Wenatchee River Watershed (WRIA 45) Fecal Coliform Bacteria Total Maximum Daily Load

Water Quality Improvement Report

March 2007
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Total Maximum Daily Load

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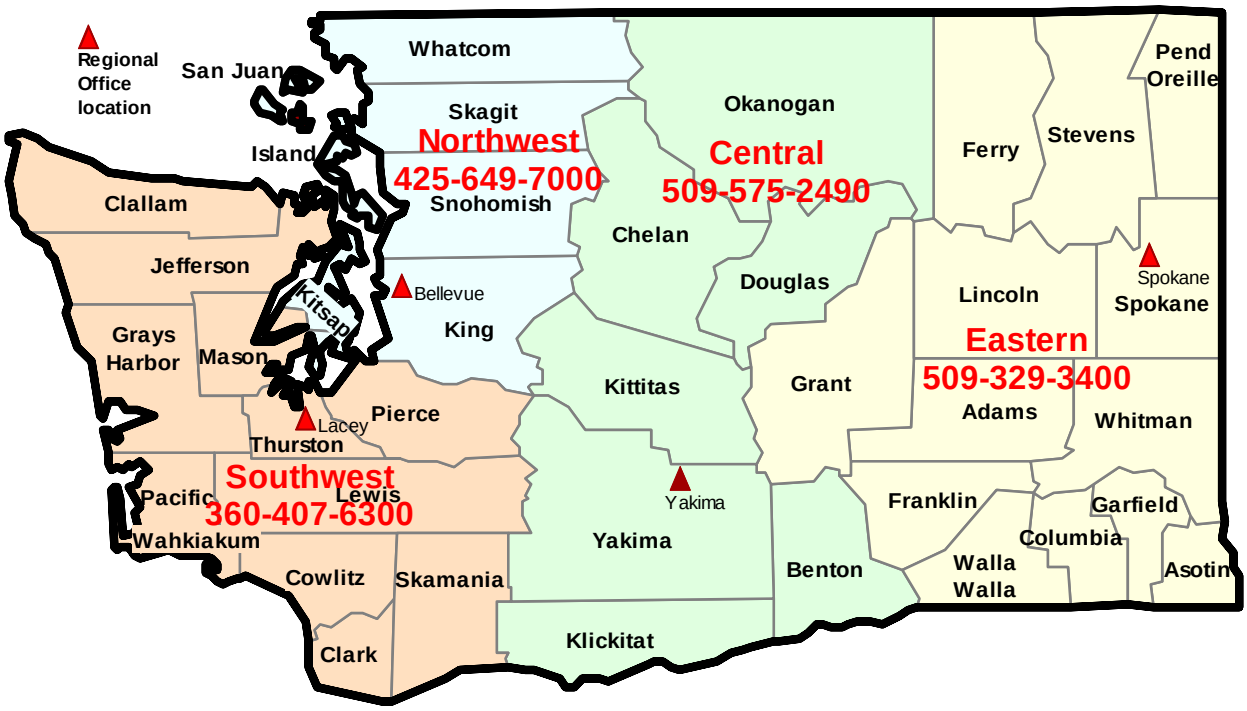

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Executive Summary

Three tributaries to the Wenatchee River, Mission, Brender, and Chumstick creeks are included on Washington State's list of water-quality-impaired waters because of high fecal coliform bacteria counts.

As part of this *Wenatchee River Watershed Fecal Coliform Bacteria Total Maximum Daily Load (TMDL),* the Department of Ecology collected stream water quality data during 2003 and 2004. Spatial and temporal fecal coliform bacteria patterns were analyzed based on dry season sampling (July-October 2003) and wet-season sampling (March-May 2004).

Wenatchee River Watershed

The Wenatchee River Watershed (Water Resources Inventory Area 45) is located in the central part of Washington State. The Wenatchee River drains an area of about 1,371 square miles, and flows southeast from the crest of the Cascade Mountains until it meets the Columbia River. The creeks with fecal coliform bacteria pollution (Mission, Brender, and Chumstick) enter the lower Wenatchee River downstream of the city of Leavenworth. Annual average precipitation in the lower Wenatchee River Watershed ranges from 25.5 inches in Leavenworth to 8.5 inches in Wenatchee.

Water Quality Standards

The 1998 Washington State Water Quality Standards set forth in Chapter 173-201A of the Washington Administrative Code (WAC) established class-based water quality criteria for surface waters of the state (AA, A, B, C, and Lake classes). Ecology revised the standards in 2003. Fresh waters are now classified by use (such as fish habitat, swimming, and water supply), rather than by class, to allow the standards to be more tailored to specific water body uses. The revised standards include the following language for recreational use designations:

- *Extraordinary Primary Contact* uses (formerly Class AA)
- *Primary Contact* uses (formerly Class A)
- *Secondary Contact* uses only (formerly Class B)

The fecal coliform bacteria criteria for each of the new recreational use designations will remain the same as the corresponding class base criteria. Table ES-1 identifies the 2003 Environmental Protection Agency approved criteria for fecal coliform bacteria in fresh waters, WAC 173-201A-200(2)(b).

Table ES-1: Fecal coliform bacteria criteria standard in fresh water WAC 173-201A-260(2)(b)

Category	Fecal Coliform Bacteria Indicator
Extraordinary Primary Contact Recreation (formerly Class AA) Waters providing extraordinary protection against waterborne disease or that serve as tributaries to extraordinary quality shellfish harvesting areas.	Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies/100 mL[1], with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.
Primary Contact Recreation (formerly Class A) Activities where a person would have direct contact with water to the point of complete submergence including but not limited to skin diving, swimming, and water skiing	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.
Secondary Contact Recreation (formerly Class B) Activities where a person's water contact would be limited (e.g., wading or fishing) to the extent that bacterial infections of eyes, ears, respiratory or digestive systems, or urogenital areas would normally be avoided.	Fecal coliform organism levels must not exceed a geometric mean value of 200 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 400 colonies /100 mL.

Stream Water Quality Assessment

Screening surveys were conducted twice a month at the mouths of all tributaries to the Wenatchee River and Icicle Creek during 2002. These surveys confirmed high fecal coliform bacteria counts exceeding standards only in the Mission, Brender, and Chumstick creek watersheds.

Twice a month synoptic surveys were conducted throughout the Mission, Brender, and Chumstick creek watersheds during a dry season (July-October 2003) and a wet season (March-May, 2004). The dry season was characterized by low streamflow conditions with irrigation management return flows providing much of the streamflow in some creeks. Parts of Mission Creek and Chumstick Creek went dry in 2003. Non-runoff sources predominated during this season. The wet season was characterized primarily by snowmelt runoff from higher elevations with some local runoff as well.

[1] 1 mL = milliliter

Conclusions

Fecal coliform bacteria data show that all three creeks had higher fecal coliform bacteria concentrations and loads during the low-flow period (dry season) when there was less dilution. This indicates principally non-runoff sources of pollution.

The upper reaches of the study area for all the creeks, most of which originate from Wenatchee National Forest land, met the *Primary Contact Recreation* fecal coliform bacteria water quality criteria. However, several of the sites in the upper-most reaches are in *Extraordinary Primary Contact Recreation* water and failed to meet fecal coliform bacteria criteria for that use (e.g., all sites on Van Creek, upper Eagle Creek, and Sand Creek).

The following are potential fecal coliform bacteria non-runoff sources:

- *Leakage from wastewater treatment plants and sanitary sewer systems.* There are no wastewater point source discharges in the creek sub-basins; however, the city of Cashmere sewer collection system is located in the lower Mission/Brender Creek sub-basin.
- *Direct deposition.* Fecal coliform bacteria may be directly deposited into surface waters by animals.
- *Illegal dumping.* The illegal dumping of wastes either to storm sewer systems or directly to surface waters is a potential fecal coliform bacteria source (e.g. portable toilet wastes, recreational vehicle wastes).
- *Potentially contaminated non-stormwater discharges.* During non-runoff periods, discharging groundwater at seeps and springs, irrigation management return flows, irrigation runoff and other sources flow into streams. This water could be contaminated with fecal coliform bacteria at the source or within the conveyance system.
- *Septic systems.* Failing septic systems have the potential to contribute fecal coliform bacteria during non-runoff periods and runoff periods.

Fecal coliform bacteria concentrations increased in the downstream reaches of each tributary to levels above the *Primary Contact Recreation* criteria (see Table ES-1). A mass-balance evaluation showed certain reaches contributing larger fecal coliform bacteria loads than others. In some cases, this contributed to exceedances at downstream stations (that is, the bacteria were transported downstream with the stream flow). For example, 85% of the dry-season fecal coliform bacteria loading in Brender Creek originated between river mile 1.2 (where Brender Creek first crosses Pioneer Road) and river mile 2.5 (see Figure ES-1).

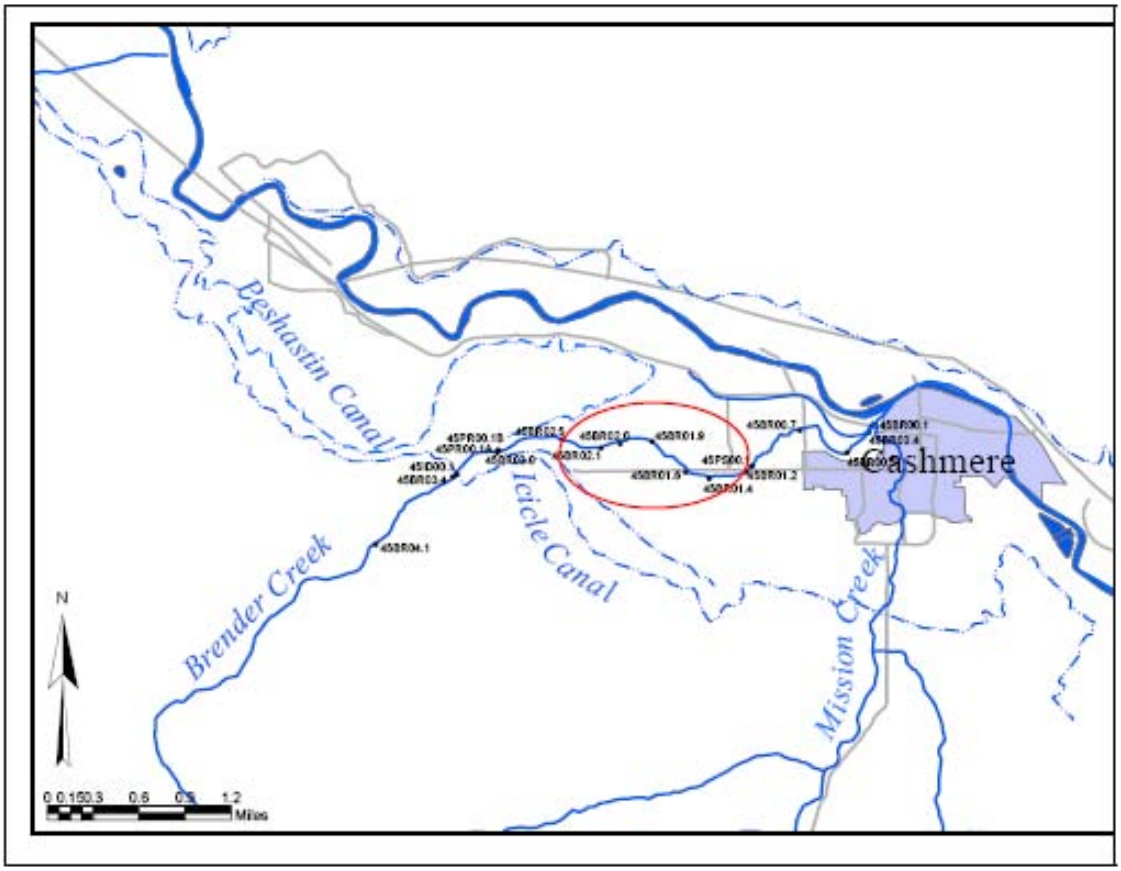

Figure ES-1: Brender Creek sampling stations and reach (circled) where 85% of the observed fecal coliform bacteria loading in 2003 originated

In Mission Creek there were significant increases in fecal coliform bacteria concentrations and loads between Binder Road (RM 1.2) and Creekside Place (RM 0.9). This is partly within Cashmere city limits, but most of this reach is within the unsewered part of the city of Cashmere Urban Growth Area (UGA).

Brender Creek had nearly four times the average fecal coliform bacteria loads compared to Mission and Chumstick creeks, indicating a significant source of pollution and a more immediate health concern.

In No Name Creek, a tributary to Brender Creek, the pond area on the side of Mill Road appears to be the major source of fecal coliform bacteria loading to both creeks.

Nearly 50% of the net fecal coliform bacteria load entered upper Chumstick Creek between RM 9.1 and 7.7, an area of primarily rural land use.

The sources of fecal coliform bacteria in each creek may be from both human and nonhuman sources.

- Where fecal coliform bacteria are found to be from human sources, septic systems should be evaluated for proper functioning condition and inspections for illicit discharges should be made.

- Where fecal coliform bacteria are found to be from non-human sources, best management practices (BMPs) should be applied to prevent non-human sources from contaminating the creek.

Target Reductions

This TMDL establishes target fecal coliform bacteria reductions for Mission, Brender, and Chumstick creek watersheds (See Table ES2). Implementation of BMPs and follow-up monitoring programs are necessary to monitor the progress of water quality improvements in Mission, Brender, and Chumstick creeks over time. It is expected that most BMPs will be implemented and shown to be effective by 2013. Fecal coliform bacteria levels are expected to be reduced by 50% by 2013 with a goal of meeting the water quality standard for fecal coliform bacteria by 2018.

Table ES-2: Summary of target reductions needed in Wenatchee River Watershed tributaries in order to comply with water quality standards

Site Description	Fecal Coliform Reduction (%)
Mission Creek and tributaries	
Mission Creek at Sunset Highway	89%
Mission Creek at Creekside Place	98%
Mission Creek at Binder Road	71%
Mission Creek at Tripp Canyon	79%
Mission Creek below Bear Gulch	41%
Peshastin Irrigation spill return at Pioneer Rd	90%
Icicle Irrigation Return	75%
Stormwater pipe discharge at Pioneer Rd	63%
Yaksum Creek at Coates Rd	61%
Pipe discharge downstream of Tripp Cyn Bridge	87%
Sand creek near mouth	6%
Brender Creek and tributaries	
Brender Creek at Sunset Highway Rd	68%
Brender Creek at Pioneer Rd	89%
Brender Creek at RM 1.9	94%
Brender Creek at RM 2.5	60%
No Name Creek at mouth	52%
No Name Creek below pond on Mill Rd	92%
Chumstick Creek and tributaries	
Chumstick Creek near mouth	49%
Chumstick Creek near Rm 4.9 on Hwy 209	71%
Chumstick Creek at Camp 12 Rd	92%

Site Description	Fecal Coliform Reduction (%)
Chumstick Creek above Second Creek	38%
Fox Irrigation Return	25%
Eagle Creek near mouth	57%
Eagle Creek above mouth	47%
Eagle Creek above Van Creek	13%
Van Creek near mouth	87%
Van Creek on USFS land	14%
Little Chumstick Creek near mouth	45%

Acknowledgements

Many thanks to the participants on the Wenatchee Water Quality Technical Subcommittee and Wenatchee Watershed Planning Unit for their ongoing participation, technical support, wise suggestions, dedication, and commitment to improving water quality and the environment. The Wenatchee River Watershed TMDL for Temperature was developed through the participation and input of numerous stakeholders from the Wenatchee Watershed over several years, many of whom spent countless hours providing information, reviewing and formulating plan actions, and attending meetings to represent their constituencies. In particular, much recognition and thanks should go to the Wenatchee Watershed Water Quality Technical Subcommittee. Members of this group provided the bulk of work that is represented in this document. These individuals include: Mike Rickel; Sarah Rudback; Mike Kaputa; Lee Duncan; MaryJo Sanborn; Dana Bates; Larry Gadbois; Mike Deason; Mark Marquis; Leslie Turner; Dan Curry; Jessica Shaw; Waikele Hampton; Dave Johnson; Paula Cox; Jason Detamore; Kirk Mayer; Steve Tift; Michelle Taylor; Charlie Cruickshank; Tom Hastings; and Rick Smith.

