

SANDY RIVER WATERSHED
TOTAL MAXIMUM DAILY LOAD
IMPLEMENTATION PLAN

Clackamas County and
Clackamas County Service District No. 1

March 25, 2008



SANDY RIVER WATERSHED TOTAL MAXIMUM DAILY LOAD IMPLEMENTATION PLAN

Prepared for

Clackamas County
and
Clackamas County Service District No. 1

March 25, 2008

This is a draft report that may be updated prior to finalization.

BROWN AND CALDWELL

6500 SW Macadam Avenue, Suite 200
Portland, Oregon 97239

TABLE OF CONTENTS

LIST OF TABLES ii

LIST OF FIGURES ii

SECTION A OVERVIEW

Chapter

1. Introduction 1

2. Clackamas County Surface Water Overview 2

 2.1 Watersheds 2

 2.2 Organizational Summary 5

 2.3 Surface Water Responsibilities 5

3. TMDL Parameters and Allocations 9

 3.1 Temperature 9

 3.2 *E. Coli* 9

4. Goals and Objectives of Plan 10

SECTION B POLLUTANT REDUCTION AND MANAGEMENT STRATEGIES

Chapter

5. Potential Sources of Pollutants 11

6. TMDL Implementation Responsibilities 13

7. Clackamas County Water Quality Programs and Activities 17

 7.1 Development Regulations and Watershed Protection Regulations 17

 7.2 Public Involvement and Education 23

 7.3 Pet Waste Management 26

 7.4 Septic System Management 27

 7.5 Illegal Dumping Management 28

 7.6 Dead Animal Management 29

 7.7 Spill Response and Illicit Discharge and Detection Elimination 30

 7.8 Sandy River Basin Watershed Council Involvement 31

SECTION C IMPLEMENTATION

Chapter

8. Temperature TMDL Implementation 33

 8.1 Matrix of Management Strategies 33

 8.2 Barriers to Implementation 33

8.3	Implementation Monitoring, Annual Status Reports, and Evaluation Reports	33
8.4	Effectiveness Monitoring.....	35
8.5	Timeline	35
9.	<i>E. coli</i> (Bacteria) TMDL Implementation	37
9.1	Matrix of Management Strategies.....	37
9.2	Barriers to Implementation.....	37
9.3	Implementation Monitoring, Annual Status Reports, and Evaluation Reports	41
9.4	Effectiveness Monitoring.....	41
9.5	Timeline	41
10.	Review and Revision of Plan	43
11.	Statewide Land Use Requirements	43
12.	Citation of Legal Authority.....	43

LIST OF TABLES

Table 1. Clackamas County Watersheds	2
Table 2. County and Service District Responsibilities	5
Table 3. Management Strategies Matrix for Temperature.....	34
Table 4. Management Strategies Matrix for Bacteria	38

LIST OF FIGURES

Figure 1. Major Watersheds of Clackamas County.....	3
Figure 2. Sandy River Watershed Areas.....	4
Figure 3. NPDES MS4 Permit Boundaries in Clackamas County.....	7
Figure 4. Land Use Types of the Sandy River Watershed.....	15
Figure 5. River and Stream Setbacks of the Sandy River Watershed.....	19
Figure 6. River and Stream Setbacks of the Sandy River Watershed in CCSD#1.....	20
Figure 7. Cedar Creek Watershed	39
Figure 8. Cedar Creek Watershed	40

SECTION A

OVERVIEW

1. Introduction

The federal Clean Water Act, section 303, requires states to develop water quality standards to support beneficial of public water bodies. Where water quality standards are not being met, the water body or the appropriate reach is listed on the 303(d) list of water quality limited water bodies for that parameter. The State of Oregon, through the Oregon Department of Environmental Quality (DEQ), is required to develop Total Maximum Daily Loads (TMDLs) to determine how to meet water quality standard for that parameter.

The TMDL process begins when a stream, lake, or river does not meet water quality standards and is classified as water quality-limited on the state's 303(d) list. TMDLs identify the maximum amount of a specific pollutant that can be present in a water body without violating water quality standards. This is known as the loading capacity. After extensive water quality monitoring and modeling efforts, TMDLs establish the difference between the loading capacity and the current pollutant load. TMDLs are expressed as numeric standards or percent pollutant reductions that need to be met to bring water bodies into compliance with water quality standards. The difference between the current load and the loading capacity is known as excess load (DEQ, 2004). The excess load is split up between the different sources of pollution according to their contribution to the overall pollution load. Any difference between the waterway's loading capacity and the current pollutant load must be mitigated by pollution reduction activities. The DEQ develops wasteload allocations for point sources such as wastewater treatment plants and industrial discharges, and load allocations for non-point pollution from agricultural, urban, and forestry lands such as erosion, animal wastes, and stormwater.

Oregon Administrative Rule (OAR) 340-042-0025) addresses TMDLs and requires local governments and other agencies to develop TMDL Implementation Plans.

Responsible parties that are able to implement pollution reduction strategies are classified as Designated Management Agencies (DMAs). In the Willamette Basin, DMAs include federal agencies such as the Bureau of Land Management, state agencies such as the Department of Forestry and the Department of Agriculture, counties, cities, and others. According to OAR 340-042-0025, TMDL Implementation Plans must include the following five elements:

1. Management strategies that will be used to achieve load allocations
2. A timeline and schedule to achieve measurable milestones
3. A plan for periodic review and revision of the implementation plan
4. Evidence of compliance with applicable statewide land use requirements
5. Any other analyses or information as specified in the Water Quality Management Plan

The DEQ finalized the Sandy River TMDL document in March 2005 and it was approved by the U.S. Environmental Protection Agency (EPA) on April 14, 2005. A portion of the Sandy River watershed lies within Clackamas County, so Clackamas County and Clackamas County Service District No. 1 (CCSD #1) were identified as DMAs in the Sandy River TMDL. The TMDL obligates certain DMAs to take measures to assess, and (if applicable) reduce their loading of pollutants regulated by the TMDL.

The TMDL document provided:

- A Load Allocation (LA) to Clackamas County for some of the non-point sources of in-stream heat loading, including lacking riparian area shade, in the Sandy River’s watershed.
- A LA to Clackamas County for some of the non-point source discharges to Cedar Creek that contain *E. coli* (bacteria).
- A Waste Load Allocation (WLA) for in-stream heat load to Clackamas County for a sewage treatment facility. This facility, located in Welches, discharges treated water to the Sandy River and is owned by CCSD #1. Water Environment Services (WES), a department of Clackamas County, administers CCSD #1’s water quality programs and operates this facility.

This TMDL Implementation Plan is for CCSD #1, and summarizes the management strategies for protecting and improving water quality. The particular focus of this Implementation Plan is on strategies for reducing TMDL pollutants from non-point sources to achieve load allocations. Strategies for reducing TMDL pollutants from point sources to achieve waste load allocations are addressed comprehensively in point source permits for storm water and wastewater discharges.

To comply with DEQ requirements for TMDL Implementation Plans (provided in OAR 340-042-0080(3)), the management strategies and information provided herein address each parameter within the Sandy River TMDL over which Clackamas County and CCSD #1 have jurisdiction (in-stream heat and *E. coli*). In addition, we believe that this Implementation Plan demonstrates commitment and reasonable assurance of implementation and maintenance of effort over time. Many of the elements of this TMDL Implementation Plan are also summarized in the Matrices of Management Strategies in Chapters 8 and 9.

2. Clackamas County Surface Water Overview

2.1 Watersheds

The major watersheds of Clackamas County are shown on Figure 1. A large portion of Clackamas County is drained by the Willamette River and its tributaries including the Clackamas, Molalla, Pudding, and Tualatin Rivers (Table 1). The remaining lands are drained by the Sandy River, which enters the Columbia River in the City of Troutdale. Figure 2 illustrates the Sandy River watershed. As can be seen in Figure 2, although over 40 percent of the Sandy River watershed is in Clackamas County, a large proportion of this part of the watershed is federally managed by the U.S. Forest Service.

Watershed name	Total watershed, acres	Watershed in Clackamas County, acres	Watershed in Clackamas County, percent
Clackamas	602,634	540,456	90
Molalla-Pudding	560,037	305,785	55
Tualatin	453,849	12,587	3
Lower Columbia-Sandy	560,566	235,361	42
Middle Willamette	455,502	73,906	16
Lower Willamette	411,905	33,797	8
Total	3,044,494	1,201,890	

