NON-POINT SOURCE TOTAL MAXIMUM DAILY LOAD IMPLEMENTATION PLAN FOR THE TUALATIN, WILLAMETTE, MOLALLA-PUDDING, AND SANDY RIVER WATERSHEDS

Clackamas County, Clackamas Water Environment Services
and the Cities of Happy Valley and Rivergrove

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OVERVIEW

1. Introduction

The federal Clean Water Act, section 303, requires states to develop water quality standards to support beneficial uses of public water bodies. A water body, or portion of that water body that does not meet water quality standards is listed as impaired for that parameter on the 303(d) list of water quality limited water bodies. 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 standards for that parameter. The TMDL then serves as a plan to meet water quality standards for a particular pollutant through the assignment of load reductions.

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) impaired waters list. Each TMDL identifies the maximum amount of a specific pollutant that can enter a water body so that it can meet water quality standards. 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 divided 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. Oregon DEQ develops wasteload allocations for point sources such as wastewater treatment plants, stormwater runoff from larger urbanized areas, and industrial discharges; and load allocations (LA) for non-point source (NPS) pollution from agricultural, rural residential, and forestry lands.; the smaller urbanized areas are regulated as a NPS.

The Oregon Administrative Rule (OAR) 340-042 regulates TMDL creation and implementation and requires local governments and other agencies to develop and implement TMDL Implementation Plans for non-point sources. Please see Chapter 13 in this Implementation Plan for the full set of these OARs. Point sources are covered through requirements in National Pollutant Discharge Elimination System (NPDES) permits. This Non-Point Source TMDL Implementation Plan (IP) has been developed to identify management strategies and activities that will be implemented to protect and improve surface water quality in the Sandy River, Tualatin River, Molalla-Pudding River, and Willamette River watersheds. Responsible parties such as state agencies, counties, cities, and other organizations who implement pollution reduction strategies are classified as Designated Management Agencies (DMAs).

According to OAR 340-042-0080, TMDL IPs must include the following five elements:

1) Management Strategies that will be used to reduce pollutant loading and eventually achieve load allocations

2) A timeline for implementing Management Strategies and a schedule for completing measurable milestones

3) Performance monitoring with 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 TMDL's Water Quality Management Plan (WQMP)

1.1 Co-Owners of this Implementation Plan

This Non-Point Source (NPS) TMDL Implementation Plan for the Sandy, Tualatin, Molalla-Pudding, and Willamette River watersheds is co-owned by the following four DMAs:

1) The Water Environment Services Partnership, which is an inter-governmental entity organized under ORS 190 (WES Partnership). Clackamas WES, a Dept. of Clackamas County, administers the WES Partnership. The WES Partnership includes two separate Clackamas County Service Districts – the Surface Water Management Agency of Clackamas County (SWMACC), and Clackamas County Service District #1 (CCSD#1) – which together comprise the WES Surface Water Management (SWM) Service Area.

2) Clackamas County, including but not limited to the Business and Community Services Dept., the Department of Transportation & Development (DTD), and the North Clackamas Parks and Recreation District

3) City of Happy Valley

4) City of Rivergrove

In this IP, these units of local government are collectively referred to as the Co-Owners of the IP. In previous years, going back to 2003 in the case of the Tualatin River TMDL IP, the Co-Owners of this IP have maintained four separate IPs, each of which only applied to one watershed. In this IP, the Co-Owners of the IP chose to address their non-point source TMDL obligations for all four TMDL watersheds in one shared IP.

For the previous and current IPs, the jurisdiction of each IP in addition to the specific TMDLs are summarized in Table 1.

Table 1. TMDL IP Jurisdiction and Important Dates

	Tualatin River Watershed TMDL IP	Willamette River Watershed TMDL IP	Molalla-Pudding River Watershed TMDL	Sandy River Watershed TMDL IP
TMDL IP Original Submission and Revision Dates	• August 7, 2003 • Revised March 31, 2008 • Revised January 6, 2011 • Revised February 2014 • Revised September 2022	• June 8, 2009 • Revised January 7, 2011 • Revised September 2022	• February 2012 • Revised September 2022	• March 25, 2008 • Revised September 2022
Designated Management Agencies (DMAs) for each watershed	• SWMACC • Clackamas County • City of Rivergrove	• Clackamas County • Clackamas County Service District No. 1 • City of Happy Valley	• Clackamas County	• Clackamas County

1.2 Management Strategies

This IP's Management Strategies, which are contained within this IP's chapter #7, are expected to reduce TMDL pollutants from non-point sources to address Load Allocations (LA).

Efforts to reduce TMDL pollutants from point sources, such as a wastewater treatment plant effluent, or NPDES-permitted municipal separate storm sewer systems (MS4), to achieve wasteload allocations (WLA) are addressed separately in NPDES permits issued by DEQ to one or more of the Co-Owners of this IP.

To comply with DEQ requirements for TMDL IPs (provided in OAR 340-042-0080(4)), the Management Strategies and other information provided herein address each parameter within the following TMDLs over which Clackamas County, Clackamas WES' SWM service area, and the Cities of Happy Valley and/or Rivergrove have jurisdiction:

- **Tualatin River TMDL:** Water temperature, *E. coli (*bacteria), total phosphorus, dissolved oxygen (DO), and mercury.
- **Willamette River TMDL**: Water temperature, *E. coli (*bacteria), mercury, and DDT/Dieldrin (only in the Johnson Creek watershed).
- **Molalla-Pudding River TMDL:** Water temperature, *E. coli (*bacteria), mercury, and DDT/Dieldrin and iron (only in the Pudding River).
- **Sandy River TMDL:** Water temperature. An *E. coli* TMDL also applies in the Cedar Creek watershed, which is a tributary to the Sandy River.

