Hangman (Latah) Creek Watershed Fecal Coliform Bacteria, Temperature, and Turbidity Total Maximum Daily Load

Water Quality Implementation Plan

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Cover photo: Emtman Brothers Farm direct seed drill planting directly into the previous crop's residue in the Hangman Creek Watershed *(credit: Spokane County Conservation District)*.

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Hangman (Latah) Creek Watershed
Fecal Coliform Bacteria, Temperature, and Turbidity
Total Maximum Daily Load

Water Quality Implementation Plan

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Executive Summary

Introduction

Streams in the Hangman Creek Watershed are impaired by excess fecal coliform, turbidity, and elevated water temperatures. The Department of Ecology (Ecology) and the Spokane County Conservation District (SCCD) studied these water quality problems and developed a total maximum daily load (TMDL) report outlining the necessary pollutant reductions and an implementation strategy (Joy et.al, 2009). This water quality implementation plan expands on the recommendations in the TMDL and lays out the roles and responsibilities for addressing various water quality issues in the watershed.

What is a total maximum daily load (TMDL)?

The federal Clean Water Act (CWA) requires that a total maximum daily load (TMDL) be developed for each of the water bodies on the 303(d) list. The 303(d) list is a list of water bodies, which the CWA requires states to prepare, that do not meet state water quality standards. The TMDL study identifies pollution problems in the watershed, and then specifies how much pollution needs to be reduced or eliminated to achieve clean water.

Watershed Description

Hangman Creek and its tributaries, Rock Creek and Little Hangman Creek, originate in Idaho and flow northwest into Washington. The watershed encompasses over 689 square miles (approximately 441,000 acres). The TMDL evaluation was limited to the 446 square miles of watershed within Washington, although landscape modeling for suspended sediment (turbidity) was conducted on the entire watershed. Hangman Creek is a tributary to the Spokane River. Agriculture has been the dominant land use in the Hangman Creek watershed since the early 1900s. The watershed contains ten permitted wastewater treatment plant (WWTP) facilities in Washington. Four of these facilities have state wastewater discharge permits to discharge to ground. The six remaining WWTPs have National Pollutant Discharge Elimination System (NPDES) permits to discharge to surface water.

What will be done?

This implementation plan outlines the issues that need to be addressed to bring the streams into compliance with water quality standards for bacteria, temperature and turbidity. Because of an interest in addressing phosphorus in the Spokane River, this plan also recommends activities to reduce nutrients. The 11 water quality issues this plan addresses are:

- Issue 1: Sediment/nutrients from agricultural operations.
- Issue 2: Sediment/fecal coliform from livestock and wildlife.
- Issue 3: Nutrients/chemicals from residential uses.
- Issue 4: Sediment/nutrients from agricultural field ditches.
- Issue 5: Nutrients/fecal coliform from improperly functioning septic systems.
- Issue 6: Sediment from gravel and summer roads.

- Issue 7: Sediment from sheer or undercut banks.
- Issue 8: Sediment/fecal coliform from stormwater.
- Issue 9: Sediment from poor forestry management.
- Issue 10: Sediment from roadside ditching.
- Issue 11: Solar heating from lack of riparian shade.

The activities described in this plan to address these issues include:

- Converting conventional farming tillage practices to direct seed tillage.
- Implementing agricultural best management practices (BMPs) to reduce erosion.
- Enhancing and restoring riparian buffers.
- Managing livestock to prevent their waste from reaching streams.
- Maintaining and repairing failing septic systems.
- Streambank restoration projects.
- Following forest practice regulations when harvesting timber.
- Education about water quality issues and the activities to address them.

Many partners will need to work together to achieve the level of implementation necessary to meet the water quality goals of the TMDL and this implementation plan.

What is a Total Maximum Daily Load (TMDL)

Federal Clean Water Act requirements

The Clean Water Act (CWA) established a process to identify and clean up polluted waters. It requires each state to have its own water quality standards designed to protect, restore, and preserve water quality. Water quality standards consist of designated uses for protection, such as cold-water biota and drinking water supply, as well as criteria, usually numeric criteria, to achieve those uses.

Every two years, states are required to prepare a list of water bodies – lakes, rivers, streams, or marine waters – that do not meet water quality standards. This list is called the 303(d) list. To develop the list, the Department of Ecology (Ecology) compiles its own water quality data along with data submitted by local state and federal governments, tribes, industries, and citizen monitoring groups. This is called a water quality assessment. All data are reviewed to ensure that they were collected using appropriate scientific methods before the data are used to develop the 303(d) list. The 303(d) list is part of the water quality assessment.

The water quality assessment tells a more complete story about the condition of Washington's water. The assessment divides water bodies into five categories:

Category 1 – Meets standards for parameter(s) for which it has been tested.

Category 2 – Waters of concern.

Category 3 – Waters with no data available.

Category 4 – Polluted waters that do not require a TMDL because:

- 4a. – Has an approved TMDL and it is being implemented.
- 4b. – Has a pollution control program in place and being implemented that should solve the problem.
- 4c. – Is impaired by a non-pollutant such as low water flow, dams, and culverts.

Category 5 – Polluted waters that require a TMDL – the 303d list.

TMDL process overview

The Clean Water Act requires that a total maximum daily load (TMDL) be developed for each of the water bodies on the 303(d) list. The TMDL identifies pollution problems in the watershed and then specifies how much pollution needs to be reduced or eliminated to achieve clean water. Then Ecology works with the local community to develop an overall approach to control the pollution, called the implementation strategy, and a monitoring plan to assess effectiveness of the water quality improvement activities. Once EPA approves the TMDL, Ecology must develop a *water quality implementation plan* in the following year. This plan identifies specific tasks, responsible parties and timelines for achieving clean water.

Elements required in a TMDL

The goal of a TMDL is to ensure the impaired water will attain water quality standards. A TMDL includes a written, quantitative assessment of water quality problems and of the pollutant sources that cause the problem. The TMDL determines the amount of a given pollutant that can be discharged to the water body and still meet standards (the loading capacity) and allocates that load among the various sources.

If the pollutant comes from a discrete source (referred to as a point source) such as a municipal or industrial facility's discharge pipe, that facility's share of the loading capacity is called a wasteload allocation. If it comes from a set of diffuse sources (referred to as a nonpoint source) such as general urban, residential, or farm runoff, the cumulative share is called a load allocation.

The TMDL must also consider seasonal variations and include a margin of safety that takes into account any lack of knowledge about the causes of the water quality problem or its loading capacity. A reserve capacity for future loads from growth pressures is sometimes included as well. The sum of the wasteload and load allocations, the margin of safety and any reserve capacity must be equal to or less than the loading capacity.

Identification of the contaminant loading capacity for a water body is an important step in developing a TMDL. EPA defines the loading capacity as "the greatest amount of loading that a water body can receive without violating water quality standards" (EPA, 2001). The loading capacity provides a reference for calculating the amount of pollution reduction needed to bring a water body into compliance with standards. The portion of the receiving water's loading capacity assigned to a particular source is a load or wasteload allocation. By definition, a TMDL is the sum of the allocations, which must not exceed the loading capacity.

TMDL = Loading Capacity = sum of all Wasteload Allocations + sum of all Load Allocations + Margin of Safety

What part of the process are we in?

Ecology and the Spokane County Conservation District (SCCD) developed the Hangman Creek Watershed TMDL for bacteria, temperature, and turbidity (Joy, et. al., 2009). The TMDL was approved by EPA on September 29, 2009. This report expands on the *implementation strategy* included in the TMDL document. It describes what needs to occur for the streams in the watershed to come into compliance with water quality standards.

Why Ecology Conducted a TMDL in this Watershed

Overview

Ecology and the SCCD developed the TMDL because Hangman Creek and several of its tributaries were identified on the 2004 and 2008 303(d) list of impaired waters for not meeting Washington State water quality standards for fecal coliform, temperature and turbidity (Table 1).

Several streams in the watershed are also listed on the 2008 303(d) list as impaired for dissolved oxygen and pH (Table2). These parameters are not addressed by this TMDL but it is expected that the implementation activities outlined in this plan will also address these impairments. A separate TMDL will be developed for dissolved oxygen and pH when resources become available. In addition, addressing phosphorus contributions from the Hangman Creek Watershed is of great concern for implementing the Spokane River and Lake Spokane Dissolved Oxygen TMDL (Moore & Ross, 2010).

Table 1. **Study area water bodies on the 2004 303(d) list for bacteria, temperature, and turbidity.**

Water Body	Parameter	Listing ID	Section, Township, Range
Hangman Creek	Fecal Coliform	16862	Section 23 T25N R42E
Hangman Creek	Fecal Coliform	16863	Section 16 T22N R44E
Hangman Creek	Fecal Coliform	6726	Section 13 T20N R45E
Hangman Creek	Fecal Coliform	41992	Section 25 T20N R46E
Hangman Creek	Fecal Coliform	45242	Section 01 T21N R44E
Hangman Creek	Fecal Coliform	45250	Section 13 T23N R43E
Hangman Creek	Fecal Coliform	45268	Section 08 T22N R44E
Hangman Creek	Fecal Coliform	46493	Section 30 T21N R45E
Hangman Creek	Fecal Coliform	46497	Section 09 T20N R45E
Hangman Creek	Temperature	3736	Section 23 T25N R42E
Hangman Creek	Temperature	48370	Section 36 T25N R42E
Hangman Creek	Temperature	48371	Section 31 T25N R43E
Hangman Creek	Temperature	48372	Section 28 T24N R43E
Hangman Creek	Temperature	48373	Section 33 T24N R43E
Hangman Creek	Temperature	48374	Section 11 T23N R43E
Hangman Creek	Temperature	48375	Section 13 T23N R43E
Hangman Creek	Temperature	48376	Section 08 T22N R44E
Hangman Creek	Temperature	48377	Section 16 T22N R44E
Hangman Creek	Temperature	48378	Section 28 T22N R44E
Hangman Creek	Temperature	48379	Section 01 T21N R44E
Hangman Creek	Temperature	48380	Section 30 T21N R45E
Hangman Creek	Temperature	48381	Section 09 T20N R45E
Hangman Creek	Temperature	48382	Section 24 T20N R45E
Hangman Creek	Turbidity	40942	Section 16 T22N R44E
Little Hangman Creek	Fecal Coliform	41994	Section 24 T20N R45E
Little Hangman Creek	Turbidity	40940	Section 13 T20N R45E
Rattler Run Creek	Turbidity	40941	Section 16 T22N R44E
Rattler Run Creek	Fecal Coliform	45310	Section 16 T22N R44E
Rattler Run Creek	Temperature	48303	Section 16 T22N R44E
Rock Creek	Fecal Coliform	41996	Section 23 T23N R44E
Rock Creek	Fecal Coliform	45312	Section 12 T23N R43E
Rock Creek	Fecal Coliform	46317	Section 33 T23N R45E
Rock Creek	Turbidity	40943	Section 23 T23N R44E
Rock Creek	Temperature	48333	Section 12 T23N R43E
Cove Creek	Fecal Coliform	45629	Section 30 T21N R45E
California Creek	Fecal Coliform	46287	Section 18 T24N R45E
California Creek	Temperature	48340	Section 03 T23N R43E
Marshall Creek	Temperature	48368	Section 31 T25N R43E
Unnamed Creek	Fecal Coliform	45553	Section 13 T21N R44E

Table 2. Additional 303(d) listings not addressed by this report.

Water Body	Parameter	Listing ID	Section, Township, Range
Hangman Creek	Dissolved Oxygen	11390	Section 24 T25N R42E
Hangman Creek	Dissolved Oxygen	41985	Section 29 T20N R45E
Hangman Creek	Dissolved Oxygen	41987	Section 16 T22N R44E
Hangman Creek	Dissolved Oxygen	47123	Section 01 T21N R44E
Hangman Creek	pH	11391	Section 24 T25N R42E
Hangman Creek	pH	50421	Section 11 T23N R43E
Rock Creek	Dissolved Oxygen	41990	Section 23 T23N R44E
Cove Creek	Dissolved Oxygen	47036	Section 30 T21N R45E
Spangle Creek	pH	50382	Section 16 T22N R44E

Issues such as stormwater runoff, sedimentation, riparian vegetation losses, streambank erosion, wetland losses, and agricultural and forestry management are major concerns affecting water quality in the watershed. To address these nonpoint sources, the advisory committee developed a list of best management practices (BMPs) for each of the water quality issues identified, which was included in the TMDL implementation strategy (see Table 5). Stormwater is also included as a nonpoint source because much of the watershed is not covered under the state's stormwater permit. Many of the BMPs address more than one of the water quality issues. The BMPs will:

- Reduce erosion.
- Reduce runoff carrying sediment.
- Reduce livestock impacts.
- Increase shading of streams.
- Inform and educate watershed residents about water quality issues.

This document describes how some of these efforts will be implemented and measured.

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Watershed Description

Hangman Creek and its tributaries, Rock Creek and Little Hangman Creek, originate in Idaho and flow northwest into Washington. The watershed has three separate regulatory areas:

- The state of Idaho.
- The Coeur d'Alene Tribal Reservation.
- The state of Washington.

The Coeur d'Alene (CDA) Tribe is conducting a TMDL study for the reservation, and the state of Idaho has completed a TMDL for the portion of the watershed within their jurisdiction (IDEQ, 2007).

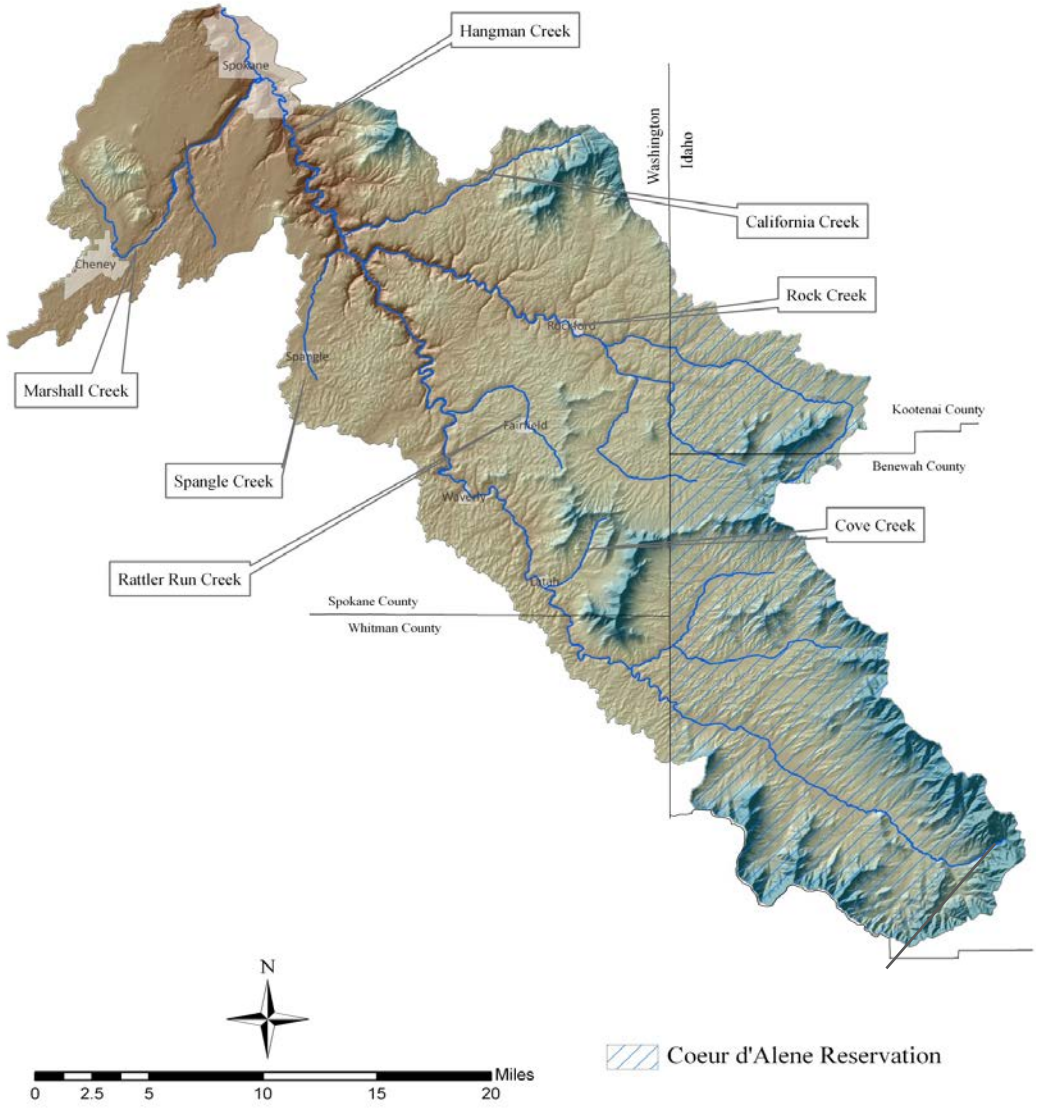

Figure 1. Hangman Creek watershed near Spokane, Washington.

The watershed encompasses over 689 square miles (approximately 441,000 acres). The TMDL evaluation was limited to the 446 square miles of watershed within Washington, although landscape modeling for suspended sediment (turbidity) was conducted on the entire watershed. Hangman Creek is a tributary to the Spokane River.

Past and current land uses within the watershed are varied and contribute to the water quality problems. Water quality issues such as stormwater runoff; sedimentation; streambank erosion; urban development; wetland destruction; and agricultural and forestry practices are all major concerns for the area.

Agriculture has been the dominant land use in the Hangman Creek watershed since the early 1900s. By the early 1920s, a significant portion of the farmable land had been cleared and cultivated for the production of wheat, barley, peas, and lentils. Thousands of acres of forest and riparian areas were cut and cleared (see "Historic Hangman Creek Vegetation" section). Miles of stream channel were straightened, and new ditches were dug to drain wetlands and quickly move water off the farm fields.

These modifications, along with stream meander cutoff by roads, changed the watershed's hydrological response. The system became stressed with heavy sediment loading, poor water quality, and accelerated streambank erosion. The altered hydrology produces flashy, and sometimes damaging stream flows during the winter and spring months. Peak winter and spring flows are generally 4,000 to 10,000 cubic feet per second (cfs), with flows up to 20,000 cfs. During the summer months, the baseflow decreases significantly throughout a majority of the watershed (daily average flows of less than one cfs have been recorded).

Several point and nonpoint issues have been identified and discussed through past Hangman Creek water quality studies. Historically, the sources targeted in the Hangman Creek watershed for reduction have been primarily nonpoint sources. Some examples include conservation tillage in croplands, streambank restoration, and riparian restoration.

The Hangman Creek Watershed contains ten permitted wastewater treatment plant (WWTP) facilities in Washington. Four of these facilities: Badger Lake Estates, Liberty School District, Latah Creek Wastewater Treatment Plant (formerly Hangman Hills), and Upper Columbia Academy have state wastewater discharge permits to discharge to ground. The six remaining WWTPs have NPDES permits to discharge to surface water (Table 3).

Table 3. Wastewater treatment plants with permits to discharge to Hangman Creek

WWTP	Permit Number	Discharges to
City of Cheney	WA0020842C	Wetland drains to Minnie Creek
Town of Fairfield	WA0045489C	Rattler Run Creek
Freeman School District	WA0045403C	Little Cottonwood Creek
Town of Rockford	WA0044831C	Rock Creek
Town of Spangle	WA0045471B	Spangle Creek
City of Tekoa	WA0023141C	Hangman Creek

All of the WWTPs monitor effluent and report results to Ecology as required in their NPDES permits. Each facility's permit was renewed or extended in 2007. When the NPDES permits for these facilities are reissued, they will contain the wasteload allocations established in this TMDL.

In addition, three entities within the watershed are regulated by an NPDES permit for stormwater. Spokane County and the city of Spokane are Phase 2 municipal separate stormwater sewer system (MS4) permit holders. The NPDES permit coverage is limited to the urban and urban growth areas of the city and county. The Washington State Department of Transportation (WSDOT) also has a statewide stormwater permit. It regulates stormwater discharges from state highways and related facilities that contribute to discharges from separate storm sewers owned or operated by WSDOT within the Phase I and II designated boundaries. WSDOT's permit also covers stormwater discharges to any water body where there is a U.S. Environmental Protection Agency (EPA)-approved TMDL with load allocations and implementation actions specified for WSDOT stormwater discharges.