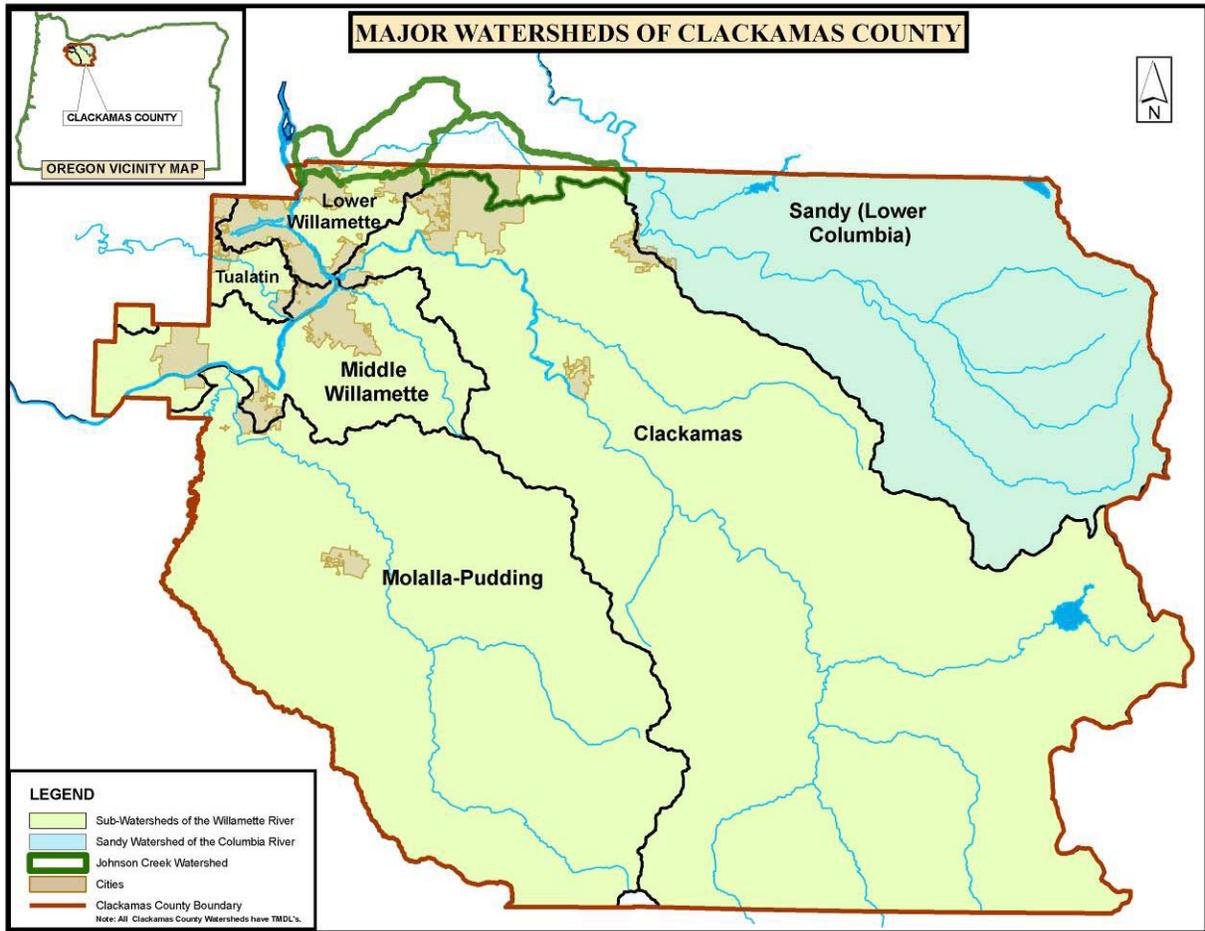


Figure 1. Major Watersheds of Clackamas County

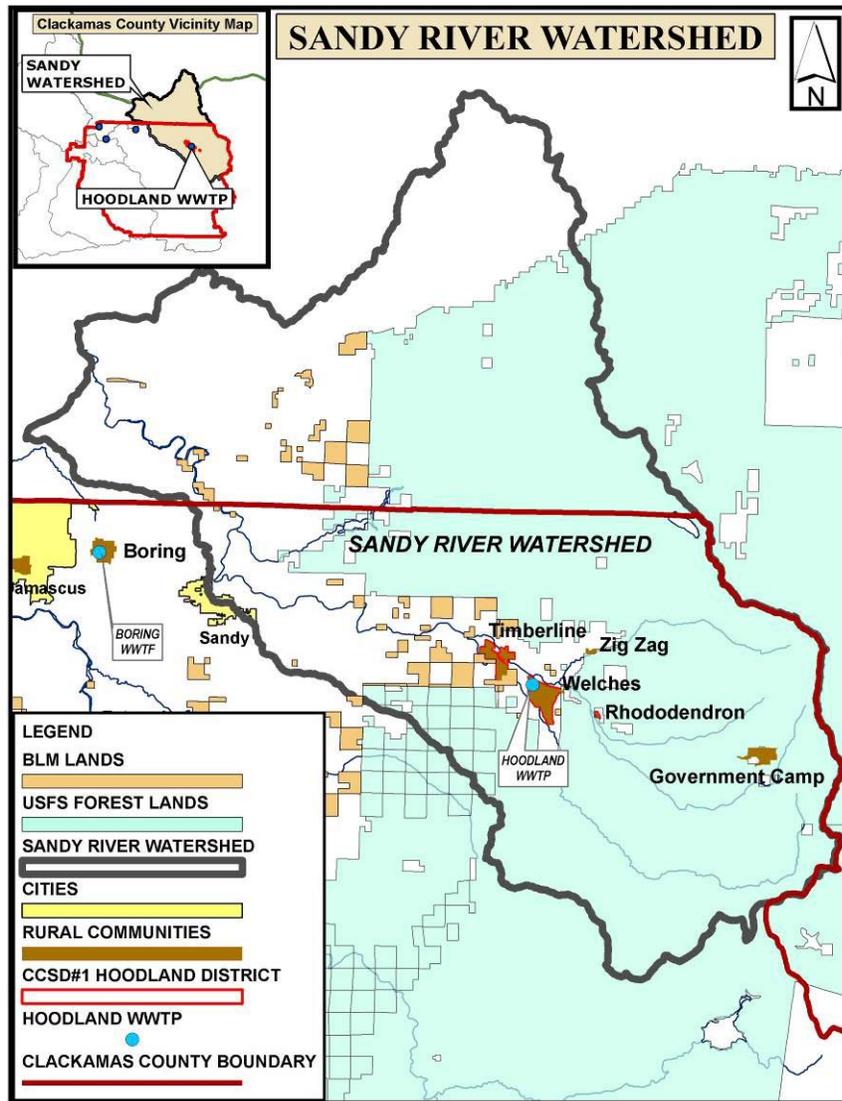


Figure 2. Sandy River Watershed

Separate TMDL Implementation Plans outline Clackamas County’s and CCSD #1’s efforts to comply with the Willamette, Clackamas, and Tualatin River TMDLs.

2.2 Organizational Summary

Clackamas County, including the Departments of Transportation and Development (DTD), WES, and Business & Community Services (BCS), as well as CCSD #1 are playing a role in implementing portions of this Implementation Plan. General responsibilities of each County Department and County Service District are outlined in Table 2.

Table 2. County and Service District Responsibilities		
DMA name	Jurisdictional area	TMDL Implementation Plan responsibility
Clackamas County WES	Limited to CCSD #1 and TCSD (except for septic system, grading, and 1200C programs, which are county-wide).	Administers CCSD #1 and TCSD. Also administers septic system, grading, and 1200C programs on a county-wide basis.
Clackamas County DTD	County-wide	Riparian area use and other land uses, roads, and all-purpose stormwater management agency; illegal dumping and solid waste nuisances on private property.
Clackamas County BCS	County-wide	Parks, management of surplus real estate, and Dump Stoppers (an illegal solid waste dumping prevention program)
CCSD #1	In-district	All-purpose stormwater management agency*, and riparian area land use.

¹ Includes, but is not limited to, public education/involvement, illicit discharge elimination, erosion control, and storm sewer system maintenance programs. Services vary by subunit.

WES administers CCSD #1 and the Tri-City Service District (TCSD). TCSD and CCSD #1 provide many services to the community, including sanitary wastewater collection and treatment. CCSD #1 provides stormwater management services in the Urban Growth Boundary (UGB) subunit (also known as the North Clackamas Urban Area) through WES.

The services provided by CCSD #1 vary in its four subunits: Hoodland, the North Clackamas Urban Area (the UGB subunit), Boring, and Fischer’s Forest Park (FFP). Surface water management fees charged to customers in the North Clackamas Urban Area (CCSD #1-UGB) support a wide range of Surface Water Management services for the community. The Hoodland subunit is in the Sandy River watershed (illustrated in Figure 2). The only surface/stormwater-related fees that are charged and services that are provided in the Hoodland, Boring and FFP subunits of CCSD #1 are for the review of plans and the issuance of permits for new/redevelopment, with corresponding controls that may include stormwater detention, erosion control, post-construction stormwater treatment, and wetland/streamside setback areas.

2.3 Surface Water Responsibilities

As described above, Clackamas County and CCSD #1 are both playing a role in implementing portions of this Implementation Plan. Each of these organizations has a variety of surface water and water quality management responsibilities, including for wastewater and stormwater. An overview of these responsibilities is provided below to offer context for the overall management of water quality and watershed health in the Sandy watershed.

2.3.1 Wastewater

CCSD #1 provides sanitary wastewater collection and treatment services to the unincorporated communities of Brightwood, Welches, Wemme, and Rhododendron through the Hoodland District (identified in Figure 2). Wastewater is treated at the Hoodland Sewage Treatment Facility (STF) at 24596 East Bright Avenue in Welches (identified in Figure 2). Treated wastewater effluent from the Hoodland STF is discharged into the Sandy River.

WES administers CCSD #1 and operates the STF. The TMDL is being implemented by DEQ through the STF's National Pollutant Discharge Elimination System (NPDES) waste discharge permit, which was renewed by DEQ on August 2, 2004. An excess thermal load limit—which specifies the maximum amount of heat that can be discharged—was issued to the STF by DEQ in this NPDES permit. The Sandy River TMDL issued a WLA to this facility. The heat load that the STF currently contributes to the Sandy River is well below the levels that are authorized in the NPDES Permit and in the TMDL's WLA.

2.3.2 Stormwater

Portions of Clackamas County are regulated by the NPDES Municipal Separate Stormwater System (MS4) program. Figure 3 illustrates the NPDES MS4 permit area in Clackamas County. The Sandy River watershed is not currently included in the Clackamas County NPDES MS4 permit area.

DEQ considers NPDES MS4-permitted storm sewer outfalls as point sources. As with other NPDES permits, the TMDLs are being implemented by DEQ through the NPDES MS4 permit for discharges from the MS4 area.

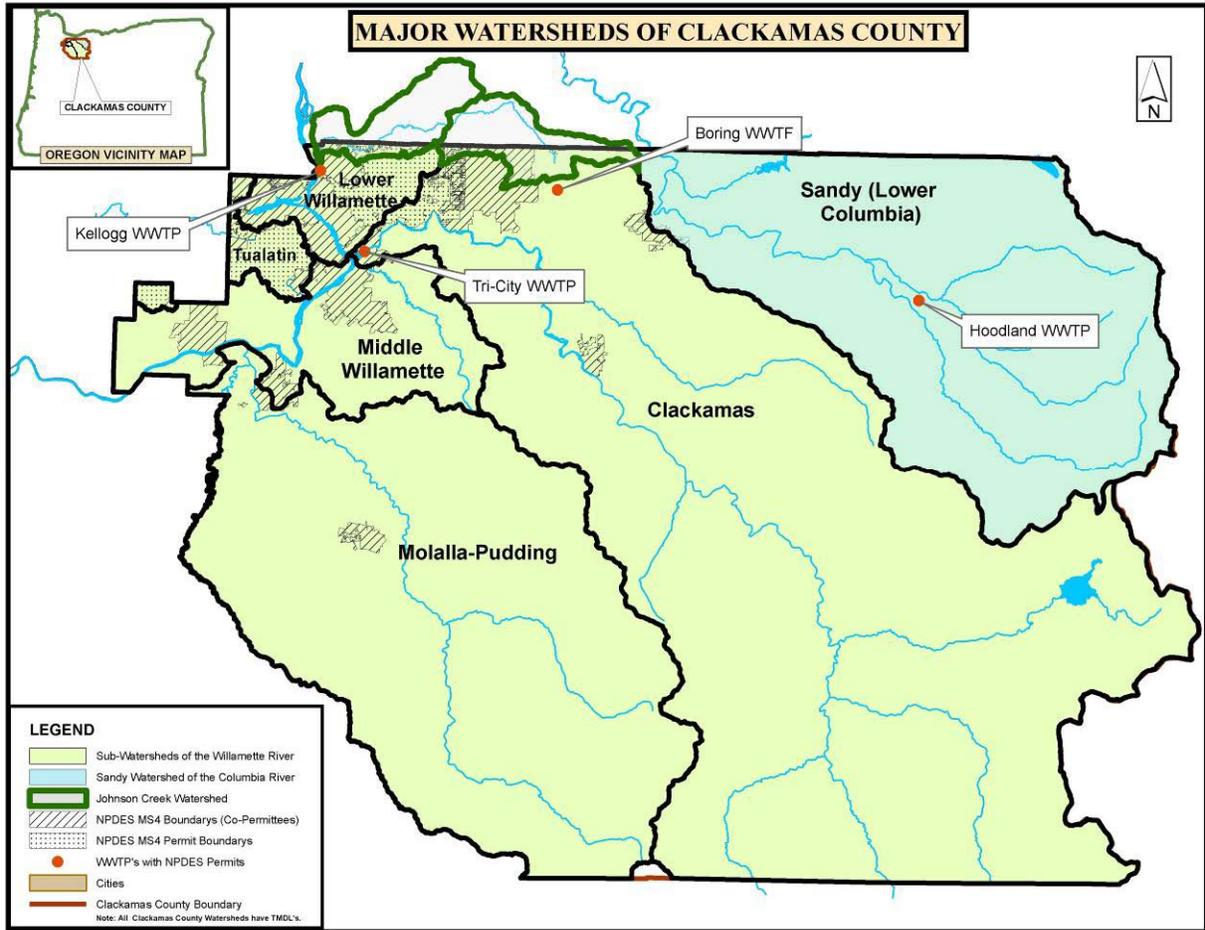


Figure 3. NPDES MS4 Permit Boundaries in Clackamas County

This page intentionally left blank.

3. TMDL Parameters and Allocations

A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources. The TMDL document provided:

- A LA to Clackamas County for some of the non-point sources of in-stream heat loading, including a lack of riparian area shade, in the Sandy River watershed.
- A LA to Clackamas County for some of the non-point source discharges to Cedar Creek that contain *E. coli* (bacteria).
- A WLA for in-stream heat load to Clackamas County for the Hoodland STF. This Implementation Plan does not apply to point source such as the Hoodland STF.

3.1 Temperature

Percent Effective Shade (PES), a measurement of the shade-yielding capacity of a riparian area, is the TMDL’s surrogate for non-point source elevated water temperature (i.e., heat load due to human influences on streams). “System potential vegetation” conditions represent areas with a high PES value. “System potential vegetation” conditions are considered by DEQ to be necessary to achieve “system potential effective shade,” which is defined by DEQ as “the potential near-stream vegetation that can grow and reproduce on a site, given the climate, elevation, soil properties, plant biology, and hydrologic processes.”

The Sandy TMDL establishes site-specific shade targets for the mainstem of the Sandy River and major tributaries, and basin-wide “shade curves” that can be used to establish shade targets for all other streams in the basin. DEQ’s analyses showed that streams in the Sandy River Basin, especially those on public lands, are generally well shaded with mature stream side vegetation. Computer modeling showed that increasing stream side vegetation would not result in significantly cooler water temperatures in most major Sandy basin tributaries. However, smaller streams, particularly in the lower portions of the basin, (e.g., Beaver Creek) would likely show significant temperature improvements by increasing mature stream side vegetation.

3.2 *E. Coli*

The LA for non-point sources of *E. coli* (see table 4.6 on page #113 in the TMDL) calls for an 86 percent reduction in *E. coli* loads in three creeks in the Sandy River watershed: Beaver, Kelly, and Cedar. The Sandy River watershed *E. coli* TMDL only applies to these three creeks. The Beaver and Kelly Creek watersheds do not drain any portion of Clackamas County.

DEQ combined the *E. coli* loading data from Beaver, Kelly, and Cedar Creeks, then calculated that an 86 percent reduction in *E. coli* loading was required based on the combined data set. Cedar Creek is actually very close to being in compliance with Oregon’s in-stream bacteria standards (see Table 4.4 of the TMDL—page 105—for more information). DEQ’s dataset showed that *E. coli* loading is much higher in Beaver and Kelly Creeks; this may be due to the fact that they drain densely developed sections of the Cities of Gresham and Troutdale. If Cedar Creek’s *E. coli* loading data had been addressed separately by DEQ in the TMDL’s Allocations section (Table 4.6), it is estimated that the required *E. coli* loading reduction in Cedar Creek would have only been about 10 percent.