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Chelan County Commissioners
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Chelan County Public Works
Chelan County Public Utility District
Chelan-Douglas Health District
Chelan-Douglas Land Trust
Citizens
Citizens for a Clean Columbia
City of Cashmere
City of Leavenworth
City of Wenatchee
The Confederated Tribes of the Colville Reservation
Golder and Associates
Hammond, Collier, Wade Engineers
Icicle Creek Watershed Council
Icicle Irrigation District
Jones-Shotwell Ditch Company
Lake Wenatchee State Park
Longview Fibre
North Central Washington Audubon Society
National Oceanic & Atmospheric Administration – Fisheries
Peshastin Hi-Up
Peshastin Irrigation District
US Bureau of Reclamation
US Environmental Protection Agency
US Forest Service
US Fish & Wildlife Service

Washington Department of Agriculture
Washington Department of Fish & Wildlife
Washington Department of Natural Resources
Washington Department of Transportation
Washington Growers Clearinghouse Association
Washington Rivers Conservancy
Washington State Senate
Washington Trout
Water Quality Engineering Inc.
Wenatchee Reclamation District
Washington State University-Extension
Yakama Nation

Appreciation and acknowledgement extends to all others that we may have inadvertently excluded, especially all the citizens who attended various public meetings and tours over the years to contribute their local knowledge to the development of the plan.…. Thank you.

Introduction

Section 303(d) of the federal Clean Water Act (CWA) mandates that the State of Washington (State) establish total maximum daily loads (TMDLs) for surface waters that do not meet standards after application of technology-based pollution controls. The U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) have promulgated regulations (40 CFR Part 130, WAC 173-201A) and developed guidance (EPA 1991, 1997, 1999, 2001, 2002; Ecology 1991, 1996, 1999, 2002) for establishing TMDLs.

Under the CWA, every state has its own water quality standards designed to protect, restore, and preserve water quality. Water quality standards consist of beneficial uses, such as cold water biota and drinking water supply, and standards to achieve those uses. When a water body fails to meet water quality standards, the CWA requires that the state place the water body on a list of "impaired" water bodies and to prepare an analysis called a TMDL.

Components of the TMDL

A TMDL determines the amount of a given pollutant, called the **loading capacity**, which can be discharged to a water body and still meet water quality standards and, subsequently, allocates that load among the various sources. If a pollutant comes from a discrete source (referred to as a point source) such as an industrial facility's discharge pipe, that facility's share of the loading capacity is called a **wasteload allocation (WLA)**. If the pollution comes from a diffuse source (referred to as a non-point source) such as farms or yards and gardens, street runoff, parking lots and roads, construction sites and other nonpoint sources, that share is called a **load allocation (LA)**.

A TMDL must also consider **seasonal variations** and include a **margin of safety (MOS)** that takes into account any lack of knowledge about the causes of the water quality problem or its loading capacity. The sum of the individual allocations and the MOS must be equal to or less than the loading capacity. The TMDL should also provide **reasonable assurance** that implementation actions, monitoring, and adaptive management will reasonably achieve water quality standards by establishing the target dates set.**Monitoring and adaptive management** describes how Ecology and the participating entities will evaluate progress over time and adaptively manage actions to make changes where necessary to achieve water quality standards.

This Total Maximum Daily Load (TMDL) report addresses fecal coliform bacteria in impaired surface waters in Mission Creek, Brender Creek, Chumstick Creek, and their tributaries. The general purposes of this TMDL submittal report are to:

- Provide data from fecal coliform bacteria water quality sampling throughout the Wenatchee River Watershed.
- Provide an analysis of the data.
- Identify potential point and non-point sources of pollution.
- Identify loading capacity and load allocations.

- Summarize a strategy of actions and effectiveness monitoring recommended for meeting water quality standards.
- Fulfill requirements of the federal CWA.

The goal of this TMDL is to ensure that fecal coliform bacteria impaired water bodies in the Wenatchee River Watershed will attain water quality standards within a reasonable period of time. This TMDL will be implemented in coordination with the Wenatchee Watershed Management Plan (2006) to address fecal coliform bacteria impairments for the entire watershed.

The Summary Implementation Strategy (SIS) section identifies methods that should be implemented by potential contributing entities to reduce fecal coliform bacteria inputs and achieve water quality standards. A detailed implementation plan (DIP) should be completed within one year after the TMDL has been approved by EPA. The DIP will be based on the information presented in this document.

It is anticipated that most best management practices (BMPs), which are identified in the SIS, will be implemented by 2018.BMPs include an extensive list of nonpoint source and point source actions that will require funding and time for implementation by participating entities. Monitoring and adaptive management will be conducted in association with BMP implementation to verify effectiveness toward meeting water quality standards. Fecal coliform bacteria levels related to actions and sources identified in the SIS should be reduced by 50% from current levels by 2013, with a goal of meeting water quality standards being met by 2018. The Department of Ecology and appropriate entities will conduct ongoing monitoring associated with achieving water quality standards at a minimum of 5-year intervals (see Summary Implementation Strategy, Table 5).

Development and implementation of the *Wenatchee River Watershed (WRIA 45) Fecal Coliform Bacteria TMDL* has been and will continue to be done in coordination with the Wenatchee Watershed Management Plan and its participating entities. The *Wenatchee Watershed Management Plan*, which covers Water Resource Inventory Area 45 (WRIA 45) and has been in development since 1999, and was unanimously approved on April 26, 2006. The plan can be downloaded from the following website:

http://www.co.chelan.wa.us/nr/nr_watershed_plan.htm

The plan addresses water quality, water quantity, habitat, and instream flow in the Wenatchee River Watershed. The water quality component of the Wenatchee Watershed Management Plan is the product of an effort to coordinate the ongoing programs within the watershed and it integrates recommendations from this TMDL.

The planning unit is comprised of 28 members from a variety of interests, including Chelan County; Wenatchee Reclamation District; City of Wenatchee; Chelan County Public Utility District (PUD); City of Cashmere; City of Leavenworth; Chelan County Conservation District; Chelan-Douglas Health District; Washington State Agency Caucus (Departments of Ecology; Fish & Wildlife; Health); Yakama Nation; U.S. Forest Service; U.S. Fish and Wildlife Service; U.S. Bureau of Reclamation; Cascade Orchards Irrigation Company; Jones-Shotwell Ditch; Icicle Irrigation District; Peshastin Irrigation District; Wenatchee-Chiwawa Irrigation District;

Blue Star Growers; Washington Growers Clearinghouse; Longview Fibre; North Central Washington Audubon Society; citizens/landowners; North Central Washington Association of Realtors; North Central Home Builders Association; and the Center for Environmental Law and Policy (CELP). Members of the planning unit participate on the Water Quality Technical Subcommittee (WQTS), which serves as the TMDL advisory committee.

The *Wenatchee River Watershed (WRIA 45)Fecal Coliform Bacteria TMDL* is a result of the partnership between Ecology and the WRIA 45 WQTS. The data, conclusions, and recommendations in this TMDL represent the current state of knowledge for fecal coliform bacteria in the watershed. Ecology will partner with stakeholders (interested parties) in the watershed to further our knowledge of fecal coliform bacteria problems and solutions, and adaptively manage actions. Conclusions, recommendations, and actions may be refined as new information becomes available and while the DIP is developed and implemented following approval of this TMDL by EPA.

Background

The Wenatchee River Watershed is located in Chelan County, Washington and encompasses 878,423 acres (1,371 square miles). The watershed, which comprises WRIA 45, is located in the southern part of the county. A map of the watershed is shown in Figure 1. The watershed is bounded on the west by the Cascade Mountians, on the north and east by the Entiat Mountains, and on the south by the Wenatchee Mountains.

The local climate is characterized by hot, dry summers and mild to severe winters. Temperature and precipitation amounts (see Figure 2) vary widely in the watershed, depending upon elevation, aspect, and nearness to the mountains. Most of the precipitation occurs as snow during the winter months. Snow depths in the mountains range from 10 to 20 feet and covers the mountain areas from late fall through early summer. Temperatures in the city of Wenatchee range from a January mean of 26.2°F to a July mean of 73.4°F. Summer thunderstorms occur periodically and can result in flash flood conditions in local tributary streams.

The Wenatchee River Watershed is a sub-basin to the Columbia River and enters that water body at the city of Wenatchee, 15 miles upstream of the Rock Island Dam. The Wenatchee River is situated over the Chiwaukum graben, which is a lowland developed on top of downdropped sandstone and shale. A graben is an elongated trench bounded by parallel normal faults, which was created when the block that forms the trench floor moved downward relative to the blocks that form the sides. The Chiwaukum graben is bordered by the Leavenworth fault to the west and the Entiat fault to the east (Gresens, 1983). The Wenatchee River flows through this structural feature until it reaches the Columbia River at the city of Wenatchee. Bordering the Chiwaukum graben, there are granitic and metamorphic rocks. During the Pleistocene Epoch, glaciers advanced and retreated over the area. These glaciers deposited significant unconsolidated sediments. There are four types of unconsolidated deposits (USGS, 1977):

1. Lacustrine deposits are silts and clays deposited as lake bottom sediments behind glacial ice and moraine dams.

2. Outwash deposits were created during the advancing and retreating glaciers which deposited sand and gravel in front of the glacier from the glacier meltwater.
3. Till layers are a very dense, poorly sorted mixture of clay, silt, sand, and gravel which were deposited directly beneath the glacial ice.
4. Alluvial deposits were created as these unconsolidated deposits were reworked by the area rivers and streams, and were redeposited to create the uppermost alluvial aquifer which averages approximately 150 feet thick.

There are two major aquifers in the Wenatchee River Watershed: (1) a lower bedrock aquifer, and (2) an overlying unconsolidated alluvial and outwash aquifer (Kimsey, 2005).

The predominant water body is the Wenatchee River (53 miles long), which flows in a southeasterly direction from Lake Wenatchee to the Columbia River at the city of Wenatchee. Streamflow varies during the year, but mean monthly discharge peaks in spring from combined effects of snowmelt and rain on snow events. Most of the flow in the Wenatchee River originates from tributaries in the upper watershed: the White River (25%), Icicle Creek (20%), Nason Creek (18%), the Chiwawa River (15%), and the Little Wenatchee River (15%) (Andonaegui, 2001). Both the White and the Little Wenatchee rivers enter Lake Wenatchee; whereas, the outlet of the lake is the head of the Wenatchee River. Nason Creek enters the river immediately below the lake outlet. The remaining major water bodies in the upper watershed are the Chiwawa River, Chiwaukum Creek, and Icicle Creek. The major water bodies found in the lower portion of the watershed are Chumstick Creek, Peshastin Creek, and Mission Creek. There are numerous other water bodies in the Wenatchee River Watershed. Appendix B lists rivers and tributaries within the Wenatchee River Watershed.

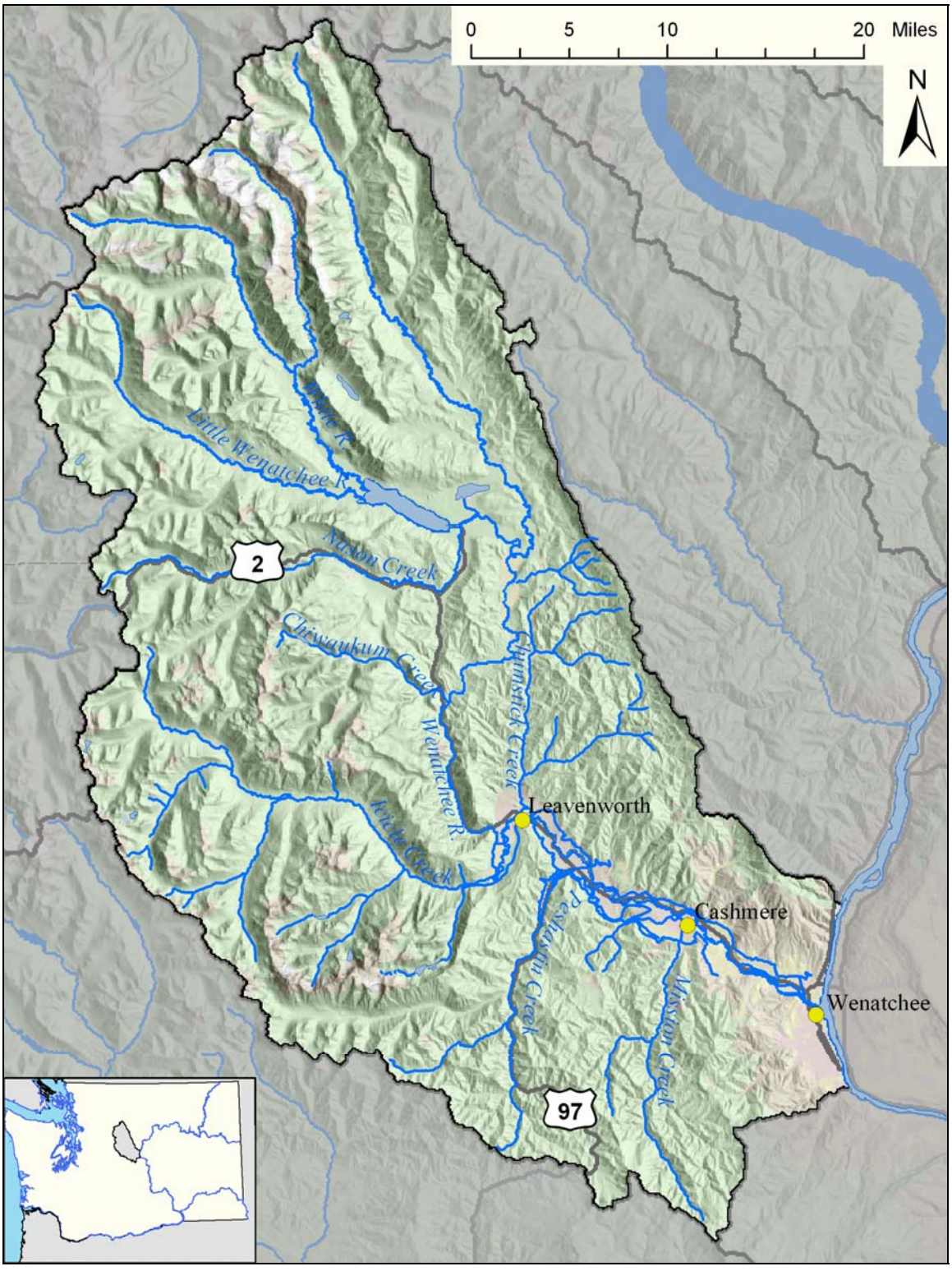


Figure 1: Wenatchee River Watershed

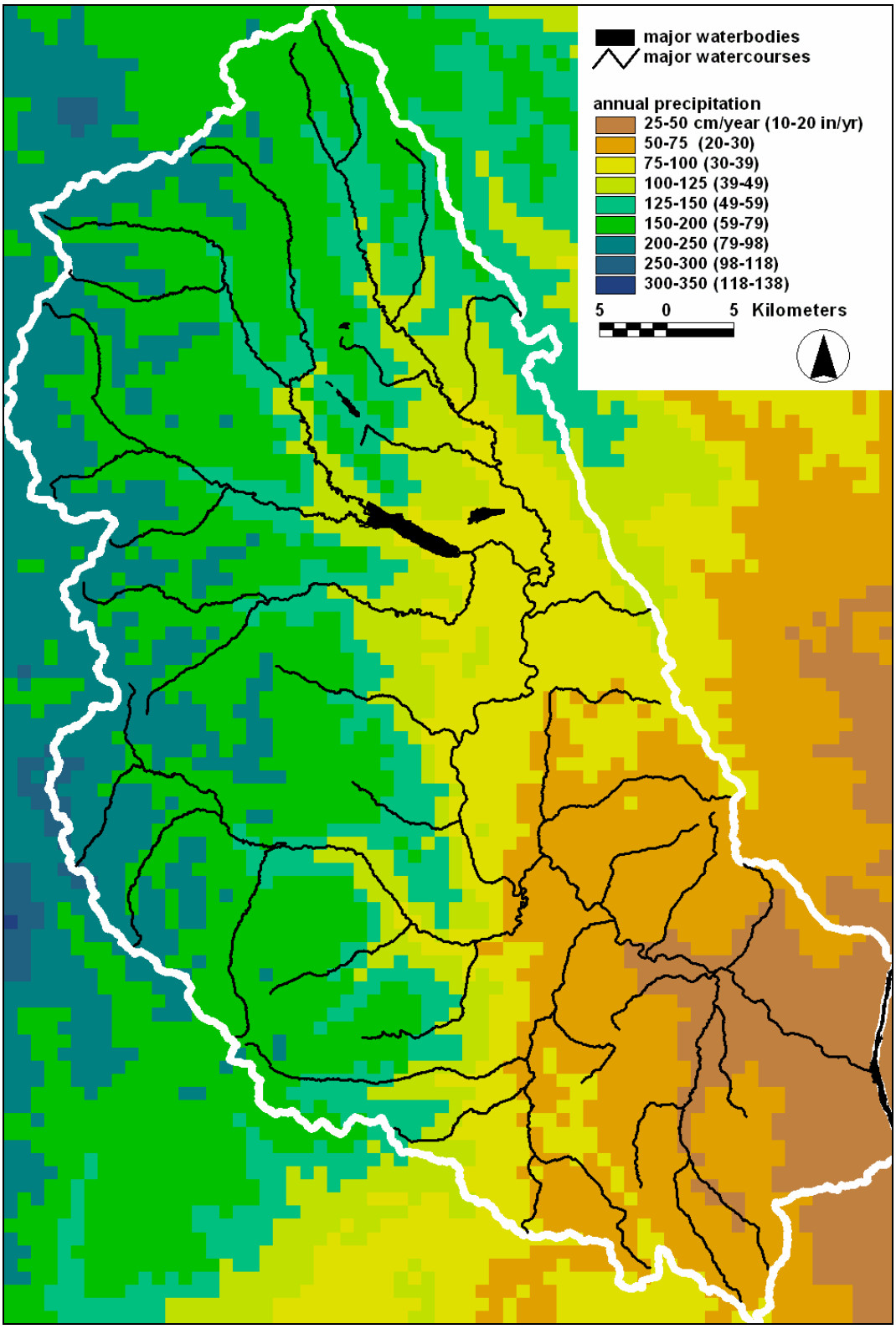


Figure 2: Annual average precipitation in the Wenatchee River Watershed
(data from www.daymet.org).