Historic Hangman Creek vegetation

The water quality degradation documented throughout the watershed raises questions about the historical conditions of the watershed. The SCCD evaluated pre-settlement watershed conditions using historic plant community cover as described in early section line surveys (2003b). The section line surveys were part of the Public Land Survey System conducted under standards set forth in the 1785 Land Ordinance (BLM, 2003). The rectangular survey system, also known as the cadastral survey, subdivided public lands into townships, ranges, and sections across the western United States.

The original land surveys of Washington were conducted by the Surveyor General's Office in Olympia, Washington during the late 19th Century. Similarly, surveys of the Idaho portions of the watershed were supervised by the Surveyor General's Office in Boise, Idaho in the early 20th Century. They recorded observations in their field notes, drew plats, and designated boundaries along the line walked. In general, most surveyors' field notes included descriptions of vegetation, landforms, soil type, water availability, and suitability for settlement. These qualitative descriptions of vegetation found in the field notes, along with the hand-drawn plats, were used to estimate the historic vegetation cover for the Hangman Creek Watershed.

The historical vegetative communities in the Hangman Creek watershed prior to settlement were significantly different from today's (Table 4). The watershed was primarily covered with rolling hills of bunchgrass prairie that extended into scattered populations of Ponderosa pine forests. The Ponderosa pine communities often included a shrub understory such as snowberry and wood's rose. Historically, the streams, springs, and drainages were densely vegetated with various shrubs and small trees including hawthorn (*Crataegus*); willows (*Salix*); aspen and cottonwood (*Populus*); alders (*Alnus*); serviceberry (*Amelanchier alnifolia*); and chokecherry (*Prunus virginiana*) (SCCD, 2003b).

Table 4. Land use changes in Hangman Creek watershed (1870-2003) from SCCD (2003b).

Sub-watershed	Land Use	Land Uses (percent of sub-watershed area)		Net Change (pre-settlement to current, in percent)
		Pre-settlement	Current	
California Creek	Agriculture	0	55	55
	Developed	0	2	2
	Forested	96	23	-73
	Rock/Transitional	0	0	0
	Shrub/Steppe	4	19	15
	Wetland or Lake	0	0	0
Lower Hangman Creek	Agriculture	0	30	30
	Developed	0	14	14
	Forested	67	18	-49
	Rock/Transitional	0	0	0
	Shrub/Steppe	29	36	7
	Wetland or Lake	3	0	-3
Marshall Creek	Agriculture	0	26	26
	Developed	0	6	6
	Forested	71	34	-37
	Rock/Transitional	0	1	1
	Shrub/Steppe	22	27	5
	Wetland or Lake	5	2	-3
Rock Creek	Agriculture	0	81	81
	Developed	0	1	1
	Forested	71	10	-61
	Rock/Transitional	0	0	0
	Shrub/Steppe	29	7	-22
	Wetland or Lake	1	0	-1
Upper Hangman Creek	Agriculture	0	70	70
	Developed	0	1	1
	Forested	48	21	-27
	Rock/Transitional	0	1	1
	Shrub/Steppe	51	6	-45
	Wetland or Lake	0	0	0

Agriculture has become the dominant land use for the watershed at over 275,000 acres. This more than doubles the pre-settlement prairie and forested areas combined. Forest land cover was reduced between 50 to 75% for all sub-watersheds with the exception of Rock Creek, which was reduced approximately 86%. The harvest and conversion of these forested areas, especially in headwater tributaries, probably had significant impacts to the hydrology of the watershed (SCCD, 2003b).

Watershed geologic conditions

Bedrock in the lower watershed is mainly Miocene basalt flows with pockets of Tertiary biotite granite and granodiorite (WDNR, 1998). During the Miocene, the basalt flows would periodically dam rivers and form lakes. Material deposited in these lakes formed the siltstones and sandstones of the Latah Formation. Pleistocene glacial deposits produced large amounts of wind-blown silt, known as loess. This wind-blown silt accumulated up to 200 feet deep over most of the basalt flows and formed dune-shaped hills.

During the late Pleistocene period, lobes from ice sheets in northern Washington, Idaho, and Montana blocked several major drainages and produced extensive lakes. The largest lake produced was Glacial Lake Missoula, located near present day Missoula, Montana; at one time it covered over 3,000 square miles. Periodically, the ice dams broke and significant floods occurred in Washington, including in the lower Hangman Creek watershed. There were over 40 separate flood events from Glacial Lake Missoula (Waitt, 1980). The floods left major channels in the region, removed the loess deposits covering the basalt, and deposited much of the sand, gravel, cobble, and boulders found in the lower reaches of Hangman Creek.

Easily erodible material is found throughout the Hangman Creek watershed. The unconsolidated material consists of three major deposits: Glacial Lake Missoula flood deposits of sand, gravel, and cobbles; reworked Missoula flood deposits; and the loess deposits found in the upper watershed (Buchanan and Brown, 2003). The Missoula Flood deposits extend from the Spokane River confluence to the Rock Creek confluence. Along with the unconsolidated sediments, the weakly-cemented sedimentary rocks of the Latah Formation are also subject to stream erosion.

The Latah Formation consists of fine layers of silts and clays with low permeability that tends to perch water above the formations. Bank slumping occurs as water erodes sediment from between the confining silt and clay layers. The silts and clays are resistant bands that tend to form vertical banks above them. Poorly consolidated sands and gravels within the Latah Formation tend to wash out, undercutting and exposing the silt and clay layers. This undercutting can result in rapid bank erosion and large masses of the bank falling in into the stream.

The Lake Missoula flood deposits consist of sorted to-unsorted silt sands, gravels, cobbles, and boulders. The unconsolidated material erodes easily along streams, producing steep unstable slopes over 100 feet high. The major type of erosion is toe failure caused by the stream removing the material at the base of the streambank. Once the toe is removed, the bank is over-steepened. The over-steepened bank fails and deposits large amounts of material directly into the stream. The deposited material is available to be mobilized under most flow conditions (Figure 2).

Figure 2. Material deposited from Missoula floods (photo by SCCD).

Post Missoula flood alluvium generally overlies all the other sediment layers. The post Missoula flood material is reworked flood deposits and is unconsolidated and easily eroded. The deposits are generally terraces that originally formed as flood plains when Hangman Creek was downcutting through the flood alluvium. The erosional characteristics are similar to the Lake Missoula flood deposits discussed previously, but are more cohesive because a significant amount of sand and gravel has been removed.

Soils within the Hangman Creek watershed have formed from a wide variety of materials. The main soils are deep soils formed from the silty loess deposits. The soils are generally medium to fine-textured, with moderate to slow permeability. The soils have high to moderate water-holding capacity. Other parent materials for the soils include volcanic ash, glacial deposits, alluvium deposited by streams, and material weathered from basaltic, granite, and metamorphic bedrock.

Watershed physiographic provinces

The Hangman Watershed can be divided into three major physiographic provinces (Figure 3): the upper Palouse soil section (headwaters to RM 32.8), the middle basalt canyon section (RM 32.8 to 18.8), and the lower Missoula flood deposit section (RM 18.8 to 0.0). The upper Palouse section extends from the headwaters of Hangman Creek (formed by the Idaho Batholith) through the rolling loess hills of the Palouse region. The upper section represents a river system that is bedrock controlled in many reaches. Some human influence can be seen, but the main channel morphology is generally controlled by existing bedrock.

The middle basalt canyon consists of steep canyons formed as Hangman Creek cuts down through the Miocene basalt flows. The stream reaches are generally represented by steep gradients and little flood plain development. Human influence is minor, with some grazing in the accessible reaches.

Hangman Creek then flows through sedimentary hills of sand, gravel, and cobbles deposited by the ancestral glacial lake Missoula floods. The third physiographic province is dominated by Missoula flood deposits and terraces of reworked Missoula flood deposits. This area represents a young system that has not had time to form an extensive flood plain system by fully reworking the deposited Missoula flood sediments. Human influence is significant, with road and housing development from the expanding city of Spokane on the existing flood plain.

Geologic and man-made features of the watershed

Several geologic and climatic conditions combine to provide a unique setting for the Hangman Creek watershed. The environmental conditions include low stream flows during the summer, easily eroded streambanks, and low groundwater storage and baseflow. These conditions affect how BMPs will perform in some areas of the watershed.

Extremely low stream flows in the late summer (below one cubic foot per second) mean that BMPs implemented to limit sedimentation will have more of an effect in winter and spring than in summer. They may also help reduce any secondary remobilization during the low-flow months. Low streamflow, groundwater storage, and baseflow mean that the benefits provided by riparian and wetland restoration will not necessarily be the same as in watersheds without these characteristics.

Easily eroded streambanks that are unstable at moderate to low flows (such as the sand banks deposited from the Missoula floods) are generally hard to stabilize. BMPs for these banks can be costly and provide a low cost/benefit ratio.

There have also been many anthropogenic changes to the watershed. These include the hydrologic effects of meander cutoffs and stream modifications by roads, agricultural fields, residences, and riparian alteration. The construction of Highway 195 changed the hydrology of Hangman Creek in the northern physiographic province of the watershed. Several changes to the stream length, vegetation, and meanders have increased stream energy and increased erosion along this reach.

The north/south orientation of the stream also determines how much effect riparian vegetation will have in shading the stream. In many areas, the lower-height native plants that should grow along the streams edges would not provide a lot of sun intercept. However, a fully functioning riparian area provides a variety of benefits other than shade.

These issues should be taken into account when implementing BMPs and estimating the predicted results.

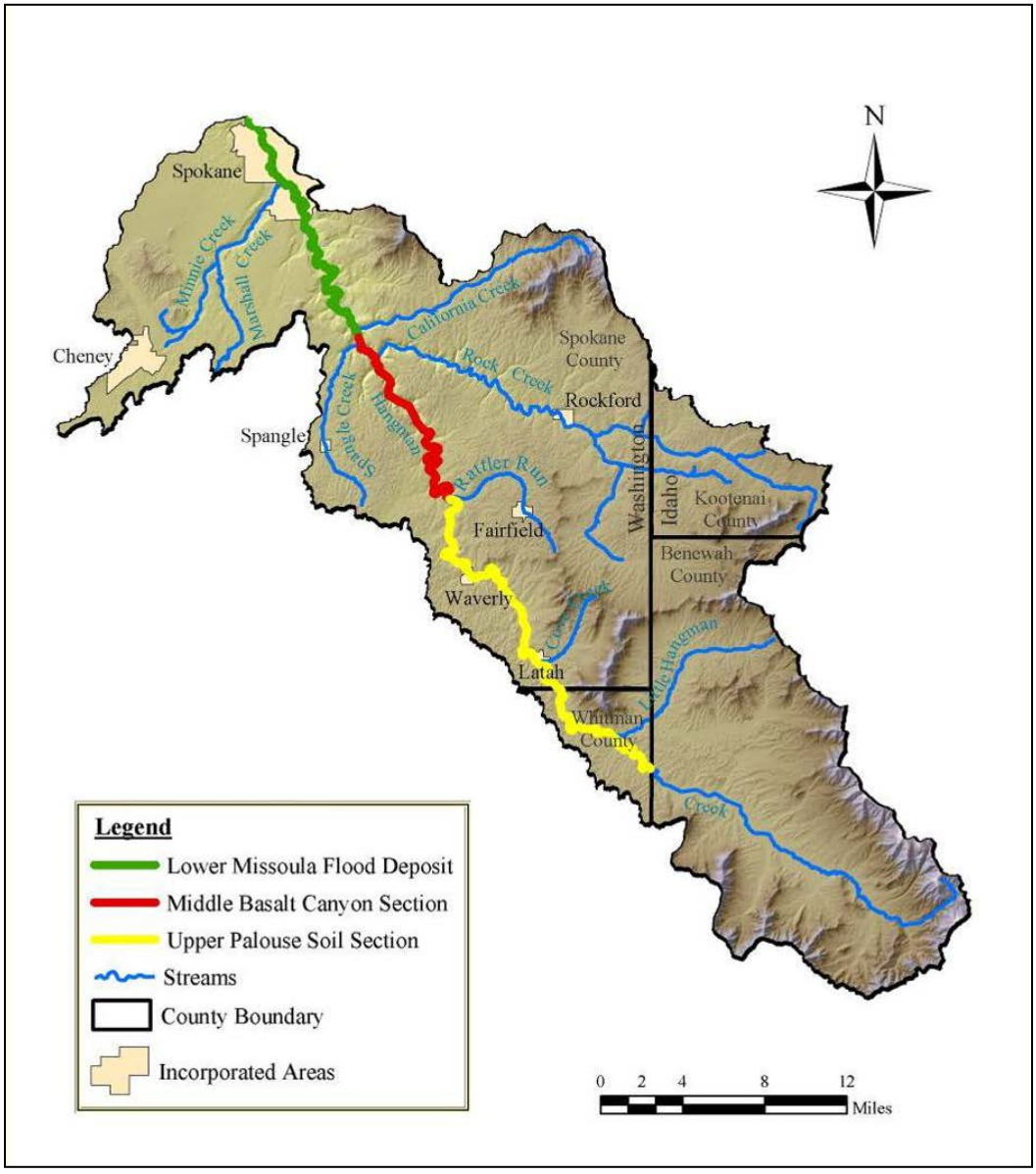

Figure 3. Hangman Creek's major physiographic provinces.

What Will be Done

Implementation plan (summary of actions)

This implementation plan describes what will be done to improve water quality. It describes the roles and authorities of cleanup partners (that is, those organizations with jurisdiction, authority, or direct responsibility for cleanup) and the programs or other means through which they will address these water quality issues. It provides a feasible and effective strategy to achieve the water quality standards for fecal coliform bacteria, turbidity, and temperature.

The Hangman Creek Watershed TMDL describes the load and wasteload allocations necessary to bring the streams into compliance with the water quality standards (Joy et.al, 2009). Pollutant reductions from nonpoint sources in the watershed will be essential, especially for fecal coliform bacteria and turbidity/total suspended solids (mainly sediment). The only point source that needs to reduce fecal coliform limits from their current NPDES permit limits is the town of Tekoa wastewater treatment plant (WWTP). Current NPDES turbidity limits for the WWTPs are adequate to protect water quality. To meet temperature water quality standards, temperature reductions from both point sources and nonpoint sources are required. The TMDL analysis predicted that Hangman Creek could not meet the numeric temperature criteria. Therefore, targets are set to return the stream to natural condition temperatures by increasing riparian shade to system potential vegetation. Point sources discharging effluent during the critical period of June – August will need to meet temperature wasteload allocations based on the predicted natural condition temperature of the stream. Load and wasteload allocations for each pollutant are included in Appendix B.

This implementation plan primarily focuses on addressing nonpoint and stormwater sources of pollutants. The WWTPs in the watershed should refer to the original TMDL (Joy et.al, 2009) for descriptions of wasteload allocations and activities the WWTP should address. It is important that each WWTP work closely with their Ecology permit manager to ensure the necessary actions are addressed in their monitoring and permit requirements to comply with the TMDL.

The strategy described in the following paragraph will also work to reduce nutrients in the water bodies. Hangman Creek is a major tributary to the Spokane River, where phosphorus loading is contributing to water quality impairments. Hangman Creek is also impaired for dissolved oxygen and pH, which are likely affected by excess nutrients. Many of the activities included in this implementation plan will help reduce nutrients.

The Hangman Creek Advisory Committee identified the following 11 issues that need to be addressed to meet water quality criteria for bacteria, temperature, and total suspended solids/turbidity.

- Issue 1: Sediment/nutrients from agricultural operations.
- Issue 2: Sediment/fecal coliform from livestock and wildlife.
- Issue 3: Nutrients/chemicals from residential uses.
- Issue 4: Sediment/nutrients from agricultural field ditches.
- Issue 5: Nutrients/fecal coliform from improper functioning septic systems.
- Issue 6: Sediment from gravel and summer roads.
- Issue 7: Sediment from sheer or undercut banks.
- Issue 8: Sediment/fecal coliform from stormwater.
- Issue 9: Sediment from poor forestry management.
- Issue 10: Sediment from roadside ditching.
- Issue 11: Solar heating from lack of riparian shade.

The following section describes the types of activities that need to occur to address each of the above listed water quality issues.

Activities to address pollution sources

Implementing the changes and activities to reduce or remove pollutant sources in the watershed will be a difficult, multifaceted process. There are many barriers to implementation, including the lack of resources or funding; the challenge of changing the current or traditional practices; political and public resistance; and lack of interest or the belief it will not make a significant difference. As various entities work to implement the necessary activities, they should take into consideration what the barriers are to successful implementation and adoption of changes. The Hangman Creek TMDL Advisory Group developed a list of BMPs (Table 5) needed to address the water quality issues, and worked through an exercise to develop a list of barriers and benefits for each desired behavior and each competing (current) behavior. These lists are available in Appendix C and should be referenced by implementing organizations as they develop their activities to help ensure success.

- **Issue 1: Sediment/nutrients from agricultural operations**.

  Reducing sediment and nutrients in runoff from agricultural operations will require farming with BMPs that keep soil on the production fields and reduce erosion. The SCCD and Ecology believe that a major process to reduce erosion throughout the watershed is to convert a large percentage of conventional-tilled agriculture to single pass, low-disturbance direct seed. In addition, riparian buffer reforestation and BMPs to reduce ditch erosion and streambank erosion should be coupled with all agricultural systems. See Table 5 for examples of BMPs to address this issue.

  Grant and loan incentive programs, coupled with education and outreach about these practices will be vital to achieving on-the-ground results.

  Potential participants: SCCD, Ecology, Pine Creek Conservation District, Natural Resource Conservation Service (NRCS), CDA Tribe and other Idaho partners, landowners/operators.

- **Issue 2: Sediment/fecal coliform from livestock and wildlife.**

  Since many of the riparian areas were historically forested, riparian buffer reforestation should be promoted to address livestock and wildlife damage. When livestock or wildlife congregate along streams they deposit fecal matter, trample vegetation and break up the soil. When the vegetation is removed and the soil is loosened, it increases erosion and removes any filtering effect for the deposited fecal matter. To address these issues, riparian fencing with off-stream watering should be installed in livestock areas to ensure the stream corridor is protected. In areas without livestock, riparian vegetation should be planted, enhanced, or maintained to discourage wildlife congregation and filter polluted runoff. See Table 5 for examples of BMPs to address this issue.

  Potential participants: SCCD, Ecology, Pine Creek Conservation District, NRCS, livestock owners, streamside landowners, The Lands Council, towns, Trout Unlimited.

- **Issue 3: Nutrients/chemicals from residential uses.**

  Education and information about proper household fertilizer and chemical use and disposal should be provided to watershed residents. This information will ensure excess amounts are not being applied or dumped and washing into streams or ground water. Education efforts should also address septic system maintenance, pet waste management, and proper lawn clipping disposal.

  Potential participants: SCCD, Ecology, city of Spokane, Spokane County, Hangman Creek Planning Unit Watershed Implementation Team (WIT), Spokane Regional Health, The Lands Council, towns, Trout Unlimited, Spokane River Forum, landowners and watershed residents.

- **Issue 4: Sediment/nutrients from agricultural field ditches.**

  Direct-seed tillage operations and BMPs should be used to reduce erosion from agricultural field ditches. Vegetative buffers (reforestation buffers where feasible and consistent with County standards) adjacent to agricultural ditches should be planted to reduce erosion (see Table 5 for examples of additional BMPs). Education and incentive programs can be used to increase the installation of BMPs.

  Potential participants: SCCD, Ecology, Pine Creek Conservation District, NRCS, CDA Tribe and other Idaho partners, Washington State Department of Transportation (WSDOT), landowners/producers.

- **Issue 5: Nutrients/fecal coliform from improperly functioning septic systems.**

  Improperly maintained septic systems can fail and lead to pollutants entering waterways. Untreated or partially-treated sewage can accumulate on the ground's surface and runoff into streams. Improperly treated sewage can also leach pollutants into the ground water, which may travel to nearby streams.

To combat failing septic systems, homeowners should be educated about the proper maintenance and inspection of septic systems. This education should include the negative effects of garbage disposals and what should and should not be disposed of in septic systems.

If failing or straight pipe (direct discharge without treatment to a ditch or stream) septic systems are found, they need to be reported to the Spokane County Regional Health District. Failing systems will need to be repaired or replaced under proper permitting regulations.

In communities with sewer available, programs should be developed to hook up antiquated septic systems and cesspools.

Potential participants: Spokane Regional Health, SCCD, towns, CDA Tribe and other Idaho partners, WSDOT (reporting), Trout Unlimited (education), Spokane River Forum (education).