4. Goals and Objectives of Plan

The goal of this Implementation Plan is to identify the ongoing and planned management strategies to improve watershed and address requirements of the Sandy River TMDL related to reductions in bacteria (*E. coli*) and in-stream heat.

The objectives of this Implementation Plan include applying adequate management strategies for pollution prevention (e.g., public education and outreach, riparian protection strategies), evaluating strategies annually for effectiveness and level of service, and implementing adaptive management as necessary.

To achieve this goal and these objectives, this Implementation Plan's DMAs (Clackamas County and CCSD #1) will be implementing the portions of this Plan that they are responsible for in a coordinated fashion. A single annual report to DEQ is expected to be submitted by these DMAs each year.

SECTION B

POLLUTANT REDUCTION AND MANAGEMENT STRATEGIES

5. Potential Sources of Pollutants

According to the DEQ specific known or suspected sources of TMDL parameters should be noted in this Implementation Plan. The potential sources of TMDL parameters in Clackamas County watersheds are discussed below.

5.1 Temperature

Stream temperature is determined by many factors. Heat energy is transferred to and from streams by the following processes:

- Short-wave radiation (primarily direct solar radiation, also known as radiant heat)
- Long-wave radiation (thermal radiation emitted from the Earth's surface)
- Convective mixing with the air
- Evaporation
- Conduction with the stream bed
- Advective mixing with inflow from groundwater and tributary streams
- Advective mixing with point source inputs such as wastewater effluent

There are varying scientific opinions about the relative importance of the above listed processes as a source for temperature increases in streams. While it is known that all of the above processes interact to produce the temperature regimes observed in streams and rivers and it is also known that the relative importance of each process differs among locations, there is disagreement as to what are the dominant processes.

Some scientific literature indicates that in small- to intermediate-sized streams of forested regions, incoming solar radiation represents the dominant form of energy input to streams during summer. Groundwater inputs may be important in small streams where they constitute a large percentage of the overall discharge, particularly during periods of the year when flows are low. As streams become larger and wider, riparian vegetation shades a progressively smaller proportion of the water surface, diminishing the effects of riparian shading and advective mixing on water temperature and increasing the importance of evaporative heat-loss.

Other recent scientific literature considers air temperature over the stream to be the most influential factor in stream temperature. Alteration of the riparian canopy, even well back from the stream, can open air flow and change the microclimate over the stream. Increasing airflow, particularly in areas with high summer air temperatures, can increase heat exchange with the stream and thereby elevate water temperatures. Thus, even where direct shade is retained over streams, alteration of riparian stands and adjacent upland areas may result in increased stream warming due to changes in the microclimate over the stream.

Riparian vegetation modifies convective and evaporative heat-exchange losses by creating a microclimate of relatively high humidity, moderate temperatures, and low wind speed compared with surrounding uplands. These microclimate conditions tend to reduce both convective and evaporative energy exchange by minimizing temperature and vapor-pressure gradients.

Potential or actual types of non-point source in-stream heat loading include:

- Alteration of the riparian and upland canopy; and removal of streambank vegetation
- Filling and drying of wetlands
- Interception and rerouting of groundwater inputs
- Withdrawal and return of water for agricultural irrigation
- Release of water from ponds and reservoirs
- Changes in channel or water body size
- Suspended sediment/turbidity in streams
- Low streamflow

Although scientific studies indicate that water temperature is affected by a variety of processes, DEQ's analysis of temperature sources in the TMDL contains a simplified assessment of non-point temperature sources. The TMDL states that elevated summertime stream temperatures attributed to non-point sources result from increased solar radiation heat loading. The TMDL attributes non-point source temperature increases to the disturbance/removal of near stream vegetation that has reduced levels of stream shading and exposed streams to higher levels of solar radiation (i.e., reduction in stream surface shading via decreased riparian vegetation height, width, and/or density increases the amount of solar radiation reaching the stream surface). As a result, management strategies to address elevated water temperature in this Implementation Plan are focused on increasing the percent effective shade in the watershed and other reasonable steps to reduce elevated stream temperatures.

As discussed further in Chapter 6, the impacts to stream temperature in the Sandy watershed from agricultural and forestry lands regulated by ODA and ODF are not addressed in this Implementation Plan. The matrix of management strategies Clackamas County and CCSD #1 are employing to address potential sources of elevated stream temperatures is included in Chapter 8. Additional information on the Clackamas County and CCSD #1 management strategies which control potential sources is provided in Chapter 7.

5.2 *E. coli*

E. coli bacteria can enter surface water bodies from many sources, including the feces of wild mammals, tame and wild waterfowl, wild songbirds, pets, and livestock, and from improperly functioning (i.e., failed) septic systems. *E. coli* can enter the waters while the host animal is swimming in, sitting above, or flying above the creek. It can also be washed in from riparian and upland areas during storm events. In unusual instances, it can be discharged into the creek during dry weather from a "point source" such as a failing septic system.

Recent scientific evidence from studies in the Puyallup River watershed in Washington state and the Tualatin River watershed in Oregon indicates that that approximately 80 percent of the *E. coli* in stormwater that was discharged from urbanized land does not originate in the gut of humans. A relatively small percentage also appears to be coming from dog and cat wastes. The Tualatin River watershed study shows that the percentage of *E. coli* that is present in stormwater which originated from dog feces is less than 20 percent and often is far lower. According to these studies and to anecdotal evidence available to WES and Clackamas County, stormwater washing over fecal matter that had been deposited by a range of wild animals, including birds and rodents, appears to be the source of most *E. coli* contamination in urban stormwater in many instances. Less

data is available on the specific sources of *E. coli* in rural portions of watersheds in the Pacific Northwest region. Livestock can be major sources in rural watersheds. Since we do not know how consistent these other studies would be to known or suspected sources within WES service district areas, WES may in the future initiate source tracking studies to identify, isolate, and prioritize specific sources within WES jurisdictional watersheds.

At this time, Clackamas County and CCSD #1 are not aware of any specific known sources of *E. coli* in the waters that are regulated by the Willamette TMDL, although suspected or general (i.e. non-specific) sources include:

- Livestock waste
- Wild bird and mammal feces
- Pet waste
- Failed septic systems
- Illegal dumping of solid waste
- Dead animals
- Spills and illicit discharges
- Stormwater runoff

6. TMDL Implementation Responsibilities

Responsibility for implementing the TMDLs has been distributed among a variety of DMAs. TMDLs are being implemented by appropriate state and federal agencies for state and federally-owned and managed lands. TMDLs for private lands in timber management areas are being implemented through the Oregon Department of Forestry (ODF), and the TMDLs for private lands in agricultural areas are being implemented through the Oregon Department of Agriculture (ODA). TMDLs are being implemented through the NPDES permitting process for point sources of pollutants such as wastewater treatment plant discharges.

This Implementation Plan focuses on management strategies that address non-point sources of pollution in Clackamas County, including surface discharges of stormwater runoff from areas that are not regulated by the NPDES MS4 program. Stormwater runoff directed to subsurface discharge through injection systems and infiltration systems is not addressed through this Implementation Plan. Lands subject to ODF and ODA jurisdiction are also not the focus of this Implementation Plan. In addition, this Implementation Plan does not address runoff from lands owned by the state or federal government. As can be seen in Figure 2, although over 40 percent of the Sandy River watershed is in Clackamas County, a large proportion of this part of the watershed is federally managed by the U.S. Forest Service. See Chapters 1 and 2 for previous discussion on jurisdictional authority and responsibility coverage.

This Implementation Plan addresses TMDL parameters that are discharged by these types of stormwater drainage systems:

- Clackamas County and County Service District-owned storm sewer outfalls that are not subject to the NPDES MS4 permit requirements. (See the areas outside the NPDES MS4 permit boundaries in Figure 3)
- Privately-owned storm sewer outfalls if they do not drain agricultural and timber management areas. These outfalls, unless they are permitted by an NPDES permit such as a 1200Z, are non-point sources of pollution. (See the land use designations in Figure 4)

- Overland sheet flow or channelized flows that do not flow through MS4-permitted or privately-owned storm sewer outfalls. These drainage systems are non-point sources of pollution. They are found on lands with every type of land use. Those drainage systems that are not in agricultural and timber management areas are addressed in this Implementation Plan. (See the land use designations in Figure 4)

It is important to note that Clackamas County's and CCSD #1's authority to control sources of pollution from privately-owned storm sewer outfalls, overland sheet flow and channelized flows is quite limited. If Clackamas County and/or CCSD #1 are aware of a privately-owned conveyance system that is a significant, known source of pollution, the matter will be referred to DEQ if public education and/or mediation fail to yield the necessary water quality improvement.

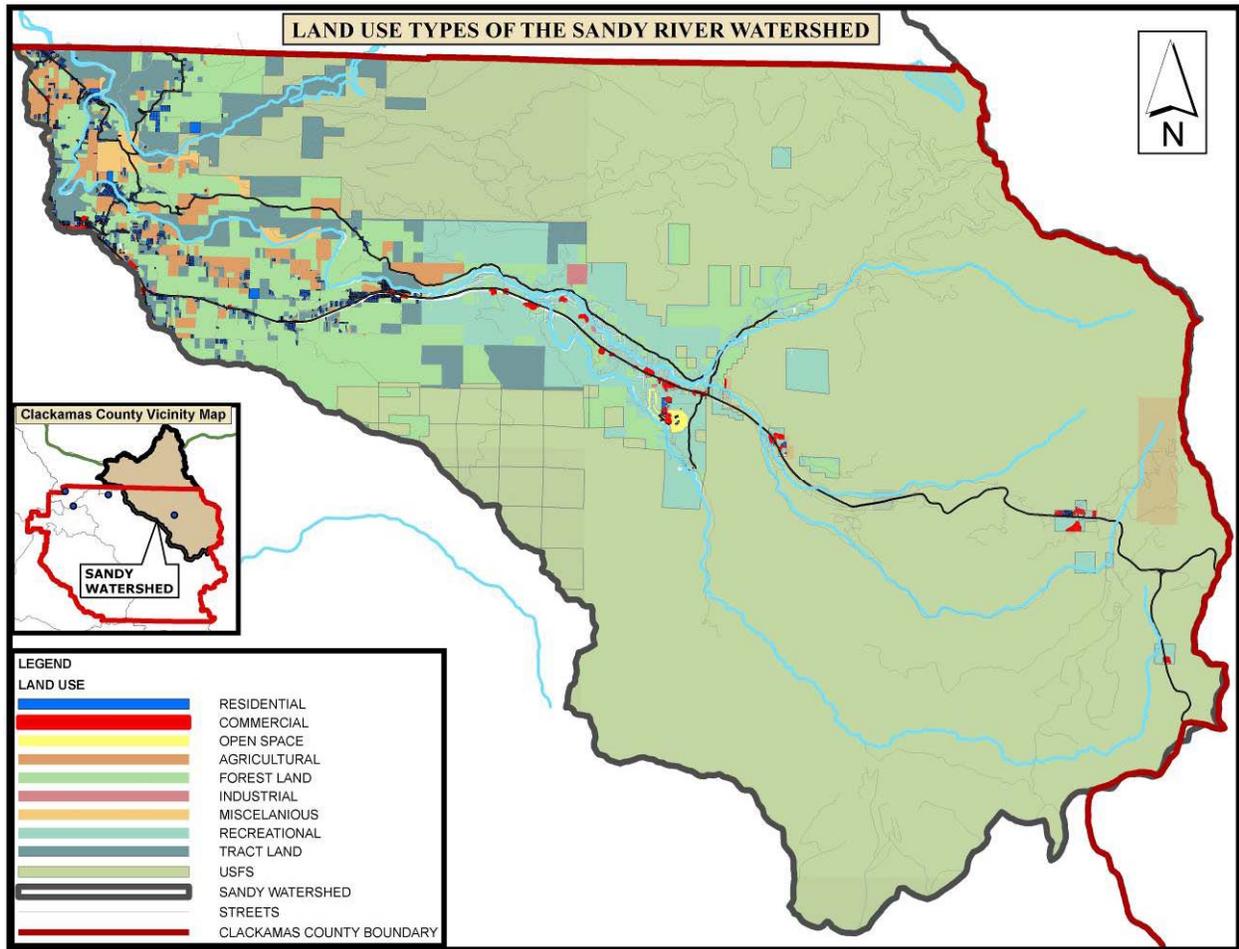


Figure 4. Land Use Types of the Sandy River Watershed

This page intentionally left blank.

