involvement is essential to any successful water quality improvement process. There was public involvement throughout the TMDL development process and public involvement in implementation will be important as well. Each DMA will be responsible for outreach efforts relating to their ongoing land management and TMDL implementation. DEQ will also promote public involvement through direct association and contact with existing public groups that work toward restoration and environmental protection in the Miles Creeks area. These groups include: Fifteenmile, Mosier and The Dalles Watershed Councils; the Wasco County Soil and Water Conservation District; the Lower Deschutes Local Advisory Committee; the Mt. Hood National Forest; and Oregon Departments of Fish & Wildlife, Water Resources, and Agriculture.

(M) Maintaining Management Strategies over Time

DEQ administers a TMDL implementation program that will oversee the combined efforts of DMA Implementation Plans and ODEQ permitting programs. As addressed in **Elements E** and **H**, each DMA will develop and/or review their TMDL Implementation Plan or program for its effectiveness in addressing load allocations. Each DMA will submit an annual report describing the implementation efforts underway and noting changes in water quality. DEQ will review these submittals and recommend changes to individual Implementation Plans if necessary. The 303(d) listing and TMDL process and the management planning associated with WQRP, forest practices, agricultural and transportation planning are ongoing by design. Taken together, these efforts should ensure that management strategies are maintained over time.

(N) Costs and Funding

One purpose of this element is to describe estimated costs and demonstrate that there is sufficient funding available to begin WQMP implementation. Another purpose is to identify potential future funding sources for project implementation. The cost of restoration projects varies considerably and can range from zero cost, or even profit due to improvements, to full channel reconstruction and land acquisition which can cost hundreds of thousands of dollars per river mile. Restoration can be passive or active. Passive restoration results from removing stresses to the channel, vegetation and floodplain and allowing the river system to naturally recover. This can be accomplished through measures such as fencing or allowing natural vegetation to grow between farm fields and streams. Active restoration involves channel construction, installation of structures to capture sediment or re-direct water, etc., and tends to cost more than passive. Different measures are appropriate for different management styles, land uses, and types of geomorphic or vegetative impairment. Given these complexities and uncertainties, a cost analysis is not attempted here. DMAs will be expected to provide a fiscal analysis of the resources needed to develop, execute and maintain the programs described in their Implementation Plans.

DMAs and other natural resource organizations are already implementing numerous natural resource enhancement efforts and projects in the Subbasin which are relevant to the goals of the plan, through a variety of funding sources. Financial assistance is provided through a mix of cost-share, tax credit, and grant funded incentive programs designed to improve on-the-ground watershed conditions. Some of these programs, due to the sources of their funding, have specific qualifying factors and priorities. **Table 4-2** shows a partial list of assistance programs available in the Subbasin.

Grant funds are available for improvement projects on a competitive basis. Field agency personnel assist landowners in identifying, designing, and submitting eligible projects for these grant funds. For private landowners, the recipient and administrator of these grants is generally the local Soil and Water Conservation District or watershed council.

Table 4-2. Partial list of funding sources for natural resource enhancement projects.

Program	Agency/Source
Oregon Plan for Salmon and Watersheds	OWEB
Environmental Quality Incentives Program	USDA-NRCS
Wetland Reserve Program	USDA-NRCS
Conservation Reserve Enhancement Program	USDA-NRCS
Stewardship Incentive Program	ODF
Access and Habitat Program	ODFW
Partners for Wildlife Program	USFWS
Conservation Implementation Grants	ODA
Conserved Water Program and other water projects	OWRD
Nonpoint Source Water Quality Control (EPA 319)	DEQ/USEPA
Statewide Planning Goals Technical Assistance Grants	DLCD
Watershed Initiative Grants	USEPA
Clean Water State Revolving Funds (SRF) Low Interest Loans	DEQ/USEPA
Bonneville Power Administration	BPA

(O) Citation of Legal Authorities

The implementation of TMDL waste load and load allocations and the associated implementation plans are generally enforceable by DEQ, other state and federal agencies, or local governments. It is envisioned that sufficient initiative exists to achieve water quality goals with minimal enforcement. Should the need for additional effort emerge, it is expected that the responsible agency will work with land managers to overcome impediments to progress through education, technical support or enforcement. Enforcement may be necessary in instances of insufficient action towards progress. This could occur first through direct intervention from land management agencies (e.g. ODF, ODA, counties and cities) and secondarily through DEQ. The latter may be based on departmental orders to implement management strategies leading to attainment of water quality standards.