- **Issue 6: Sediment from gravel and summer roads.**

  Cities and the county should apply practices to reduce erosion and runoff from gravel and summer roads. Examples of these practices may include paving or increasing grading and graveling some roads. Winter-time closure of summer roads should be enforced and county residents should be educated about the consequences of using these roads in non-summer months.

  Potential participants: Spokane County, towns, city of Spokane, CDA Tribe and other Idaho partners, landowners/producers.

- **Issue 7: Sediment from sheer or undercut banks.**

  Riparian restoration is needed throughout much of the Hangman Creek watershed. Sheer and undercut banks are depositing large quantities of sediment into the creeks, especially during high flows. Riparian restoration, including riparian buffer reforestation and stream bank restoration practices such as reshaping banks, in-stream bioengineering, and planting vegetation can address this issue.

  Potential participants: SCCD; Ecology; Pine Creek Conservation District; NRCS; CDA Tribe and other Idaho partners; Trout Unlimited; Lands Council; Inland Northwest Land Trust; Washington Department of Fish and Wildlife.

- **Issue 8: Sediment/fecal coliform from stormwater.**

  Many BMPs exist to reduce sediment and fecal coliform bacteria transport to streams via stormwater. Cities and the county should inventory stormwater outfalls to determine where stormwater may be delivering pollutants to streams and apply BMPs to the drainage. The Eastern Washington Stormwater Permit and Manual (Ecology, 2004) contain many practices and procedures to address stormwater pollution.

The main ways to reduce bacteria and sediment transport to streams via stormwater include:

- Infiltration.
- Pollution prevention/source control.
- Improved operations and maintenance.

Since stormwater is primarily a transporter of bacteria to surface waters, approaches that infiltrate stormwater also decrease pollutant delivery. Examples of BMPs for stormwater reduction include water dispersion into vegetated areas; infiltration via trenches; bioretention or rain gardens; soil amendments for lawn and landscaped areas; permeable paving; and other methods described in the Low Impact Development (LID) Manual for the Puget Sound Basin (Hinman, 2005). Infiltration is a passive means of treatment which uses existing soil or amended soils and substrate to collect and treat stormwater.

Controlling the source and preventing bacteria and sediment from entering stormwater or MS4s can reduce its transport to streams. Both public education and illicit discharge and detection (IDDE) programs can reduce the amount of pollutants entering stormwater and MS4s.

Bacteria and sediments inputs to an MS4 can be reduced by assessing and adjusting the frequency of storm system maintenance and by optimizing the scheduling of street sweeping and catch basin cleanout to limit sediment and debris buildup (above language adapted from Lawrence, Roberts, & Johnston, draft 2011).

The city of Spokane and Spokane County are required to apply the regulations in the Eastern Washington Stormwater Permit in areas covered by the permit. This coverage is currently limited to the urban growth area in the lower watershed (Figure 4). However, the county and smaller cities throughout the watershed should also apply practices described in the permit and manual to reduce stormwater runoff and pollutant delivery.

Potential participants: Ecology, Spokane County, city of Spokane, WSDOT, towns, landowners/residents.

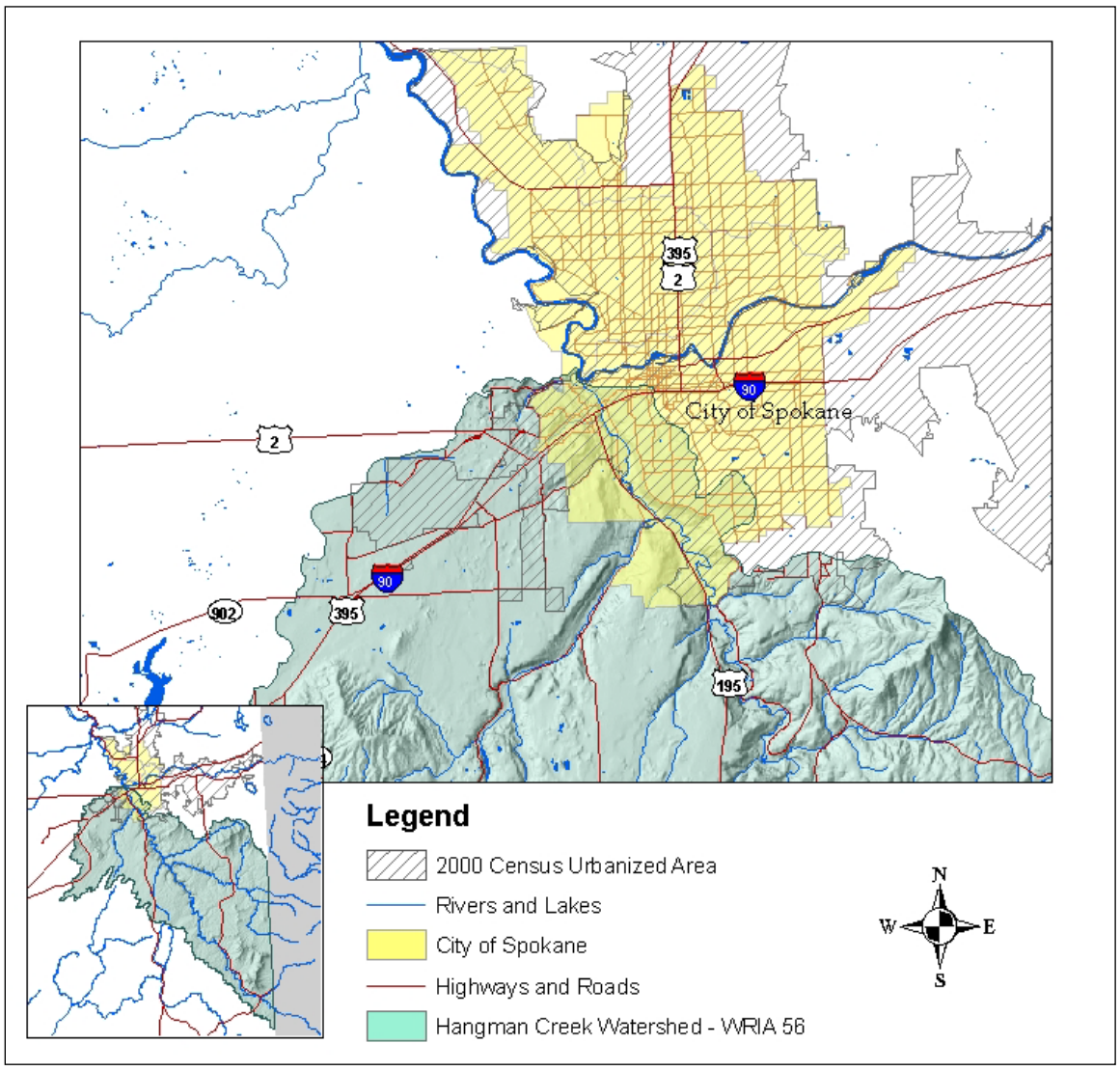

Figure 4. Hangman Creek watershed urban growth area covered by Phase II NPDES Stormwater Permit.

- **Issue 9: Sediment from poor forestry management.**

  The state's forest practices regulations will be relied upon to bring waters into compliance with the load allocations established in the TMDL on private and state forest lands. This strategy, referred to as the Clean Water Act Assurances, was established as a formal agreement to the 1999 Forests and Fish Report (http://www.dnr.wa.gov/Publications/fp_rules_forestsandfish.pdf).

  The state's forest practices rules were developed with the expectation that the stream buffers and harvest management prescriptions were stringent enough to meet state water quality standards for temperature and turbidity, and provide protection equal to what would be required under a TMDL. As part of the 1999 agreement, new forest practices rules for roads were also established. These new road construction and maintenance standards are intended to provide better control of road-related sediments, provide better stream bank stability protection, and meet current BMPs.

  To ensure the rules are as effective as assumed, a formal adaptive management program was established to assess and revise the forest practices rules, as needed. The agreement to rely on the forest practices rules in lieu of developing separate TMDL load allocations or implementation requirements for forestry is conditioned on maintaining an effective adaptive management program.

  Consistent with the directives of the 1999 Forests and Fish agreement, Ecology conducted a formal ten-year review of the forest practices and adaptive management programs in 2009:

  > www.ecy.wa.gov/programs/wq/nonpoint/ForestPractices/CWAassurances-FinalRevPaper071509-W97.pdf

  Ecology noted numerous areas where improvements were needed, but also recognized the state's forest practices program provides a substantial framework for bringing the forest practices rules and activities into full compliance with the water quality standards. Therefore, Ecology decided to conditionally extend the CWA assurances with the intent to stimulate the needed improvements. Ecology, in consultation with key stakeholders, established specific milestones for program accomplishment and improvement. These milestones were designed to provide Ecology and the public with confidence that forest practices in the state will be conducted in a manner that does not cause or contribute to a violation of the state water quality standards.

  Potential participants: Washington State Department of Natural Resources (DNR), Ecology, landowners/foresters.

- **Issue 10: Sediment from roadside ditching.**

  The most effective method to reduce sediment from road side ditches is to reduce runoff and sediment loading to the ditches. In the rural parts of the watershed, much of the runoff and sediment enters ditches from conventionally-tilled agricultural fields and operations lacking

BMPs (See Issue 1). Some of these operations farm into the road right-of-ways, removing any buffering vegetation between the field and the ditch.

Programs to maintain a buffer in the road right-of-way to filter runoff before it enters the road side ditch should be investigated and developed. This type of effort would decrease the need to clean ditches, so grass could be established in the ditches to reduce flow and remove sediment before it enters a water way.

Potential participants: WSDOT, Spokane County, SCCD, NRCS, landowners/producers.

- **Issue 11: Solar heating from lack of riparian shade.**

  To reduce the temperature of streams, the amount of sunlight reaching the stream must be reduced. Planting native vegetation (including riparian reforestation) to increase effective shade will help the stream meet its system potential temperature conditions. Effective shade is the fraction of sunlight blocked from reaching the surface of the stream. System potential temperature is the estimated water temperature with mature riparian vegetation. The TMDL found that during the hot time of year Hangman Creek and its tributaries are unlikely to reach the numeric water quality criteria, therefore the goal of this implementation plan is to restore natural levels of riparian vegetation to block excess sunlight from reaching the stream. This will return the streams' temperature to natural conditions. The TMDL analysis showed that current shade levels on Hangman Creek need to be increased between seven to 43 percent, depending on the reach, to achieve estimated natural conditions. Appendix B shows shade requirements for each reach of Hangman Creek and provides a shade curve to determine the appropriate shade requirements for the tributaries.

  Potential participants: SCCD; Pine Creek Conservation District; Ecology; NRCS; CDA Tribe and other Idaho partners; towns; Inland Northwest Land Trust; The Lands Council; Trout Unlimited; landowners.

Table 5. Best management practices (BMPs) for water quality issues.

Water Quality Issue	Best Management Practices						
Issue 1: Sediment/nutrients from agricultural operations	Direct Seed Tillage Operations (No Till/Minimum Till)	Riparian Buffers	Sediment Basins	Grassed Waterways	Filter Strips	Divided Slopes	Reforestation
Issue 2: Sediment/fecal coliform from livestock and wildlife	Riparian Buffers	Livestock Fencing and off-stream watering	Manure Retention Facilities	Off-Stream Watering	Intensive Management Grazing	Nutrient and manure management	
Issue 3: Nutrients/chemicals from residential uses	Education about fertilizer management	Septic system maintenance, repair and replacement	Pet waste management	Proper use and disposal of household chemicals	Proper use and disposal of pesticides and fertilizers	Proper disposal of lawn clippings	Follow shoreline management regulations
Issue 4: Sediment/nutrients from agricultural field ditches	Uphill plowing	Ditch maintenance	Proper construction and engineering	Conversion to grassed waterways	Vegetative buffer adjacent to ditches		
Issue 5: Nutrients/fecal coliform from improper functioning septic systems	Education on the negative effects of garbage disposals	Have system inspected every 1-3 years	Remove roof drains from system and away from the drainfield	Education about what should and should not go into septic systems	Comment on new developments through SEPA process	Repair or replace failing systems	
Issue 6: Sediment from gravel and summer roads	Pave roads	Close roads in winter	Increase grading and graveling				
Issue 7: Sediment from sheer or undercut banks	Plant vegetation	Reshape banks and plant vegetation	Install engineered structures	Riparian reforestation			
Issue 8: Sediment/fecal coliform from stormwater	Road runoff to sediment basins	Implement practices in Eastern Washington Stormwater Manual or approved equivalent					
Issue 9: Sediment from poor forestry management	Selective harvest	Stream crossings need to follow requirements in WAC 222-24-040	Forested streamside management zones required for fish-bearing and perennial non-fish waters (WAC 222-30)	Limit equipment in streamside management zones for seasonal non-fish waters (WAC 222-30)	Proper road planning, construction and maintenance (follow WAC 222-24)	Plant or maintain natural forest buffers consistent with County standards	
Issue 10: Sediment from roadside ditching	Design and implement vegetated ditches	Install detention basins	Install roadside swales	Buffers adjacent to agriculture or forestry operations			
Issue 11: Solar heating from lack of riparian shade	Riparian restoration projects	Riparian buffers	Livestock fencing and off-stream watering				

Prioritizing implementation

Significant sources of pollutants in the tributary and upper reaches of the watershed should be the first priority. Reducing and removing those sources will assist in protecting subsequent projects and improvements throughout the downstream reaches. The next priority should be areas with the most severe, yet correctable problems. Correcting severe problems that are not likely to be compromised by upstream flows will improve water quality.

The geological and man-made watershed features described in the Watershed Description Section of this document should be taken into consideration as implementation efforts are planned and implemented. Also, the benefits of reforestation in riparian and upland areas should be considered when planning and developing implementation solutions.

Following are specific implementation prioritization recommendations to address each pollutant.

Fecal Coliform Bacteria

The bacteria TMDL analysis found that storm events any time of the year resulted in elevated bacteria counts in many reaches of the watershed. This suggests that the largest bacteria loads are delivered through runoff (stormwater) rather than through chronic delivery methods such as failing septic systems or WWTP discharges. Therefore, emphasis should be given to locations where fecal matter collects on the surface of the ground and can be washed into the stream. Examples include livestock operations in or near riparian areas, pet waste in yards near streams, and transient and pet waste in public parks. Malfunctioning septic systems, where waste may be pooling on the surface and washed into streams during storms, should also be investigated. Areas with denuded stream banks also encourage wildlife and waterfowl to congregate near the water where their waste can be washed into the stream. All bare banks should be a priority for riparian plantings. The best possible treatment of stormwater in ditch and collection systems should be applied to reduce bacteria delivery from contaminated runoff.

A few locations sampled during the TMDL study had high geometric means, which suggest that there is a possibility of a more consistent source in the areas upstream of that sample site. The following reaches should be investigated for chronic sources of bacteria, such as failing septic systems and direct livestock access to waterways:

- Cove Creek
- Hangman Creek above Keevy Rd
- Rock Creek between the mouth and Rockford

The recreational areas near Duncan and the mouth of Hangman Creek are the most critical for protection due to human contact with the water. However, it is possible that the highest loading is occurring upstream and being carried downstream, so reducing sources between Keevy Road and the state line, where there is the highest loading, should be a priority. Because there is a greater health risk associated with human sources of bacteria, areas of suspected septic system failure should be a priority.

Temperature
Restoring a mature, natural, riparian buffer along all streams in the watershed is the best method to reduce in-stream water temperature to meet system potential levels. Areas with no native riparian vegetation and those needing the greatest increase in effective shade (see Appendix B) should be the top priority. In addition, the best shading will be in reaches that are oriented east and west; therefore, this may be considered in choosing locations when resources are limited.

Sediment (which will also benefit phosphorus reductions)
The fine Palouse soils are readily carried downstream during high flow events. Therefore, sediment reduction implementation in the upper watershed will benefit the entire system. The TMDL analysis also indicated that sub-watersheds in the upper basin required (and should be able to achieve) the greatest reductions. Therefore, the following sub-watersheds (Figure 5) should be priorities for implementation:

- Upper Hangman Creek (including reductions across the state line)
- Rock Creek
- Little Hangman Creek and Hangman upstream of Bradshaw Road

The sources in these (and all) sub-basins that produce the greatest sediment loading are conventional agriculture and streambank erosion. Projects to convert conventional agriculture to direct seed and minimum tillage, and projects to restore stable, properly-functioning riparian areas should be the highest priority for sediment (and phosphorus) reductions.

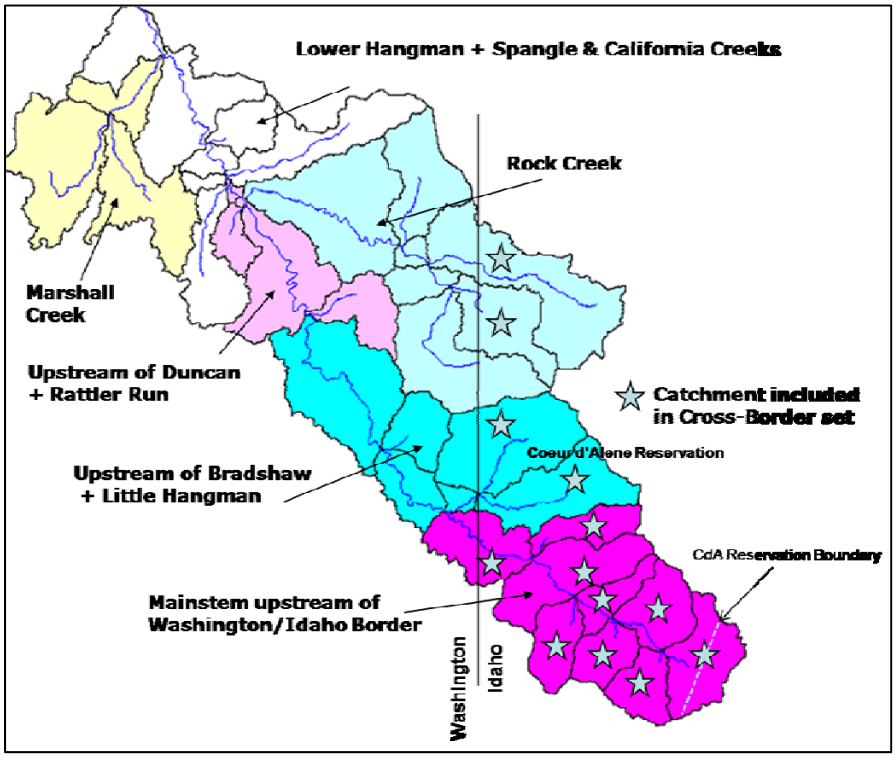

Figure 5. Hangman Creek sub-watersheds. *The watershed was broken into these sub-watersheds for analysis and modeling during the TMDL study. The analysis took into consideration loading in the entire watershed on both sides of the state line.*

Organizations' implementation actions, goals and schedules

Following is a description of activities to be performed by various organizations to reduce pollutants in the watershed. This list is not exhaustive and other ideas should be investigated. When developing programs to reduce pollutants, organizations should refer to Appendix C and use the information provided there to ensure they plan for the barriers their program may encounter.

All organizations

All entities conducting or approving major land use projects must consider TMDLs during local land use planning reviews, including the state Environmental Policy Act (SEPA) review. If the land use action is known to potentially impact fecal coliform bacteria, in-stream temperature, or sediment loading as addressed by the TMDL, then the project may have a significant adverse environmental impact. Land use planners, SEPA lead agencies, and reviewers are required to look at potentially significant environmental impacts and alternatives and to document that the necessary environmental analyses have been made. Land-use planners and project managers should consider findings and actions in the TMDL to help prevent new land uses from violating water quality standards. Ecology published (www.ecy.wa.gov/biblio/0806008.html) a focus sheet on how TMDLs play a role in SEPA impact analysis, threshold determinations, and mitigation. Additionally, the TMDL should be considered in the issuance of land use permits by local authorities.

Since the SCCD is often involved in the implementation of mitigation projects, they will explore the opportunity to establish a mitigation fund for the Hangman Creek watershed. This in-lieu fee mitigation program would need to follow all state and federal rules and regulations regarding mitigation (Ecology, et.al, 2006a & 2006b). If a program is developed, organizations that are required to provide mitigation for a project would be able to pay into this fund if opportunities to mitigate at the site were not possible or greater environmental benefit could be achieved through an alternative project. Selecting mitigation sites will follow the recommendations in Ecology's (2010) guidance "*Selecting Mitigation Sites Using a Watershed Approach (Eastern Washington).*"

Avista Corporation

In early 2009, Avista entered into a settlement agreement with Ecology related to the Section 401 Water Quality Certification for Avista's Spokane River Project, which includes five hydroelectric developments located on the Spokane River. Per the settlement agreement, Avista identified reasonable and feasible improvements and/or mitigation measures that could be used to address its proportional level of responsibility for dissolved oxygen in Lake Spokane. The "Potential Reasonable and Feasible Improvements and/or Mitigation Measures for Dissolved Oxygen in Lake Spokane" was submitted to Ecology on December 28, 2009 (Avista, 2009), and endorsed by Ecology per the letter dated March 4, 2010.