7. Clackamas County Water Quality Programs and Activities

A variety of management programs, activities, and strategies are employed by Clackamas County and CCSD #1 to improve and protect water quality and overall watershed health. The strategies that are implemented or planned for implementation to address non-point sources of TMDL parameters in the area covered by this Plan include:

- 7.1 Development regulations and watershed protection regulations
- 7.2 Public involvement and education
- 7.3 Pet waste management
- 7.4 Septic system management
- 7.5 Illegal dumping management
- 7.6 Dead animal management
- 7.7 Spill response and Illicit Discharge, Detection, and Elimination Program (IDDE)
- 7.8 Sandy River Basin Watershed Council Involvement

These management strategies are described in detail in the sections below. Applicable management strategies for each TMDL parameter are also summarized in the matrices in Chapters 8 and 9.

7.1 Development Regulations and Watershed Protection Regulations

TMDL parameters addressed: Temperature

Description of the potential sources: Removal or disturbance of vegetation reduces stream shading, exposing streams to higher levels of solar radiation. Solar radiation (sunlight) falling directly on streams can cause water temperature to increase. Alteration of the riparian canopy can also change the microclimate near streams, increasing air flow and heat exchange with the stream and thereby elevating water temperatures.

Description of the Management Strategy: Protection of system potential vegetation and effective shade in riparian areas is one of the primary mechanisms for achieving load allocations for temperature. The following watershed protection regulations that protect streamside vegetation are implemented in Clackamas County.

Streamside Buffer Areas

Many lands that include at least some riparian area are subjected to “streamside buffer regulations” when these lands are developed or re-developed in a significant manner under Clackamas County’s building permitting process. Areas with streamside setbacks are illustrated in Figures 5 and 6. Streamside buffer regulations include:

- ◆ *Metro Title 3.* WES administers the equivalent of Metro Title 3 regulations in CCSD #1. Clackamas County’s Planning Dept. administers these regulations in the other unincorporated other areas within the Portland metro area’s Urban Growth Boundary in Clackamas County, including but not limited to, the OLSB.

Significant new and re-development that is regulated by Clackamas County near wetlands, springs, natural ponds, creeks, and rivers generally provides a largely undisturbed buffer area varying in width from 25 feet up to as much as 200 feet in certain cases. Buffer areas apply on each side of the creek or River. Wetland setback areas are fixed at 50 feet from the delineated wetland boundary. Creek buffer area width depends on several factors, including topography, whether the stream is perennial or intermittent, and how much contributing drainage acreage in the watershed is upstream of the proposed development.

The buffer area is protected in one of two ways: a conservation easement or a separate tract of land. In CCSD #1, a) if an owner proposes to encroach into WES' buffer and can enhance the buffer by creating additional buffer on the property at a ratio of 1.5:1.0, than no other mitigation is required; or b) if a variance is applied for and granted, WES can authorize a customized vegetation plan that includes removing invasive species and replanting the buffer area with native vegetation, including shade-yielding trees.

- ◆ *Wetlands.* Clackamas County's Zoning and Development Ordinances (ZDO) 1002 and 709 apply in unincorporated, urban areas in the watershed. The "wetland provisions" of Sections 1002 and 709 of the ZDO regulate disturbances and specify setback distances for wetlands. Disturbances and setbacks to these wetlands are reviewed in accordance with applicable provisions of the ZDO and are dependent upon several factors that are determined on a case-by-case basis. ZDO 1002 and 709 are administered by Clackamas County's DTD. Wetlands are noted here in this Implementation Plan, for many wetlands in the Willamette River's watershed discharge their waters directly to creeks and rivers in the watershed.
- ◆ *River and Stream Conservation Area, ZDO 704.* This ordinance applies to all unincorporated private lands in Clackamas County and is administered by DTD pursuant to the applicable provisions of the ZDO. Significant new and re-development which is regulated by Clackamas County that occurs on land lots near rivers and qualifying creeks must provide a largely undisturbed setback area varying in width from 50 feet to 100 feet (ZDO 704.07 requires that no less than 75 percent of the setback's area be preserved with native vegetation). For a river's riparian area, a setback area wider than 100 feet can be required in certain circumstances. The setback distance for creeks is based on whether a creek has been determined to be "small" (50 feet), "medium" (75 feet), or "large" (100 feet). Smaller (non-fish-bearing) streams and all wetlands are unprotected by ZDO 704's provisions. All riparian areas around creeks and rivers that are eligible for protection under ZDO 704 are on Water Protection Rule Classification maps that were compiled pursuant to OAR 629-635-000.
- ◆ *Floodplain Management District, ZDO 703.* This ordinance, administered by Clackamas County DTD, applies on the unincorporated lands that are addressed by this Implementation Plan. This ZDO restricts the types, and in some instances, the magnitude of development that can occur in floodplains. This ZDO tends to direct development away from areas that are directly adjacent to a creek or river's low and high flow channels, making it more likely that native vegetation will be allowed to provide shade to the water body (see the previous four bullets for regulations which formally establish riparian area setback areas).

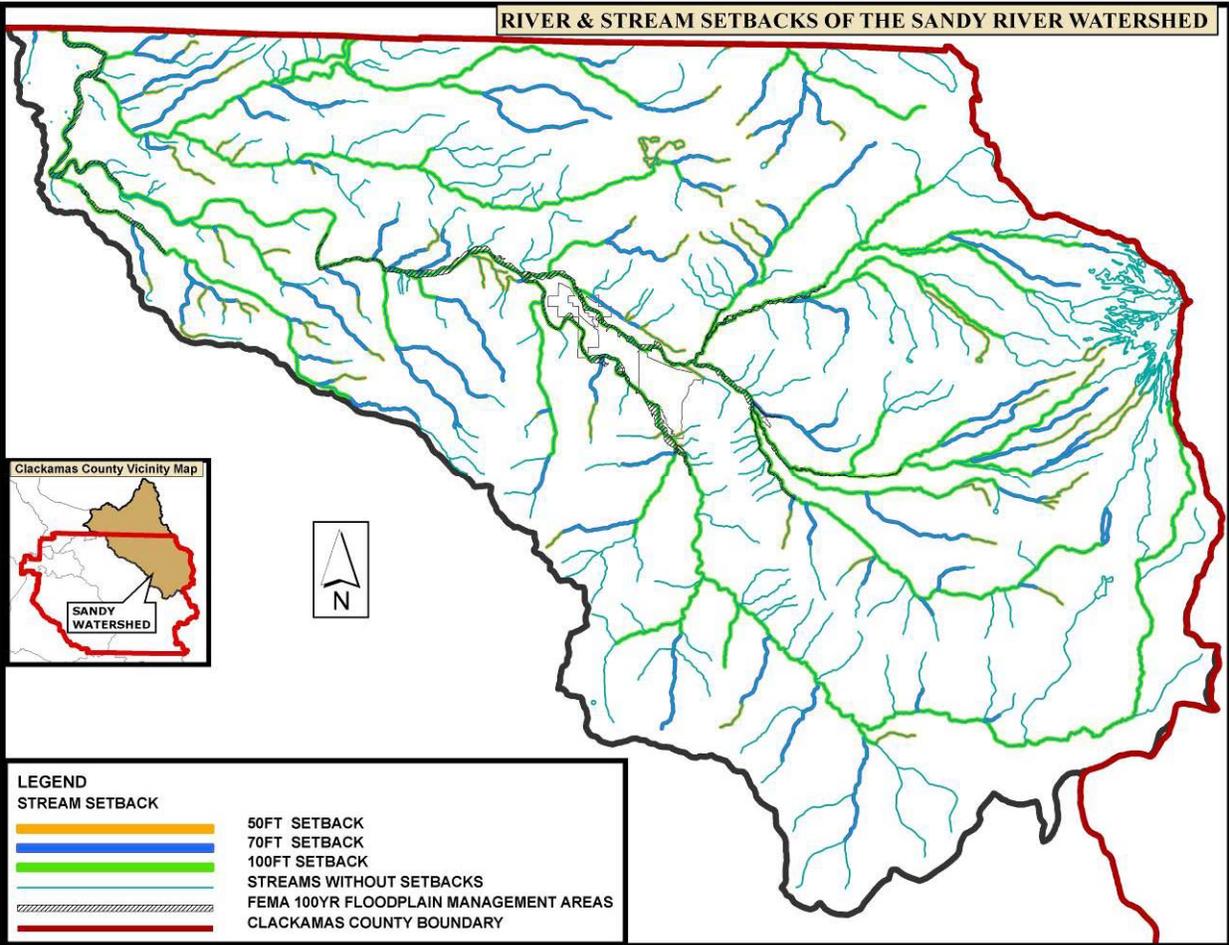


Figure 5. River and Stream Setbacks of the Sandy River Watershed

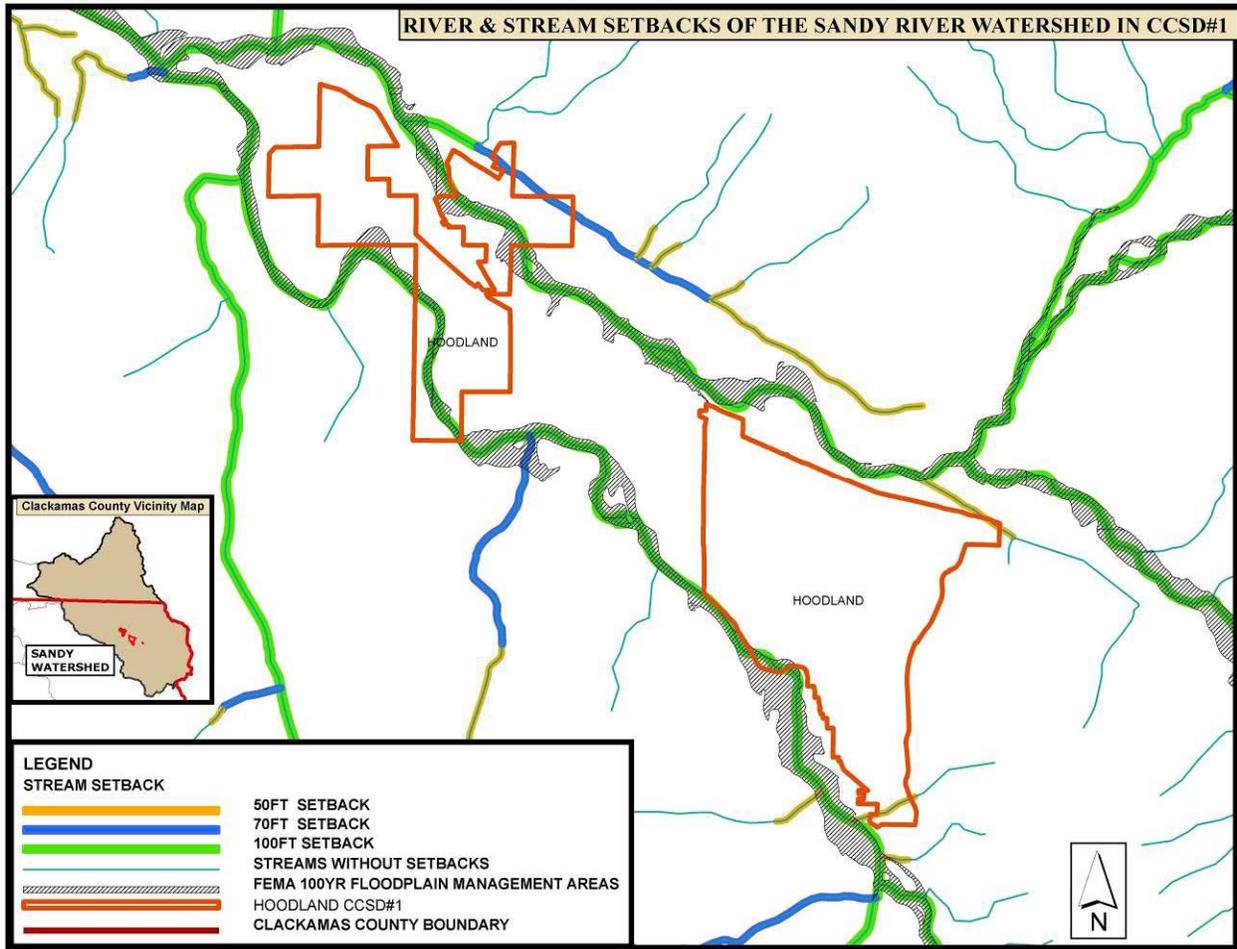


Figure 6. River and Stream Setbacks of the Sandy River Watershed in CCSD#1

- ◆ *Metro Title 13 (Goal 5):* Clackamas County DTD is currently re-writing portions of the Metro Title 13 (Goal 5) model ordinance and associated maps and plans to adopt them by December, 2008. The purpose of Title 13 is to (1) conserve, protect, and restore a continuous ecologically viable streamside corridor system, from the streams' headwaters to their confluence with other streams and rivers, and with their floodplains in a manner that is integrated with upland wildlife habitat and with the surrounding urban landscape; and (2) to control and prevent water pollution for the protection of the public health and safety, and to maintain and improve water quality throughout the region.