Applicable Water Quality Standards

The 1997 Washington State Water Quality Standards set forth in Chapter 173-201A Washington Administrative Code (WAC) established class-based water quality criteria for surface waters of the state (i.e., AA, A, B, C, and Lake classes). In 2003 the standards were revised. Fresh waters are now classified by use (such as fish habitat, swimming, and water supply), rather than by class, to allow the standards to be more tailored to specific water body uses.

The revised standards include the following language for recreational use designations:

- *Extraordinary Primary Contact Recreation* uses (formerly Class AA)
- *Primary Contact Recreation* uses (formerly Class A)
- *Secondary Contact Recreation* uses only (formerly Class B)

The fecal coliform bacteria criteria for each of the new recreational use designations are the same as the corresponding class-based criteria. Table 1 identifies the 2003 EPA-approved criteria for fecal coliform bacteria in fresh waters, WAC 173-201A-200(2)(b).

Table 1: Fecal coliform bacteria criteria standard in fresh water WAC 173-201A-200(2)(b)

Category	Fecal Coliform Bacteria Indicator
Extraordinary Primary Contact Recreation (formerly Class AA) Waters providing extraordinary protection against waterborne disease or that serve as tributaries to extraordinary quality shellfish harvesting areas.	Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.
Primary Contact Recreation (formerly Class A) Activities where a person would have direct contact with water to the point of complete submergence including, but not limited to, skin diving, swimming, and water skiing. Such activities where the water and skin or body openings (e.g. eyes, ears, nose, mouth, and urogenital) come into direct and extended contact.	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.
Secondary Contact Recreation (formerly Class B) Uses are boating, fishing, and other activities where only brief incidental water contact is likely. These are activities where a person's water contact would be limited (e.g., wading or fishing) to the extent that bacterial infections of eyes, ears, respiratory or digestive systems, or urogenital areas would normally be avoided.	Fecal coliform organism levels must not exceed a geometric mean value of 200 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 400 colonies /100 mL.

Chumstick and Mission creeks discharge to the *Primary Contact Recreation* (formerly Class A) portion of the Wenatchee River. These creeks and their tributaries are considered *Primary*

Contact Recreation water bodies from their confluence with the mainstem Wenatchee River to any Wenatchee National Forest boundary. From the national forest boundary to their headwaters, Chumstick and Mission creeks and their tributaries are all considered *Extraordinary Primary Contact Recreation* (formerly Class AA) water bodies.

BMPs will be used to achieve water quality standards for fecal coliform bacteria (see *Summary Implementation Strategy* section). The state water quality standards [WAC 173-201A-160(3)(a)] describe the use of BMPs in implementation related to non-point sources of pollution:

> "Activities which generate non-point source pollution shall be conducted so as to comply with the water quality standards. The primary means to be used for requiring compliance with the standards shall be through best management practices required in waste discharge permits, rules, orders, and directives issued by the department for activities which generate non-point source pollution." [WAC 173-201A-160(3)(a)]

Water Quality and Resource Impairments

Streams listed on the 2004 303(d) list for fecal coliform bacteria impairments in the Wenatchee River Watershed (WRIA 45) are listed in Table 2.

Table 2: Streams on the 2004 303(d) list for fecal coliform bacteria impaired Water bodies in the Wenatchee River Watershed (WRIA 45)

Stream Name	2004 Cat #5 Listing ID	Water Course Number	1996 Listing WBID	Location
Brender Creek	8408	FB41UG	WA-45-1100	T23N, R19E, Section 5
	41677	FB41UG		T23N, R19E, Section 6
	41682	FB41UG		T23N, R18E, Section 1
	41685	FB41UG		T23N, R18E, Section 11
Chumstick Creek	8412	TX45RJ	WA-45-1200	T24N, R17E, Section 1
	41689	TX45RJ		T25N, R18E, Section 19
	41691	TX45RJ		T25N, R18E, Section 18
	41693	TX45RJ		T25N, R18E, Section 6
	41722	TX45RJ		T26N, R18E, Section 31
	41724	TX45RJ		T26N, R18E, Section 30
	41725	TX45RJ		T26N, R18E, Section 33
Eagle Creek	41696	ZW35YH		T25N, R18E, Section 30
	41727	ZW35YH		T26N, R18E, Section 24
Fox irrigation return	41920	TX45RJ		T24N, R18E, Section 6
Icicle irrigation return	41925	DQ04NW		T23N, R19E, Section 14
Little Chumstick Creek	41731	FA38NK		T26N, R18E, Section 30
Mission Creek	16832	DQ04NW	WA-45-1011	T23N, R19E, Section 5
	8423	DQ04NW		T23N, R19E, Section 20

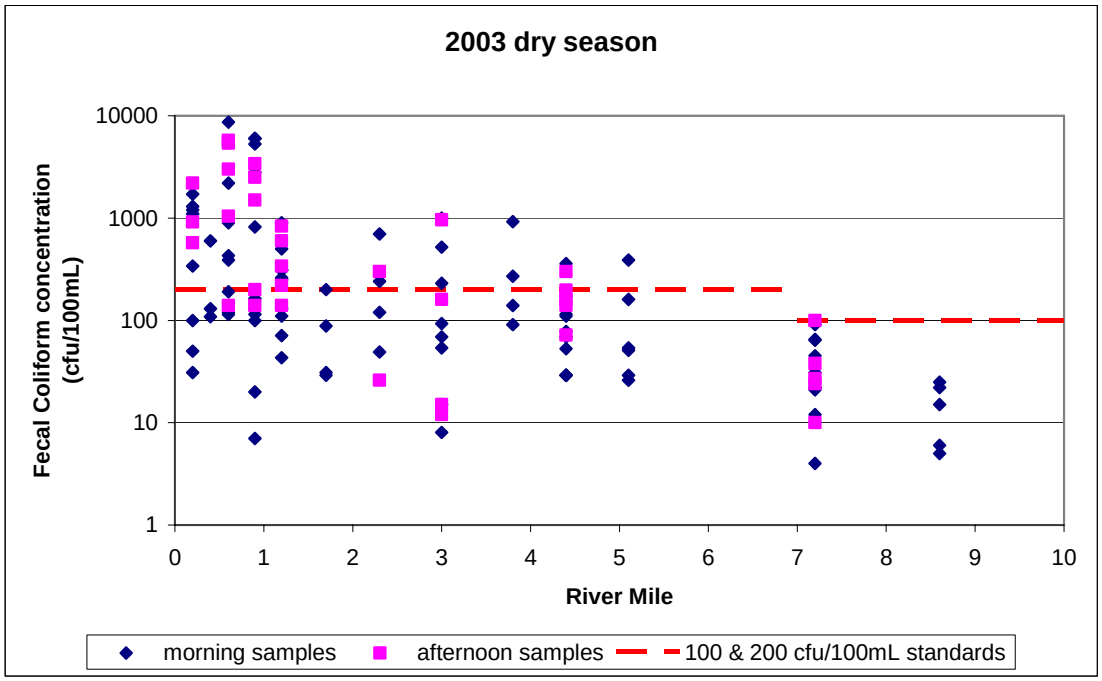
Stream Name	2004 Cat #5 Listing ID	Water Course Number	1996 Listing WBID	Location
	41557	DQ04NW		T23N, R19E, Section 4
	41559	DQ04NW		T23N, R19E, Section 9
	41561	DQ04NW		T23N, R19E, Section 8
	41562	DQ04NW		T23N, R19E, Section 17
No Name Creek	41928	UNK000		T23N, R19E, Section 5
	41929	UNK000		T23N, R19E, Section 5
	41930	UNK000		T23N, R19E, Section 5
	41932	UNK000		T23N, R19E, Section 5
	42537	UNK000		T23N, R19E, Section 5
Peshastin irrigation return	41938	DQ04NW		T23N, R19E, Section 4
Van Creek	41942	VF45OQ		T25N, R18E, Section 24
Yaksum Creek	41704	XL42OT		T23N, R19E, Section 8

Seasonal Variation

Section 303(d)(1) of the CWA requires that TMDLs "…be established at the level necessary to implement the applicable water quality standards with seasonal variations." The current regulation also states that determination of "TMDLs shall take into account critical conditions" [40 CFR 130.7(c)(1)].

All of the water bodies in the Wenatchee River Watershed demonstrate a seasonal flow regime typical of the east slope of the Cascade Mountains, with the highest flows occurring in conjunction with the area's snowmelt during the spring. Water body flows typically decrease to minimums in early to mid-autumn following dry summer periods. However, Brender Creek and Yaksum Creek (a tributary to Brender Creek) flows may increase during the spring and summer due to the addition of irrigation water management return flows from the Icicle and Peshastin irrigation canals.

Ecology conducted a water quality monitoring study during 2003 and 2004 as part of the Wenatchee River Watershed (WRIA 45) Fecal Coliform Bacteria TMDL (see Appendix A). The greatest numbers of fecal coliform bacteria exceedances in Mission, Brender, and Chumstick creeks were measured from July through October. Therefore, the critical condition period for Mission, Brender, and Chumstick creeks occurs during the low-flow, dry (irrigation) season from July through October. Brender and No Name Creek (a tributary to Brender) had fecal coliform bacteria exceedances during both the dry and wet seasons (see Figures 3 through 6). Implementation should be focused on Mission, Brender, and Chumstick creeks during the dry season (July through October) and on Brender and No Name Creeks during the wet season (November through June). Similar implementation activities can be applied in other areas of the watershed during both the dry and wet seasons if fecal coliform bacteria problems are identified.



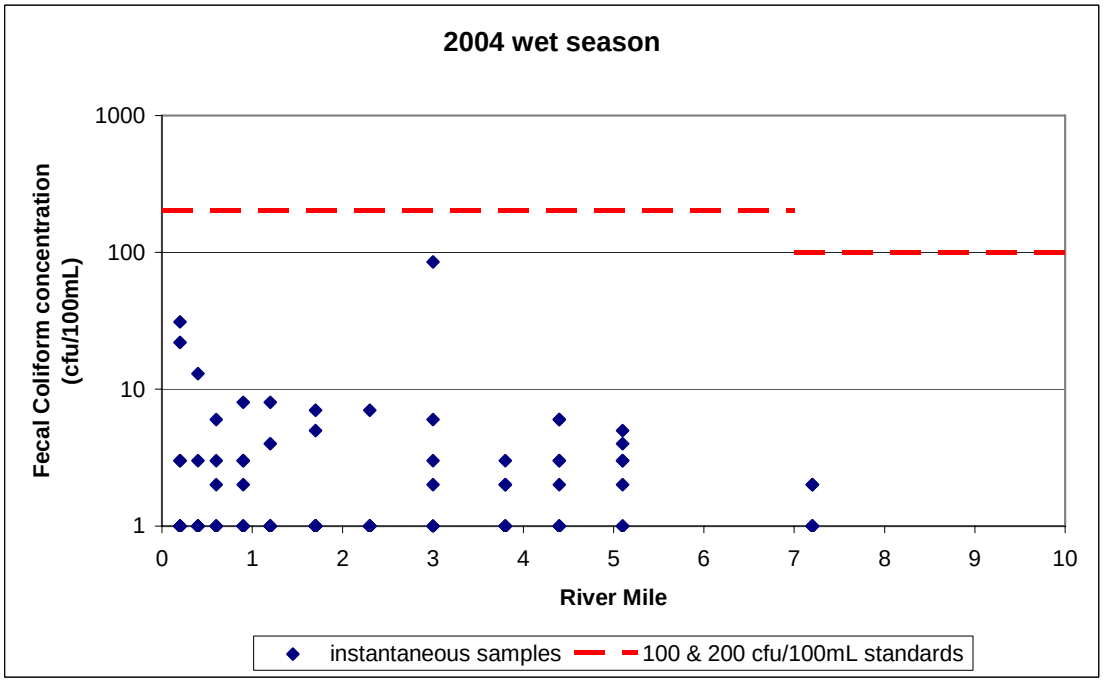
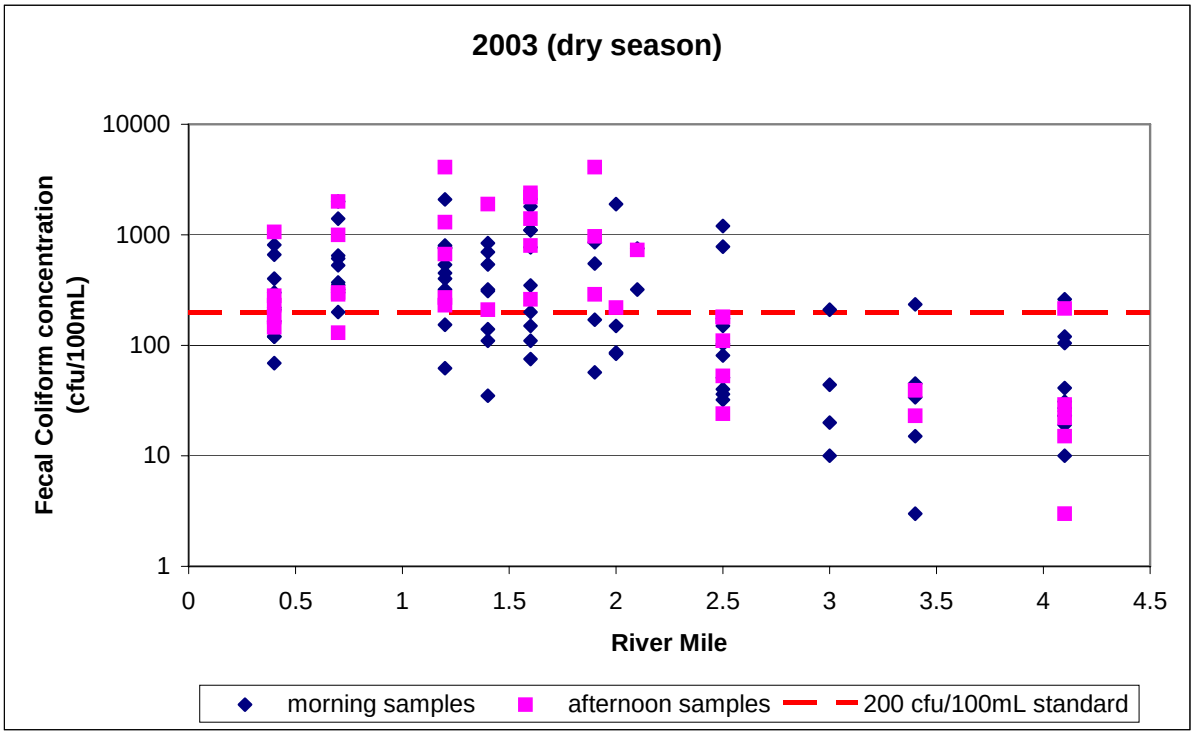


Figure 3: Fecal coliform bacteria concentrations in Mission Creek during the July through October 2003 (dry season) and the March through May 2004 (wet season) sampling surveys. (Vertical scale is logarithmic; horizontal axis is arithmetic.)