The list of possible reasonable and feasible improvements and/or mitigation measures includes working with landowners to implement practices to reduce phosphorus loadings into Hangman Creek from cropland, pastures, and/or stream bank erosion. These efforts may also reduce sediment and bacteria, as well as increase stream shading. Avista will coordinate its efforts and work with the appropriate county and state agencies to determine potential projects in the watershed.

In addition, the federal Energy Regulatory Commission (FERC) License for the Spokane River Project also requires Avista to acquire, restore, and/or enhance 42 acres of wetlands downstream of Nine Mile Dam. However, it also states that Avista can fulfill its wetland mitigation requirements within the immediate vicinity of the confluence of the Spokane River and Hangman Creek.

Avista is currently evaluating potential projects as it develops the Lake Spokane Dissolved Oxygen Water Quality Attainment Plan, which is due to Ecology on May 27, 2012.

City of Spokane

Fecal management in parks near the mouth of Hangman Creek is the responsibility of the city of Spokane (Parks Department). Several parks, such as High Bridge Park and People's Park, have transient populations with no bathrooms. The installation of portable bathrooms or permanent facilities may help reduce the amount of human waste to Hangman Creek. Along with human waste concerns, pet waste is a problem in most parks. The installation of pet-waste stations with bags and weekly cleanup should be reviewed by the city of Spokane Parks Department. The city Parks Department will apply for grants or seek other resources to install and maintain portable restroom facilities and pet waste stations.

The city of Spokane is subject to the Eastern Washington Phase II Municipal Stormwater Permit. The city is responsible for management of stormwater in accordance with the permit and must implement the six permit components and applicable TMDL requirements. To implement this TMDL the city will:

1. Promote compliance with the Spokane Regional Stormwater Manual (SRSM), which addresses engineering design, construction, post construction, and the implementation of BMPs.
2. Enforce the city's Post-Construction Ordinance.
3. Inventory MS4 components (including any roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) and any associated stormwater outfalls that discharge to Hangman Creek or one of its tributaries.
4. Implement BMPs or other controls to address any MS4 components found to be causing or contributing to pollutant loading to Hangman Creek or one of its tributaries. Potential sources of fecal coliform bacteria and sediment will be given priority.
5. Target education efforts to developers, businesses and residents to prevent pollutant delivery to stormwater systems.

Some areas within the city of Spokane have combined sewers, which means that sanitary and storm water flow in a single pipe. During heavy rains or rapid snowmelt, the flow in these sewer lines can overflow to a stream, resulting in untreated sewage entering the stream. There are two of these combined sewer overflow (CSO) outlets to Hangman Creek: CSO-19 and CSO-20. Both CSO outfalls rarely discharge and are part of the city's CSO Reduction Program. In 2010, a new flow control vault was installed on the sewer line to CSO-19. This upgrade will improve the hydraulics and provide enough holding capacity to control future overflows to no more than once a year on average, per Ecology regulations. CSO-20 is scheduled for improvements within the next four to five years, dependent on funding. These improvements include a storage tank to store excess flow that would otherwise overflow. After the storm, the stored flow will be returned to the sewer for treatment at the plant. The facility will control overflow to once a year on average, and seeks to relocate the outfall. The location of the current outfall is in the Missoula Flood deposits and has experienced erosion around the pipe.

Coeur d'Alene Tribe

Significant pollutant load reductions from the Coeur d'Alene (CDA) Tribal Reservation, especially for sediment and fecal coliform bacteria, will be necessary for Hangman Creek to meet water quality standards in Washington. EPA, in cooperation with the CDA Tribe, will develop TMDLs for the reservation waterways based on CDA Tribe's Water Quality Standards and the targets set at the border by the Washington TMDL.

The CDA Tribe will partner with the SCCD to establish a direct seed program on tribal land and with the tribal farm. CDA Tribal representatives will attend the annual Direct Seed Conference.

The CDA Tribe is working on a project to realign Sheep Creek, a tributary to Hangman Creek. This project will reduce erosion. The CDA Tribe is also exploring options to enhance beaver habitat to encourage increased beaver activity to slow water, erosion and enhance riparian areas.

Hangman Creek Planning Unit Watershed Implementation Team (WIT)

The 1998 Washington Legislature funded the Watershed Planning Act (Chapter 90.82 RCW) to assist local communities with addressing water resource issues. This effort focuses primarily on addressing water quantity, but planning units can choose to address water quality.

The Hangman Creek Planning Unit formed in 2000 and chose to include water quality in their planning efforts. The culmination of this process was the WIT's detailed implementation plan (DIP) adopted February 19, 2008. This plan outlines the specific steps the Watershed Implementation Team (WIT) and other entities are going to take to address water issues in the watershed. Many of these activities overlap with or complement activities that need to occur to address water quality. The complete DIP can be viewed at:
www.sccd.org/water/hangman/documents/WRIA56DIPFINAL.pdf

The WIT's commitment to addressing water quality is demonstrated from their ongoing efforts in the watershed. The WIT also commits to continuing or initiating the following activities in the DIP to specifically address the water quality concerns covered by this TMDL:

- Prioritize locations for greenbelts or conservancy corridors and begin working with landowners.
- Assist and coordinate in the development of a cross-state group of stakeholders to organize and implement efforts to protect and improve water quality in the Hangman (Latah) watershed.
- If applicable, develop implementation strategies to address priority data gaps in the TMDL and seek funding.
- Meet with the Health District to develop a list of possible incentives for septic system replacements and upgrades, and to identify potential funding sources.
- Assist the SCCD in offering technical assistance to landowners to address stock watering impacts to surface waters.
- Provide comment and input on proposed streamside/shoreline land uses and suggest specific BMPs.
- Review and make recommendations regarding BMPs identified as part of the Hangman/Latah TMDL process.
- With the SCCD, involve landowners in building catchment basins, snow fences, and vegetated buffer strips.
- Seek funding to implement priority restoration projects.
- Encourage the Spokane Regional Health District to develop and conduct an annual mailing to all septic system owners, and if necessary, develop specific implementation actions for a septic system maintenance program.

Inland Northwest Land Trust

The Inland Northwest Land Trust (INLT) is a private, nonprofit organization that works cooperatively with private landowners to conserve land for its natural, recreational, scenic, historical, or productive value. Through easements, acquisitions, and by working with other conservation partners, INLT has helped preserve over 11,000 acres of wetlands, shorelines, farmlands, and forests in eastern Washington and northern Idaho.

The INLT would like to increase conservation easements in the Hangman Creek watershed. They will seek funding to continue outreach to landowners in the Hangman watershed. The INLT will hold workshops with the SCCD and other organizations to promote the services they can provide.

INLT will seek funding to partner with organizations such as the SCCD, the Lands Council, and the Department of Ecology to offer restoration and BMP implementation on preserved easements. When a landowner enrolls their property into a conservation easement, the INLT will assess the property to see if the riparian areas would benefit from restoration or BMP

implementation. If appropriate, the INLT will contact the SCCD or seek funding through Ecology or other sources to install TMDL recommended BMPs and riparian improvements.

The Lands Council

The Lands Council (TLC) analyzed the potential to re-introduce beavers to the Hangman Creek watershed. TLC found that approximately 37 miles of stream are suitable for re-introduction. Their findings suggest that optimizing re-introduction in these reaches could result in significant nutrient and sediment reductions. Future beaver dams could store 1.2 to 3.9 million cubic feet of sediment. TLC developed a short- and long-term beaver re-introduction plan for the watershed. They are locating landowners willing to participate in the program, and will continue to pursue beaver re-introduction to benefit both water quantity and quality.

TLC will also seek opportunities to sponsor volunteer events for projects in the watershed annually, but at least once every two years. As an example of the type of project, TLC sponsored a "Willow Warrior Weekend" in the Hangman Creek watershed, which resulted in 30 volunteers planting over 3,000 coyote willows along banks of Hangman Creek.

In addition, TLC will conduct outreach to landowners in the watershed to find property owners willing to have native riparian tree and shrub plantings on their property. TLC will partner with the SCCD and other organizations on riparian planting projects, including plantings in Campion Park in the lower watershed.

Local environmental and resource groups

There are many local environmental and resource groups and organizations that are not specifically listed in this document. However, these organizations can play an important role in restoring water quality in the Hangman Creek watershed.

The SCCD and Ecology will work with local environmental and resource groups to provide opportunities for volunteers to help complete projects in the watershed.

Potential groups include, but are not limited to the following.

- Audubon Society of Spokane
- Boy Scouts – Eagle projects
- Conservation Northwest
- Futurewise of Eastern Washington
- Inland Northwest Wildlife
- Local Environmental Consulting Firms
- Pheasants Forever
- Veterans of Foreign Wars

Natural Resources Conservation Service (NRCS)
NRCS will administer the Agricultural Watershed Enhancement Program (AWEP) that was awarded to Ecology and the SCCD. The NRCS is responsible for developing plans and contracts with the producers participating in the program. The NRCS will also assist landowners with their other conservation programs in the watershed. More information about these NRCS programs is available in the Potential Funding section of this document.

Pine Creek Conservation District
The Pine Creek Conservation District will provide landowners, who seek to install BMPs on their property, with financial and technical assistance through existing NRCS and FSA programs. Pine Creek Conservation District will partner with the SCCD and Ecology to assist any producers interested in the AWEP program.

The Pine Creek Conservation District will also partner with the SCCD on grant applications to seek funding to provide livestock owners assistance in addressing water quality concerns from their operations.

The Pine Creek Conservation District partnered with Palouse-Rock Lake Conservation District to submit a Fiscal Year 2012 grant application to assist landowners in converting to direct seed farming techniques. If funded, a portion of this grant would assist landowners in the Hangman Creek watershed.

Private landowners and watershed residents
The Hangman Creek watershed's water quality problems are primarily from nonpoint sources of pollution. Nonpoint source pollution results from the actions of all people living in a watershed. Therefore, everyday activities by citizens can have a significant impact on local water quality. Actions watershed residents can take to lessen their impact include properly disposing of and managing animal waste; avoiding placing grass clippings in or near streambanks; restoring their riparian areas; implementing farming practices that reduce erosion; repairing failing or regularly pumping septic systems; and educating others about the impacts of their everyday actions on water quality. Many of the agencies and organization mentioned in this plan can provide technical or financial assistance to landowners and residents for these activities.

Spokane County Conservation District (SCCD)
The SCCD will seek funding opportunities for implementation efforts in the watershed. In 2010, the SCCD and Ecology applied for the Agricultural Watershed Enhancement Program (AWEP) to get assistance for agricultural producers to implement direct seed technologies and livestock fencing and off-stream watering. AWEP is an NRCS program that provides cost-share for conservation practices. The SCCD and Ecology were awarded $221,500 for 2010 and will receive additional funds for the years 2011 and 2012. The SCCD and Ecology will reapply for AWEP or similar funding programs for continued implementation after 2012.

The SCCD will explore options for creating an in-lieu fee mitigation program for the Hangman Creek watershed. If developed, this program would provide funding to restoration projects in the watershed to compensate for aquatic losses at other sites. This program would follow all state and federal regulations.

The SCCD will advocate for the expansion of direct-seed acreage and BMPs to reduce sediment in the watershed by:

- Applying for Washington Pollution Control Revolving Funds to promote loans for direct seed and conservation tillage equipment.
- Applying for Centennial Clean Water Fund, Clean Water Act Section 319 Fund, and other funding sources for the Direct Seed Mentoring program in Hangman Creek watershed.
- Developing and utilizing outreach tools and resources to reach all Hangman Creek producers about sediment reduction techniques, including direct seed. The outreach will include education, outreach and technical assistance about cost-share programs, and BMPs. This outreach will be conducted at places like Ag Expo, Farm Forum, Pacific Northwest Direct Seed Association events, Earth Day events, and the Southeast Spokane County Fair at Rockford.

To address livestock and non-livestock riparian impacts, the SCCD will:

- Apply for grants to provide livestock fencing and off-creek watering systems to Hangman Creek landowners on a cost-share basis.
- Partner with Pine Creek Conservation District to address degraded riparian areas within their district inside the Hangman Creek watershed.
- Identify programs available to landowners to promote livestock management BMPs through public and private sources, including Ecology water quality grants and loans, NRCS, FSA, and Conservation Commission programs.
- Identify new or future projects that combine livestock management and riparian restoration for future grant applications.
- Seek funding to conduct reach-based restoration projects that reduce stream bank erosion and reestablish the riparian vegetation. The SCCD will seek funding from Ecology grants, WSDOT mitigation funds, and Conservation Commission grants.
- Partner with volunteer organizations (such as the Lands Council) to conduct resource management projects. These projects, such as the “Willow Warrior Weekend” used 30 volunteers to plant over 3,000 coyote willows on Hangman Creek, which will reduce sediment and eventually provide shade to reduce temperature.
- Provide streamside landowner packets to residents along Hangman Creek and provide streamside landowners with an assessment of their riparian area with recommendations for improvement.

The SCCD will provide education and information about proper household fertilizer and chemical management through newsletter articles, other publications, and at events such as Earth

Day; the Spokane Youth Environmental Conference; Farm Forum; the Southeast Spokane County Fair; and the Spokane River forum.

To address impacts from failing septic systems, the SCCD will:

- Partner with Spokane Regional Health on education and outreach programs.
- Work with the Spokane Regional Health to expand the septic system maintenance and inspection program.
- Apply for grants and/or loans to establish an incentive programs for the replacement or upgrade of a substandard septic system or for the connection to a sewer system if one is available.

To address sediment from forestry management areas, the SCCD will:

- Work with the Washington Department of Natural Resources to provide forest land owners with information on proper forest practices that will result in reduced amounts of sediment in the water.
- Develop and utilize outreach tools and resources to reach all Hangman Creek forestland owners and teach about sediment reduction techniques.
- Continue to work with the Family Forest Fish Passage program to create stream crossings that minimize sediment introduced to the streams.

Spokane County

A portion of the lower Hangman Creek Watershed falls within the coverage area for the Phase II Stormwater NPDES Permit (see Figure 4). Spokane County is responsible for management of stormwater in accordance with the permit from their property and facilities in this coverage area. Spokane County will also seek to manage areas outside permit coverage to minimize impacts from stormwater and will seek opportunities to expand permit-type stormwater management outside the permit area as funding allows.

Within the Phase II Permit coverage area, Spokane County will:

1. Implement the six Phase II Permit components, which include Public Education and Outreach; Public Involvement and Participation; Illicit Discharge Detection and Elimination; Construction Site Stormwater Runoff Control; Post Construction Stormwater Management for New Development and Re-development; Pollution Prevention; and Good Housekeeping for Municipal Operations.
2. Promote compliance with the Spokane Regional Stormwater Manual (SRSM), which addresses engineering design, construction, post construction, and the implementation of BMPs.
3. Implement new Spokane County Code revisions designed to prevent stormwater pollution within waters of the state.
4. Investigate and identify MS4 components (including any roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains)

and any associated stormwater outfalls to waters of the state. Outfalls that have a potential to discharge bacteria or sediment to Hangman Creek or its tributaries will be prioritized for investigation to help meet the TMDL WLAs.

5. Evaluate MS4 for potential sediment sources that could be delivered via stormwater to Hangman Creek or its tributaries, and if discharges are found plan appropriate resolutions.
6. Retrofit any identified outfalls with BMPs as per SRSM as funding allows.
7. Evaluate the potential purchase of properties or easements in high value riparian, restoration, and priority natural drainage areas to develop new or maintain natural bio-infiltration areas.
8. Promote compliance with the critical aquifer recharge area (CARA).

Spokane County leads the Nonpoint Advisory Committee (NPAC), which is gathering data and making recommendations for reducing nonpoint sources of phosphorus throughout the greater Spokane basin, including the Hangman Creek watershed. Many of the recommendations will involve implementation activities in the Hangman Creek watershed that will benefit the TMDL's parameters. Spokane County will work with Ecology and the SCCD to provide assistance toward reducing nonpoint source pollution through this effort.

If recommendations for implementation are made in Spokane County's implementation plan that are not covered in this TMDL implementation plan, those recommendations may be added to future adaptive management efforts.

Spokane Regional Health District

The Spokane Regional Health District (Health District) is the agency responsible for on-site septic system education, permitting, and regulations in the Spokane County portion of the Hangman Creek watershed.

The Health District has an existing septic system education program consisting of several publications and record-keeping tools. The Health District will enhance their septic system education program in the Hangman Creek watershed by partnering with the SCCD. This effort may include conducting a septic system workshop for residents every three to five years, as staffing resources allow.

Currently, new residential on-site systems and systems over the Spokane-Rathdrum Prairie Aquifer are issued a renewable three-year permit. This program requires the inspection and maintenance of the system prior to permit renewal. The Health District is seeking to expand this program county-wide in the near future.

The Spokane Regional Health District will coordinate with the city of Spokane on the number and placement of restroom facilities in public places, such as parks.

The Health District will support the SCCD's efforts to seek funding to provide incentives to homeowners to repair or replace failing septic systems.

The Health District also responds to complaints regarding suspected septic system failures. The Health District may use dye tests for suspected systems and require compliance if a failure is found.

The Health District works with local communities and residents to educate them about the on-site sewage program.

Spokane River Forum

The Spokane River Forum (Forum) will support education and outreach efforts related to implementing this plan. The Forum is a non-profit organization that creates materials, events, and activities that promote regional dialogs for sustaining a healthy river system while meeting the needs of a growing population. Forum interest in supporting efforts in Hangman Creek has several dimensions.

First, Hangman is one of two tributaries flowing into the Spokane River. Second, Hangman is a vital part of the Spokane River watershed, extending into Idaho and the Coeur d'Alene Reservation. Third, working with landowners along Hangman may be an important aspect to reducing sediment loading that contributes to dissolved oxygen issues in the Spokane River. As such, working with stakeholders along this tributary will contribute to the community's overall understanding and support of a healthy Spokane River watershed.

A Hangman Creek education and outreach program will extend successful efforts the Forum developed for the Spokane River. These include the Forum's *Meet Me at the River*, water trail, interpretive signage, and web site development initiatives.

Meet Me at the River

The Forum's Meet Me at the River program provides raft and kayak trips down the length of the Spokane River. A key component is "eco-tours," where resource experts explain geology, riparian, water quality, fishery and wildlife information of interest to an area. Additionally, they explain specific protection and restoration programs being used to meet environmental needs. The public, elected officials, and stakeholders come away with a much deeper understanding of issues and what is being done to address them. In addition, networking and new relationships are forged that can be built on into the future.

Extending this program to Hangman Creek is particularly interesting because the area is agricultural in nature, difficult to access, and not well known by stakeholders and the general public. Opportunities for farmers, officials, and other stakeholders to interact would contribute to creating a foundation for future collaboration.

While there are some challenges in extending the Meet Me at the River program to Hangman Creek, the Forum commits to determining the feasibility of this and other in-person outreach activities. Some of the challenges include planning around optimum flow, inclement weather. and access issues. Rafts, kayaks, and ground transportation will be investigated. The Forum will work with partner organizations, such as Ecology and the SCCD, to find funding for this effort.

Water Trail
The Forum is actively developing a water trail, which is defined as "providing non-motorized public access to the river for the recreational and educational benefit of paddlers, anglers and others." Water trails are becoming increasingly popular around the country because increased desires for recreation are combined with equally strong principles of environmental stewardship, promoting educational and cultural resource values, and supporting economic development and healthy living goals.

Recently, an inventory for prospective water trail sites for the Spokane River was conducted. Based on this work, Spokane County is in the final stages of adopting the water trail as part of the county's regional trails plan. If successful, the water trail will be included in the county's comprehensive plan and will be eligible to compete for state grants to support these efforts.

The Forum will work with stakeholders to consider extension of the water trail to Hangman Creek. This would include identification of existing and proposed locations, possible interpretive signage, web site education and promotion, and working with the visitor and convention bureau to promote this area to the general public and tourists.

Interpretive Signage
As described previously, signage at access points is an on-going means of educating the public about river, watershed, cultural resources, and other initiatives unique to the area. Such signage is most effective at high traffic areas. For this project, the Forum will seek water trail access points, trail biking locations, and potential scenic by-way locations. Scouting options will be done in collaboration with Inland Northwest Trail Association, the Lands Council, biking groups, and others with interest and knowledge of the area. Once priority areas are selected, signage will be developed and installed collaboratively once funding is obtained.