Metro has mapped the areas deemed to be regionally significant and has further designated as "Habitat Conservation Areas" (HCAs) those areas requiring protection. HCAs shall be protected, maintained, enhanced, and restored as specified in the Metro Code Section 3.07.1340, and city and county development codes shall include provisions for enforcement of these performance standards and best management practices. Discretionary development approval standards are designed to first avoid HCA's, next to minimize impacts on HCAs and water quality, and finally to mitigate the impacts to these areas.

Additionally, each city and county in the region shall identify provisions in the city's or county's comprehensive plan and implementing ordinances that prohibit or limit the use of a list of habitat-friendly development practices.

Sustainability Resolution

Clackamas County established an Office of Sustainability in 2007. In a resolution, adopted February, 28, 2008, the Board of County Commissioner's adopted a resolution regarding sustainability. A portion of that resolution is listed below. Some of the elements of this resolution will aid in the implementation of management measures to control and reduce TMDL parameters:

We are committed to meeting or exceeding global targets for mitigating climate change by taking actions in our own operations and communities, including the following:

- a. Create an action plan for reducing global warming emissions in County operations
- b. Increase the average fuel efficiency of County fleet vehicles
- c. Increase recycling rates in County operations and in the community
- d. Make County procurement decisions that minimize negative environmental and social impacts
- e. Continue to practice and promote sustainable building practices using the U.S. Green Building Council's LEED™ program
- f. Adopt and enforce land-use policies that reduce sprawl; preserve open space; create compact, walkable urban communities
- g. Protect and foster productive and healthy agriculture and natural resource lands
- h. Make energy efficiency a priority, and increase the use of clean, alternative energy

- i. Promote transportation options
- j. Preserve water resources through education, planning and water supply coordination
- k. Help educate the public, schools, other jurisdictions, professional associations, businesses and industry about reducing the negative impacts of climate change

In addition, Clackamas County is currently considering its own tree ordinance. The County is researching various tree ordinances and is conducting an urban tree canopy coverage survey. The tree ordinance discussions developed out of citizen concerns from a group entitled, “Urban Green”.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include:

- Tracking the number of approved building and development permits per year with riparian area buffers or setbacks.
- Tracking the number and acreage of HCA’s protected, mitigated, or restored.
- Tracking the number of approved building permits per year which receive a ZDO 703 review.
- Tracking the number of approved building permits per year with wetland riparian area buffers.
- Qualitative assessment through interviews with staff.

Fiscal analysis: Implementation of Metro Title 3 equivalent stream buffer regulations, river and stream conservation areas (ZDO 704), the floodplain management district (ZDO 703), and wetland provisions of ZDO 1002 and 709 is currently funded. Implementation of Metro Title 13 (Goal 5) in Clackamas County will require additional resources, estimated at approximately \$100,000 for Clackamas County.

Timeline for implementation: Clackamas County will adopt Title 13 by December, 2008. Other management strategies are currently being implemented. Implementation will continue. .

7.2 Public Involvement and Education

TMDL parameters addressed: *E. coli* and temperature

Description of the potential sources: Land management decisions on private lands and activities conducted by the public throughout the watershed affect overall watershed health and may contribute to the release of TMDL parameters into waterways. Educating the public about the way their practices can negatively or positively impact the health of the watershed is an important component in managing these potential sources.

Description of the Management Strategy: Public involvement and education is targeted by Clackamas County DTD and WES to encourage citizens to work and live in ways that protect or improve water quality. Public involvement and education is a part of many water quality management strategies implemented in Clackamas County including Pet Waste Education and Management, Septic System Education and Management, Responding to and Preventing Illegal Solid Waste Dumping, Addressing Dead Animals on County Roads, Spill Response, Industrial/Commercial Stormwater Maintenance, Erosion Prevention and Sediment Control, and Design/Construction Standards for New/redevelopment Management Strategies. Specific activities and strategies employed by Clackamas County to reduce potential sources of *E. coli* and temperature are described below.

E. coli

Public involvement and educational activities intended to reduce *E. coli* load contributions to waterways include the following:

Public involvement and educational activities intended to reduce *E. coli* contributions to waterways include the following:

- ◆ Educating the public about how to prevent septic system failures and how to report failures when they occur. This information is provided in brochures, on WES' website, and on request when citizens contact WES in person, by phone, e-mail, or U.S. mail.
- ◆ Clackamas County's *Citizen News* newsletter. *Citizen News* is U.S. Mailed to every Clackamas County address, including those in the Cedar Creek watershed, four times per year. The Summer 2007 issue's page 6 contained a large (3/4 page) article on the proper way to care for a home's septic system. Proper care of septic systems prevents the discharge of sewage (and thus bacteria) into surface water bodies.

The Spring 2006 issue contained an article titled "Buffer Zones: Protecting Sensitive Creeks and Streams", which as the title suggests, encouraged citizens to maintain their healthy—and enhance their degraded—riparian areas. Healthy riparian areas infiltrate, transpire, and filter non-point source stormwater runoff, and can reduce or assist in eliminating *E. coli* loading to streams and creeks, and may contribute to reducing water temperatures in receiving waterbodies.

One or more future newsletters may possibly include an article on one or more of the following topics that have the potential to further reduce in-stream *E. coli* loading levels:

- “Reasons why you should not feed ducks and geese”
 - “Proper management of dog and cat wastes”
 - “Please take your RV to an approved dump site after your vacation”
- ◆ *Clackamas County Fair*. In August 2007, WES employees staffed the County’s booth at the Fair during about quarter of the time that the Fair was open, and WES literature was available and distributed to the public from the booth during all hours that the Fair was open. Clackamas County employees distributed the literature during the times when WES employees were not in the booth. It is expected that WES employees will continue to staff the County’s booth about quarter of the time during Fairs in future years. When citizens visit the booth during the Fair, WES literature provides information to the public on various bacteria-related subjects, including proper pet waste management and the value of proper maintenance of septic systems, and guidance is provided on water quality and watershed health related issues.
 - ◆ *Clackamas County’s Dog Services*. Provides information about proper dog waste management to the general public. For example, during a special event in June 2006, “dog poop scoops” were provided as free gifts to citizens to motivate dog owners to clean up after their pets.
 - ◆ *The Clackamas County Soil & Water Conservation District (CCSWCD)*. The CCSWCD provides assistance to landowners who are interested in conservation and watershed enhancement. While the CCSWCD is not a Department of Clackamas County, it is noted here for Clackamas County and the CCSWCD work closely together. The CCSWCD helps landowners identify, plan for, and implement conservation measures that reduce pollutants coming off their lands including *E. coli* contamination through wise management of livestock manure, pet waste (this can include horses), and by installing vegetated buffer areas that allow stormwater to infiltrate into, be evaporated by, or filtered through the vegetated area. In November 2006, Clackamas County voters elected to increase their taxes and provide a stable funding source for the CCSWCD, allowing the CCSWCD to increase the level and quality of the services it provides.

Temperature

Public involvement and education is targeted by Clackamas County and CCSD #1 to encourage citizens to maintain their existing healthy riparian areas, and to encourage them to enhance any degraded riparian areas that are on their property. Riparian area-related public involvement and educational opportunities available to the citizens and property owners in the area regulated by the Willamette temperature TMDL are present in many forms, including, but not limited to the following:

- ◆ Clackamas County’s *Citizen News* newsletter. This newsletter is sent via U.S. mailed to every Clackamas County address, including those in the Willamette River watershed, four times per year. The spring 2006 issue, for example, contained an article titled “Buffer Zones: Protecting Sensitive Creeks and Streams”, which as the title suggests, encourages citizens to maintain their healthy—and enhance their degraded—riparian areas.

- ◆ *Clackamas County Fair.* In August 2007, WES employees staffed the County’s booth at the Fair during about a quarter of the time that the Fair was open, and WES literature was available and distributed to the public from the booth during all hours that the Fair was open. Clackamas County employees distributed the literature during the times when WES employees were not in the booth. It is expected that WES employees will continue to staff the County’s booth about a quarter of the time during Fairs in future years. When citizens visit the booth during the Fair, WES literature provides information to the public on the benefits of (and recommended way to) perform riparian restoration or protection. If WES staff are present in the booth at the time citizens visit, additional information, advice, and guidance on this subject is provided.
- ◆ *The Clackamas County Soil & Water Conservation District (CCSWCD).* The CCSWCD provides assistance to landowners who are interested in conservation and watershed enhancement. While the CCSWCD is not a Department of Clackamas County, they are noted here for Clackamas County and the CCSWCD work closely together. They routinely assist landowners with identifying, planning, and undertaking riparian area protection and enhancement projects.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include performing qualitative assessments through interviews with staff and our customers as well as tracking public education and outreach metrics such as:

- The number of website “hits” per year.
- The number of brochures printed and distributed/year.
- The number of requests for speakers or surveys taken, give-away requests, or for more information.
- The number of pet waste bags taken from dispensers each year.
- The number of attendees at various WES sponsored or project related events.
- Erosion control education and outreach activities implemented each year.

Fiscal analysis: This management strategy is currently funded, although additional resources may be needed in the future.

7.3 Pet Waste Management

TMDL parameters addressed: *E. coli*

Description of the potential sources: When pet waste is left in uncovered areas stormwater can transport *E. coli* from the land surface into the waters of the Sandy watershed.

Description of the Management Strategy: There are two main elements to the pet waste management strategy:

- *Public involvement and education.* Please see the Public Involvement and Education Management Strategy (Chapter 7.2) for more information on this element.
- *Technical assistance and enforcement.* This management strategy is implemented when reports of improper pet waste management are submitted to the Clackamas County DTD Community Environment Division (CED). The CED's staff are the County's solid waste management experts, and they can interface with complainants and pet owners to find solutions which prevent or greatly minimize the discharge of pet waste to the waterways.

Not all types of solid waste generated by animals are addressed by CED's program (e.g., agricultural activities that generate manure). If reports of improper pet waste management in CCSD #1-UGB are submitted to WES, WES will respond as needed and appropriate to the situation in a manner substantively similar to CED's.

Timeline for implementation: This management strategy is currently being implemented and is an on-going activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include performing qualitative assessments through interviews with staff and our customers and by tracking public education and outreach metrics such as:

- The number of website "hits" per year.
- The number of brochures printed and distributed per year.
- The number of pet waste bags taken from dispensers each year.

Fiscal analysis: This management strategy is currently funded.

7.4 Septic System Management

TMDL parameters addressed: *E. coli.*

Description of the potential sources: A potential source of bacteria in the waters regulated by the Willamette TMDL is failing septic systems. A septic system that is failing or has failed can discharge improperly treated or untreated wastewater into a surface water body. A properly functioning septic system discharges all of its wastewater into the earth's uppermost, unsaturated soil layers after treatment; the water then percolates down into groundwater.

Description of the Management Strategy: WES administers the Onsite Sewage Treatment and Disposal (Onsite) Program as an agent of DEQ throughout Clackamas County. The goals of the program are to have no septic system failures and for all septic systems to be in a properly functioning condition. To achieve these goals, WES implements:

- A process to address suspected failed or failing systems, and
- A process to educate the public about how to prevent septic system failures and how to report failures when they occur. This process is discussed in the Public Involvement and Education description in Chapter 7.7.

When septic systems fail, WES is most often notified by the owner or renter of the property with the system, by an adjacent property owner/renter, by other County departments, or by other governmental agencies. Failing and failed septic systems are potential environmental and health hazards and they are a high priority for WES to address. The Onsite Program makes every effort to investigate a reported problem or complaint the same day that it has been received.

Once a site visit has been performed and a failed septic system is identified during the visit, steps for needed correction are identified and a process for implementation is established. Time frames for repair are discussed with the property owners and the length of time allotted to repair is determined based on the severity of the problem. Discharges to the ground surface and into waterways are not allowed and are given the shortest time that is feasible for construction of repairs or implementation of alternatives. Alternatives vary from limiting the usage of the septic system (timing of laundry, for example) to vacating the premises until the problem is resolved. To address failing septic systems Clackamas County funds the Safety Net Program, which provides low interest loans for low income property owners to repair failing septic systems.