Clean Water Act Section 303(d)

Section 303(d) of the 1972 Federal Clean Water Act as amended requires states to develop a list of rivers, streams and lakes that cannot meet water quality standards without application of additional pollution controls beyond the existing requirements on industrial sources and sewage treatment plants. Such water bodies are referred to as “water quality limited”. Water quality limited waterbodies must be identified by the Environmental Protection Agency (EPA) or by a state agency which has been delegated this responsibility by EPA. In Oregon, this responsibility rests with DEQ. DEQ generally updates the list of water quality limited waters every two years. The list is commonly known as the 303(d) list. Section 303 of the Clean Water Act further requires that Total Maximum Daily Loads (TMDLs) be developed for all waters on the 303(d) list. DEQ also has this responsibility.

Oregon Revised Statute

The ODEQ is authorized by law to prevent and abate water pollution within the State of Oregon pursuant to the following statute:

ORS 468B.020.
(1) Pollution of any of the waters of the state is declared to be not a reasonable or natural use of such waters and to be contrary to the public policy of the State or Oregon, as set forth in ORS 468B.015.

(2) In order to carry out the public policy set forth in ORS 468B.015, ODEQ shall take such action as is necessary for the prevention of new pollution and the abatement of existing pollution by:
- *(a) Fostering and encouraging the cooperation of the people, industry, cities and counties, in order to prevent, control and reduce pollution of the waters of the state; and*

(b) Requiring the use of all available and reasonable methods necessary to achieve the purposes of ORS 468B.015 and to conform to the standards of water quality and purity established under ORS 468B.048.

ORS 468B.025 No person shall cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.

NPDES and WPCF Permit Programs

DEQ administers two different types of wastewater permits in implementing Oregon Revised Statute (ORS) 468B.050. These are: the National Pollution Discharge Elimination System (NPDES) permits for waste discharge; and Water Pollution Control Facilities (WPCF) permits for waste disposal. The NPDES permit is also a Federal permit and is required under the Clean Water Act. The WPCF permit is a state program. As permits are renewed they will be revised to insure that all 303(d) related issues are addressed in the permit.

Oregon Administrative Rules

OAR 340-042 contains Department rules for TMDL establishment, issuance, implementation, and public participation. OAR 340-041-0028 provides numeric and narrative criteria for temperature.

Oregon Forest Practices Act

The Oregon Forest Practices Act (FPA) was enacted in 1971. The Oregon Department of Forestry (ODF) is the designated management agency for regulation of water quality on non-federal forest lands. The Board of Forestry has adopted water protection rules, including but not limited to OAR Chapter 629, Divisions 635-660, which describes BMPs for forest operations. The Environmental Quality Commission (EQC), Board of Forestry, DEQ and ODF have agreed that these pollution control measures will be relied upon to result in achievement of state water quality standards. Forest operators conducting operations in accordance with the Forest Practices Act (FPA) are considered to be in compliance with water quality standards. A 1998 Memorandum of Understanding between both agencies guides the implementation of this agreement, as described in **Element H**.

ODF and DEQ statutes and rules also include provisions for adaptive management that provide for revisions to FPA practices where necessary to meet water quality standards. These provisions are described in ORS 527.710, ORS 527.765, ORS 183.310, OAR 340-041-0026, OAR 629-635-110, and OAR 340-041-0120.

Oregon Senate Bill 1010 (Agriculture Water Quality Management Act)

The Oregon Department of Agriculture has primary responsibility for water pollution control from agriculture sources. This is accomplished through the Agriculture Water Quality Management program authorities granted ODA under Senate Bill 1010 adopted by the Oregon State Legislature in 1993 (ORS 569.000 through 568.933) and Senate Bill 502 adopted 1995 (ORS 561.191).

SB1010 directs ODA to work with local communities, including farmers, ranchers, and environmental representatives, to develop Agricultural Water Quality Management Area Plans (AgWQMAP) and rules throughout the State. SB502 stipulates that ODA "*shall develop and implement any program or rules that directly regulate farming practices that are for the purpose of protecting water quality and that are applicable to areas of the state designated as exclusive farm use zones or other agricultural lands*." The plans are accompanied by regulations in OAR 603-90 and portions of OAR 603-95, which are enforceable by ODA. As discussed in **Element H**, TMDL implementation coordination between ODA and DEQ is guided by an MOA signed in 1998.

Local Ordinances

Within the TMDL Implementation Plans, the DMAs are expected to describe their specific legal authorities to carry out the management measures they choose to meet the TMDL allocations. Legal authority to enforce the provisions of a City's NPDES permit would be a specific example of legal authority to carry out management measures.