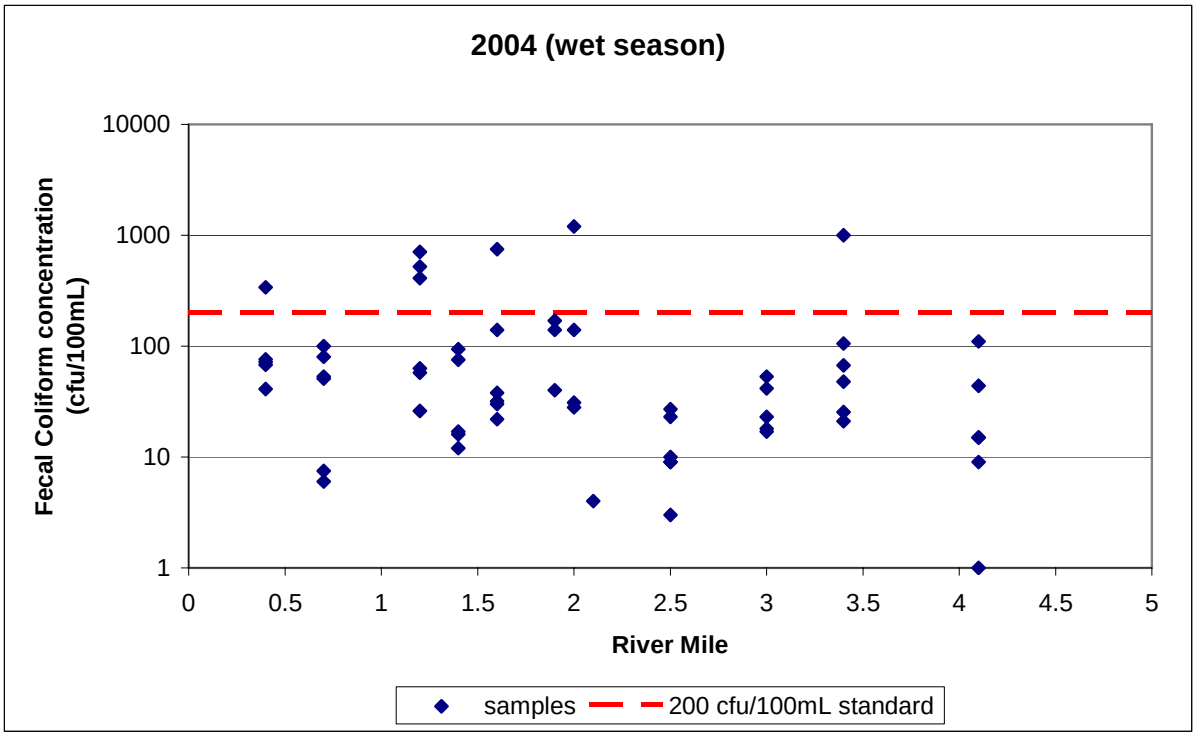


Figure 4: Fecal coliform bacteria concentrations in Brender Creek during the July through October 2003 (dry season) and the March through May 2004 (wet season) sampling surveys. (Vertical scale is logarithmic; horizontal axis is arithmetic.)

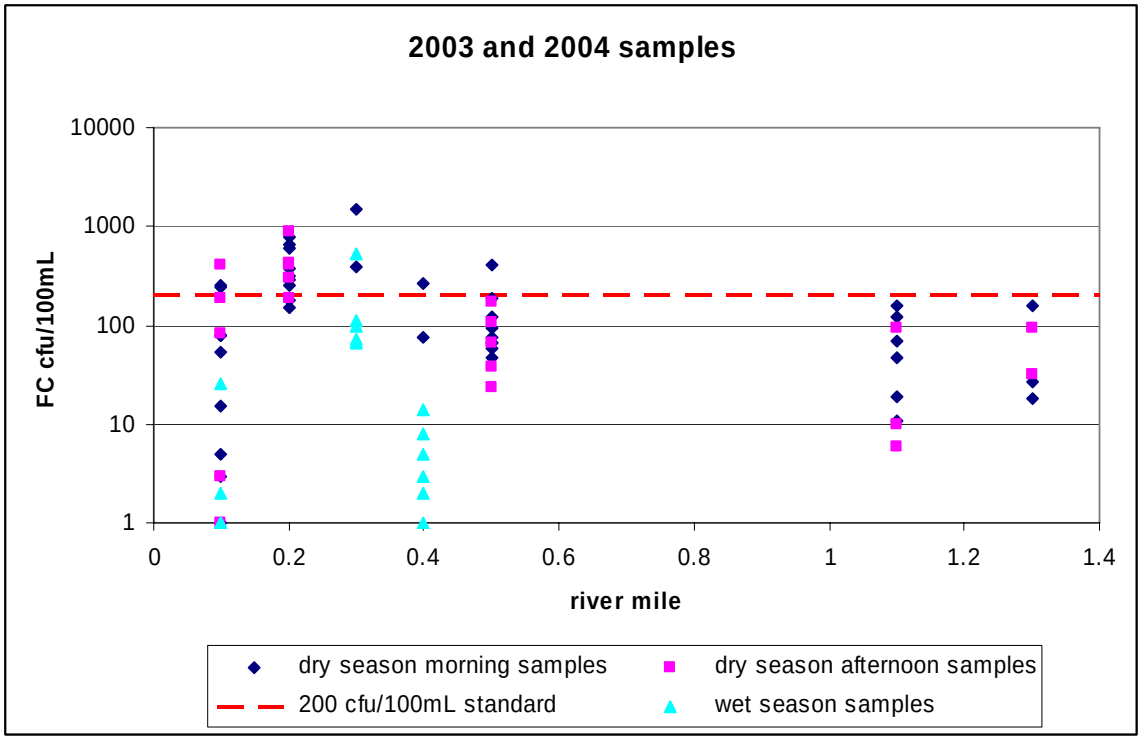
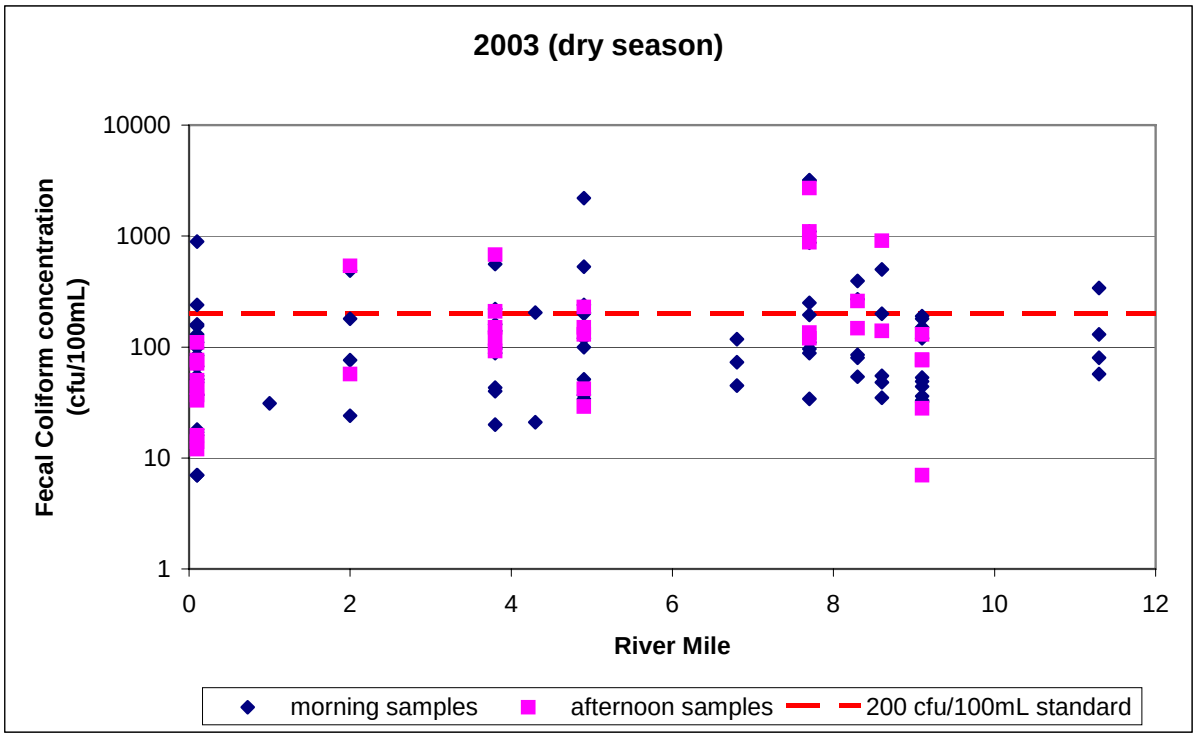


Figure 5: Fecal coliform bacteria concentrations in No Name Creek during the July through October 2003 (dry season) and the March through May 2004 (wet season) sampling surveys. (Vertical scale is logarithmic; horizontal axis is arithmetic.)



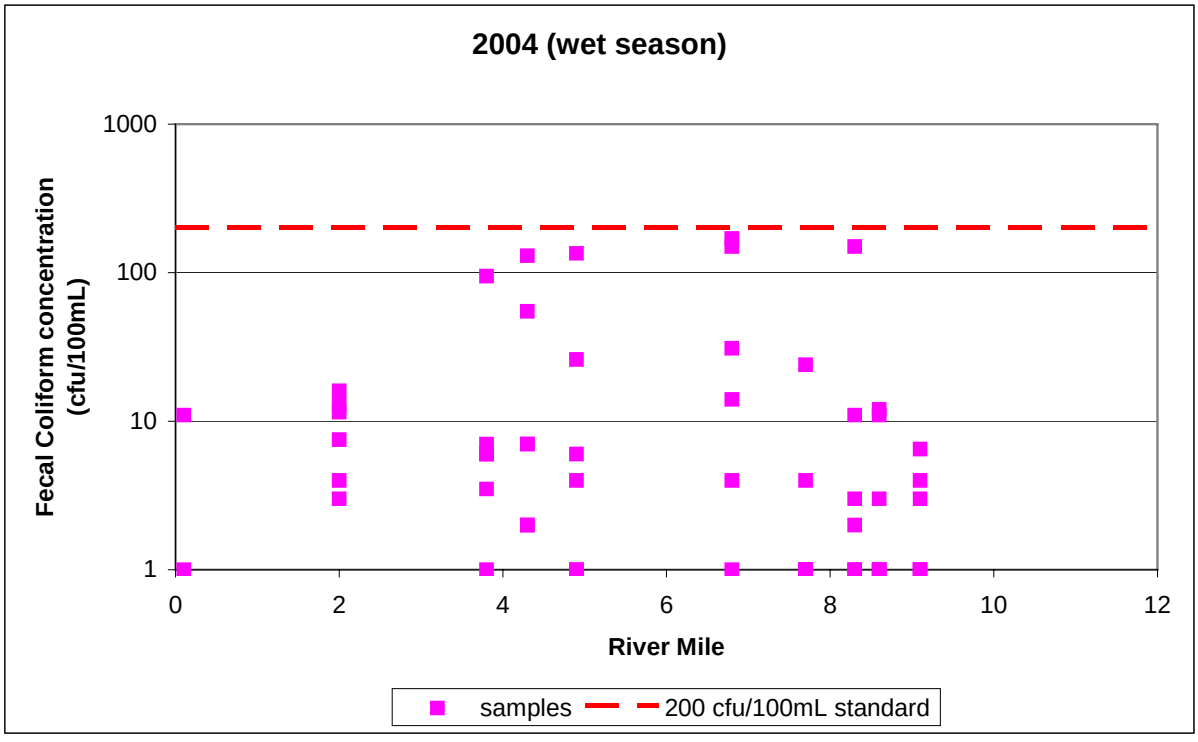


Figure 6: Fecal coliform bacteria concentrations in Chumstick Creek during the July through October 2003 (dry season) and the March through May 2004 (wet season) sampling surveys. (Vertical scale is logarithmic; horizontal axis is arithmetic.)

Technical Analysis

Technical Report Overview

Ecology conducted monitoring twice monthly at the mouths of tributaries to the Wenatchee River and Icicle Creek during 2002. This monitoring confirmed high fecal coliform bacteria counts exceeding standards only in the Mission, Brender, and Chumstick creek watersheds. (Carroll 2005) Additionally, Ecology monitored discharge from waste water treatment plants during 2002. This monitoring showed that no waste water treatment plants were contributing to fecal coliform bacteria violations in the Wenatchee River Watershed.

TMDL sampling identified Mission, Brender, and Chumstick creeks as exceeding water quality standards for fecal coliform bacteria. Further mass balance monitoring and analysis identified specific reaches with the highest fecal coliform bacteria loadings (see Figure 7). Additional fecal coliform bacteria exceedances were observed in the following tributaries to these creeks: Yaksum and Sand (Mission Creek Watershed), No Name (Brender Creek Watershed), and Little Chumstick, Eagle, and Van (Chumstick Creek Watershed).

Although TMDL studies normally express allocations as pollutant loads (pollutant concentration multiplied by streamflow), this approach does not work well for bacteria TMDL studies. An allocation of fecal coliform bacteria pollutant loads in terms of "numbers of bacteria per day" is awkward. Instead of managing fecal coliform bacteria pollution in terms of total load, Ecology used the statistical rollback method (Ott, 1995) to establish fecal coliform bacteria reduction targets for the Wenatchee River Watershed. The approach has been successful in other bacteria TMDL assessments (Cusimano, 1997; Joy, 2000; Sargeant, 2002).

The technical analysis is based on 2003-2004 fecal coliform bacteria data. Excel spreadsheets were used to evaluate the sampling data, including development of mass balances, statistical analyses, and plots. Simple spreadsheet mass-balance, reach-load analyses were used to calculate fecal coliform bacteria data loads in Mission, Brender, No Name, and Chumstick creeks, treating fecal coliform bacteria data as conservative (i.e., no losses from die-off or settling, plus no gain from re-suspension) and averaging by station for stations that were sampled on the same dates (the number of sample results, n, was 9 or 10).

The statistical roll-back method was used to establish fecal coliform bacteria data reduction targets for the various segments of the mainstem and tributaries. The roll-back method assumes that the distribution of fecal coliform bacteria data concentrations follows a log-normal distribution. A cumulative probability assessment of the data gives an estimate of the geometric mean and 90^{th} percentile which can be compared to the state's fecal coliform bacteria standards. The roll-back procedure is described below:

- The fecal coliform bacteria data were checked to confirm that the data fit a log-normal distribution.
- The geometric mean of the data was calculated using Excel.

- The 90th percentile was estimated using the following statistical equation[1]:

$$90^{th}\text{ percentile} = 10^{(\mu_{log} + 1.28 * \sigma_{log})}$$

where: μ_{log} = mean of the log transformed data

- The target percent reduction required to meet water quality standards was set as the highest of the following two values:

For Primary Contact waters:

$$\text{Target percent reduction} = \left[\frac{observed\ 90th\ percentile - 200\ cfu/100mL}{observed\ 90th\ percentile}\right] x100$$

$$\text{Target percent reduction} = \left[\frac{observed\ geometric\ mean - 100\ cfu/100mL}{observed\ geometric\ mean}\right] x100$$

For Extraordinary Primary Contact waters, the 100 cfu/100 mL and 50 cfu/100 mL criteria were used in the equations.

As BMPs for nonpoint sources are implemented and the target reductions are achieved, it is assumed that a new but similar distribution (same coefficient of variation) of the data will occur, with the previous mean and standard deviation decreased by an amount equal to the target percent reductions. This assumption can be verified using TMDL effectiveness monitoring data.

[1] A 90th percentile value is defined as that single data value which represents the beginning of the largest ten percent (10%) of data values after ranking all applicable data values, from highest to lowest. For example, if a data set contains 19 values, the 90th percentile value shall be the largest value; if a data set contains 20 to 29 values, the 90th percentile value shall be the second largest value (WAC 173-201A).