WES has an agreement with Clackamas County DTD Community Environment Division (CED) to bring violators into compliance if initial efforts are unsuccessful. All failing septic systems are an enforcement priority for CED. Initial efforts made by CED encourage voluntary compliance. In the event this is unsuccessful, CED has the ability to levy both fines and fees for code violations. A citation with forfeiture up to \$500 can be issued for a high priority violation. If a violation case is referred to the Compliance Hearings Officer, he/she can issue civil penalties up to \$3,500 on priority one violations. Additionally, all costs incurred by CED while administering the enforcement action, or a \$75 monthly administrative fee, can also be assessed.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include tracking the number of reports of failing septic systems, the outcome of inspections (failing or not), the date of follow-up that confirmed repairs were made, and the number of Safety Net loans provided.

Fiscal analysis: This management strategy is currently funded.

7.5 Illegal Dumping Management

TMDL parameters addressed: *E. coli*

Description of the potential sources: Illegal dumping of solid waste can allow stormwater to move pollutants from the waste and into the waterways regulated by the Willamette Basin TMDL. Solid waste that may contain *E. coli* includes but is not limited to diapers and other waste containing fecal matter.

Description of the Management Strategy: Illegal dumping of solid waste is addressed by two separate programs, each of which serves their own geographic area within the area that is regulated by the Sandy TMDL. Each program is described separately below:

- *Developed, unincorporated, primarily urban areas:* County Ordinance

Illegal dumping in developed, unincorporated, primarily urban areas is addressed by Clackamas County's DTD CED. CED administers a solid waste nuisance ordinance which pertains to illegal dumping on public and private property. This ordinance is administered on a priority-rated basis, and illegal dumping that involves household garbage is a high priority for enforcement and resolution. Mediation is an additional tool that CED uses to resolve certain types of solid waste issues that cause a condition of unsightliness on private property.

- *Rural areas:* Clackamas County's *Dump Stoppers* Program

Illegal dumping of solid waste in rural areas, including the edges of roadways in these areas, is addressed by Clackamas County's *Dump Stoppers* Program. County employees respond to reports of illegally dumped waste and coordinate the removal of the waste. Crews of people who have been ordered to perform community service remove the garbage and properly dispose of or recycle it. County employees install "no dumping" signs, with the program's hotline prominently displayed, in places where dumping has occurred. County employees aggressively sift through the trash in search of clues that can identify the persons who illegally dumped the waste. A Sheriff Deputy who is assigned to this program uses these clues to confirm identities of dumpers, and then tracks down and, if appropriate, cites those persons. The Clackamas County District Attorney's office has assigned a prosecutor to this program, and it pursues the most egregious cases.

As of March 21, 2007, 28 persons have been convicted by the Dump Stoppers program of illegal solid waste disposal since the program's creation in 2003. During this same time period, 225 cars, 4,398 tires, 24 tons of scrap metal, and 176 tons of other solid wastes have been removed from dump sites by the program.

This program's success is largely due to effective partnerships between several County Departments, residents, schools, recreationalists, and large landowners in the watershed like the U.S. Forest Service, the Bureau of Land Management, and Longview Fibre Company.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include tracking waste removed through the Dump Stoppers Program, tracking the number of persons per year who complete the mediation process for solid waste dumping, and tracking the number of enforcement actions taken per year for solid waste dumping.

Fiscal analysis: This management strategy is currently funded.

7.6 Dead Animal Management

TMDL parameters addressed: *E. coli*.

Description of the potential sources: Warm-blooded animals carry *E. coli* in their gastrointestinal tract. Stormwater runoff could carry *E. coli* from a dead, warm-blooded animal's (deer, for example) gastrointestinal tract into surface water bodies if its carcass was laying on or adjacent to a roadway or drainageway.

Description of the Management Strategy: Large, dead animals on County roads with "full County maintenance" are removed and properly disposed of by Clackamas County's Road Department. Clackamas County's Road Department recently submitted an ESA 4(d) limit submittal for Routine Road Maintenance to NOAA Fisheries and began the process of adhering to the Oregon Dept. of Transportation's *Routine Road Maintenance, Water Quality and Habitat Guide, Best Management Practices, Revised 2004* (ODOT Guide). Removal of dead animals from the road is addressed under "Accident Cleanup (Activity 149)" on page #32 of the ODOT Guide.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include tracking the number of dead animal removals performed annually.

Fiscal analysis: This management strategy is currently funded.

7.7 Spill Response and Illicit Detection and Elimination Programs

TMDL parameters addressed: *E. coli*

Description of the potential sources: The spill or illicit discharge of certain substances containing TMDL parameters such as *E. coli* can cause watershed health impairment. Potential sources of *E. coli* include untreated sewage releases from a privately-owned sanitary sewer line due to pipe failures or improper connections.

Description of the Management Strategy: If materials that potentially contain harmful substances (such as TMDL parameters including *E. coli*) are spilled or illicitly discharged onto a Clackamas County road's right-of-way in non-MS4-permitted areas and the impacted road segment is eligible for "full County maintenance", personnel from Clackamas County's Road Department will respond if they discover the incident or if they are notified about the incident and it is determined that a response is appropriate.

Road Department crews will ensure that the release of the material is halted and that the material is subsequently cleaned up in a manner that prevents harmful substances from entering waters, if possible, or minimizes the amount of harmful substances that enters waterways if that is not possible. If a response by a government agency is required for a spill involving agricultural materials that contain TMDL parameters (i.e., *E. coli* from animal manure), ODA will provide oversight for the incident in coordination with the Road Department. As was noted previously, the Clackamas County Road Department adheres to the ODOT Guide. Roadway spill response work is addressed in these two sections of this document: "Accident Cleanup" (Activity 149) on page 32 and "Spill Prevention and Cleanup" on page 15 of the ODOT Guide.

If WES staff are made aware of non-septic system related material containing TMDL parameters that is spilled or illicitly discharged in areas other than County roads with "full County maintenance," WES staff will contact DEQ and refer the case to them. DEQ has the authority to do the applicable source control work on these lands and, if need be, can compel most responsible parties to halt or modify their discharge if spilled or illicitly discharged material contains a significant concentration of TMDL parameters and is likely to flow directly to Waters of the State.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include tracking the number of illicit discharges and spills per year.

Fiscal analysis: This management strategy is currently funded.

7.8 Sandy River Basin Watershed Council Involvement

TMDL parameters addressed: Temperature

Description of the potential sources: Removal or disturbance of vegetation reduces stream shading, exposing streams to higher levels of solar radiation. Solar radiation (sunlight) falling directly on streams can cause water temperature to increase. Alteration of the riparian canopy can also change the microclimate near streams, increasing air flow and heat exchange with the stream and thereby elevating water temperatures.

Description of the Management Strategy: The Sandy River Basin Watershed Council plans and implements habitat restoration projects at high priority sites on rivers and creeks in the Sandy River watershed. These projects include tree planting and other projects to improve watershed health such as encouraging the removal of the Marmot Dam. The Sandy River Basin Watershed Council meets monthly and engages volunteers and community groups in restoration projects as well as public education efforts such as tours and workshops.

A Clackamas County staff member participates in the Sandy River Basin Watershed Council. In the future, Clackamas County will evaluate opportunities to support tree planting and other restoration efforts that could improve effective shade in the Sandy watershed through the Sandy River Basin Watershed Council.

Timeline for implementation: This management strategy is currently being implemented and is an ongoing activity.

Measurable milestones (if any): This management strategy will be evaluated annually for effectiveness and appropriate level of service. Adaptive management will be applied as appropriate to address limiting factors for watershed health. Assessment of this strategy will include tracking projects completed by the Sandy River Basin Watershed Council that Clackamas County supports.

Fiscal analysis: This management strategy is currently funded. Additional funding may be required to support specific projects.

This page intentionally left blank.

SECTION C

IMPLEMENTATION

8. Temperature

8.1 Matrix of Management Strategies

Table 3 lists strategies for reduction and management of elevated water temperature.

8.2 Barriers to Implementation

Much of the land in Clackamas County's portion of the area regulated by the Sandy River temperature TMDL lies within timber management and agricultural areas. The TMDL for the privately-owned lands in timber management and agricultural areas is being implemented through ODF and ODA. The TMDL is also being implemented separately for federally owned and managed lands such as U.S. Forest Service land. Management strategies for these lands are not contained within this Implementation Plan.

The Sandy TMDL establishes site-specific shade targets for the mainstem of the Sandy River and major tributaries, and basin-wide "shade curves" that can be used to establish shade targets for all other streams in the basin. DEQ's analyses showed that streams in the Sandy River Basin, especially those on public lands, are generally well shaded with mature stream side vegetation. Computer modeling showed that increasing stream side vegetation would not result in significantly cooler water temperatures in most major Sandy basin tributaries. However, smaller streams, particularly in the lower portions of the basin, (e.g. Beaver Creek) would likely show significant temperature improvements by increasing mature stream side vegetation.

System Potential shade conditions likely cannot be attained within 100 percent of the watershed's riparian area in Clackamas County on Clackamas County, CCSD #1, and non-ODA/ODF privately-owned lands due to private property rights, historic land use decisions, and other factors.

8.3 Implementation Monitoring, Annual Status Reports, and Evaluation Reports

Implementation monitoring will be conducted by Clackamas County's Departments of Transportation & Development, Business and Community Services, and/or WES to confirm that specific Management Strategies that are outlined in this Implementation Plan were actually implemented. A summary of the work that was done to implement the Management Strategies will be submitted to DEQ in Annual Status Reports, as is required by the TMDL's "Water Quality Management Plan" (see page 11 in chapter 14). Every fifth year, an Evaluation Report will also need to be submitted. For more information on Evaluation Report requirements, also see page 11 of the TMDL's Water Quality Management Plan.

Table 3: Management Strategies Matrix for Temperature

Source	Strategy	How	Fiscal analysis	Measure	Timeline	Milestone
<i>What sources of this pollutant are under your jurisdiction?</i>	<i>What is being done, or what will you do, to reduce and/or control pollution from this source?*</i>	<i>How will this be done?*</i>	<i>What is the expected resource need?*</i>	<i>How will we demonstrate successful implementation or completion of this strategy?*</i>	<i>When do you expect it to be completed?*</i>	<i>What goals do you expect to achieve, and by when, to know progress is being made?*</i>
1. Effective shade (radiant heat)	a. Watershed Protection Regulations	i. Metro Title 3. The equivalent of this is administered by WES in CCSD #1 and in SWMACC. Clackamas County administers Title 3 in all other areas of County jurisdiction where it applies.	Currently funded	Track the number of approved building and development permits per year with riparian area setbacks.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
		ii. Metro Title 13 (Goal 5) – Clackamas County/WES jurisdictional areas. This will be adopted by ordinance by DTD.	Additional resources needed: (Minimum \$100,000).	Track the number and acreage of HCA's protected, mitigated, or restored.	Ordinance and Map of Habitat Conservation Areas adopted by Dec. 2008	Protection of Class 1 and II HCA's. Report to Metro REIN Program and annually.
		iii. River and Stream Conservation Area (ZDO 704). This is administered by Clackamas County.	Currently funded	Track the number of approved building permits per year with riparian area setbacks.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
		iv. Floodplain Management District (ZDO 703). This is administered by Clackamas County.	Currently funded	Track the number of approved building permits per year which receive a ZDO 703 review.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
		v. Wetland Provisions of ZDO 1002 and 709. These ZDOs, which only apply to wetlands, are administered by Clackamas County.	Currently funded	Track the number of approved building permits per year with wetland riparian area setbacks.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
1. Effective shade (radiant heat)	b. Public involvement and education	Encourage landowners to voluntarily protect/enhance their riparian areas through public education and involvement.	Currently funded, additional resources may be needed.	Qualitative assessment through interviews with staff.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
	c. Sandy River Basin Watershed Council Involvement	A Clackamas County staff member participates in the Sandy River Basin Watershed Council. In the future, Clackamas County will evaluate opportunities to support tree planting and other restoration efforts that could improve effective shade in the Sandy watershed through the Sandy River Basin Watershed Council.	Currently funded, additional resources may be needed.	Qualitative assessment through interviews with staff.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.

* Note: Details on management strategies are provided in Chapter 7.

8.4 Effectiveness Monitoring

Effectiveness monitoring is conducted to determine if the selected management strategies are effectively reducing in-stream pollutant loading from sources that Clackamas County and/or CCSD #1 are responsible for. The resulting data will then, from time to time, be compared to:

- The non-point source temperature LA—or the LA surrogate, percent effective shade—to determine if the allocation or surrogate has been attained, and/or
- Current water quality standards and to historic data to determine if in-stream water quality has improved to the desired level or by the desired percentage.

It is expected that riparian area shade monitoring will be conducted in the future in portions of Clackamas County through efforts by other agencies or entities. Shade monitoring could be conducted by DEQ, ODFW, the USFS, the BLM, and/or PGE. Clackamas County plans to use data as it becomes available to perform effectiveness monitoring.