Web Site
The Forum is developing fund- raising plans to develop a water trail web site. This would include access, safety, environmental, cultural resource, and other information to develop awareness and promote public utilization of the resource. The web site will be extended to include information regarding Hangman Creek as well. One desire is to create "virtual tours" showcasing unique features of the area and initiatives to promote restoration and protection.

Towns
There are several towns in the watershed, including Rockford, Fairfield, Spangle, Waverly, Tekoa, Latah, Valleyford, and Cheney. Each town in the watershed should evaluate ways to prevent or reduce polluted runoff entering streams from parks, streets, parking lots, and residences. Towns with public land along streams should seek funding to plant native riparian vegetation to benefit water quality and increase the aesthetic value for their citizens. Road maintenance should be conducted in a manner that minimizes runoff.

If a town does not have a pet waste ordinance requiring the proper disposal of fecal waste, one should be developed and adopted. Towns with an ordinance should remind citizens of this regulation through education efforts. Citizens should also be educated about the proper disposal

of yard and lawn clipping waste so that it does not contribute nutrients to the streams. The towns can remind residents of their responsibilities to reduce nonpoint source pollution through educational flyers included in their utility bills.

If a town with septic systems also has a sewer system and treatment plant, it should seek opportunities to connect the houses to the system. Towns with only septic systems should work with the SCCD and Regional Health Department to provide education about proper maintenance and operation of their systems.

The TMDL required new permit limits for several of the treatment plants in the watershed. These new limits will be included in their NPDES permit when they are reissued and the towns should plan for the necessary improvements to meet these limits and to prepare for potential nutrient limits in the future.

Trout Unlimited and Spokane Fly Fishers (TU/SFF)

The mission of the Spokane Falls Chapter of Trout Unlimited (TU) is to conserve, protect and restore cold water fisheries, their watersheds, and ecosystems as a means of maintaining our quality of life. The mission of the Spokane Fly Fishers (SFF) is to make fly fishing fun and support conservation of fisheries and watersheds. TU and SFF do this by taking an active part in habitat restoration, water quality issues, and fish protection and enhancement projects.

TU and SFF would like to ensure a healthy future for Hangman Creek's cold water trout fisheries. TU and SFF will work with landowners that are potentially interested in water quality and fishery improvement projects in the watershed. TU and SFF will partner with organizations such as the SCCD, the Lands Council, and the Department of Ecology to offer restoration and BMP technical and financial assistance. Types of BMPs TU and SFF may be involved with include livestock fencing, off-creek watering systems, and riparian plantings. TU and SFF will seek non-state public, private, and in-kind funding to act as match to state grants and to allow work across state lines into Idaho. TU and SFF will also organize volunteers to assist with on-the-ground implementation activities. For all of the mentioned activities, TU and SFF will have available professional support from TU national staff.

TU is currently working in the upper watershed in Idaho to address logging practices that have resulted in erosion and increased runoff. They will continue this effort with the operators and the Coeur d'Alene Tribe.

TU and SFF will provide education in the watershed on local fish issues. This may include providing fishing demonstrations at stream-side events, working with the Boy Scouts of America to make and post educational signs, and other watershed activities. TU and SFF will also seek opportunities to bring the "Trout in the Classroom" program to schools in the watershed. As previously mentioned, youth education activities will have available professional staff support from TU Youth Education and Trout in the Classroom staff and SCCD education staff.

Washington Department of Ecology (Ecology)
Ecology will track the implementation of the TMDL to ensure progress is made towards meeting the goals of this implementation plan and the water quality standards in the Hangman Creek watershed.

Ecology will provide funding through its competitive water quality grant and loan funding cycle to projects that address the goals of the TMDL and rank high enough to receive funding. Additional points are awarded during the application evaluation for projects implementing TMDLs. The Ecology TMDL Lead will provide feedback on grant applications, prior to their submission, to help applicants refine their scope of work to develop the best project that has the highest likelihood of being funded.

Ecology will also seek funding opportunities for implementation efforts in the watershed. In 2010, Ecology and the SCCD applied for the Agricultural Watershed Enhancement Program (AWEP) to get assistance for agricultural producers to implement direct-seed technologies, livestock fencing, and off-stream watering. AWEP is an NRCS program that provides cost-share for conservation practices. Ecology and the SCCD were awarded $221,500 for 2010 and will receive additional funds for the years 2011 and 2012. Ecology and the SCCD will reapply for AWEP or similar funding programs for continued implementation after 2012.

Ecology will administer NPDES permits for wastewater treatment plants and stormwater NPDES Phase II permits. These permits will reflect the revised permit limits and actions needed to reduce pollutant discharge loads to bring the streams into compliance with water quality standards.

Ecology will refer nonpoint sources of pollution to the appropriate entity, such as a conservation district, to receive technical and financial assistance to correct the pollution problem. If necessary, Ecology will use its authority under the Revised Code of Washington (RCW) 90.48 to enforce water quality regulations.

Washington Department of Natural Resources (WDNR)
The Washington Department of Natural Resources (WDNR) will implement the Clean Water Act Assurances forest practices regulations, including the additional milestones specified in the 2009 assessment of these regulations. WDNR should consider using the Hangman Creek watershed as a focus area for compliance checks for private forestry operations.

Washington State Department of Transportation (WSDOT)
Ecology did not directly measure WSDOT stormwater outfalls during the TMDL study. But it is reasonable to assume that WSDOT stormwater is a source or a conveyance of fecal coliform and sediment in areas where adjacent land uses are recognized sources. While WSDOT stormwater outfalls can be the source of bacteria and sediment in some locations, there is greater likelihood that the pollutants at a WSDOT outfall (if measured) come from adjacent private property via an illicit discharge or illegal connection. With this understanding, there are multiple WSDOT highways within the study area that have the potential to discharge stormwater containing fecal coliform bacteria and sediment.

WSDOT will implement the following, which include some pollution-prevention measures that address fecal coliform and sediment delivery, for state road and highway runoff according to its Stormwater Management Program Plan (SWMPP) and Municipal Stormwater NPDES General Permit in all applicable Phase I and II coverage areas:

- Discharge inventory/IDDE (source identification and control).
- Construction stormwater pollution prevention.
- Implementation of Highway Runoff Manual (stormwater BMP design manual equivalent to Ecology's Stormwater Management Manual.)
- Baseline fecal coliform stormwater grab sampling of highways (at selected sites statewide per the Permit requirements).
- Stormwater BMP retrofit program.
- Highway maintenance program.

WSDOT will inventory highway stormwater discharge locations within its right-of-way inside the Hangman Creek fecal coliform bacteria, temperature, and turbidity TMDL boundary. The inventory will include the identification of illicit bacteria and sediment discharges to WSDOT's stormwater conveyance system. WSDOT will coordinate with Phase II municipalities to acquire stormwater discharge point data and IDDE information within municipal boundaries. Prioritization of inventory efforts should be:

- Highway 27 crossings and discharge locations to Hangman Creek; Cove Creek; Rattlers Run Creek; Rock Creek; and California Creek and the ditches leading up to discharge locations.
- Highway 195 crossings and discharge locations to the Hangman Creek; Spangle Creek; Marshall Creek; and Garden Springs Creek and the ditches leading up to discharge locations.
- Highway 278 crossings and discharge locations to Rock Creek and North Fork Rock Creek and the ditches leading up to discharge locations.
- Highway 274 discharge locations to Little Hangman Creek and the ditches leading up to discharge locations.
- Interstate-90 crossings and discharge locations to Hangman Creek and the ditches leading up to discharge locations.
- Highway 904 crossings and discharge locations to Minnie Creek and the ditches leading up to discharge locations.
- Crossings and discharge locations to other tributaries and the ditches leading up to discharge locations.

To address total suspended solids/turbidity WSDOT will:

- Work to prevent agriculture encroachment on SR 27 right-of-way in upper watershed (priority area).
- Work to prevent agriculture encroachment on SR 195 right-of-way (lower priority area).

To address fecal coliform bacteria WSDOT will implement source identification for fecal coliform within its right-of-way inside the Hangman Creek TMDL boundary. If discharges that transport bacteria to the streams are found, WSDOT will apply BMPs from their SWMPP or perform remediation to correct the situation. If source identification reveals this area has significant WSDOT related contributions, WSDOT's fecal coliform programmatic approach (currently under development) may be applied where highways discharge to a water body within the TMDL boundary.

To ensure WSDOT is not contributing to in-stream temperature increases, WSDOT will evaluate stormwater systems and prevent stormwater heating of discharges to Hangman Creek or its tributaries.

WSDOT stormwater activities are summarized in Table 6.

Table 6. Summary and schedule of WSDOT stormwater activities.

Action	Timeline
Implement WSDOT's SWMPP and Municipal Stormwater NPDES General Permit in all Phase I and II areas	On-going
Work to prevent agricultural encroachment on right-of-ways	Initiate efforts by July 2012; then on-going
Inventory highway stormwater discharge locations within WSDOT's right-of-way inside the Hangman Creek TMDL boundary. Coordinate with Phase II municipalities as necessary for inventory efforts.	Complete by March 2014
Implement source identification for fecal coliform within WSDOT's right-of-way inside the Hangman Creek TMDL boundary	Complete by March 2014
Apply best management practices from SWMPP or perform remediation to correct bacteria and sediment discharges	As needed
Evaluate stormwater systems and prevent stormwater heating of discharges to Hangman Creek or its tributaries.	Complete by March 2014
If significant WSDOT fecal coliform bacteria contributions are found, determine if the fecal coliform programmatic approach should be applied within TMDL boundary	If determined necessary and based on discussions with Ecology.

Ongoing implementation activities

There is considerable interest and local involvement toward resolving the water quality problems in the Hangman watershed. Numerous organizations and agencies are already engaged in stream restoration and are providing support to help identify and correct the fecal coliform, turbidity, and temperature problems.

The Hangman Creek Planning Unit Watershed Implementation Team (WIT) also was involved in the development of the TMDL and participated in activities that will help move the streams towards the goals of the TMDL. These activities included:

- Held a briefing by Ecology and/or other stormwater experts on stormwater management in small communities; invited representatives of small communities to participate.

- Reviewed the water quality data needs listed in the Hangman/Latah TMDL and prioritized data gaps.
- Facilitated a meeting with Health District staff to discuss optimal education programs for septic system owners.
- Met with staff from the Health Board to discuss septic system inspection compliance and means to improve compliance.
- Developed specific riparian restoration needs based on TMDL-related modeling and studies of soils and non-point sources.
- Used the SCCD riparian assessment tool to identify high priority shorelines.
- Provided comments on projects affecting water resources in the watershed.

Ecology and the SCCD believe that the following activities already support this TMDL and add to the assurance that fecal coliform, temperature and turbidity in Hangman Creek will meet conditions required by Washington State water quality standards. This assumes that the following activities are continued and maintained.

- Interests in both Washington and Idaho portions of the watershed formed a bi-state coordination group to work on implementation issues throughout the entire watershed. This group meets approximately quarterly to plan and coordinate funding and implementation activities and share progress updates.
- In 2010, Ecology and SCCD were awarded a funding allocation from NRCS titled *Hangman Creek Collaboration: A Comprehensive Watershed Restoration Initiative.* The award for 2010 was $221,000 and is expected to be a total of $1.2 million over three years. This award is NRCS funding for the entire watershed (both Washington and Idaho) for agricultural conservation practices.
- The SCCD has a Washington Pollution Control Revolving Fund loan, which allows them to offer low interest loans to agricultural producers to purchase direct seed equipment. Along with this loan program, the SCCD received grant funding for a direct seed mentoring project. The district also received funds for water quality testing to determine the effectiveness of direct seed practices in the watershed. This project involves the implementation of direct seeding operations by several landowners in the Hangman Creek watershed.

  The purpose of the direct seed project is to demonstrate, through a cost-share program, that sediment and nutrient issues can be significantly reduced by utilizing direct seeding systems and increasing crop residue levels. Direct seeding systems increase the soil's ability to absorb greater quantities of water during a short period of time, thereby reducing sediment and nutrient runoff to local streams. The increase of residue also prevents overland flows from entering the surface waters. At least 30% of the eroded soil is deposited in Spokane County perennial streams each year. Therefore, the total amount of stream sediment loading can be significantly reduced through the incorporation of direct seeding.
- The SCCD has programs for the implementation of BMPs, including grassed waterways, riparian buffers, replanted stream banks, and sediment basins. The BMPs to be implemented are elements of farm plans that are being developed in conjunction with the district's

sediment reduction efforts in the Hangman Creek watershed. These efforts are being conducted in coordination with NRCS and Farm Service Agency (FSA).

The goal of this work is to provide soil erosion prevention and control on agricultural lands adjoining the waterways. These efforts will not only reduce the effects of sediments and nutrients on the waterway ecosystems, but will also benefit the soil productivity of the agricultural lands. Grassed waterways reduce the velocity of runoff, thereby preventing erosion. Sediment basins are a commonly used means of off-site sediment control. The basins will be used in combination with grassed waterways or where erosion prevention and on-site control are not achievable or appropriate.

- The SCCD is committed to providing farm planning services. The district currently has two certified farm planners on staff. The farm planning program strives to address non-point source pollution problems through improved management, technology transfer, and BMP implantation. Through this program, agricultural producers will be provided with a farm plan describing BMPs that can be installed on their working lands. The result will be the implementation of new and proven measures to reduce non-point source pollution.
- The SCCD has an ongoing riparian/buffer enhancement program. This program initially targeted the small tract landowners. Working with these landowners, the district installed 37 projects covering 68,000 feet of stream bank with 84,000 riparian trees and shrubs. In addition to the stream plantings, 16,000 feet of fence was installed to keep livestock out of the riparian areas.
- Along with the Buffer/BMP cost share program, a social marketing program was developed to overcome barriers identified as the program continues. This plan includes printed materials with testimonials of successful operations, water quality results, and cost analysis. The social marketing plan also includes a focus for fair booths and other events within the watershed. One-on-one contact with operators who have participated in the program will be ongoing, and operators will be used, when possible, for mentoring other interested landowners.

Adaptive management

Natural systems are complex and dynamic. The way a system will respond to human management activities is often unknown and can only be described as probabilities or possibilities. Adaptive management involves testing, monitoring, evaluating applied strategies, and incorporating new knowledge into management approaches that are based on scientific findings. In the case of TMDLs, Ecology uses adaptive management to assess whether the actions identified as necessary to solve the identified pollution problems are the correct ones and whether they are working. As these actions are implemented, the system will respond, and it will also change. Adaptive management allows us to fine-tune our actions to make them more effective, and to try new strategies if we have evidence that a new approach could help us to achieve compliance.

The ability to meet specific interim targets and milestones will depend on the funds available, the personnel and resources available, and the producers in the watershed. Some pollutants will take longer to reach water quality standards than others. For example, it will take longer to reach the

temperature standards because of the time it takes to grow plants and trees that will shade the streams. TSS will require the establishment of functioning riparian areas, streambank stabilization, and other measures throughout the watershed. Table 7 shows the proposed schedule for achieving water quality standards for each pollutant.

If water quality standards are achieved, but wasteload and load allocations are not, the TMDL will be considered satisfied. It is ultimately Ecology's responsibility to assure that implementation is actively pursued and water quality standards are achieved.

Table 7. Schedules for achieving water quality standards.

Percentage of TMDL targets achieved	Number of Years after TMDL Water Quality Implementation Begins*		
	Fecal Coliform	Temperature	Turbidity/TSS
25%	3	10	5
50%	5	15	7
75%	8	20	10
100%	10	25	15

* Ecology and SCCD considers 2010 to be the year TMDL implementation began.

These targets will require significant commitment from all stakeholders described previously. Without watershed-wide commitment, the targets may not be met. If the Idaho portion of the watershed does not commit to the goals of this TMDL, progress on the Washington side could be delayed.

Partners will work together to monitor progress towards these goals, evaluate successes, obstacles, and changing needs, and make adjustments to the implementation strategy as needed.

Ecology will use adaptive management when water monitoring data show that the TMDL targets are not being met or implementation activities are not producing the desired result. A feedback loop (Figure 6) consisting of the following steps will be implemented:

Step 1. The activities in the water quality implementation plan are put into practice.

Step 2. Programs and BMPs are evaluated for technical adequacy of design and installation.

Step 3. The effectiveness of the activities is evaluated by assessing new monitoring data and comparing it to the data used to set the TMDL targets.

Step 3a. If the goals and objectives are achieved, the implementation efforts are adequate as designed, installed, and maintained. Project success and accomplishments should be publicized and reported to continue project implementation and increase public support.

Step 3b. If not, then BMPs and the implementation plan will be modified or new actions identified. The new or modified activities are then applied as in Step 1.

Additional monitoring may be necessary to better isolate the bacteria sources so that new BMPs can be designed and implemented to address all sources of bacteria to the streams.

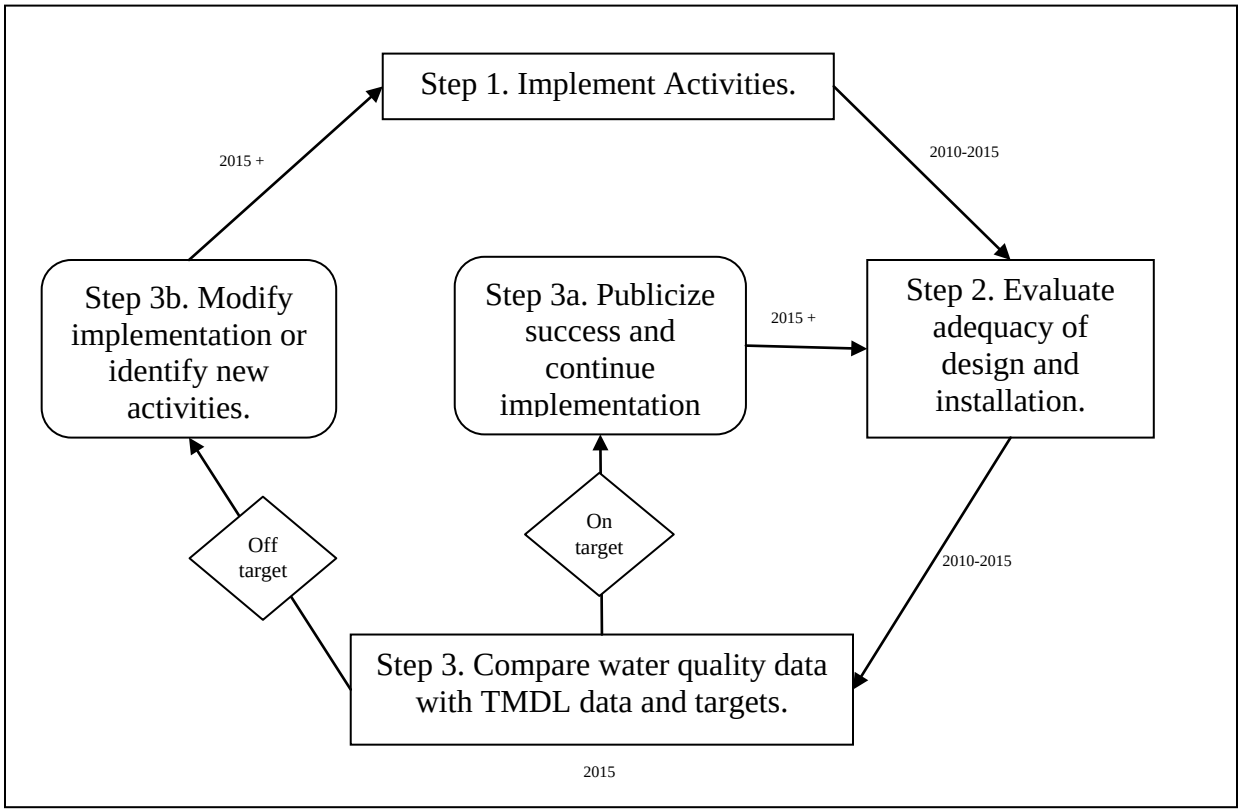

Figure 6. Feedback loop for determining need for adaptive management. *Dates are estimates and may change depending on resources and implementation status.*

Funding Opportunities

Ecology's Centennial Clean Water Fund, Clean Water Act Section 319 and Washington State Water Pollution Control Revolving Fund can provide funding resources to complete some of the activities in this TMDL implementation plan. In addition to Ecology's funding programs, there are many other funding sources available for watershed planning and implementation, point and nonpoint source pollution management, fish and wildlife habitat enhancement, stream restoration, and education. Public sources of funding include federal and state government programs, which can offer financial as well as technical assistance. Private sources of funding include private foundations, which most often fund nonprofit organizations with tax-exempt status. Forming partnerships with other government agencies, nonprofit organizations, and private businesses can often be the most effective approach to maximize funding opportunities. Some of the most commonly accessed funding sources for TMDL implementation efforts are shown in Table 8 with descriptions following.