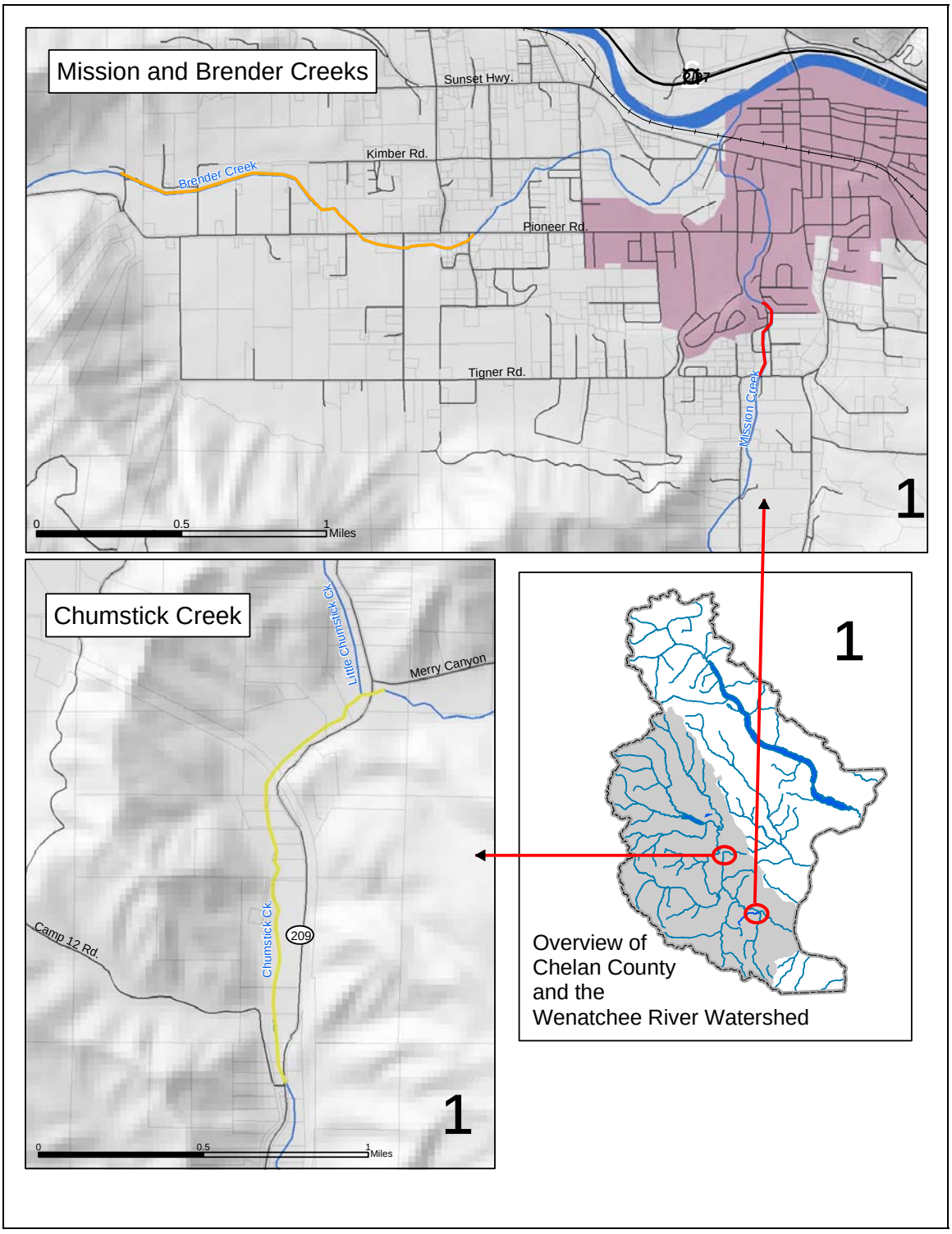


Figure 7: Reaches of Mission, Brender, and Chumstick Creeks where fecal coliform bacteria loading were highest during the Wenatchee River Watershed TMDL dry season field studies conducted during 2003 and 2004.

Technical Analysis Results

Mission Creek

Mission Creek is 9.4 miles long and drains an area of 58,899 acres. The creek's elevation is 6,887 feet at its headwaters and 783 feet at the mouth in the town of Cashmere at the confluence with the Wenatchee River (see Figure 1). Precipitation ranges from 25 inches per year in the headwaters area to 10 inches per year at the mouth.

There are several irrigation diversions in the lower 6 miles of the river which limit flow during the irrigation season. Additionally, there are three known irrigation management return flows operated by the Icicle Irrigation District that returns water to Mission Creek. Above the Cashmere city limits and urban growth area (UGA) boundary, and below the Wenatchee National Forest boundary, Mission Creek has primarily rural land use with agriculture (primarily orchards), on-site septic systems, domestic animals, and wildlife potentially contributing as nonpoint sources of fecal coliform bacteria.

During the wet season, flows are continuous throughout the Mission Creek corridor. Flows gradually increase downstream, ranging from 20 to 60 cubic feet per second (cfs). There were no fecal coliform bacteria water quality exceedances during the 2004 wet season surveys.

In the dry season, flows in Mission Creek decreased from the national forest boundary to Tripp Canyon (RM 3.0). There are several surface water diversions for agriculture. At Tripp Canyon, Mission Creek was dry.

Fecal coliform bacteria loads during the dry season increased greatly between RM 1.2 and RM 0.9 (see Figure 8). Most of this reach is outside the Cashmere city limits but within the city's UGA, where city sewer services are not provided. There were also moderate increases in concentrations at Mission Creek below Bear Gulch (RM 5.1), below Sherman Canyon (RM 3.8), and at Binder Road (RM 1.2).

During 2003, a study was completed to identify on-site septic systems located in the Mission Creek Watershed outside the UGA (Burgoon and Rickel, 2003). Inspections were not conducted to identify whether systems were functioning properly.

Tributaries and other inputs to Mission Creek exceeded fecal coliform bacteria standards and added fecal coliform bacteria loads during the dry season but not during the wet season. These include a pipe discharge just below the Tripp Canyon Road crossing of Mission Creek (45MC03.0P), the ditch from the Icicle Irrigation District irrigation management return flow (45ISR00.1), Yaksum Creek (45YC00.3 and 45YC02.5), and two culverts at the Pioneer Street bridge crossing (45PRM00.1 and 45MC00.6P). One culvert at Pioneer Street discharges from the city of Cashmere stormwater drain system and apparently runs in the dry season when there is no stormwater discharge because of nearby seepage infiltration. The other culvert at Pioneer Street diverts management return flows from the Peshastin Irrigation District to Mission Creek. The Icicle Peshastin Irrigation District also returns water to Brender Creek (at station PS00.1). There were no fecal coliform bacteria exceedances there. This suggests there might be other nonpoint contributions to the water within the culvert, which is also part of the city's stormwater collection system. It also suggests that the Peshastin Irrigation District water should be tested at

the point of discharge to the stormwater collection system to confirm that it is not a source to Mission Creek.

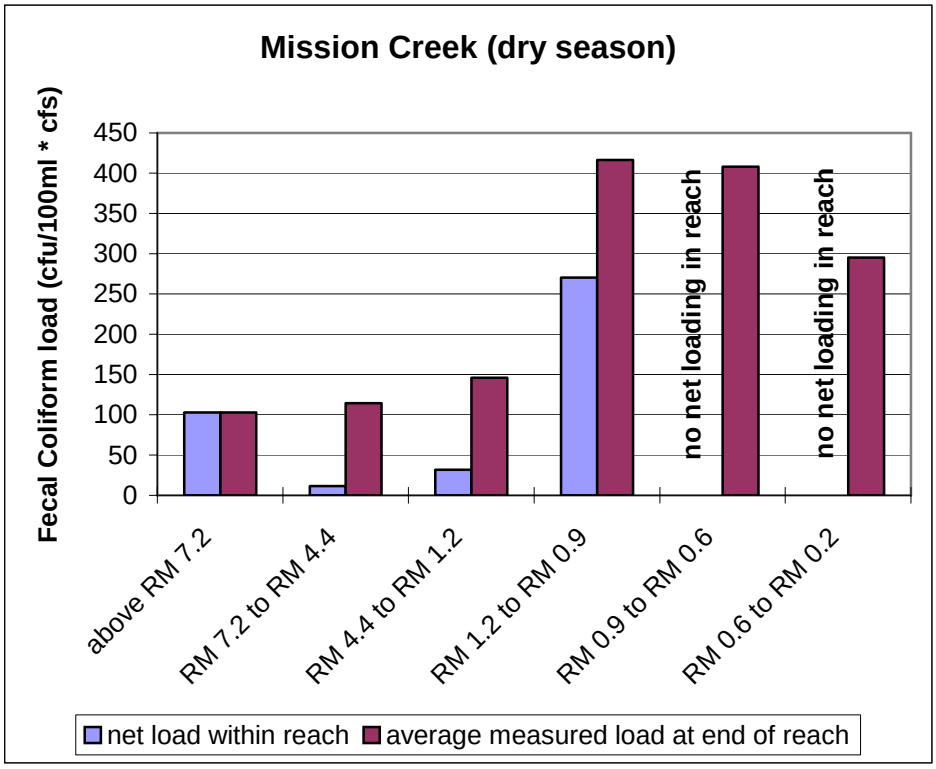


Figure 8: Average measured and net reach fecal coliform bacteria loads in Mission Creek for July through October 2003 (n=10).

Brender Creek and No Name Creeks

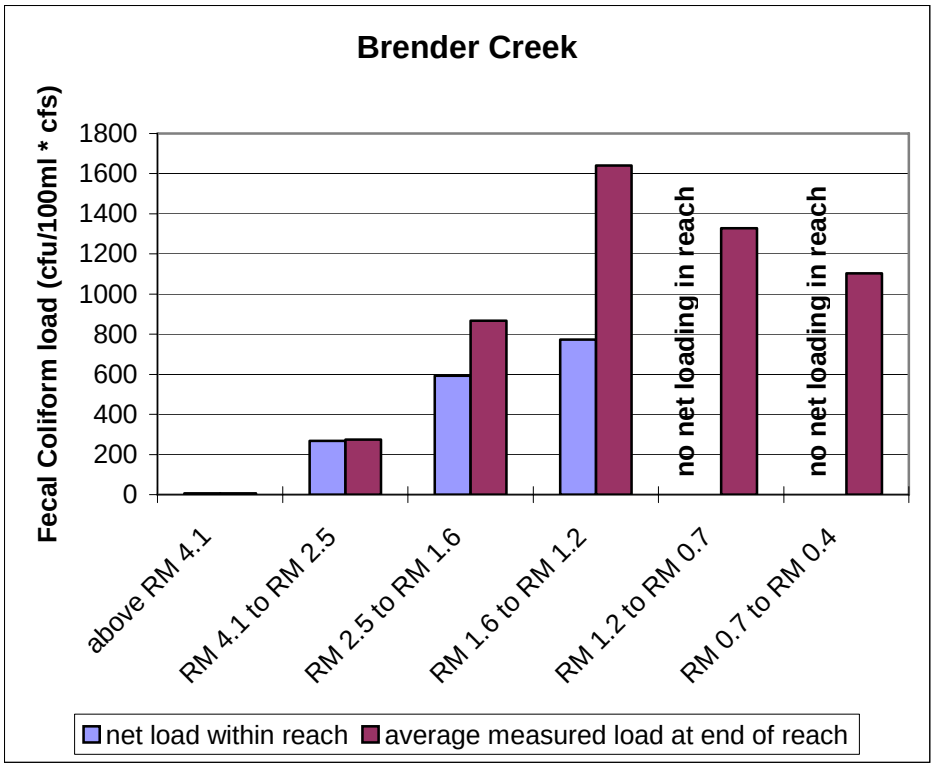
Brender Creek is approximately 6.8 miles long and drains an area of 6,489 acres. Elevation in this tributary ranges from 2,666 feet at the headwaters and 789 feet at the confluence with Mission Creek. Precipitation ranges from 20 inches per year in the headwaters to 10 inches per year at the mouth.

There are two irrigation-management flow returns on Brender Creek at about RM 3.3 and one return at Pioneer Road (RM 1.2). The irrigation returns augment flow in Brender Creek throughout the dry season. There is a man-made pond (sediment trap) at about RM 0.6. Almost all land ownership in this watershed is private. Orchards and rural development are the dominant land use along lower Brender, outside of the Cashmere city limits and the UGA.

No Name Creek is approximately 0.5 miles long. No Name Creek probably did not exist historically. No Name Creek also conveys irrigation-management return flow that runs through the Sunset Highway road-ditches throughout the irrigation season. No Name Creek is essentially a roadside ditch along Mill Road in what was once a large wetland, now occupied by the mill and wood waste fill; a spring-fed roadside pond and various seeps are located in this area. Much of No Name Creek runs through culverts before entering Brender Creek.

Figure 9 shows the net and cumulative dry-season average fecal coliform bacteria loads observed in Brender Creek. Nearly 85% of the net average fecal coliform bacteria load was contributed to Brender Creek between RM 2.5 and Pioneer Road (RM 1.2). The reach from RM 1.2 to RM 1.6 has moderate groundwater inflow with observed saturated soils and seepage along the streambanks. There were no fecal coliform bacteria in groundwater samples taken from piezometers in this reach (Sinclair, 2003; unpublished data). The reach from RM1.6 to RM 2.5 is generally orchard land with about a dozen houses along the creek corridor.

There were no net average fecal coliform bacteria loading in the creek between Pioneer Road (RM 1.2) and the Sunset Highway (RM 0.4). The cumulative average load loss in this reach could be explained by fecal coliform bacteria die-off or settling within the reach, but also by dilution from irrigation-management return flow at Pioneer Road and wetland drainage around Mill Road. Burgoon and Rickel (2003) found high fecal coliform bacteria counts in shallow wells adjacent to Brender Creek in the Mill Road area, but determined that ground water in those wells was downgradient of the creek. Sampled irrigation-management return flow to Brender Creek from the Icicle and Peshastin irrigation district canals generally had fecal coliform bacteria concentrations well below fecal coliform bacteria standards. Even though there is no apparent loading in the lower part of Brender Creek, additional loading in this area could be masked by the high loading from above.



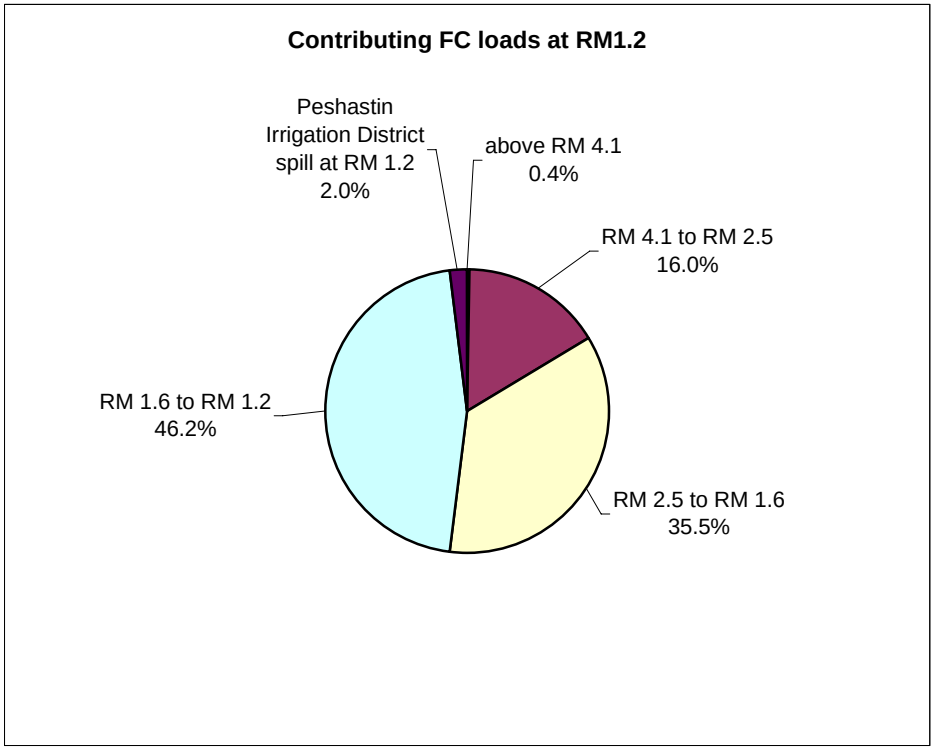


Figure 9: Average measured and net reach fecal coliform bacteria loads in Brender Creek with percent contributing loads for July through October 2003 (n=10).