8.5 Timeline

The goal of Clackamas County and CCSD #1 is to attain the load allocations for each TMDL parameter through an adaptive management process. Clackamas County is committed to investing in activities and programs that contribute to overall watershed health. Clackamas County is currently implementing a variety of management strategies to improve and maintain water quality, as described in Chapter 7, and tracking the effectiveness of these activities with as described in Chapter 8.4. It is unknown at this time whether the current and planned level of management activities will provide enough pollutant load reduction to meet the load allocation given the barriers to implementation described in Chapter 8.2. As monitoring demonstrates progress toward pollutant reduction, Clackamas County will adaptively manage its activities and programs in order to work toward attaining the load allocations.

Clackamas County will address the temperature TMDL by focusing on protecting existing riparian shading and supporting work to increase riparian shading through the Sandy River Basin Watershed Council. It will take many years for new trees to be planted and many more decades for those trees to grow to full height to develop effective riparian shading where it is lacking. Even if every degraded riparian area in the portion of the watershed in Clackamas County were to be planted with native trees within ten years, which is exceedingly unlikely, it would take at least sixty more years for the trees in all of these areas to reach sufficient size to yield System Potential shade conditions.

As discussed in the Barriers section, System Potential shade conditions likely cannot be attained within 100 percent of the watershed's riparian area in Clackamas County on Clackamas County, CCSD #1, and non-ODA/ODF privately-owned lands due to private property rights, historic land use decisions, and other factors.

Nearly all portions of the Sandy River and its tributaries in Clackamas County appear to be meeting current temperature standards at this time. The following three sections of river in the Sandy River watershed were on the 303(d) list for temperature (table 1.1 of page 2 of the TMDL) just prior to TMDL development:

- Thirty (30) of the Sandy River’s river miles, from the mouth to river mile 30—the former Marmot Dam site—were on the 303(d) list. The Sandy River enters Multnomah County near river mile 16. For the section of the Sandy River that flows through Clackamas County, the Sandy River failed to meet the temperature standard only in the (approx.) 14 river miles that are closest to Multnomah County.

Until October 2007, Marmot Dam was at river mile 30. Now that this dam has been removed, summer-season in-stream temperatures may be at least somewhat colder in the area immediately below Marmot dam.

Much of the watershed’s lands above this reach are owned by the U.S. Forest Service (USFS) and Bureau of Land Management, as illustrated in Figures 3 and 4. Riparian area protection policies now in effect on these federal lands are expected to eventually lead to lower Summer-season river temperatures in this reach (river mile 16 to 30).

- One (1) of the Salmon River’s river miles, from the mouth to Boulder Creek, was on the 303(d) list. Since all but one of the Salmon River’s miles are meeting the temperature standard, we expect the River to eventually meet the temperature standard. Over three quarters of this watershed’s lands are owned by the U.S. Forest Service. We expect that riparian area protection policies in effect on these lands will eventually lead to lower Summer-season river temperatures.
- Five (5) of the Bull Run River’s river miles, from the mouth to the Portland Water Bureau’s dam No. 2, were on the 303(d) list. The Bull Run River watershed’s lands are largely owned by the U.S. Forest Service and the City of Portland. We expect that potable water management policies/regulations and riparian area protection policies/regulations in effect on these lands will eventually lead to lower Summer-season river temperatures.

It is expected that the eventual attainment of high system potential shade values in the Clackamas County portion of the Sandy watershed will be the product of a loose or structured partnership between Clackamas County, CCSD #1 and:

- Citizens
- Non-profit organizations (watershed councils, Friends of Trees, SOLV, etc.)
- Certain for-profit companies who own land in the watershed
- The Clackamas County SWCD
- Metro (large landowner and riparian area regulator)

9. *E. coli* (Bacteria)

9.1 Matrix of Management Strategies

Table 4 lists strategies for reduction and management of *E. coli* (bacteria).

9.2 Barriers to Implementation

DEQ combined the *E. coli* loading data from Beaver, Kelly, and Cedar Creeks, then calculated that an 86 percent reduction in *E. coli* loading was required based on the combined data set. Cedar Creek is actually very close to being in compliance with Oregon's in-stream bacteria standards (see Table 4.4 of the TMDL—page 105—for more information). DEQ's dataset showed that *E. coli* loading is much higher in Beaver and Kelly Creeks; this may be due to the fact that they drain densely developed sections of the Cities of Gresham and Troutdale. If Cedar Creek's *E. coli* loading data had been addressed separately by DEQ in the TMDL's Allocations section (Table 4.6), it is estimated that the required *E. coli* loading reduction in Cedar Creek would have only been about 10 percent.

The Cedar Creek watershed is illustrated in Figures 7 and 8. Most of the Cedar Creek watershed contains land managed by the U.S. Forest Service. There are few County roads in the Cedar Creek watershed. Land ownership categories that are potential sources of in-stream *E. coli* loading which Clackamas County and CCSD #1 have very little or no authority to regulate or control include, but are not limited to:

- Privately-owned timberlands
- Privately-owned farm, ranch, and orchard lands
- BLM and Forest Service lands (U.S. government)
- Nearly all lands within the other cities in the TMDL's geographic area
- Highways and other State-owned lands

This Implementation Plan addresses *E. coli* that are discharged by the following types of conveyance systems from lands under Clackamas County jurisdiction for the TMDL implementation (i.e., land not owned by the state or federal government, and land not in ODA/ODF regulated areas):

- Clackamas County and County Service District-owned (in Boring, for example) storm sewer outfalls that are not subject to the MS4 permit's requirements.
- Privately-owned storm sewer outfalls.
- Overland sheet flow or channelized flows that do not flow through MS4-permitted or privately-owned storm sewer outfalls.

Clackamas County's and CCSD #1's authority to control sources of bacteria in privately-owned conveyance systems is usually quite limited. If Clackamas County and/or WES is aware of a privately-owned conveyance system that is a significant, known source of *E. coli*, the matter will be referred to DEQ if public education and/or mediation fail to yield the necessary water quality improvement.

Table 4. Management Strategies Matrix for Bacteria

Source	Strategy	How	Fiscal analysis	Measure	Timeline	Milestone
<i>What sources of this pollutant are under your jurisdiction?</i>	<i>What is being done, or what will you do, to reduce and/or control pollution from this source?*</i>	<i>How will this be done?*</i>	<i>What is the expected resource need?*</i>	<i>How will we demonstrate successful implementation or completion of this strategy?*</i>	<i>When do you expect it to be completed?*</i>	<i>What goals do you expect to achieve, and by when, to know progress is being made?*</i>
1. Failing septic systems	a. Septic system management	Respond to reports of failing systems; work with homeowner to set a timeline for repair. County-funded Safety Net Program provides low interest loans for low income property owners to repair failing septic systems.	Currently funded	Track # of reports, outcome of inspection (failing or not), date of follow-up that confirmed repairs were made, and # of Safety Net loans provided.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management.
	b. Public involvement and education	Provide information in brochures, on WES' website, and upon request about septic system maintenance and how to detect failures.	Currently funded	Track the number of website "hits" and the number of brochures printed/year	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management
2. Pet waste	a. Pet waste management and Public involvement and education	Public education to pet owners through a variety of sources. Maintain educational signs and provide dog waste bag dispensers in parks.	Currently funded	Track number of bags taken from dispensers each year. Track the number of website "hits" and the number of brochures printed/year	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management
3. Dead animals	a. Dead animal management	Personnel from Clackamas County Road Dept. collect and properly dispose of large dead animals on full-service roads.	Currently funded	Track the number of removals performed annually.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management
4. Illegal dumping of solid waste	a. Illegal dumping management and public education and involvement	Implement Clackamas County's Dump Stoppers Program. Provide public education related to illegal dumping.	Currently funded	Track waste removed through Dump Stoppers Program. Track # of persons/year who complete mediation process for solid waste dumping. Track # of enforcement actions taken/year for solid waste dumping.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management
5. Illicit discharges and spills	a. Spill response and IDDE	Implement spill response and IDDE program on Clackamas County full service roads and within CCSD #1's UGB subunit. Refer other cases to DEQ.	Currently funded	Track the number of discharges/spills per year.	Ongoing	Evaluate measures annually for effectiveness and level of service; apply adaptive management

* Note: Details on management strategies are provided in Chapter 7.