Table 8. Potential funding sources for implementation projects.

Fund Source	Type of Project Funded	Maximum Amounts
Agricultural Watershed Enhancement Program	Agricultural natural resource projection practices	Dependent on practices implemented
Centennial Clean Water Fund	Watershed planning, stream restoration, & water pollution control projects.	$500,000
Section 319 Nonpoint Source Fund	Nonpoint source control; i.e., pet waste, stormwater runoff, & agriculture, etc.	$500,000
State Water Pollution Control Revolving Fund	Low-interest loans to upgrade pollution control facilities to address nonpoint source problems; failing septic systems.	10% of total SRF annually
Coastal Zone Protection Fund (also referred to as Terry Husseman grants)	Stream restoration projects to improve water quality.	~$50,000
Conservation Reserve Program (CRP)	Establishes long-term conservation cover of grasses, trees and shrubs on eligible land.	Rental payments based on the value of the land; plus 50% - 90% cost share dependant on practices implemented
Environmental Quality Incentives Program (EQIP)	Natural resource protection.	Dependent on practices implemented
Wildlife Habitat Incentive Program (WHIP)	Provide funds to enhance and protect wildlife habitat including water.	$25,000 dependent on practices implemented
Conservation Stewardship Program (CSP)	Provides financial assistance for conservation on private working lands	Dependent on practices implemented
Housing Rehabilitation Loan Program	Loans to low-income homeowners for safety & sanitation.	0-6% interest dependent on household income
Wetland Reserve Program (WRP)	Wetland enhancement, restoration, and protection by retiring agricultural land.	Dependent on appraised land value

Agricultural Watershed Enhancement Program (AWEP)

The Agricultural Water Enhancement Program (AWEP) is a voluntary conservation initiative that provides financial and technical assistance to agricultural producers to implement agricultural water enhancement activities on agricultural land for the purposes of conserving surface and ground water and improving water quality. As part of the Environmental Quality Incentives Program (EQIP), AWEP operates through program contracts with producers to plan and implement conservation practices in project areas established through partnership agreements.

In 2010, Ecology and the SCCD applied for and were awarded AWEP funding for contracts totaling $221,500. Based on the success of enrollment for 2010, Ecology and SCCD will ask for funding to continue in subsequent years.

Centennial Clean Water Fund (CCWF)

A 1986 state statute created the Water Quality Account, which includes the Centennial Clean Water Fund (CCWF). Ecology offers CCWF grants and loans to local governments, tribes, and other public entities for water pollution control projects. The application process is the same for CCWF, 319 Nonpoint Source Fund, and the state Water Pollution Control Revolving Fund.

Section 319 Nonpoint Source Fund

The 319 Fund provides grants to local governments, tribes, state agencies and nonprofit organizations to address nonpoint source pollution to improve and protect water quality. Nonpoint source pollution includes many diffuse sources of pollution, such as stormwater runoff from urban development, agricultural and timber practices, failing septic systems, pet waste, gardening, and other activities. Non-governmental organizations can apply to Ecology for funding through a 319 grant to provide additional implementation assistance.

State Water Pollution Control Revolving Fund

Ecology administers the Washington State Water Pollution Control Revolving Fund. This program uses federal funding from U.S. Environmental Protection Agency and monies appropriated from the state's Water Quality Account to provide low-interest loans to local governments, tribes, and other public entities. The loans are primarily for upgrading or expanding water pollution control facilities, such as public sewage and stormwater plants, and for activities to address nonpoint source water quality problems.

Coastal Zone Protection Fund

Since July 1998, water quality penalties issued under Chapter 90.48 RCW have been deposited into a sub-account of the Coastal Protection Fund (also referred to as Terry Husseman grants). A portion of this fund is made available to regional Ecology offices to support on-the-ground projects to perform environmental restoration and enhancement. Local governments, tribes, and state agencies must propose projects through Ecology staff. Stakeholders with projects that will reduce bacterial pollution are encouraged to contact their local TMDL coordinator to determine if their project proposal is a good candidate for Coastal Zone Protection funding.

Conservation Reserve Program (CRP)

The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners. Through CRP, landowners can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland. Included under CRP is the Continuous Conservation Reserve Program (CCRP), which provides funds for special practices for both upland and riparian land. Landowners can enroll in CCRP at anytime. There are designated sign up periods for CCRP.

Environmental Quality Incentives Program (EQIP)

The federally funded Environmental Quality Incentives Program (EQIP) is administered by NRCS. EQIP is the combination of several conservation programs that address soil, water, and related natural resource concerns. EQIP encourages environmental enhancements on land in an environmentally beneficial and cost-effective manner. The EQIP program:

- Provides technical assistance, cost share, and incentive payments to assist crop and livestock producers with environmental and conservation improvements on the farm.
- Has 75% cost sharing but allows 90% if producer is a limited resource or beginning farmer.
- Divides program funding 60% for livestock-related practices, 40% for cropland.
- Has contracts lasting five to ten years.

Wildlife Habitat Incentive Program

The Wildlife Habitat Incentive Program (WHIP) is administered by NRCS. WHIP is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP, NRCS provides both technical assistance and up to 75% cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from five to ten years from the date the agreement is signed.

Conservation Stewardship Program

The Conservation Stewardship Program (CSP) through NRCS will provide financial and technical assistance to eligible producers to conserve and enhance soil, water, air, and related natural resources on their land. Eligible lands include cropland, grassland, prairie land, improved pastureland, rangeland, nonindustrial private forest lands, agricultural land under the jurisdiction of an Indian tribe, and other private agricultural land (including cropped woodland, marshes, and agricultural land used for the production of livestock) on which resource concerns related to agricultural production could be addressed. Participation in the program is voluntary.

CSP encourages land stewards to improve their conservation performance by installing and adopting additional activities and improving, maintaining, and managing existing activities on agricultural land and nonindustrial private forest land. The NRCS will make CSP available nationwide on a continuous application basis.

The state conservationist, in consultation with the state technical committee and local work groups, will focus program impacts on natural resources that are of specific concern for a state, or the specific geographic areas within a state. Applications will be evaluated relative to other

applications addressing similar priority resource concerns to facilitate a competitive ranking process among applicants within a state who face similar resource challenges.

The entire operation must be enrolled and must include all eligible land that will be under the applicant's control for the term of the proposed contract that is operated substantially separate from other operations.

CSP offers participants two possible types of payments:

1. Annual payment for installing and adopting additional activities, and improving, maintaining, and managing existing activities.
2. Supplemental payment for the adoption of resource-conserving crop rotations.

Housing Rehabilitation Loan Program

The Housing Rehabilitation Loan Program provides zero-interest and low-interest loans to residents to repair and improve the quality and safety of their homes. These loans can be used to repair and replace failing septic systems. Interest rates are based on household income. To qualify for this funding, homeowners must have an inspection performed for their residences and upgrade any other potential health risks that are identified.

Rural Housing Repair and Rehabilitation Loans

The Rural Housing Repair and Rehabilitation Loans are funded directly by the federal government. Loans are available to low-income rural residents who own and occupy a dwelling in need of repairs. Funds are available for repairs to improve or modernize a home, or to remove health and safety hazards such as a failing on-site system. This loan is a 1% loan that may be repaid over a 20-year period.

To obtain a loan, homeowner-occupants must have low income (defined as under 50% of the area median income), and be unable to obtain affordable credit elsewhere. They must need to make repairs and improvements to make the dwelling more safe and sanitary. Grants (up to $7,500) are available only to homeowners who are 62 years old or older and who cannot repay a Section 504 loan (USDA, 2006).

Wetland Reserve Program (WRP)

The Wetland Reserve Program (WRP) is a voluntary program administered by NRCS to restore and protect wetlands on private property (including farmland that has become a wetland as a result of flooding). The WRP provides technical and financial assistance to eligible landowners to address wetland, wildlife habitat, soil, water, and related natural resource concerns on private lands. The program offers three enrollment options: permanent easement, 30-year easement, and restoration cost-share agreement. Landowners receive financial incentives to enhance wetlands in exchange for retiring marginal agricultural land.

Under WRP, the landowner limits future use of the land, but retains ownership, controls access, and may lease the land for undeveloped recreational activities and possibly other compatible

uses. Compatible uses are allowed if they are fully consistent with the protection and enhancement of the wetland.

Implementation Grant (Conservation Commission Grant)

The SCCD has an implementation grant from the Conservation Commission to provide cost-share funding for all farm plan approved BMPs.

Spokane County Conservation District SRF Program (Ecology Loan)

This funding program provides low interest loans to producers in the watershed for purchase of conservation equipment, such as direct seed drills. Increasing direct seed in the watershed will help reduce polluted runoff and erosion.

In addition, the SCCD applied for a grant through Ecology's Fiscal Year 2011 Funding Cycle for a grant to conduct a Direct Seed Mentoring Program and address livestock and other riparian area issues throughout the Hangman Creek watershed. This application was awarded and will be available for cost-share starting in 2010.

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Measuring Progress toward Goals

A monitoring program for evaluating progress is an important component of any implementation plan. Monitoring is needed to keep track of what activities have been done, measure the success or failure of actions, and evaluate if water quality standards are achieved. Monitoring should continue after water quality standards are obtained to ensure implementation measures are effective and standards continue to be met.

Ecology will monitor the progress of implementation and resulting in-stream water quality conditions. Ecology will use this information to make sure Hangman Creek and its tributaries are on track for meeting the schedule above.

A quality assurance project plan (QAPP) should be prepared before any water quality monitoring is conducted by Ecology or others. The QAPP should follow Ecology guidelines (Lombard and Kirchmer, 2004), paying particular attention to consistency in sampling and analytical methods.

Performance measures and targets

The activities listed in this implementation plan need to be tracked to determine:

- What activities were performed and where.
- Whether the actions worked and could be applied elsewhere.
- What practices should be considered for adaptive management, if necessary.
- If resources or some other factor are preventing some actions from occurring.
- Whether this implementation plan is adequate to meet water quality standards.

Ecology's TMDL coordinator will work with the organizations outlined in this document to track implementation activities occurring in the watershed. Depending on Ecology's resources and current implementation tracking tools, the coordinator will either use an Excel© spreadsheet, Ecology's TMDL management database or geographic information system (GIS) mapping to track where implementation has occurred or is planned.

Each organization should track the progress they have made on implementation.

Effectiveness monitoring plan

Effectiveness monitoring determines if the interim targets and water quality standards are being met. This monitoring (i.e. the in-stream water quality monitoring) usually begins five years after the water quality implementation plan is completed, assuming enough implementation has occurred in the watershed to result in changes and resources are available. Effectiveness monitoring of TMDLs is usually conducted by Ecology's Environmental Assessment Program through the ambient monitoring network. At the time this monitoring, the network may need to be expanded to monitor the Rock, Marshall, and Idaho sub-basins to effectively determine if targets are being met.

The Ecology TMDL coordinator will recommend monitoring schedules and locations based on this report and completed implementation. The coordinator will use the results of monitoring by Ecology and others to determine if this plan is working as written. If sufficient progress is not made, the coordinator will begin adaptive management (discussed above).

Maintaining continuous ambient monitoring in Hangman Creek at the state line and at the mouth will be important for tracking trends and water quality improvements. These two sites could help determine progress throughout the entire watershed.

Other monitoring

Any organization conducting innovative or significant BMP implementation projects should have a monitoring component to evaluate the effectiveness of the BMP. These project-specific monitoring plans will consist of a small-scale evaluation program set up for each site to compare water quality. Other long-term monitoring will continue, and presently consists of Ecology ambient monitoring, USGS stream gage monitoring, and SCCD stream gages.

Future significant monitoring effort should include follow-up sediment load (including phosphorus sampling) evaluation at the USGS gauging stations (Hangman Creek at the mouth and at the state line). The sampling protocol should be identical to the previous four-year study by the USGS and the SCCD at the USGS gage at the mouth. Follow-up sampling at five-year intervals will show improvement in sediment and phosphorus reductions.

The SCCD will update baseline inventories of riparian vegetation, channel conditions, and riparian buffer projects as projects are funded and completed.

Entities with enforcement authority will be responsible for following up on any enforcement actions. Those conducting restoration projects or installing BMPs will be responsible for monitoring plant survival rates and maintenance of improvements, structures, and fencing. Stormwater permit holders will be responsible for any monitoring requirements in their permits. Wastewater treatment plants are responsible for monitoring effluent and reporting the results to Ecology on their discharge monitoring reports (DMRs).

Summary of Public Involvement Methods

The Hangman Creek Fecal Coliform, Temperature, and Turbidity TMDL was developed with input from an advisory committee made up of many interest groups and organizations. The TMDL went through a 30-day public comment period prior to submittal to EPA (Joy et.al, 2009).

The agency and organization's commitments in this implementation plan were developed through meetings and discussions with staff from the individual entities. A draft implementation plan was presented to the original advisory group and their input incorporated into the document.

A 30-day public comment period on the draft implementation plan was held from February 15 to March 18, 2011. A press release announced the comment period and display ads were placed in the March 15, 2011 edition of the Spokesman Review. Comments received are responded to in Appendix D.

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Appendices

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Appendix A. Acronyms and Glossary

303(d) list: Section 303(d) of the federal Clean Water Act requires Washington State periodically to prepare a list of all surface waters in the state for which designated uses of the water – such as for drinking, recreation, aquatic habitat, and industrial use – are impaired by pollutants. These are water quality limited estuaries, lakes, and streams that fall short of state surface water quality standards, and are not expected to improve within the next two years.

Best management practices (BMPs): Physical, structural, and/or operational practices that, when used singularly or in combination, prevent or reduce pollutant discharges.

Clean Water Act (CWA): Federal Act passed in 1972 that contains provisions to restore and maintain the quality of the nation's waters. Section 303(d) of the CWA establishes the TMDL program.

Designated uses: Those uses specified in Chapter 173-201A WAC (Water Quality Standards for Surface Waters of the State of Washington) for each water body or segment, regardless of whether or not the uses are currently attained.

Effective shade: The fraction of incoming solar shortwave radiation that is blocked from reaching the surface of a stream or other defined area.

Existing uses: Those uses actually attained in fresh and marine waters on or after November 28, 1975, whether or not they are designated uses. Introduced species that are not native to Washington, and put-and-take fisheries comprised of nonself-replicating introduced native species, do not need to receive full support as an existing use.

Fecal coliform (FC): That portion of the coliform group of bacteria which is present in intestinal tracts and feces of warm-blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium within 24 hours at 44.5 plus or minus 0.2 degrees Celsius. FC are "indicator" organisms that suggest the possible presence of disease-causing organisms. Concentrations are measured in colony forming units per 100 milliliters of water (cfu/100mL).

Geometric mean: A mathematical expression of the central tendency (an average) of multiple sample values. A geometric mean, unlike an arithmetic mean, tends to dampen the effect of very high or low values, which might bias the mean if a straight average (arithmetic mean) were calculated. This is helpful when analyzing bacteria concentrations, because levels may vary anywhere from ten to 10,000 fold over a given period. The calculation is performed by either: (1) taking the nth root of a product of n factors, or (2) taking the antilogarithm of the arithmetic mean of the logarithms of the individual values.

Load allocation (LA): The portion of a receiving waters' loading capacity attributed to one or more of its existing or future sources of nonpoint pollution or to natural background sources.

Loading capacity: The greatest amount of a substance that a water body can receive and still meet water quality standards.

Margin of safety (MOS): Required component of TMDLs that accounts for uncertainty about the relationship between pollutant loads and quality of the receiving water body.

Municipal separate storm sewer systems (MS4): A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains): (1) owned or operated by a state, city, town, borough, county, parish, district, association, or other public body having jurisdiction over disposal of wastes, storm water, or other wastes and (2) designed or used for collecting or conveying stormwater; (3) which is not a combined sewer; and (4) which is not part of a Publicly Owned Treatment Works (POTW) as defined in the Code of Federal Regulations at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES): National program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements under the Clean Water Act. The NPDES program regulates discharges from wastewater treatment plants, large factories, and other facilities that use, process, and discharge water back into lakes, streams, rivers, bays, and oceans.

Nonpoint source: Pollution that enters any waters of the state from any dispersed land-based or water-based activities, including but not limited to atmospheric deposition, surface water runoff from agricultural lands, urban areas, or forest lands, subsurface or underground sources, or discharges from boats or marine vessels not otherwise regulated under the NPDES program. Generally, any unconfined and diffuse source of contamination. Legally, any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act.

Pathogen: Disease-causing microorganisms such as bacteria, protozoa, viruses.

Phase I stormwater permit: The first phase of stormwater regulation required under the federal Clean Water Act. The permit is issued to medium and large municipal separate storm sewer systems (MS4s) and construction sites of five or more acres.

Phase II stormwater permit: The second phase of stormwater regulation required under the federal Clean Water Act. The permit is issued to smaller municipal separate storm sewer systems (MS4s) and construction sites over one acre.

Point source: Sources of pollution that discharge at a specific location from pipes, outfalls, and conveyance channels to a surface water. Examples of point source discharges include municipal wastewater treatment plants, municipal stormwater systems, industrial waste treatment facilities, and construction sites that clear more than 5 acres of land.

Pollution: Such contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the state. This includes change in temperature, taste, color, turbidity, or odor of the waters. It also includes discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state. This definition assumes that these changes will,

or is likely to, create a nuisance or render such waters harmful, detrimental, or injurious to (1) public health, safety, or welfare, or (2) domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or (3) livestock, wild animals, birds, fish, or other aquatic life.

Primary contact recreation: 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.

Salmonid: Any fish that belong to the family *Salmonidae*. Basically, any species of salmon, trout, or char. www.fws.gov/le/ImpExp/FactSheetSalmonids.htm

Stormwater: The portion of precipitation that does not naturally percolate into the ground or evaporate but instead runs off roads, pavement, and roofs during rainfall or snow melt. Stormwater can also come from hard or saturated grass surfaces such as lawns, pastures, playfields, and from gravel roads and parking lots.

Surface waters of the state: Lakes, rivers, ponds, streams, inland waters, saltwater, wetlands and all other surface waters and water courses within the jurisdiction of the state of Washington.

Total maximum daily load (TMDL): A distribution of a substance in a water body designed to protect it from exceeding water quality standards. A TMDL is equal to the sum of all of the following: 1) individual wasteload allocations (WLAs) for point sources, 2) the load allocations (LAs) for nonpoint sources, 3) the contribution of natural sources, and 4) a margin of safety to allow for uncertainty in the wasteload determination. A reserve for future growth is also generally provided.

Wasteload allocation (WLA): The portion of a receiving water's loading capacity allocated to existing or future point sources of pollution. WLAs constitutes one type of water quality-based effluent limitation.

Watershed: A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

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Appendix B. Wasteload and load allocations

The Hangman Creek TMDL set wasteload and load allocations for fecal coliform bacteria, temperature, and turbidity (total suspended solids –mostly sediment). The tables below show the wasteload and load allocations necessary to meet the water quality standards for these pollutants (Joy et. al, 2009).

Fecal coliform bacteria

Table B1. Fecal coliform wasteload allocations for point sources. *Those discharging to Hangman Creek and its tributaries.**

Point Source	Wasteload Allocation (10^8 cfu/day)[1]	Current Load[2] (10^8 cfu/day)	Target Reduction[3] (percent)
Tekoa WWTP[3]	31	140	78
Fairfield WWTP	18	90	80*
Rockford WWTP	20	47	57*
Freeman School District WWTP	1.6	1.9	16
Spangle WWTP	6.6	2.2	0.0
Cheney WWTP	100	–	0.0
WSDOT Stormwater	NC	NC	72[4]
Spokane County Stormwater	NC	NC	72[4]
City of Spokane Stormwater	NC	NC	72[4]

* According to the most recent monitoring records, the WWTPs are in compliance with these fecal coliform target reductions.

[1] 10^8 cfu/day is 100,000,000 colony forming units per day.

[2] Current load calculated on 2003-2004 data

[3] Target reductions assume the National Pollutant Discharge Elimination System (NPDES) permit has a monthly effluent geometric mean limit of 100 cfu/100 mL and a weekly maximum of 200 cfu/100 mL.