Figure 10 shows the net and cumulative average dry-season fecal coliform bacteria loads observed in No Name Creek. No Name Creek contributed approximately 25% of the fecal coliform bacteria cumulative load to Brender Creek. Nearly 90% of the net fecal coliform bacteria load for No Name Creek entered between RM 0.5 and 0.2. This reach contains a ponded area of the creek used by ducks. Generally five or six ducks were counted during dry-season surveys. Using published manure production characteristics for ducks (ASAE, 1999), the five or six ducks using the pond could potentially account for a majority of the fecal coliform bacteria load in No Name Creek at low flows (e.g., the mean flow for the 2003 surveys was 0.8 cfs below the pond). This area however, is also in an unsewered area of the city of Cashmere UGA with several businesses and residences using on-site septic systems, possibly in the filled wetland at the mill site. Burgoon and Rickel (2003) found high fecal coliform bacteria counts in shallow wells adjacent to No Name Creek.

The 10% of the fecal coliform bacteria load entering No Name Creek above the pond area (RM 0.4) is from nonpoint sources to the roadside ditch. Several businesses and residences along Sunset Highway could be contributing. There was no net loading in the lowest reach of No Name Creek from RM 0.2 to the mouth (RM 0.1). The cumulative load loss in this reach could be explained by fecal coliform bacteria loss (die-off or settling within the reach) or dilution (there is an increase in flow at the mouth apparently from wetland drainage into the creek). No Name Creek has been routed through an underground culvert from Sunset Highway to near the mouth; recent fill and grading work was evident during this study.

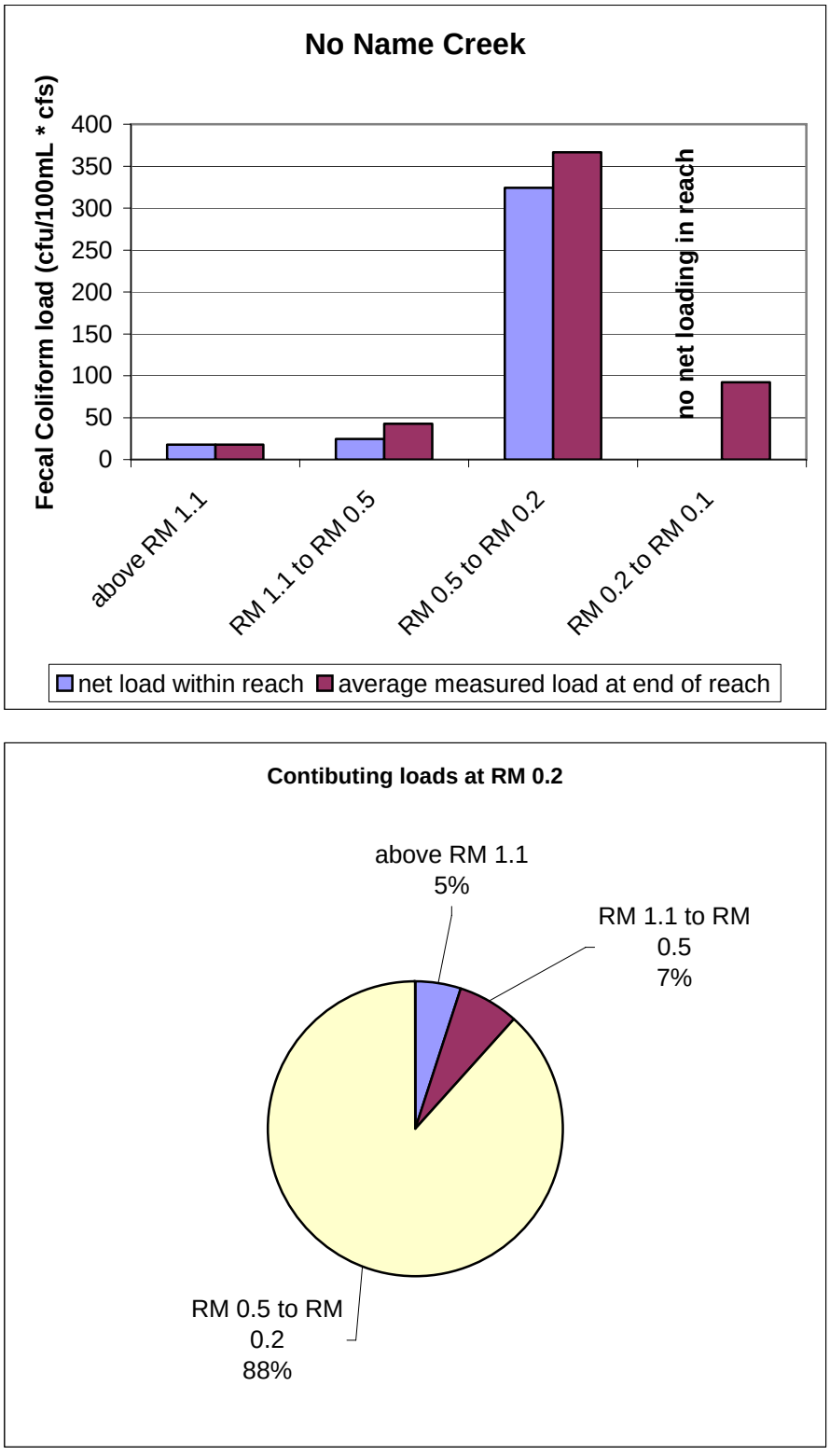


Figure 10: Average measured and net reach fecal coliform bacteria loads in No Name creek with percent contributing loads for July through October 2003 (n=9).

Chumstick Creek

Chumstick Creek has a total of 13.0 river miles and drains a watershed area of 49,920 acres. The elevation at the headwaters is 2,400 feet and at the mouth of Chumstick Creek at its confluence with the Wenatchee River the elevation is 1,068 feet above sea level. There are only minor surface water withdrawals in the watershed for limited agricultural uses and three known irrigation-management flow returns.

Anthropogenic (human-caused) impacts to water quality in the watershed include construction and maintenance for State Highway 209, a utility corridor, railroad activities, and a significant amount of private ownership along the creek. There is a potential for additional development on steep slopes near Chumstick Creek with a high potential for erosion and other impacts on the creek. Private lands consist of some agriculture and farming with several small hobby farms as well as extensive Longview Fiber inholdings. National Forest lands in the watershed are used largely for dispersed recreation. There are no wilderness or state forest lands in the watershed.

Streamflow in Chumstick Creek was discontinuous below RM 3.8 from late August 2003 until late October 2003 when the creek was dry. Flow returned to the mouth of Chumstick Creek during the dry season, primarily from irrigation-management return flow, but also from upstream groundwater seepage starting near RM 1.0.

The 2004 (wet-season) flows were higher than the dry-season flows and generally increased downstream. Concentrations increased beginning at RM 8.6 (below the Little Chumstick Creek mouth) in both seasons. Fecal coliform bacteria exceedances were observed in Little Chumstick, Eagle, and Van creeks, which are tributaries to Chumstick Creek.

During the dry season, the upper-most reach of Chumstick Creek (station 45CS11.3) exceeded the Primary Contact fecal coliform bacteria water quality criteria. The next downstream site (45CS09.1) met criteria. Moving downstream, fecal coliform bacteria concentrations increased again, and *Primary Contact Recreation* exceedances began to occur.

Tributaries and other inputs to Chumstick Creek exceeded fecal coliform bacteria standards, and some added fecal coliform bacteria loads. Little Chumstick Creek was dry in September and October 2003, and the mouth of Eagle Creek was dry from July 2003 throughout the rest of the dry-season sampling ending in October 2003. Several other sites in the upper-most reaches of the watershed are in *Extraordinary Primary Contact Recreation* waters and failed to meet the fecal coliform bacteria criteria (all sites on Van and upper Eagle creeks).

Figure 11 shows the net and cumulative dry-season average fecal coliform bacteria loads observed in upper Chumstick Creek. Cumulative fecal coliform bacteria loads in Chumstick Creek were slightly lower than those in No Name Creek. For most of the dry season, Chumstick was dry at RM 2.0, so only the upper portion of the creek (above RM 3.8) was evaluated in the reach load analysis. Nearly 50% of the net fecal coliform bacteria load entered upper Chumstick Creek between RM 9.1 and 7.7. This stretch of the creek is characterized as having primarily rural land use with agriculture, on-site septic systems, and wildlife potentially contributing as nonpoint sources.

Flow returned at the mouth of Chumstick Creek, primarily from nearby irrigation returns, but also from upstream groundwater seepage. Generally, the irrigation returns had very low fecal coliform bacteria concentrations, so the fecal coliform bacteria load at the mouth can be attributed to land use and nonpoint sources in the reach above the mouth.

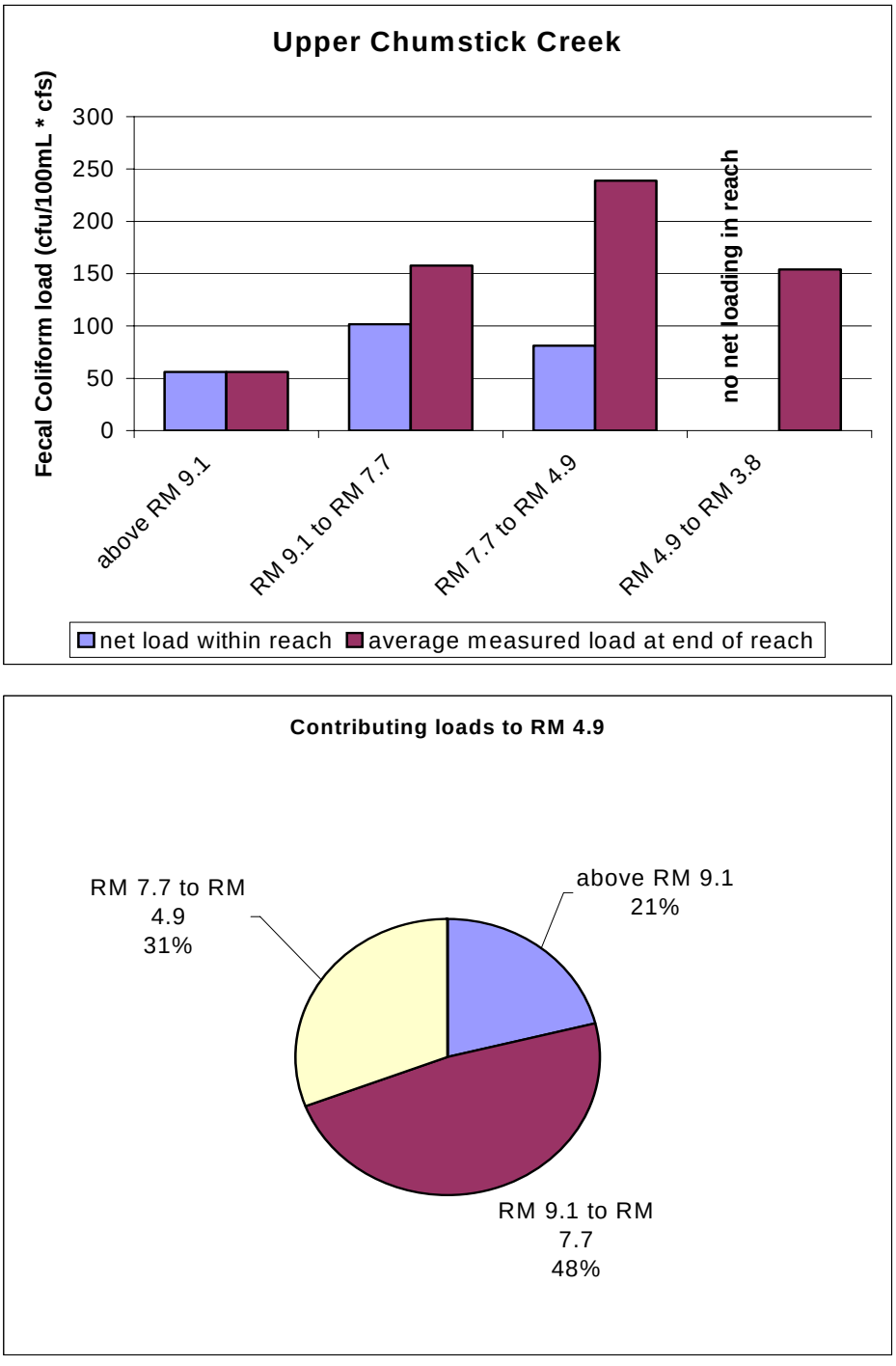


Figure 11: Average measured and net reach fecal coliform bacteria loads in upper Chumstick Creek with percent contributing loads for July through October 2003 (n=10).

Technical Analysis Conclusions and Recommendations

TMDL monitoring during the dry and wet seasons in 2003 and 2004 *(Wenatchee River Basin Fecal Coliform Bacteria Total Maximum Daily Load Study, December 2005)* confirmed previous historical fecal coliform bacteria exceedances from 1998 through 2002 (Ecology ambient water quality monitoring). Fecal coliform bacteria values exceeded the Washington State water quality standards in Mission, Brender, and Chumstick creeks and several of their tributaries during these periods.

Historical water quality data monitoring and TMDL data showed that all the creeks had higher fecal coliform bacteria concentrations and loading during the dry season when there was less flow and dilution, indicating non-runoff sources of pollution. Exceptions were the headwaters of Brender Creek and Little Chumstick Creek, where slightly higher flows were observed during the wet season.

All monitoring sites in the upper reaches of the creeks in the study met *Primary Contact* fecal coliform bacteria water quality standards, except for Chumstick Creek (site 45CS11.3). However, several of the sites in the upper reaches failed to meet the *Extraordinary Primary Contact Recreation* fecal coliform bacteria standards (all sites on Van Creek, upper Eagle Creek, and Sand Creek).

The majority of fecal coliform bacteria exceedances occurred in the lower reaches of all creeks. A mass-balance evaluation identified certain reaches that contribute large loads, and in some cases, these reaches contributed to fecal coliform bacteria exceedances downstream, a consequence of bacteria being transported downstream with stream flow.

Brender Creek had nearly four times the average fecal coliform bacteria loads of Mission and Chumstick creeks, indicating a significant source of pollution and a more immediate health concern. Most of this fecal coliform bacteria load (85%) originates between the first crossing of Pioneer Road (RM 1.2) and RM 2.5. In No Name Creek, the pond area on the side of Mill Road appears to be the major source of fecal coliform bacteria concentrations and load.

Nearly 50% of the net fecal coliform bacteria load entered upper Chumstick Creek between RM 9.1 and 7.7. This stretch of the creek is characterized as having primarily rural land use with agriculture, on-site septic systems, and wildlife potentially contributing as nonpoint fecal coliform bacteria sources.

Each of these reaches should be checked for nonpoint fecal coliform bacteria load contributions and an assessment made to determine whether the sources are primarily human or non-human. If fecal coliform bacteria are from human sources, the properties adjacent to and near the reach should be evaluated for properly functioning on-site septic systems. If the fecal coliform bacteria are found to be primarily from non-human sources, BMPs should be implemented to prevent further inputs. Some contamination from both human and non-human sources is likely.

Loading Capacity and Load Allocations

Loading capacity is defined as the maximum amount of a pollutant that a water body can receive and still meet water quality standards. Historical fecal coliform bacteria monitoring data conducted by Ecology from 1998-2002 showed water quality standards for fecal coliform bacteria were exceeded throughout the year in the Mission, Brender, and Chumstick Creek watersheds. Monitoring for the TMDL further identified that fecal coliform bacteria concentrations in these watersheds are elevated during the dry season from May through October. The TMDL study therefore identified that the critical season of concern for fecal coliform bacteria loading in the Mission, Brender, and Chumstick creek watersheds is the dry season.

The dry season encompasses the irrigation season in the Wenatchee River Watershed. In some instances, the creeks and tributary flows were augmented by irrigation-management return flow above wet-season flows (e.g., Brender and No Name Creeks). In most cases, fecal coliform bacteria loads were highest during the dry season. Exceptions were the upper Brender Creek stations (45BR04.1 and 45BR03.4), Little Chumstick Creek (45LC00.1), and Chumstick Creek RM 4.3 (45CS04.3), which apparently experience some additional fecal coliform bacteria runoff loading during the wet season.