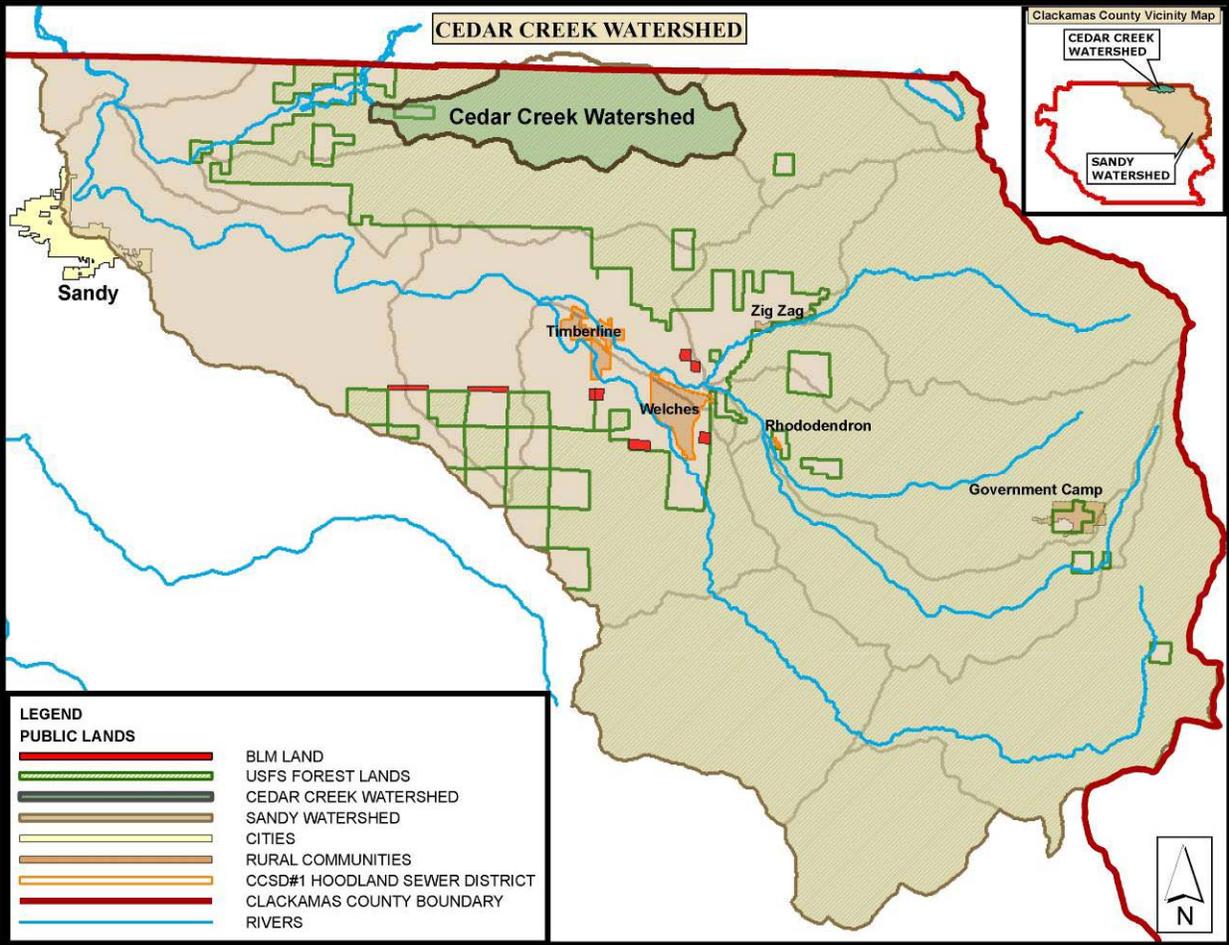


Figure 7. Cedar Creek Watershed

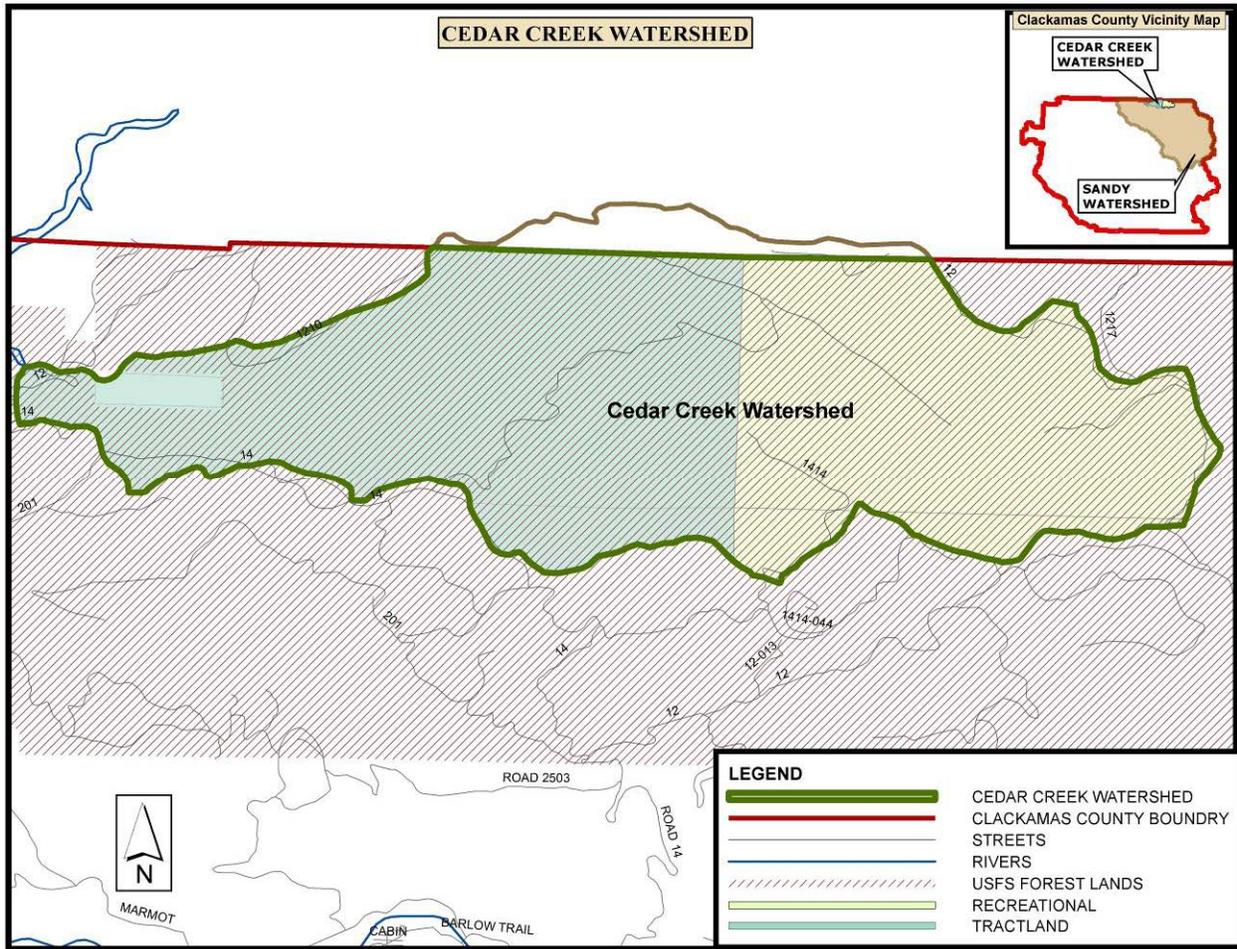


Figure 8. Cedar Creek Watershed

9.3 Implementation Monitoring, Annual Status Reports, and Evaluation Reports

Implementation monitoring will be conducted by Clackamas County's Departments of Transportation & Development, Business and Community Services, and/or WES to confirm that specific Management Strategies that are outlined in this Implementation Plan were actually implemented. A summary of the work that was done to implement the Management Strategies will be submitted to DEQ in Annual Status Reports, as is required by the TMDL's "Water Quality Management Plan" (see page 11 in chapter 14). Every fifth year, an Evaluation Report will also need to be submitted. For more information on Evaluation Report requirements, also see page 11 of the Water Quality Management Plan.

9.4 Effectiveness Monitoring

Effectiveness monitoring is conducted to determine if selected Management Strategies are effectively reducing in-stream pollutant loading from sources that Clackamas County and/or CCSD #1 are partially or completely responsible for. The resulting data will then, from time to time, be compared to:

- The *E. coli* LA to determine if the allocation has been attained, and/or
- Current *E. coli* water quality standards/criteria and to historic data to determine if in-stream water quality has improved to the desired level or by the desired percentage.

The Clackamas County Soil & Water Conservation District (SWCD) has performed water quality monitoring work in the Cedar Creek watershed in the past. Clackamas County expects to use water quality data collected by the SWCD or other agencies to monitor the effectiveness of its Management Strategies in the future as data becomes available.

9.5 Timeline

The goal of Clackamas County and CCSD #1 is to attain the load allocations for each TMDL parameter through an adaptive management process. Clackamas County is committed to investing in activities and programs that contribute to overall watershed health. Clackamas County is currently implementing a variety of management strategies to improve and maintain water quality, as described in Chapter 7, and tracking the effectiveness of these activities with monitoring as described in Chapter 8.4. It is unknown at this time whether the current and planned level of management activities will provide enough pollutant load reduction to meet the load allocation given the barriers to implementation described in Chapter 8.2. As monitoring demonstrates progress toward pollutant reduction, Clackamas County will adaptively manage its activities and programs in order to work toward attaining the load allocations.

Water quality in Cedar Creek is generally good. An analysis of data by DEQ during TMDL development from 34 separate Cedar Creek water samples found that the median number of colony forming units (CFU) per 100 milliliters (ml) was 113, and that the geometric mean was 66 CFU/100ml. Both of these figures are well below the DEQ's "multiple sample" standard of 126 CFU/100ml, so Cedar Creek's waters meet the DEQ's "multiple sample" *E. coli* standard.

Attaining the load allocation for *E. coli* in the Sandy TMDL watershed will likely require action by a variety of government agencies and private landowners. Clackamas County and CCSD #1's work toward reducing *E. coli* in surface water will likely be complemented by actions taken by the following government agencies that provide additional regulatory authority and/or education and technical assistance:

- The Clackamas County Soil and Water Conservation District
- ODA
- ODF

10. Review and Revision of Plan

According to OAR 340-042-0080(3)(a)(C), Clackamas County and CCSD #1 shall “Provide for... periodic review and revision of the implementation plan.” We will review and revise the Implementation Plan on an as-needed basis. At minimum, we expect to review and, if deemed necessary, revise the Implementation Plan soon after the Willamette TMDL is revised in the future by the DEQ. We and the DEQ expect that the TMDL revision date will be in 2011, five years from the date it was issued as an Order in 2006. This Implementation Plan may be reviewed and, if we deem it necessary, revised at other times if we learn that one or more cost-effective modifications to the Implementation Plan can be made which, if implemented, will result in attainment, or significant progress towards attainment, of one or more LA.

11. Statewide Land Use Requirements

Oregon Administrative Rule 340-042-0080(3)(a)(D) states that – to the extent required by ORS 197.180 and OAR chapter 340, Division 18 – evidence of this Implementation Plan’s compliance with the applicable land use requirements shall be provided. Clackamas County and CCSD #1 are currently in compliance with all land use requirements which pertain to this Implementation Plan. This Implementation Plan is consistent with Clackamas County’s Comprehensive Plan and land use regulations. These Comprehensive Plans have been acknowledged by Oregon’s Land Conservation and Development Commission to be in compliance with the Statewide Planning Goals. This Implementation Plan is consistent with the County’s Comprehensive Plan and the City’s Comprehensive Plan to the extent required by law.

For example, within the Clackamas County Comprehensive Plan’s “Natural Resources and Energy” Chapter, setback distances from streams/wetland/rivers are addressed with broad policies and in specific detail. These broad setback distance policies and details are then repeated and detailed further in Section 704 of the Zoning and Development Ordinance. While the Clackamas County Comprehensive Plan does not specifically mention TMDLs by name, overarching goals that are present in the TMDL – including the need to keep in-stream water temperatures down during the summer – are addressed in the Comprehensive Plan.

We have concluded that Clackamas County’s Comprehensive Plans have provisions that are relevant to this Implementation Plan and that this Implementation Plan is compatible with these provisions.

12. Citation of Legal Authority

Clackamas County Service District #1

Organized under ORS 451 in 1974, CCSD #1 was empowered with surface/stormwater management authority by Clackamas County Board Order No. 93-196 on February 25, 1993. This Order authorizes CCSD #1 to provide nonstructural and structural non-point source pollution controls to meet state and federal regulations and to, in general, address surface/stormwater quality and flooding problems in the district. These controls are contained with the *Surface Water Management Rules & Regulations*, revised February 1, 2005, and in the *Surface Water Management Administrative Procedures*, dated January 2003.

The fees charged for services vary in CCSD #1's four subunits: Hoodland, the North Clackamas Urban Area (includes a large, urbanized, unincorporated area), Boring, and Fischer's Forest Park (FFP). Surface water management fees charged to customers in the North Clackamas Urban Area (CCSD #1-UGB) support a wide range of Surface Water Management services for the community. The Hoodland subunit is in the Sandy River watershed. The only surface/stormwater-related services that are provided and fees that are charged in the Hoodland, Boring and FFP subunits of CCSD #1 are for the review of plans and the issuance of permits for new/redevelopment – with corresponding controls that may include stormwater detention, erosion control, post-construction stormwater treatment, and wetland/streamside setback areas – so these are the only surface/stormwater-related services which are provided by CCSD #1 in Boring and FFP.

Clackamas County Comprehensive Plan, ZDOs, and Other Board Orders

The Clackamas County Comprehensive Plan was last updated on May 31, 2000. The Comprehensive Plan addresses planning goals and policies, including land use, transportation, community and design plans, stormwater drainage, natural resources, and open space/parks. Current policies regarding development, implementation, and enforcement of stormwater controls for new development or redevelopment are identified in the Public Facilities and Services element of the Comprehensive Plan. The Comprehensive Plan provides authority to adopt measures that protect surface/stormwater quality.

Zoning and Development Ordinances (ZDO) provides the rules, regulations, and standards that implement the goals and policies of the Comprehensive Plan. The ZDOs that serve to protect surface/stormwater quality are:

- Floodplain Management District (Section 703)
- River and Stream Conservation Area (Section 704)
- Conservation Wetland District (Section 709)
- Willamette River Greenway (Section 705)
- Protection of Natural Features (Section 1002)
- Utility Lines and Facilities (Section 1006)
- Storm Drainage (Section 1008). Includes stormwater quality control, such as detention and erosion control.
- Open Space and Parks (Section 1011)
- Density Standards, Transfers and Bonuses (Section 1012)
- Planned Unit Developments (Section 1013)
- Open Space Review (Section 1103).

Regulations necessary to implement Metro's Title 13 (mandated in part by State of Oregon Goal 5) are expected to be approved soon that will provide additional protection for riparian shade.

Existing regulations that prohibit illicit connections to storm sewers are promulgated in ORS 447.140. Clackamas County Board Order 81-1-36 ("An Ordinance Pertaining to Enforcement of the Building Code, Excavation and Grading Standards, and Sewage Disposal System Standards") provides Clackamas County with the authority to enforce regulations which prevent and control illicit connections. This Order was amended by Board Order 88-179 to include grading and filling regulations.

The Comprehensive Plan, ZDOs, and Board Orders apply during new/redevelopment and during times when development is not proposed or occurring. If a property is not being developed or redeveloped, Clackamas County's Planning and/or Community Environment Divisions administer the applicable portions of the Comprehensive Plan, the applicable ZDOs, and many Board Orders. If a property has been proposed to be developed/redeveloped, all Plans are checked for conformance with the following:

- ZDOs. (Clackamas County)
- Grading and Excavation Ordinances. (WES)
- The Roadway Standards Manual. This document provides requirements for drainage standards, roadway standards, submittal requirements, including a section on hydrology, hydraulics, and water quality. The manual was completed in January 1999. (Clackamas County)
- CCSD #1's Rules and Regulations, but only if the property is in (or is requesting annexation into) CCSD #1. Developers may be required to provide stormwater detention, erosion control, post-construction stormwater treatment, and a streamside/wetland setback area. (WES)

Development Review

Clackamas County DTD and WES, on behalf of CCSD #1, review plans for new development and redevelopment in certain unincorporated areas in the Sandy River watershed. All Plans are checked for conformance with the following:

- ZDOs
- The Grading and Excavation Ordinance
- The Roadway Standards Manual. This document provides requirements for drainage standards, roadway standards, submittal requirements, including a section on hydrology, hydraulics, and water quality. The manual was completed in January 1999.
- CCSD #1's Rules and Regulations, but only if the property is in (or is requesting annexation into) CCSD #1. Developers may be required to provide stormwater detention, erosion control, post-construction stormwater treatment, and a streamside/wetland setback area.