[4]Based on the FC reductions necessary to achieve water quality standards in the lower watershed (phase II permit coverage area) during the critical period.

WWTP is wastewater treatment plant.

NC is not calculated.

WSDOT is Washington State Department of Transportation.

Table B2. Fecal coliform load allocations for Hangman Creek reaches and tributaries.

Reach Name	Load Allocation (10^8 cfu/day)[1]	Current Load (10^8 cfu/day)	Target Reduction (percent)
Hangman Creek at State Line (Road)	5,600	20,000	72
Little Hangman Creek	560	1700	67
Hangman Creek at river mile 53.8[2]	6,200	22,000	72
Hangman Creek at Fairbanks Rd	2,400	5,400	56
Hangman Creek at Spring Valley Rd	2,800	8,000	65
Hangman Creek at Marsh Rd	3,300	4,900	32
Cove Creek	13	60	79
Unnamed tributary at Griffith Rd	3.0	4.1	25
Unnamed tributary at Roberts Rd	1.5	3.0	61
Hangman Creek at Roberts Rd	5,100	7,000	27
Hangman Creek at Bradshaw Rd	6,800	17,000	60
Rattler Run Creek at the mouth[3]	23	150	85
Rattler Run Creek nonpoint	5	60	92
Hangman Creek at Keevy Rd	3,700	17,000	78
Hangman Creek at river mile 21.4	2,900	6,700	56
Rock Creek at the mouth	660	2,200	70
Rock Creek at Jackson Rd	2,400	7,500	68
Rock Creek at Rockford	240	740	67
Spangle Creek at the mouth[3]	8.6	12	28
Spangle Creek nonpoint	2.0	10	80
Hangman Creek at Duncan	7,000	7,800	10
California Creek at the mouth	25	32	23
California Creek at Marsh Rd	7.1	14	49
Marshall Creek at the mouth	8.3	18	54
Marshall Creek at McKenzie Rd	30	30	0.0
Hangman Creek at mouth	230	820	72

[1] 10^8 cfu/day is 100,000,000 colony forming units per day.
[2] River mile is the number of miles upstream from the mouth of Hangman Creek.
[3] Nonpoint load allocations for Spangle and Rattler Run Creeks are the total allowed loads from nonpoint sources. The load allocations at the mouths of these creeks include the nonpoint allocation and the WWTP.

Temperature

Table B3. Temperature Wasteload Allocations. (*As 7-day average daily maximum effluent temperatures) for municipal wastewater treatment plant (WWTP) Discharges*

Facility	September - May	June	July	August
Tekoa WWTP	As calculated by WAC 173-201A-200(1)(c) (i) – (vii)	18.2˚C	21.5˚C	17.7˚C
Spangle WWTP	As calculated by WAC 173-201A-200(1)(c) (i) – (vii)	18.2˚C	21.5˚C	17.7˚C
Rockford WWTP	As calculated by WAC 173-201A-200(1)(c) (i) – (vii)	No discharge	No discharge	No discharge
Fairfield WWTP	As calculated by WAC 173-201A-200(1)(c) (i) – (vii)	No discharge	No discharge	No discharge
Freeman School District WWTP	As calculated by WAC 173-201A-200(1)(c) (i) – (vii)	No discharge	No discharge	No discharge
Cheney WWTP	As calculated by WAC 173-201A-200(1)(c) (i) – (vii)	No discharge	No discharge	No discharge

Table B4. Summary of percent of effective shade required to meet heat load allocations.

Reach Location	Shade Required (percent)
Rattler Run Creek at the mouth	Use Shade Curve
Rock Creek at the mouth	Use Shade Curve
California Creek at the mouth	Use Shade Curve
Marshall Creek at the mouth	Use Shade Curve
Hangman Creek at river mile 3.6	45
Hangman Creek above Marshall Creek	32
Hangman Creek at Hangman Valley Golf Course	28
Hangman Creek at river mile 18.2	34
Hangman Creek at Duncan	34
Hangman Creek at Latah Road	42
Hangman Creek at Keevy Road	37
Hangman Creek at Bradshaw Road	21
Hangman Creek at Hays Road	29
Hangman Creek at Roberts Road	40
Hangman Creek at Spring Valley Road	47
Hangman Creek at Fairbanks Road	48
Hangman Creek above Tekoa WWTP	50

Shade required is the percent of the water surface effectively in shade from the surrounding vegetation.
WWTP is wastewater treatment plant.

Table B5. Hangman Creek individual river kilometer heat load allocations and shade requirements.
By kilometer from the Idaho-Washington border to the mouth.

Distance from upstream segment boundary (Km)	Distance to downstream segment boundary (Km)	Current shade condition (%)	System potential shade	Increase in % shade needed	Landmark river mile station	Load allocation for daily average shortwave solar radiation on August 1 (watts/m2)
1	2	21%	56%	35%		137.5
2	3	27%	67%	40%		102.0
3	4	23%	66%	43%		106.3
4	5	11%	47%	36%		166.7
5	6	18%	59%	41%		128.9
6	7	20%	58%	38%	ID-WA border	131.3
7	8	25%	52%	27%		149.6
8	9	22%	54%	32%		144.4
9	10	22%	54%	32%		143.6
10	11	11%	45%	34%	Tekoa	172.9
11	12	19%	60%	41%	Little Hangman	125.8
12	13	18%	56%	37%	Tekoa	139.1
13	14	26%	68%	42%		100.3
14	15	30%	67%	37%		104.0
15	16	19%	62%	43%		119.8
16	17	14%	43%	29%		179.7
17	18	11%	48%	37%		162.0
18	19	9%	39%	30%		191.0
19	20	17%	50%	33%		155.3
20	21	27%	43%	17%		178.0
21	22	11%	47%	36%		167.0
22	23	18%	49%	31%	Cove Creek	160.4
23	24	15%	44%	29%	Latah	176.5
24	25	11%	46%	34%		170.4
25	26	12%	47%	35%		165.5
26	27	9%	42%	33%		180.7
27	28	9%	39%	30%		189.9
28	29	10%	35%	25%		203.3
29	30	14%	53%	39%		147.8
30	31	7%	21%	14%		247.1
31	32	14%	41%	27%		186.1
32	33	14%	47%	33%		166.5
33	34	7%	25%	17%		236.0
34	35	7%	37%	30%		196.9
35	36	10%	41%	31%		184.7
36	37	4%	24%	20%	Waverly	239.1
37	38	9%	39%	30%		192.1
38	39	7%	21%	14%		247.1
39	40	18%	54%	37%		142.4
40	41	9%	29%	20%		221.6
41	42	11%	45%	33%		173.5

Distance from upstream segment boundary (Km)	Distance to downstream segment boundary (Km)	Current shade condition (%)	System potential shade	Increase in % shade needed	Landmark river mile station	Load allocation for daily average shortwave solar radiation on August 1 (watts/m2)
42	43	7%	33%	26%		209.6
43	44	14%	44%	31%		173.8
44	45	5%	21%	16%	Rattler Run	247.4
45	46	6%	26%	20%		231.4
46	47	7%	31%	24%		214.4
47	48	5%	31%	25%		216.2
48	49	7%	32%	25%		212.2
49	50	12%	33%	21%		209.7
50	51	17%	37%	20%		197.8
51	52	11%	21%	10%		247.5
52	53	22%	29%	7%		221.8
53	54	28%	48%	19%		163.5
54	55	19%	33%	15%		207.9
55	56	20%	37%	17%		196.5
56	57	16%	44%	28%		175.8
57	58	7%	33%	26%		209.3
58	59	9%	39%	29%		190.5
59	60	13%	43%	30%		177.4
60	61	23%	59%	36%		127.3
61	62	16%	42%	26%		180.7
62	63	6%	30%	24%	Latah Road	219.0
63	64	6%	23%	18%		239.3
64	65	10%	23%	13%		240.4
65	66	12%	24%	12%	Rock Creek	236.4
66	67	5%	29%	24%	Spangle Creek	221.9
67	68	13%	34%	21%	Duncan Road	206.6
68	69	10%	34%	24%	California Creek	206.3
69	70	17%	35%	18%		203.3
70	71	8%	35%	27%		202.7
71	72	16%	50%	34%		156.4
72	73	13%	38%	25%		194.6
73	74	14%	31%	17%		215.1
74	75	14%	45%	30%		172.0
75	76	7%	28%	21%		225.2
76	77	11%	29%	18%	Hangman Val. GC	222.1
77	78	9%	34%	26%		204.3
78	79	7%	21%	14%		245.9
79	80	9%	22%	13%		243.9
80	81	14%	38%	23%		193.4
81	82	7%	28%	21%		223.1
82	83	16%	41%	24%		184.1
83	84	12%	33%	21%		207.2

Distance from upstream segment boundary (Km)	Distance to downstream segment boundary (Km)	Current shade condition (%)	System potential shade	Increase in % shade needed	Landmark river mile station	Load allocation for daily average shortwave solar radiation on August 1 (watts/m2)
84	85	13%	39%	27%		188.7
85	86	6%	23%	18%		239.1
86	87	26%	37%	11%		195.9
87	88	27%	42%	15%		180.5
88	89	9%	39%	29%		191.2
89	90	11%	24%	13%		237.2
90	91	14%	32%	18%	Marshall Creek	212.4
91	92	26%	45%	19%		171.8
92	93	19%	50%	32%		154.3
93	94	23%	56%	33%		136.0
94	95	18%	56%	38%		136.9
95	96	19%	48%	29%	USGS Gage	161.9
96	97	22%	31%	10%		213.0
97	97.6	6%	14%	7%		268.6

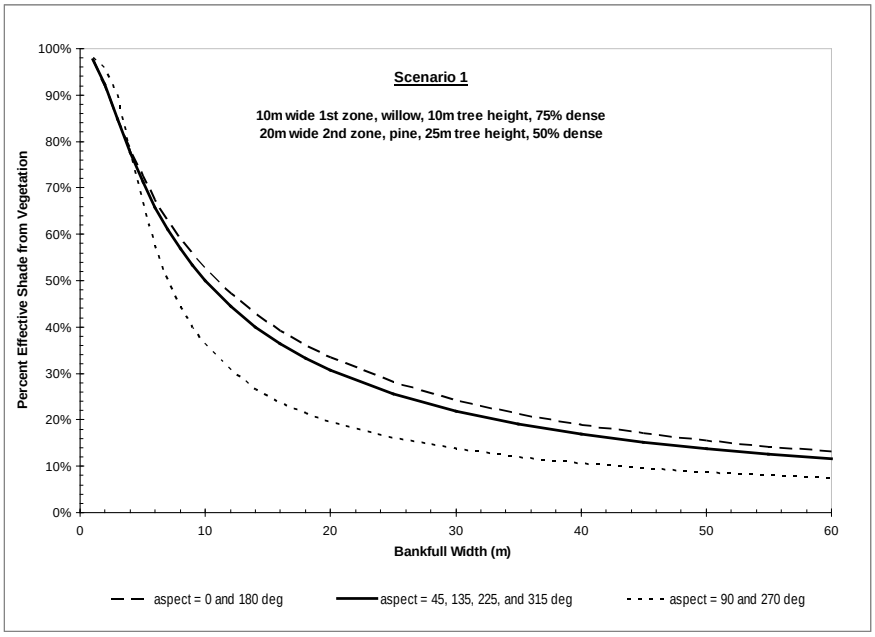

Figure B1. Shade curve constructed for sites in the Hangman Creek watershed. *Based on system potential vegetation maximum heights and stream orientation (aspect) to sunlight in August. (A stream that runs north and south has an aspect of 0 an 180 degrees).*

Turbidity (total suspended solids)

Table B6. Total suspended solids load allocations. *For geographic sub-basins and 303(d) listed stream segments.*

	Sub-basin	303(d) listed segment	Estimated % reduction	
			Basin	303(d)
Hangman Creek	Upper Hangman Creek	Hangman Creek at Bradshaw Road (ID 40942)	26%	19%
	Hangman Creek from Tekoa to Bradshaw Rd		16%	
	Hangman Creek from Bradshaw Rd to Duncan		15%	n/a
	Lower Hangman Creek		11%	
Tributaries	Little Hangman Creek	Little Hangman Creek (ID 40940)	16%	15%
	Rattler Run Creek	Rattler Run Creek (ID 40941)	15%	15%
	Rock Creek	Rock Creek at Jackson Road (40943)	18%	17%
	Marshall Creek		8%	n/a

n/a – there are no 303(d) listed segments in this geographic area.

Table B7. TSS load allocation compliance points approved by EPA as TMDLs.

Location	Section Township Range	Compliance Reasoning
Hangman Creek (Stateline Road)	Section 29 T20N R45E	Sub-basin % reduction
Hangman Creek (Bradshaw Road)	Section 16 T22N R44E	Stream location % reduction
Hangman Creek (Duncan Road)	Section 11 T23N R43E	Sub-basin % reduction
Hangman Creek (mouth)	Section 24 T25N R42E	Sub-basin % reduction
Little Hangman Creek (mouth)	Section 13 T20N R45E	Stream location % reduction
Cove Creek (mouth)	Section 30 T21N R45E	Sub-basin % reduction
Rattler Run Creek (mouth)	Section 16 T22N R44E	Stream location % reduction
Rock Creek (mouth)	Section 12 T23N R43E	Stream location % reduction
Cottonwood Creek (mouth)	Section 10 T23N R44E	Sub-basin % reduction & priority trout habitat
Spangle Creek (mouth)	Section 11 T23N R43E	Sub-basin % reduction
California Creek (mouth)	Section 03 T23N R43E	Sub-basin % reduction & priority trout habitat
Stevens Creek (mouth)	Section 28 T24N R43E	Sub-basin % reduction & priority trout habitat
Marshall Creek (mouth)	Section 01 T24N R42E	Stream location % reduction & priority trout habitat
Garden Springs (mouth)	Section 24 T25N R42E	Sub-basin % reduction & priority trout habitat

Sub-basin % reduction is a compliance point based on reducing TSS throughout a geographic sub-basin.
Stream location % reduction is a compliance point where a reduction was assigned at a specific location in a stream.
Priority trout habitats are locations that require TSS Severity Scores below 4 during spawning periods or that result in healthy fish and benthic invertebrate populations, and habitat to support these populations.

Table B8. Total suspended solids wasteload allocations for the Hangman Creek watershed.

Source	Permit Requirements		WLA
	Average Monthly Limit	Average Weekly Limit	
Tekoa WWTP	30 mg/L, 34.5 lbs/day	45 mg/L, 51.7 lbs/day	same
Fairfield WWTP	15 mg/L, 29.0 lbs/day	23 mg/L, 44.5 lbs/day	same
Spangle WWTP	15 mg/L, 8.5 lbs/day	23 mg/L, 12.8 lbs/day	same
Rockford WWTP	30 mg/L	45 mg/L	same
Freeman School District #358	20 mg/L, 7.2 lbs/day	30 mg/L, 10.8 lbs/day	same
Cheney WWTP	15 mg/L, 338 lbs/day	23 mg/L, 507 lbs/day	same
Industrial Facility Stormwater[1]	27 mg/L	88 mg/L[2]	same
Spokane County Stormwater	All known and reasonable treatment		80% reduction[3]
city of Spokane Stormwater	All known and reasonable treatment		80% reduction[3]
Washington Department of Transportation Stormwater	All known and reasonable treatment		80% reduction[3]
Construction Site Stormwater[4]	All necessary best management practices Turbidity Benchmark: 25NTU Background and discharge sampling required Turbidity Limit: 5 NTU over background or when background is over 50 NTU less than a 10% increase over background		same

[1]No permitted industrial facilities currently exist in the watershed.

[2] Limit is a maximum daily (not average weekly).

[3]Best management practices estimate 80% removal of TSS from stormwater sources (Ecology, 2004).

[4] Construction stormwater NPDES permit regulates turbidity but does not regulate TSS.

Appendix C. Barriers and benefits to implementation activities

For each of the issues identified for inclusion in the TMDL, the current practice(s) and the implementation activities (BMPs) to improve water quality were identified. Along with the desired practices, both costs and benefits for continuing the current practices, and costs and benefits for changing to the desired practices were evaluated. The costs and benefit summary provides an overview from the local stakeholders of how implementation could affect them. The costs identified are not just financial. They include other costs, such as costs in time; loss productivity; increased maintenance; water quality violations; and increased pollution. These barriers should be taken into consideration and planned for during implementation to ensure each activities success.

General benefits common to most desired practices were identified as:
Improves water quality.
Decrease any penalties associated with water quality violations.
It is the right thing to do, may influence neighbors.

General costs or barriers common to most desired practices were identified as:
Cost more money.
Inconvenience, need more equipment or infrastructure.
Increased maintenance.
Takes land out of production.

General benefits common to most current practices were identified as:
Easy, convenient.
Costs less, cheaper.
No government interference.
More land in production, especially for leased land.

General costs or barriers common to most current practices were identified as:
Possible fines, enforcement actions.
Future regulations.
Contributing to pollution.
Missing opportunities for financial assistance.

Implementation activities
The issue list, along with the benefits and costs, follows. For each water quality issue evaluated by the advisory group, implementation activities (BMPs) were proposed for each issue. Along with each issue and BMP, the targeted water quality parameter and potential problems to implement the BMP were identified. The BMPs, parameters addressed, and the potential problems for implementing the BMPs are detailed below.

Issue 1: Sediment/nutrients from agricultural operations

BMP	Parameters Addressed	Potential Problems to Implement BMP
No Till/ Minimum Till	Sediment, Nutrients Turbidity	Equipment change, change in farm plans and practices, owner vs. leaser, initial decrease in yields, increase in chemical use, colder soil temperature, fields stay wetter.
Riparian Buffers	Sediment, Nutrients, Temperature, DO	Loss of highly productive land, harder to farm, weeds, costs in time and money to establish, potential wildlife fecal inputs.
Sediment Basins	Sediment, Nutrients	Cost to install, have to be able to farm around, may need to clean out, small loss of farmland.
Grassed Waterway	Sediment Nutrients	Hay usually produces less return than other crops, maintenance, limited habitat, establishment time can be long.
Filter Strips	Sediment Nutrients Temperature	Reduces farmable land, weed problems, requires maintenance.
Divided Slopes	Sediment Nutrients	Harder to farm, may not work with all crops, increased turning time, pesticide and herbicide application harder.

Issue 2: Sediment/fecal from livestock and wildlife

BMP	Parameters Addressed	Potential Problems to Implement BMP
Riparian Buffer	Sediment Nutrients Fecal coliform	Requires new water access or source, more maintenance, weed problems.
Livestock Fencing	Sediment Nutrients Fecal coliform	Requires new water access or source, more maintenance, potential problem during high water events.
Manure Retention Facilities	Nutrients Fecal coliform	Initial costs, requires truck access and space may be a problem.
Off-Creek Watering	Sediment Nutrients Fecal coliform	Need year round water source, may need numerous sources if lots of livestock, maintenance.
Intensive Management Grazing	Sediment Nutrients Fecal coliform	Requires more land.
Nutrient/fecal Management	Sediment Nutrients Fecal coliform	Requires soil testing, may require more equipment.

Issue 3: Nutrients/Chemicals from Residential uses

BMP	Parameters Addressed	Potential Problems to Implement BMP
Fertilizer Management	Nutrient	Need better education at local level.
Septic Maintenance	Nutrients Fecal coliform	Increased maintenance costs.
Pet waste Management	Nutrients Fecal coliform	Need to have bags along when walking pets, need a place to put waste.
Proper Household Chemical Use and Disposal	Chemicals Nutrients	Need local recycle centers where hazardous household waste can be taken.
Proper Pesticide/ Herbicide Use and Disposal	Chemicals Nutrients	Need local recycle centers where hazardous household waste can be taken.
No Lawn Clipping Dumping in Streams	Chemicals Nutrients	Need another way to compost or dispose of yard waste.
Follow Shoreline Management	Sediment Chemicals Nutrients	Less access to the water, loss of view, weed problems.

Issue 4: Sediment from agricultural field ditches

BMP	Parameters Addressed	Potential Problems to Implement BMP
Uphill Plowing	Sediment Nutrients	Uses more fuel, harder to plow.
Ditch Maintenance	Sediment Nutrients	Increased time and costs.
Proper Construction/ Engineering	Sediment Nutrients	Dependent on upstream land uses remaining the same over time, may require assistance from NRCS or conservation district.
Grassed Waterway Conversion	Sediment Nutrients	Could take more land out of primary production.