4.3 TMDL-RELATED PROGRAMS, INCENTIVES AND VOLUNTARY EFFORTS

TMDLs in Oregon are designed to coordinate with and support other watershed protection and restoration efforts. Watershed enhancement in the Subbasin is ongoing and is, for the most part, consistent with or directly implements the load allocations of the TMDL. While regional programs are in place, much of the restoration is locally based. The following is a list of several of the watershed assessment and planning programs already in place guiding watershed restoration efforts in the Subbasin:

- Watershed Assessments and Action Plans. Three watershed councils operate in the geographic area covered by the Middle Columbia-Hood (Miles Creeks) TMDL and WQMP – Fifteenmile Watershed Council, The Dalles Watershed Council, and Mosier Watershed Council. All three Councils have developed Watershed Assessments (Wasco SWCD, 2002, 2003a, 2003b) and Action Plans (Wasco SWCD, 2005a, 2005b, 2005c) following the guidelines established by the Oregon Watershed Enhancement Board.
- Subbasin Planning. Through the Northwest Power and Conservation Council's regional response to ESA-listed Columbia Basin fish and wildlife, a recent Subbasin Plan was collaboratively and locally developed for the Fifteenmile Subbasin (Wasco SWCD, 2004).

The Oregon Plan for Salmon and Watersheds (Oregon Plan)

The Oregon Plan represents a major process, unique to Oregon, to improve watersheds and restore endangered fish species. The Plan consists of four essential elements:

(1) Coordinated Agency Programs: Many state and federal agencies administer laws, policies, and management programs that have an impact on salmonids and water quality. These agencies are responsible for fishery harvest management, production of hatchery fish, water quality, water quantity, and a wide variety of habitat protection, alteration, and restoration activities. Previously, agencies conducted business independently. Water quality and salmon suffered because they were affected by the actions of all the agencies, but no single agency was responsible for comprehensive, life-cycle management. Under the Oregon Plan, all government agencies that impact salmon are accountable for coordinated programs in a manner that is consistent with conservation and restoration efforts.

(2) Community-Based Action: Government, alone, cannot conserve and restore salmon across the landscape. The Oregon Plan recognizes that actions to conserve and restore salmon must be worked out by communities and landowners, with local knowledge of problems and ownership in solutions. Watershed councils, soil and water conservation districts, and other grassroots efforts are vehicles for getting the work done. Government programs provide regulatory and technical support to these efforts, but local people will do the bulk of the work to conserve and restore watersheds. Education is a fundamental part of the community based action. People must understand the needs of salmon in order to make informed decisions about how to change their way of life to accommodate clean water and the needs of fish.

(3) Monitoring: The monitoring program combines an annual appraisal of work accomplished and results achieved. Work plans are used to determine whether agencies meet their goals as promised. Biological and physical sampling are conducted to determine whether water quality and salmon habitats and populations respond as expected to conservation and restoration efforts.

(4) Appropriate Corrective Measures: The Oregon Plan includes an explicit process for learning from experience, discussing alternative approaches, and making changes to current programs. The Plan emphasizes improving compliance with existing laws rather than arbitrarily establishing new protective laws. Compliance is achieved through a combination of education and prioritized enforcement of laws that are expected to yield the greatest benefits to salmon.

Landowner Assistance Programs

A variety of grants and incentive programs are available to landowners in the Subbasin. These incentive programs are aimed at improving the health of the watershed, particularly on private lands. They include technical and financial assistance, provided through a mix of state and federal funding. This assistance is administered by several organizations, including but not limited to: Fifteenmile, The Dalles and Mosier Watershed Councils; the Wasco County Soil and Water Conservation District; the Oregon Department of Water Resources; the Oregon Department of Fish and Wildlife; DEQ; and the National Resources Conservation Service. These services include site evaluations, technical project design, stewardship/conservation plans, and referrals for funding as appropriate. This assistance and funding is further assurance of implementation of the TMDL WQMP. A list of funding sources or programs is provided in **Element N** of **Section 2.2**.

Voluntary Measures

There are voluntary, non-regulatory, watershed improvement programs (Actions) that are in place and addressing water quality concerns in the County. These programs provide both technical expertise and partial funding. Examples of activities promoted and accomplished through these programs include: planting of conifers, hardwoods, shrubs, grasses and forbs along streams; relocating legacy roads that may be detrimental to water quality; replacing problem culverts with adequately sized structures, and improvement/ maintenance of legacy roads known to cause water quality problems. These activities have been and are being implemented to improve watersheds and enhance water quality. Many of these efforts are helping resolve legacy water quality issues.

4.4 REFERENCES

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