TMDL target reductions may be presented in terms of concentration, load, or both. This TMDL is expressed in terms of fecal coliform bacteria concentration as allowed under Federal Regulations [40 CFR 130.2(I)] as "other appropriate measures." The density measure is appropriate since the water quality standard can be directly compared to measured concentrations in the receiving water under all flow scenarios. This density measure of loads and loading applies on daily and longer time scales such as the critical dry season. The target reductions show what is necessary to achieve the water quality standard.

Table 3 identifies the target load reductions necessary to meet water quality standards for fecal coliform bacteria in the Mission, Brender, and Chumstick Creek watersheds. The mouths of the creeks, as well as additional key stations, were selected as compliance points to protect the creeks. The upstream stations were included because attaining compliance at the downstream site could still leave the upstream sites potentially out of compliance. All tributaries, including discrete sources such as culverts and irrigation-management flow returns, were given mouth or end-of-pipe compliance points for fecal coliform bacteria reductions. Eagle and Van creeks were also given upstream compliance points.

Stormwater data was not collected as part of this TMDL. This TMDL recognizes that stormwater is a potential nonpoint source of fecal coliform bacteria to streams in the project area. Actions to address potential stormwater are included in the summary implementation strategy (SIS) and Wenatchee River Watershed Plan (action item #20).

Table 3: Target reductions needed in Wenatchee River Watershed tributaries to comply with the 90th percentile fecal coliform bacteria water quality criterion.

Station	Use	Site Description	Fecal Coliform Bacteria Target Reduction (%)
Mission Creek and tributaries			
45MC00.2	Primary Contact Recreation	Mission Creek at Sunset Highway	89%
45MC00.9	Primary Contact Recreation	Mission Creek at Creekside Place	98%
45MC01.2	Primary Contact Recreation	Mission Creek at Binder Road	71%
45MC03.0	Primary Contact Recreation	Mission Creek at Tripp Canyon	79%
45MC05.1	Primary Contact Recreation	Mission Creek below Bear Gulch	41%
45PRM00.1	Primary Contact Recreation	Peshastin Irrigation return at Pioneer Road	90%
45ISR00.1	Primary Contact Recreation	Icicle Irrigation Return	75%
45MC00.6P	Primary Contact Recreation	Pipe discharge at Pioneer Road	63%
45YC00.3	Primary Contact Recreation	Yaksum Creek at Coates Road	61%
45MC03.0P	Primary Contact Recreation	Pipe discharge downstream of Tripp Canyon bridge	87%
45SN00.3	Extraordinary Primary Contact Recreation	Sand Creek near mouth	6%
Brender Creek and tributaries			
45BR00.4	Primary Contact Recreation	Brender Creek at Sunset Highway	68%
45BR01.2	Primary Contact Recreation	Brender Creek at Pioneer Road	89%
45BR01.9	Primary Contact Recreation	Brender Creek at RM 1.9	94%
45BR02.5	Primary Contact Recreation	Brender Creek at RM 2.5	60%
45NN00.1	Primary Contact Recreation	No Name Creek at mouth	52%
45NN00.3	Primary Contact Recreation	No Name Creek below pond on Mill Road	92%
Chumstick Creek and tributaries			
45CS00.1	Primary Contact Recreation	Chumstick Creek near mouth	49%
45CS04.9	Primary Contact Recreation	Chumstick Creek at RM 4.9 on Hwy 209	71%
45CS07.7	Primary Contact Recreation	Chumstick Creek at Camp 12 Road	92%
45CS11.3	Primary Contact Recreation	Chumstick Creek above Second Creek	38%

Station	Use	Site Description	Fecal Coliform Bacteria Target Reduction (%)
45FX00.1	Primary Contact Recreation	Fox irrigation return	25%
45EG00.3	Primary Contact Recreation	Eagle Creek near mouth	57%
45EG00.9	Primary Contact Recreation	Eagle Creek above mouth	47%
45EG05.8	Extraordinary Primary Contact Recreation	Eagle Creek above Van Creek	13%
45VC00.1	Extraordinary Primary Contact Recreation	Van Creek near mouth	87%
45VC00.5	Extraordinary Primary Contact Recreation	Van Creek on USFS land	14%
45LC00.1	Primary Contact Recreation	Little Chumstick Creek near mouth	45%

Margin of Safety

The federal Clean Water Act requires that a margin of safety be identified to account for uncertainty when establishing a TMDL. The margin of safety can be placed either implicitly in the use of conservative assumptions, or explicitly as a separate load allocation or an additional target component. In this TMDL, the margin of safety is addressed implicitly by using the 90th percentile of a log-normal distribution. This is often more conservative than the water quality criterion which allows for 10% of the fecal coliform bacteria samples to exceed the standard without considering the distribution of the data.

Summary Implementation Strategy

Overview

The goal of a TMDL study is to ensure that an impaired water body attains water quality standards within a reasonable period of time.This Summary Implementation Strategy (SIS) identifies actions that should be implemented and potential implementing entities for this TMDL to reduce fecal coliform bacteria inputs and achieve water quality standards. It is anticipated that most BMPs should be implemented by 2013. At least 50% of the target reductions for fecal coliform bacteria identified in Table 3 should be achieved by 2013, with a goal of meeting water quality standards by 2018. Ongoing monitoring and adaptive management should be conducted by the implementing parties to verify effectiveness of BMPs for reducing fecal coliform bacteria inputs and make refinements as needed. Monitoring associated with achieving water quality standards will be conducted by Ecology at a minimum of 5-year intervals (see Table 5).

Ecology began working with the Wenatchee Water Quality Technical Subcommittee (WQTS) in 2001. At the same time, the Wenatchee Watershed Planning Unit began developing a watershed plan to address water quantity, water quality, habitat, and instream flow issues in the watershed.

The actions in the SIS are included in the water quality component of the Wenatchee Watershed Management Plan. The committee is comprised of representatives from the EPA, Ecology, Chelan County, Chelan County Public Utility District (CCPUD), Chelan-Douglas Health District (CDHD), and the Chelan County Conservation District (CCCD), as well as irrigation districts, city agencies, environmental groups and other special interests, and private citizens.

The success of this TMDL depends upon implementation of the many actions identified in this SIS and a Detailed Implementation Plan (DIP). The DIP should be prepared within one year after EPA approves this TMDL. The DIP will describe the specific implementation activities to be performed by each of the participating entities in order to achieve the target reductions. It will provide detail on how, when, and where implementation and monitoring activities should be conducted. Ecology and other entities are expected to provide technical assistance and seek additional funding for these activities and new activities that may be identified as the body of data grows. Public input will be sought to help prepare the plan. Continued monitoring of implementation activities and water quality will be essential to assess the progress toward achieving water quality improvements.

Early Implementation Activities

Activities have already begun to address fecal coliform bacteria impairments in the Wenatchee River Watershed.

Wenatchee River Watershed Action Plan

In 1995, a committee of 20 people was created by the CCCD that became the Wenatchee River Watershed Steering Committee and a Technical Advisory Committee. The committees developed the *Wenatchee River Watershed Action Plan*. Its purpose was to implement an effective, coordinated program of actions to identify, correct, and prevent nonpoint pollution as well as protect beneficial uses of the water within the Wenatchee River Watershed.

The plan was created as a guidance document for individuals, citizen groups, businesses, schools, governmental agencies, tribes, and other entities responsible for protecting and/or restoring water quality in the Wenatchee River Watershed from nonpoint pollution. The primary emphasis of the plan was to develop a plan to provide information, education, technical assistance and, finally, monetary incentives that will ultimately protect the Wenatchee River, its tributaries, associated lakes, and wetlands through specific actions.

The Mission Creek Watershed was identified as Priority 1 (the most polluted) within the Wenatchee River Watershed. Fecal coliform bacteria were identified as one of the problem pollutants. Chumstick Creek was identified as Priority 2, also with fecal coliform bacteria identified as one of the pollutants to be addressed.

Many actions have been implemented by various entities since the *Wenatchee River Watershed Action Plan* was approved in 1998. This work continues today.

Ecology TMDL Support Grant

An Ecology Centennial Clean Water Fund grant was awarded in the fall of 2001 to the CCCD and the project was completed in January 2005. The purpose was to allow the CCCD to provide

assistance to Ecology in starting the TMDL process and implementation of BMPs in the Wenatchee River Watershed.

Increased landowner awareness of water quality issues was accomplished through a variety of means including supporting grass roots efforts to collectively increase the stewardship ethic of the people living in the Wenatchee River Watershed. The following specific items were completed:

- The CCCD developed a total of eight newsletters about every four months. Each issue was sent to approximately 4,000 homes in Chelan County. None of these newsletters were dominated by one topic.

- Three display boards were prepared to highlight water quality issues and topics. The displays were exhibited during events where they would have the maximum exposure to the public: Chelan County Fair (1,000 people) and Salmon Festival (10,000). The displays were also exhibited at watershed and Horticultural Association meetings.

- Two flyers were produced and distributed at events where the display was exhibited. The flyers focused on the TMDL process and explained how BMPs can be implemented to address water quality issues.

- Three direct mailings (once per year) were sent out to residents and businesses in the Mission, Brender, Yaksum, Chumstick and Peshastin Creek watersheds. The mailings focused on fecal coliform bacteria pollution in the water bodies in these watersheds and summarized the current status of the TMDL.

- Three radio interviews were conducted and seven newspaper stories were printed during the project. They were made to educate and increase local awareness about water quality issues and potential funding sources for BMP implementation.

- Three presentations to students were used to educate and increase awareness of water quality problems in the watershed. Presentations were made to the Cashmere High School's chapter of Future Farmers of America and the Forestry and Outdoor Education Program. A network of monitoring sites was also set up for the use of the students.

- The CCCD assisted Ecology with water quality monitoring and provided valuable assistance with various landowners to obtain permission for sampling on their property.

- The CCCD worked closely with the Natural Resource Conservation Service (NRCS) and its Environmental Quality Incentive Program (EQIP) to apply BMPs to 521 acres. By using Centennial grant and EQIP funding, the CCCD developed 25 Conservation Plans and 80 BMPs, many of which assisted in fecal coliform bacteria reductions to surface waters.

- The CCCD was very involved with the WRIA 45 2514 Watershed Planning process since its inception in 2001. A primary goal of the CCCD under the project was to assist Ecology in

incorporating appropriate actions outlined in the Wenatchee River Watershed Action Plan and TMDL into the Watershed Plan.

Wenatchee Watershed Planning Unit

As described earlier (see Introduction), development and implementation of the *Wenatchee River Watershed(WRIA 45) Fecal Coliform Bacteria TMDL* has been and will continue to be a collaborative effort with the *Wenatchee Watershed Management Plan* and its participating entities. Many collaborative actions have been undertaken in development of the TMDL and Wenatchee Watershed Management Plan, which will continue as the plans are implemented. Implementation action items identified in the SIS below are included in the watershed plan, and are cross-referenced to the watershed plan with parentheses at each heading.

Implementation Strategy Development

The overriding goal of the implementation plan is to reduce and/or prevent the impacts of pollution sources to the water bodies within the Wenatchee River Watershed. Several key milestones in the evolution of the TMDL implementation plan are worth noting. Field studies addressing the 303(d) listed parameters were developed and conducted by Ecology from 2002-2004, with additional studies conducted by the CCCD during that time. Technical analysis of the studies were completed from 2004-2006. Numerous drafts of the technical reports were reviewed and commented on by the TMDL advisory committee and planning unit. Comments were incorporated into the technical reports and responded to by Ecology. Scientists conducting the work provided numerous presentations and engaged in discussions with the group.

The Water Quality Technical Subcommittee and Wenatchee Watershed Planning Unit assisted Ecology with development of this submittal document from 2005-2006. The process included education, outreach, and media coverage. Information regarding the public comment period and public outreach for this TMDL can be found in Appendix B.

Implementation Actions and Responsibilities

The following actions were developed by the Water Quality Technical Subcommittee (WQTS) utilizing the TMDL technical study, **"***Wenatchee River Basin Fecal Coliform Bacteria Total Maximum Daily Load Study* (see Appendix A)."

The BMP actions and assessments listed here should be implemented to address the 303(d) listings in this TMDL for fecal coliform bacteria. Additionally, the WQTS recommends the implementation of BMPs and associated assessments for any other private and public lands in the watershed where fecal coliform bacteria problems may exist. The WQTS encourages the Wenatchee Watershed Planning Unit and its other subcommittees (Water Quantity, Instream Flow, Habitat, and Growth and Land Use) to utilize this information along with their subcommittee conclusions, recommendations, and actions for a more holistic approach to restoration, preservation, and enhancement of the watershed for all beneficial uses. Table 4 below contains general suggestions for actions to be made by each of the entities involved with the implementation of the Wenatchee River Watershed (WRIA 45) Fecal Coliform Bacteria TMDL.

Ecology is the responsible entity for determining compliance of interim and final targets, and conducting Effectiveness Monitoring in the future.

Implementation Action Item #1 (WWMP, 9.2.2, MissionQual-10)
Identify sources of fecal coliform bacteria pollution to Mission Creek subwatershed, utilizing the fecal coliform bacteria technical study. Identify potential contributions, human versus nonhuman sources, and/or failing on-site septic systems. Plan and implement corrective actions. The Chelan-Douglas Health District (CDHD) will address failing septic systems. Other entities should address manageable sources of fecal coliform bacteria pollution as appropriate. Assessments should include the following areas:

a. Mission Creek between Binder Road (RM 1.2) and Creekside Place (RM 0.9).
b. Mission Creek above RM 5.1, RM 3.8, and RM 1.2.
c. A pipe discharge just below the Tripp Canyon road crossing of Mission Creek (RM 3.0)
d. Mission Creek culvert at Pioneer Street that discharges from the city of Cashmere stormwater drain system and apparently runs in the dry season due to nearby seepage infiltration (RM 0.7)
e. Mission Creek culvert at Pioneer Street that diverts irrigation management return flows from the Icicle-Peshastin Irrigation Canal to Mission Creek (RM 0.7)
f. The Peshastin Irrigation District irrigation management return flow to the stormwater collection system to confirm it is not a source to Mission Creek (RM 0.7)
g. The Peshastin Irrigation District irrigation management return flow that returns water to Brender Creek (RM 0.1)
h. Yaksum Creek (RM 0.3 and RM 2.5), and two culverts at the Pioneer Street bridge crossing (RM 0.1 and RM 0.6)
i. Brender Creek between river mile 1.2 (where Brender Creek first crosses Pioneer Road) and river mile 2.5. Investigate suspect domestic on-site septic systems in this reach (RM1.2 to RM 1.6) for proper functioning. A walking inspection of the creek should be conducted to look for illicit discharges.
j. No Name Creek from its source (RM 1.3), downstream to Mill Pond (RM 0.5), to the mouth (RM 0.1).
k. Sand Creek in the forested area of upper Mission Creek (Station 45SN00.1)
l. The ditch from the Peshastin Irrigation District irrigation management flow return (RM 0.1).

Implementation Action Item #2 (WWMP, 9.4.2, ChumQual-1)
Identify sources of fecal coliform bacteria pollution to Chumstick Creek subwatershed, including Van Creek and Upper Eagle Creek, utilizing the fecal coliform bacteria technical study.
Identify human versus nonhuman sources and/or failing on-site septic systems.
Plan and implement corrective actions.

The CDHD will address failing septic systems. Other entities should address manageable sources of fecal coliform bacteria pollution as appropriate.

Implementation Action Item #3 (WWMP, 9.2.2, MissionQual-11, 9.4.2 ChumQual-2)
Implement and monitor BMPs to meet the Fecal Coliform Bacteria TMDL Technical Assessment target reductions**.**

Implementation Action Item #4 (WWMP, 9.2.2, MissionQual-12)
The city of Cashmere will work to identify areas where repair and upgrades are needed in their sewer collection system.

Implementation Action Item #5 (WWMP, 9.2.2, MissionQual-13)
The CDHD will continue to work with consenting homeowners to conduct monitoring of on-site wells in areas of fecal coliform bacteria exceedances to help identify the source(s). Utilize this assessment (July 2003) to help identify locations for testing.

Implementation Action Item #6 (WWMP, 9.2.2, MissionQual-14, 9.4.2 ChumQual-3)
CDHD will continue to implement onsite sewage disposal system technical assistance and education programs for homeowners and the industry.