Issue 5: Nutrients/fecal from Improper Functioning Septic Systems

BMP	Parameters Addressed	Potential Problems to Implement BMP
Educate on the negative effects of garbage disposals	Fecal coliform Chemicals Nutrients	Desired in kitchens, may already exist
Have system inspections every 1-3 year	Fecal coliform Chemicals Nutrients	Cost of inspection/pumping done on a regular basis. Need to target older systems near streams
Take roof drains out of system/away from drainfield	Fecal coliform Chemicals Nutrients	May not have a good area to drain roof system to
Educate about proper items to go into systems	Fecal coliform Chemicals Nutrients	Reaching people with septic systems, not enough places for disposal of household hazardous wastes
Comment on new developments through SEPA	Fecal coliform Chemicals Nutrients	SCCD may not be on all lists for review. Public may not be aware of opportunity to comment
Replace or repair failing systems	Fecal coliform Chemicals Nutrients	High cost, many people may not know systems need to be replaced

Issue 6: Sediment from Gravel and Summer Roads

BMP	Parameters Addressed	Potential Problems to Implement BMP
Pave Roads	Sediment	Initial cost to pave and maintenance.
Close Roads in Winter	Sediment	Less access to fields, may require gates on roads, more maintenance.
Increased Grading & graveling	Sediment	Increased costs for the county.

Issue 7: Sediment from Sheer or Undercut Banks

BMP	Parameters Addressed	Potential Problems to Implement BMP
Live Plantings	Sediment Erosion Temperature	Not an instant fix, may need time to fully develop, requires maintenance.
Reshape Bank and Plantings	Sediment Erosion Temperature	Increased cost, must remove cut bank material from floodplain, erosion potential for first few years, loss of land.
Engineered Structures	Sediment Erosion	Provides less habitat, cost more to install, need permits.

Issue 8: Sediment from Storm Water

BMP	Parameters Addressed	Potential Problems to Implement BMP
Road Runoff to Basin	Sediment Chemicals	Increased cost, increase land use near roads, maintenance of ditches

Issue 9: Forestry Management

BMP	Parameters Addressed	Potential Problems to Implement BMP
Selective Harvest	Sediment	Less income, need skilled logger, may be topography dependent.
Stream Crossings	Sediment	Cost more, may have to remove after completion.
Streamside Management Zones	Sediment Temperature	Fewer trees available for logging, harder to remove logs.
Proper Road Planning & Construction	Sediment	May take longer to plan, could increase road costs.

Issue 10: Sediment from Roadside Ditching

BMP	Parameters Addressed	Potential Problems to Implement BMP
Design Vegetated Ditches	Sediment Chemicals	Weeds, may need maintenance of vegetation, may need more space to install, some engineering required.
Install Detention Basins	Sediment Chemicals	Weeds, may need maintenance, some engineering required.

Issue 11: Solar Heating from lack of Riparian Shade

BMP	Parameters Addressed	Potential Problems to Implement BMP
Riparian Buffers	Sediment, Nutrients, Temperature, DO	Loss of highly productive land, harder to farm, weeds, costs in time and money to establish, potential wildlife fecal inputs.
Live Plantings	Sediment Erosion Temperature	Not an instant fix, may need time to fully develop, requires maintenance.
Reshape Bank and Plantings	Sediment Erosion Temperature	Increased cost, must remove cut bank material from floodplain, erosion potential for first few years, loss of land.

Appendix D. Response to comments

A public comment period on the draft version of this Implementation Plan for the Hangman Creek Fecal Coliform Bacteria, Temperature, and Turbidity TMDL was held from February 15 to March 18, 2011. A press release announced the comment period and a display ad was placed in the February 15, 2011 edition of the Spokesman Review newspaper. Letters announcing the comment period were sent to the Hangman Creek Watershed mailing list maintained by the Eastern Regional Office's Water Quality Program.

Below are the comments received and Ecology's responses. Please note that the page numbers referred to in the comments refer to the original draft publication published February 2011; due to edits and formatting changes they may not match the page number in this final publication.

Comment from Sergio Hernandez, Superintendent, Freeman School District

My official comment on the Hangman Creek TMDL plan is very simple.

Please….if the plan calls for the Freeman School District to make changes for our current operations….we must have funding from the state. We are cutting teaching positions next year…..and cannot have any more unfunded mandates. Thanks.

Response: This implementation plan does not call for any additional measures beyond the original TMDL approved in 2009. For the Freeman School District wastewater treatment plant (WWTP), the TMDL indicated the existing limits for fecal coliform bacteria and turbidity are adequate to protect water quality. To protect in-stream water temperatures, the TMDL specified the WWTP could not discharge during June, July, and August.

While this TMDL did not result in significant changes for most of the WWTPs in the watershed, future efforts to address low dissolved oxygen and pH problems could result in limits on nutrients like nitrogen and phosphorus. Please be sure to address potential, future requirements and any concerns you have with your permit manager at Ecology.

Comments from Barbara Scaroni, Citizen, Tekoa, Washington

I am writing this letter to comment on the Hangman (Latah) Creek Watershed Fecal Coliform, Bacteria, Temperature, and Turbidity Total Maximum Daily Load Water Quality Implementation Plan. My name is Barbara Scaroni. I have resided within the Hangman Creek Watershed, in Tekoa, Washington for the last 17 years, and I work on the Coeur d'Alene Reservation as a Tribal forester. These comments are only those of a private citizen of the State of Washington, and do not represent in any way those of the Tribe. I have reviewed the document online, and wish to express my appreciation to all those involved in creating it. This beautiful watershed deserves to be more than what it currently is. It has bothered me to watch the years go by and see so little improvement in water quality, and I am so glad that you are addressing it at this time.

There is no question in my mind that erosion and runoff from the agricultural land is the biggest contributor to the sediment laden creek waters. I would urge you to not let anything stand in your way of improving this situation. As a forester, we are required by law to protect riparian zones through the use of buffer strips or riparian management zones. It is a constant frustration to me to see streams originating in the forest land that are protected by buffer strips that after entering the agricultural lands, these streams are either plowed through, or up to the edge. It would take so little to do so much for water quality. It is almost like the Emperor's New Clothes. No one seems to acknowledge that these fields are killing water quality. People say that the size of the farm lobby building in Washington DC is the size of a football field. However, these are not bad people. We all want clean water. I would suggest that whatever can be done to **insist and require** that filter strips, riparian plantings, and streamside fencing with offsite watering be done. Make it illegal to pollute the water through these farm practices. In the forestry world, there are trees that go unharvested because of their location near a stream. In the farm world, there will be acres that could be producing crops, that need to be in filter strips and riparian management zones. It is not okay for these lands to be polluting our water because we avert our eyes. As a citizen of Washington, I request that you move forward, and rock the boat to address these issues.

Again, I really like what you have done in this document, and wish you success in the implementation phase. Let me know if I can be of any help.

Response: Our streams and lakes belong to all citizens of the state; therefore, it's important that agencies and governments regulating water quality and land uses hear the concerns of citizens like you.

Streamside buffer requirements are set by local county and city jurisdictions under their Shoreline Master Programs (SMPs). SMPs are reviewed and approved by Ecology to ensure they meet the requirements of the Shoreline Management Act established in 1972. However, when SMPs are updated the new requirements do not apply retroactively to existing agricultural development. Updated shoreline requirements do apply to new agricultural activities or shorelines where agricultural activities are converted to other uses. To learn more about SMPs please visit our citizen's guide at: www.ecy.wa.gov/programs/sea/shorelines/smp/citizen.html.

The state's clean water law, codified in the Revised Code of Washington 90.48, regulates water pollution, and makes it illegal for any person or entity to discharge any matter into a water body that causes pollution. Point sources (usually entities with a pipe that discharge treated water to a water body) are required to have a permit that limits what can be in the discharge. However, nonpoint sources (pollution we all create that runs off the ground when it rains or snows) are harder to regulate because they occur everywhere and are difficult to trace. When Ecology staff observe a nonpoint source discharge that can be linked to an individual source, the responsible party is contacted and required to address the problem. Since many of these sources are not observed directly by Ecology, we rely on citizens and businesses to report nonpoint source discharges to water ways. In Eastern Washington, complaints can be made by calling 509-329-3400. More information about reporting water quality or other environmental problems can be found at: www.ecy.wa.gov/reportaproblem.html.

Fortunately, there is much interest in addressing water quality problems in the Hangman Creek Watershed. The Spokane County Conservation District and Ecology recently sought funding from the Natural Resources Conservation Service (NRCS) to assist agricultural producers to convert to direct seed tillage practices, establish buffers, and provide off-stream water and fencing for livestock, and other best management practices to protect water quality. NRCS awarded funding through the Agricultural Watershed Enhancement Program specifically to address agricultural related water quality problems in the Hangman Creek watershed. There are also several Ecology funded grants to help pay for agricultural best management practices that result in water quality protection.

Thank you for your support and compliments.

Comments from Kenneth Stone, Resource Programs Branch Manager, Washington State Department of Transportation

Comment 1: Page 5, first paragraph: "To address these nonpoint sources, the advisory committee developed a list of best management practices (BMPs) for each of the water quality issues identified which was included in the TMDL implementation strategy."

Comment: Suggest listing the BMPs that the advisory committee developed or citing where the list can be found (Table 5) for clarity.

Response 1: A reference to Table 5 was added to this sentence.

Comment 2: Page 9, second paragraph, "The Washington State Department of Transportation (WSDOT) also has a statewide stormwater permit that applies to state routes, interstates, and facilities within the Phase 1 and Phase 2 areas and watersheds with approved TMDLs."

Comment: Suggest revising this sentence to be more consistent with the permit coverage language, Sl.B.l & 2; "The Washington State Department of Transportation (WSDOT) also has a statewide stormwater permit that regulates stormwater discharges from state highways and related facilities contributing to discharges from separate storm sewers owned or operated by WSDOT within the Phase I and II designated boundaries. WSDOT's permit also covers stormwater discharges to any water body in Washington State for which there is a U.S. Environmental Protection Agency (EPA) approved TMDL with load allocations and associated implementation documents specifying actions for WSDOT stormwater discharges (applicable TMDLs listed in Appendix 3 of the WSDOT permit)."

Response 2: Language was modified to address your comment.

Comment 3: Page 13, sixth paragraph: "Highway 195 has had significant hydraulic effects in the northern physiographic province of the watershed. Several changes to the stream length, vegetation, and meanders have reduced the dissipation of stream energy and increased erosion along this reach of Hangman Creek."

Comment: This sentence is written as a statement of fact and the use of the word "significant" infers statistical quantification. Statements of this type require a citation or reference as it is unclear how or where this statement originated. If no statistic analysis was done on this stream reach, wording more appropriate for a qualitative assessment should be used. The wording "reduced the dissipation of stream energy" is similar to a double negative and has potential to cause confusion in some readers. Suggest replacing these words with "increased stream energy".

Response 3: This paragraph was edited as suggested.

Comment 4: Page 18, last paragraph: "Many BMPs exist to reduce sediment and fecal coliform bacteria transport to streams via stormwater."

Comment: Ecology has no approved or designated storm water BMPs for bacteria treatment in their stormwater manuals, nor does WSDOT in the Highway Runoff Manual. In order to have a clear understanding regarding expectations and compliance pathways, a list of Ecology-approved BMPs should be added to Ecology's Stormwater Management Manual, or this document, that are considered sufficient to "reduce ... fecal coliform bacteria transport to streams via stormwater."

Response 4: The sentence referenced in your comments states there are BMPs for reducing the transport of bacteria via stormwater rather than suggesting treatment for bacteria. Examples of BMPs to reduce stormwater (that may transport sediment and bacteria) include water dispersion into vegetated areas; infiltration via trenches; bioretention or rain gardens; soil amendments for lawn and landscaped areas; permeable paving; and other methods described in the Low Impact Development (LID) Manual for the Puget Sound Basin. LID principles and management practices in this manual are readily applied in Eastern Washington and many are usable in a highway setting. Language regarding ways to reduce stormwater delivery of these pollutants has been added following the referenced paragraph.

Comment 5: Page 23, fourth paragraph, last sentence: "The best possible treatment of storm water in ditch and collection systems should be applied to reduce bacteria delivery from contaminated runoff.

Comment: Refer to comment 4.

Response 5: See response 4.

Comment 6: Page 37, last paragraph.

Comment: Suggest adding the following sentences prior to listing WSDOT's action items: "Ecology did not directly measure WSDOT stormwater outfalls during the TMDL study; but it is reasonable to assume that WSDOT stormwater is a source or a conveyance of fecal coliform in areas were adjacent land uses are a recognized source of this bacteria. While WSDOT can be the source of bacteria in some locations, there is greater likelihood that the source of fecal coliform bacteria at a WSDOT outfall (if measured) comes from adjacent private property via an illicit discharge or illegal connection. With this understanding, there are multiple WSDOT highways

within the study area that have the potential to discharge stormwater containing fecal coliform bacteria."

Response 6: Ecology modified your suggested language, including incorporating sediment into it, and added it to the Implementation Plan. It is reasonable to assume that WSDOT stormwater could be a source of both bacteria and sediment.

Comment 7: Page 38, first paragraph: "WSDOT will inventory highway discharge locations within the Hangman Creek fecal coliform bacteria, temperature and turbidity TMDL boundary. The inventory will include the identification of illicit bacteria and sediment discharges to WSDOT's conveyance system."

Comment: For clarity and due to overlapping responsibilities in Phase II permit coverage areas in regard to mapping and IDDE, I suggest adding the underlined text to this paragraph, "WSDOT will inventory highway stormwater discharge locations within its right-of-way inside the Hangman Creek fecal coliform bacteria, temperature and turbidity TMDL boundary. The inventory will include the identification of illicit bacteria and sediment discharges to WSDOT's stormwater conveyance system. WSDOT will coordinate with Phase II municipalities to acquire stormwater discharge point data and IDDE information within municipal boundaries."

Response 7: Suggestions were added to this paragraph as requested.

Comment 8: Page 38, last paragraph: "To address fecal coliform bacteria WSDOT will implement source identification for fecal coliform within the Hangman Creek TMDL boundary. If discharges that transport bacteria to the streams are found, WSDOT will apply BMPs from their SWMPP or perform remediation to correct the situation. If source identification reveals this area has significant WSDOT related contributions, WSDOT's fecal coliform programmatic approach (currently under development) may be applied where highways discharge to a water body within the TMDL boundary."

Comment: Suggest the following revisions, "To address fecal coliform bacteria WSDOT will implement source identification for fecal coliform within its right-of-way in the Hangman Creek TMDL boundary. I f discharges that transport bacteria to the streams are found, WSDOT will apply BMPs from their SWMPP or perform remediation to correct the situation. ~~If source identification reveals this area has significant WSDOT related contributions, WSDOT's fecal coliform programmatic approach (currently under development) may be applied where highways discharge to a water body within the TMDL Boundary."~~

In order to responsibly expend resources WSDOT has had to make a distinction in regard to TMDL implementation criteria based on whether highway stormwater data was collected (or other actionable information exists) as part of the TMDL study or not. WSDOT's fecal coliform programmatic approach (currently under development) will only be fully implemented for TMDLs where WSDOT stormwater data was collected and WSDOT has been identified as a contributor of the pollutant of concern. This TMDL study did not include sampling of WSDOT stormwater.

Response 8: The "right-of-way" designation was added to this paragraph. Since the language regarding the programmatic approach is not required and will only potentially be triggered ("may be applied") by findings of significant WSDOT contributions, it was left in place. If WSDOT's inventory and/or sampling found significant loadings it would be similar to the TMDL study finding WSDOT as a contributor of the pollutant of concern. Therefore, it would be appropriate under these circumstances to determine if the programmatic approach should be applied.

Comment 9: Page 39, Table 6.

Comment: Suggest updating this table based on the proposed revisions in comments 7 and 8 above. This includes adding the underlined language proposed in comment 7 and deleting the last row of the table based on comment 8.

Response 9: The table was updated to reflect changes in the text. The last row of the table was clarified to avoid misinterpretation of the requirements for this action.

Comment 10: Page 42, last sentence: "Additional monitoring may be necessary to better isolate the bacteria sources so that new BMPs can be designed and implemented to address all sources of bacteria to the streams."

Comment: Refer to comment 4.

Response 10: Please see response 4.

Comment 11: WSDOT stormwater was not sampled during the TMDL study, therefore, the percent reductions assigned to WSDOT (contained in Appendix B) are presumptive and without basis. We do support the adaptive management feedback loop process (Figure 6) which focuses on actions to address problems and Ecology's TMDL effectiveness monitoring to evaluate whether the assigned actions are effectively meeting the TMDL goals.

WSDOT has not performed a QA/QC check on the water quality or flow data presented in this report, nor have we re-computed the math behind derived values, and reserve the right to make corrections if errors are found at a later date.

Response 11: Fecal coliform bacteria and sediment wasteload allocations (WLAs) were set in the original TMDL report (Joy et. al, 2009) not in this implementation plan. They are only included in the Appendix for reference. While the WLAs may be presumptive they were assigned based on the data available and accepted knowledge of sediment reductions that can be achieved through stormwater best management practices. Please refer to the original TMDL for information on how the WLAs were determined. See pages 93-94 for explanation of the bacteria WLA and pages 144–146 for explanations of the sediment WLA.

Comments from Lars Hendron, Principal Engineer-Wastewater Management, City of Spokane

Comment 1: Fecal Coliform WLA and BMPs (p. 18 at Issue 8; p. 23 at Fecal Coliform Bacteria; p. 26 at "City of Spokane;" p. 63 at Table B-1)

The City feels that the effectiveness of the referenced BMPs is overstated in regard to reducing fecal coliform bacteria. Disinfection is likely required to achieve fresh water standards.

Response 1: Language has been added to the description of Issue 8 to provide clarity on the types of activities that can help address fecal coliform bacteria in stormwater. Ecology does not typically recommend disinfection of stormwater. Instead efforts should be put into reducing runoff through methods like infiltration or addressing sources to prevent bacteria from getting into stormwater.

Comment 2: Total Suspended Solids WLA and BMPs (p. 18 at Issue 8; p. 13 re: watershed features; p. 23 at Fecal Coliform Bacteria; p. 26 at "City of Spokane;" p. 70 at Table B-7)

While bio-infiltration swales provide substantial TSS removal by capturing the first ½ inch of rain, reliably reducing TSS via BMPs in every instance may overstate their effectiveness. Particularly in the winter and spring when the TMDL indicates sediment BMPs will be more effective, swales may be temporarily ineffective from being frozen or blocked by snow or ice.

Response 2: If activities undertaken as part of this Implementation Plan are ineffective at bringing the streams into compliance with water quality standards and the goals of the TMDL, adaptive management will be applied.

Comment 3: Compliance Date (pp. 26 and 41)

We note that the TMDL requires the City's stormwater system to meet wasteload allocations for fecal coliform and TSS by 2025 if Hangman Creek does not meet water quality standards at that time.

Response 3: The language under “Adaptive Management” has been revised since the 1st sentence of the 2nd paragraph in the draft Implementation Plan was misleading. The date for compliance did not specify the different dates estimated for each parameter addressed by the TMDL.

Any compliance dates for the city of Spokane under the Municipal NPDES Stormwater Permit will be included in a future issuance of the permit and are not specified in the TMDL. The dates in Table 7 are the estimated dates for when certain water quality milestones should observed in-stream; they are not dates related to permit compliance.

Comment 4: p. 22 at Issue 8 in Table 5- in third column, please add "... Stormwater Manual or approved equivalent" since we use the Ecology-approved Spokane Regional Stormwater Manual, which references Ecology's manual.

Response 4: Suggested language added.

Comment 5: p. 23, regarding septic systems, the mobile home park between HWY 195 and Hangman Creek at the Cheney-Spokane Road may be a source of fecal coliform, without pooling on the surface.

Response 5: The language in this section prioritizes sources to address. Since the TMDL found that most bacteria standards violations occurred during stormwater and runoff events, this language prioritizes addressing sources where bacteria could be washed into a waterway. Issue 5 under "Activities to address pollution sources" addresses septic systems that may be a source of fecal coliform through groundwater transport and straight pipe discharges.

Please note that this mobile home park and its associated septic systems will be decommissioned according to Department of Health regulations, if the WSDOT US 195 Safety Corridor project is completed as planned.

Comment 6: p. 27, re: CSO- the CSO 19 upgrade was completed on schedule in 2010.

Response 6: This language was revised to reflect the completion of this upgrade.

Comment 7: p. 52, 2nd paragraph under "Other Monitoring" - "gagging" should be "gaging" or "gauging"

Response 7: This typo has been corrected.