Implementation Action Item #7 (WWMP, 9.2.2, MissionQual-15, 9.4.2 ChumQual-4)
The CDHD will continue to permit sewage systems per Washington Administrative Code (WAC), including analyzing soils and technologies suitable for individual sites; review/approve the proposed design, specifications, installation and if required, the ongoing maintenance in accordance with the WAC; provide public information under real estate disclosure laws; and review all land use proposals to ensure that the WAC is properly enforced prior to approval by the County.

Implementation Action Item #8 (WWMP, 9.2.2, MissionQual-16, 9.4.2 ChumQual-5)
A grant/loan funding program should be developed and implemented to replace or repair failing septic systems.

Implementation Action Item #9 (WWMP, 9.2.2, MissionQual-17, 9.4.2 ChumQual-6)
The CDHD should explore obtaining legal authority from Chelan County to operate a pumper notification program with area septage pumpers as part of its onsite septic system operation and maintenance program. The septage pumpers would work with the CDHD to appropriately identify and correct failing septic systems.

Implementation Action Item #10 (WWMP, 9.2.2, MissionQual-18, 9.4.2 ChumQual-7)
The CDHD and watershed would benefit from the funding, development and maintenance of a digital system for all on-site septic system permits issued in Chelan County, and a GIS database of the onsite septic systems.

Implementation Action Item #11 (WWMP, 9.2.2, MissionQual-19, 9.4.2 ChumQual-8)
When the TMDL DIP is developed, the committee should utilize detailed recommendations from the Wenatchee River Watershed Action Plan.

Implementation Action Item #12 (WWMP, 9.2.2, MissionQual-20, 9.4.2 ChumQual-9)
Conduct stream walk cleanups along the stream (fall, spring, summer) with area schools, homeowners, and other groups.

Implementation Action Item #13 (WWMP, 9.2.2, MissionQual-21, 9.4.2 ChumQual-10)
Conduct ongoing community fecal coliform bacteria education/awareness campaigns throughout the year. Engage and get support from homeowners.

Implementation Action Item #14 (WWMP, 9.2.2, MissionQual-22, 9.4.2 ChumQual-11)
Work with city, county, state, and federal governments, and the Humane Society to deal with the feral cats and dogs living within the stream corridor. Monitor and remove dead animals within the stream corridor throughout the year.

Implementation Action Item #15 (WWMP, 9.2.2, MissionQual-23, 9.4.2 ChumQual-12)
Conduct education and enforcement actions to stop illegal dumping of wastes either to storm drains or directly to surface waters. This dumping may be of portable toilet wastes, recreational vehicle wastes, or from similar sources.

Implementation Action Item #16 (WWMP, 9.2.2, MissionQual-24, 9.4.2 ChumQual-13)
The WQTS should encourage the CDHD, Chelan County, cities, DOH, and utilities to continue ongoing review and upgrading of ordinances regarding developments and sewage systems technologies.

Implementation Action Item #17 (WWMP, 9.2.2, MissionQual-25, 9.4.2 ChumQual-14)
The WQTS and its participating entities should work with the public and homeowners regarding BMPs to reduce fecal coliform bacteria runoff. General actions should include public information, education, and technical assistance regarding watering practices, landscaping, stormwater runoff, filtration practices, animal waste, and other similar pollutant sources.

Implementation Action Item #18 (WWMP, 9.2.2, MissionQual-26, 9.4.2 ChumQual-15
Work with irrigation districts to implement and enforce policies to prevent illicit fecal coliform bacteria discharges to irrigation canals.

Implementation Action Item #19 (WWMP, 9.2.2, MissionQual-27, 9.4.2 ChumQual-16)
Work with landowners regarding fecal coliform bacteria runoff.

Implementation Action Item #20 (WWMP, 9.2.2, MissionQual-28, 9.4.2 ChumQual-17)
Encourage Chelan County and municipalities to develop and implement stormwater policies, standards, and guidelines, utilizing the Eastern Washington Stormwater Manual or equivalent, in comprehensive plans, critical area ordinances, growth management plans, and other appropriate plans.

Implementation Action Item #21 (WWMP, 9.2.2, MissionQual-29, 9.4.2 ChumQual-18)
Work with appropriate entities to reduce fecal coliform bacteria runoff from impervious surfaces.

Implementation Action Item #22 (WWMP, 9.2.2, MissionQual-30, 9.4.2 ChumQual-19)
Work with U.S. Forest Service, Washington State Department of Natural Resources, and private owners on forested lands to restore and protect streams from fecal coliform bacteria runoff pollution.

Implementation Action Item #23 (WWMP, 9.2.2, MissionQual-31)
Work with wastewater purveyors to examine sewer collection systems to identify problems or damage within them that may contribute fecal coliform bacteria loading in the watershed. Correct identified problems as appropriate.

Implementation Action Item #24 (WWMP, 9.2.2, MissionQual-32, 9.4.2 ChumQual-20)
Funding should be sought through Department of Ecology grants and loans programs to implement actions and ongoing monitoring. Other funding sources should be identified and applications submitted to provide funding for ongoing activities. The WQTS will recommend qualified entities to conduct associated monitoring. Self-sustaining funding mechanisms to reduce fecal coliform bacteria inputs should be explored and developed in concert with the Wenatchee Watershed Planning Unit and its participating entities.

Implementation Action Item #25 (WWMP, 9.2.2, MissionQual-33)
Work with the wastewater utilities regarding their ordinances to connect unconnected homes in service areas.

Implementation Activities Table

Table 4 below contains general suggestions for actions to be made by each of the entities involved with the implementation of the Wenatchee River Watershed (WRIA 45) Fecal Coliform Bacteria TMDL. Implementation actions fit into one of three categories: (1) actions that are already required by existing programs/regulations, (2) actions that are voluntary to meet TMDL goals, and (3) monitoring or adaptive management actions. Categories will be clearly identified in the DIP.

Table 4: Organization of TMDL entities and their contributions

		TMDL Year		
Implementation Action Item	Potential Contributors	2007-08	2008-13	2013-18
Complete DIP	WQTS and stakeholders	x		
Implement #1 Identify fecal coliform bacteria to Mission Creek subwatershed	CCCD, CCNR, City of Cashmere, Ecology, CDHD, appropriate entities		X	
Implement #2 Identify fecal coliform bacteria to Chumstick Creek subwatershed	CCCD, CCNR, Ecology, CDHD, appropriate entities		X	
Implement #3 Implement and monitor BMPs	WWPU, WQTS, CCNR, CDHD, CCCD, Ecology, municipalities, utilities, appropriate entities		X	X

Implementation Action Item	Potential Contributors	2007-08	2008-13	2013-18
Implement #4 Cashmere sewer system	City of Cashmere, Ecology, appropriate entities		X	X
Implement #5 Voluntary well monitoring	CDHD, CCCD, CCNR, Ecology, appropriate entities		X	X
Implement #6 CDHD on-site septic technical assistance	CDHD		X	X
Implement #7 CDHD on-site permit program per WAC	CDHD		X	X
Implement #8 Grant/loan program for on-site systems	CCNR, CDHD, CCCD, Ecology, appropriate entities		X	X
Implement #9 Septage pumper notification program	CDHD		X	X
Implement #10 CDHD digital, GIS database	CDHD, appropriate entities		X	X
Implement #11 Use DIP from WRWAP	WWPU, WQTS, CCNR, CDHD, CCCD, Ecology, municipalities, utilities, appropriate entities		X	X
Implement #12 Stream walk cleanups	CCNR, CDHD, CCCD, Ecology, appropriate entities		X	X
Implement #13 Community education and awareness	WWPU, WQTS, CCNR, CDHD, CCCD, Ecology, municipalities, utilities, appropriate entities		X	X
Implement #14 Humane Society involvement	CDHD, CCNR, CCCD, municipalities, appropriate entities		X	X
Implement #15 Illegal dumping	WWPU, WQTS, CCNR, CDHD, CCCD, Ecology, municipalities, utilities, appropriate entities		x	x
Implement #16 Review and upgrading of ordinances	WWPU, WQTS, CCNR, CDHD, CCCD, Ecology, municipalities, utilities, appropriate entities		X	x
Implement #17 Homeowner BMPs	WWPU, WQTS, CCNR, CDHD, CCCD, Ecology, municipalities, utilities, appropriate entities		X	x
Implement #18 Irrigation District policies	WWPU, WQTS, CCNR, CCCD, appropriate entities		X	x
Implement #19 Landowner fecal coliform bacteria runoff	WWPU, WQTS, CCNR, CDHD, CCCD, Ecology, municipalities, utilities, appropriate entities		X	x
Implement #20 Stormwater policies	WWPU, WQTS, CCNR, Ecology, municipalities, utilities, appropriate entities		X	x

Implementation Action Item	Potential Contributors	2007-08	2008-13	2013-18
Implement #21 Fecal coliform bacteria runoff from impervious surfaces	WWPU, WQTS, CCNR, CDHD, CCCD, Ecology, municipalities, utilities, appropriate entities		X	x
Implement #22 Forest runoff	WWPU, WQTS, USFS, DNR, CCNR, CCCD, Ecology, appropriate entities		X	x
Implement #23 Sewer collection systems	CCNR, CCCD, Ecology, municipalities, utilities, appropriate entities		X	x
Implement #24 Funding	WWPU, WQTS, CCNR, CCCD, CDHD, Ecology, agencies, utilities, municipalities, appropriate entities		X	x
Implement #25 Wastewater utility ordinances	WWPU, WQTS, CCNR, CCCD, CDHD, Ecology, agencies, utilities, municipalities, appropriate entities		X	x
Collect data at points of compliance	CCNR, CCCD, CDHD, Ecology, agencies, utilities, municipalities, appropriate entities		X	x
Review data and targets (annual)	WWPU, WQTS, CCNR, CCCD, CDHD, Ecology, agencies, utilities, municipalities, appropriate entities		X	x
Adaptive management	WWPU, WQTS, CCNR, CCCD, CDHD, Ecology, agencies, utilities, municipalities, appropriate entities		X	x
TMDL effectiveness monitoring every 5 years	Ecology, CCNR, CCCD, appropriate entities		X	X
Target reductions 50% achieved			X	
Water quality standards met				X

BMP = Best Management Practice
CCCD = Chelan County Conservation District
CCNR = Chelan County Natural Resources Department
CDHD = Chelan-Douglas Health District
DIP = Detailed Implementation Plan
DNR = Department of Natural Resources
Ecology= Washington State Department of Ecology
TMDL= Total Maximum Daily Load study
WQTS = Water Quality Technical Subcommittee
WRWAP = Wenatchee River Watershed Action Plan
WWMP = Wenatchee Watershed Management Plan
USFS = United States Forest Service

Reasonable Assurance

The technical report for this TMDL (Carroll, 2005) concluded that only nonpoint sources of pollution contribute to fecal coliform bacteria water quality standards violations in the Wenatchee River Watershed. So, this TMDL addresses only nonpoint sources of pollutions and formal reasonable assurance is not required. However, the Wenatchee Watershed Planning Unit

WQTS and participating entities provide assurance that actions will be implemented to achieve targets by publishing these actions in the Wenatchee River Watershed Management Plan. Ecology may provide technical assistance, grant, and loan funding availability. Ecology will complete effectiveness and permit management to provide assurances that water quality standards will be maintained and achieved. Ecology's authorities under RCW 90.48 and WAC 173-201A assure the agency the authority to protect and preserve waters o the state.

Summary of Public Involvement

The Wenatchee Watershed Planning Unit's Water Quality Technical Subcommittee acted as the advisory group for the TMDL. Groups represented include agriculture, conservation districts, irrigation districts, health district, local governments, state and federal agencies, citizens, and other interested parties. There is a high level of cooperation and communication between project participants, and their continued active pursuit of the goals of the TMDL.

In addition to the numerous meetings of the Planning Unit and Water Quality Technical Subcommittee, Ecology staff met with and presented information about this TMDL to numerous interested groups and individuals.

The public comment period occurred from February 5, 2007 through March 9, 2007. A public workshop was held on January 31, 2007 by the WQTS at the Cashmere Riverside Center. Another open house was held on February 7, 2007 in the city of Leavenworth Fire Hall. The public provided no comments on this report.

Adaptive Management

The *Wenatchee River Watershed (WRIA 45) Fecal Coliform Bacteria TMDL* is the result of a partnership between the Department of Ecology (Ecology), the Wenatchee Watershed Planning Units (WWPU) Water Quality Technical Subcommittee (WQTS). The data collection, analyses, and implementation actions presented in this TMDL represent the current state of knowledge of fecal coliform bacteria pollution in the Wenatchee River Watershed. It is the understanding of the WQTS that additional studies will be performed to fill data gaps and address unanswered questions, as determined by the WQTS.

Conclusions and recommendations currently presented in this TMDL may be revised based on new data as they become available. It is also the understanding of the WQTS that any new data gathered from further study can be incorporated in the TMDL process in the DIP wherein recommendations and management strategies may be refined. This adaptive management approach is acceptable to Ecology, WWPU and WQTS. Ecology will partner with stakeholders (interested parties) in the watershed to conduct studies addressing information gaps (e.g., monitoring).

Further monitoring for purposes of TMDL will be addressed in the DIP. Any new science available may be integrated into the DIP and new implementation activities as new conclusions and management recommendations. Management strategies addressing both point (discrete) and nonpoint (diffuse) pollution sources are subject to this adaptive management approach Ecology

is responsible for complying with the 2004 Water Quality Data Act RCW 90.48.570-590, when making decisions regarding water quality standards.

Monitoring Strategy

Monitoring is included as part of the implementation strategy to track and evaluate the effectiveness of implementation measures. Ecology, the Chelan County Natural Resources program, the CCCD, and other appropriate entities should continue to work together in ongoing monitoring in the Wenatchee River Watershed.

After EPA approves this TMDL, Ecology and WQTS will develop a DIP. The DIP will provide greater detail to all of the elements presented in the SIS and will contain a monitoring plan that will be used to evaluate implementation measures. The DIP monitoring plan will follow targets established in this TMDL. Ecology is the agency responsible for determining when water quality standards are met.

Potential Funding Sources

Entities are encouraged to apply to Ecology's Centennial Clean Water Fund, Section 319 Fund, and State Revolving Fund to fund activities. Participants are also strongly encouraged to pursue other funding sources.

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Appendix A: Wenatchee River Basin
Fecal Coliform Bacteria
Total Maximum Daily Load Study

December 2005
Publication Number 05-03-012

This study can be located on the Department of Ecology website at:

www.ecy.wa.gov/biblio/0503012.html

Appendix B:
TMDL Public Notice
Public Comments and Responses

The public comment period ran from February 7 – March 9, 2007. Ecology published the public comment period notice (below) in the Wenatchee World and on Ecology's Public Involvement Calendar on the internet. Ecology did not receive any public comments.

Public Notice

DEPARTMENT OF ECOLOGY

Seeks your comments on the Draft – Wenatchee River Watershed (WRIA 45) Fecal Coliform Bacteria TMDL – Water Quality Improvement Report

The Department of Ecology has drafted a water quality improvement report, known as a TMDL, for fecal coliform bacteria in the Wenatchee River Watershed. The plan sets goals and recommends actions to reduce fecal coliform in order to meet state water quality standards and protect people that come into contact with local creeks and rivers.

Public comment period: Feb. 7 - March 9, 2007

How you can review the draft Water Quality Improvement plan:

- Ask for a reserve copy at the community Library
- Online copy at: http://www.ecy.wa.gov/biblio/0710009.html
- Call (509) 575-2642 to request a printed copy

There will be an open house and presentation on these efforts followed by a question and answer period. Various state and local officials and other professionals will be present at the meeting.

The Wenatchee Watershed's Water Quality Technical Committee will host a Open House/Public Workshop

Wednesday, Feb. 7
4:00 p.m. – 7:00 p.m.
Leavenworth Fire Hall
228 Chumstick Highway
Leavenworth WA 98826

Please send written comments ***by March 9, 2007,*** to Ryan Anderson, Dept. of Ecology, 15 W. Yakima Ave, Suite 200, Yakima WA 98902, or email *rand461@ecy.wa.gov*.

For more information please call Ryan Anderson at (509) 575-2642. If you require this publication in an alternative format, please call (509) 454-7888 (voice). The TTY number is 711 or 1-800-833-6388.