1.3 Revised Willamette River Mercury TMDL

The February 2021 revised mercury TMDL replaced the original 2006 mercury TMDL for the Willamette River. The 2021 revised mercury TMDL also fully applies throughout the Willamette River Basin, including in the Tualatin River and Molalla-Pudding sub-basins. The adoption of this revised TMDL by USEPA (United States Environmental Protection Agency) initiated a requirement for DMAs in the watershed, including this IP's Co-Owners, to update their IP to address the new requirements within the 2021 revised mercury TMDL. See Section 9 for a summary of mercury management strategies to address the revised Willamette River Mercury TMDL requirements.

2. Clackamas County Surface Water Overview

This section includes a summary of this IP's TMDL watersheds, the organizational structure of the IP Co-Owners related to TMDL implementation, and TMDL implementation responsibilities.

2.1 Watersheds

This TMDL IP incorporates efforts to improve water quality for the Sandy River and the Willamette River and their tributaries in Clackamas County.

The major watersheds of Clackamas County are shown in Figure 1 and summarized in Table 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 2).

The remaining lands are drained by 1) the Sandy River, which enters the Columbia River in the City of Troutdale, and 2) a small portion of Clackamas County that appears to be located in a section of the Santiam River's watershed, however, these lands are owned by the United States Forest Service, so Clackamas County is not required to address these lands in any TMDL IP.

Table 2. Clackamas County Watersheds			
Clackamas County Watersheds	**Total acres in Watershed**	**Watershed in Clackamas County, acres**	**Percent of Watershed in Clackamas County**
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	39
Sub-watershed of Lower Willamette			
Johnson Creek	32,709	9,902	30

2.2 Organizational Summary

Clackamas WES plays a leading role in implementing portions of this IP as the administrator of the WES SWM service area; however, others also play a role in implementation. General responsibilities of WES, each County Department, and the Cities of Happy Valley and Rivergrove related to this TMDL are outlined in Table 3.

The Surface Water Management Agency of Clackamas County (SWMACC) is a Clackamas County Service District administered by Clackamas WES, a Department of Clackamas County, which was created in 1992 for the specific purpose of addressing the Tualatin TMDLs. Its boundaries include:

- All the properties in the Tualatin River Watershed that are unincorporated in Clackamas County.
- The portion of the City of Rivergrove that is in Clackamas County.

Other than the Cities of Happy Valley and Rivergrove, this TMDL Implementation Plan does not address or include lands that are located in cities. Those cities address their own NPS TMDL requirements.

Table 3. WES, County, and City Responsibilities		
DMA Name	**Jurisdictional Area**	**TMDL Implementation Plan Responsibility**
Clackamas WES	Limited to WES' SWM service area	Administers SWMACC and CCSD#1, both of which are all-purpose stormwater management entities. [a]
Clackamas County - DTD	County-wide	Includes Planning, Road Maintenance & Engineering, and the Office of Sustainability. Examples include riparian area land use and other land uses of private property, maintenance of County-maintained roads, and addressing illegal dumping of solid waste on private property.
Clackamas County - Business and Community Services Dept.	County-wide	Is a department of Clackamas County and includes Economic Development, management of surplus real estate, and Dump Stoppers (an illegal solid waste dumping prevention program), Clackamas County Parks (e.g., Barton Park), the library service district, and the County Fair.
Clackamas County - Facilities Management Dept.	County-wide	Maintains many County-owned buildings and some County-owned lands.
Clackamas County - North Clackamas Parks & Recreation District	On North Clackamas Parks & Recreation District (NCPRD)-owned and operated parks only	NCPRD is a department of Clackamas County that is also a Clackamas County service district which provides Parks services.
City of Rivergrove	Within City limits only	Limited to land use authority. Most other stormwater management functions are provided by WES/SWMACC on behalf of the City. [a]
City of Happy Valley	Within City limits only	Roads, erosion control permitting, tree ordinance, and land use. Most other stormwater management functions are provided by WES on behalf of the City.

[a] Clackamas WES does not provide SWM services in the portion of the City of Rivergrove, which lies within Washington County, or in the Boring, Fisher's Forest Park and Hoodland subunits of CCSD#1.

2.3 Surface and Stormwater Management Responsibilities

Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove have responsibilities as DMAs for these TMDLs and have cooperated in the development of this IP. Each entity has ongoing programs that provide for overall management of surface and ground water quality that contribute to improved watershed health.

2.3.1 Stormwater

Stormwater enters portions of these rivers and tributaries in the TMDL geographic area from areas regulated by the NPDES MS4 Permit program as well as from areas that are not regulated under the NPDES MS4 program. Figure 2 illustrates the MS4 permit area in the Northwestern portion of Clackamas County. These MS4-permitted storm sewer systems are point sources, and as a result, they are not addressed in this Implementation Plan. The Clackamas County MS4 permit was originally issued to Clackamas County and several co-permittees (including SWMACC) in December 1995. It was subsequently renewed in March 2004 (and modified in July 2005), March 2012, and, most recently, in October 2021.

Tualatin River Watershed

Stormwater enters the Tualatin River and tributaries in the Tualatin TMDL's geographic area from areas regulated by the NPDES MS4 Permit program as well as from areas that are not regulated under the NPDES MS4 program. Figures 2 illustrates the NPDES MS4 permit area in Clackamas County. DEQ considers these MS4-permitted storm sewer outfalls as point sources, and as a result, they are not addressed in this IP. WES is aware of five outfalls which are regulated by the Clackamas County MS4 Permit that are located in the SWMACC's/Rivergrove's MS4 permitted area. It is our understanding that a few pockets of rural unincorporated land in the SWMACC area, which are within the Portland metro area's urban growth boundary (UGB), are also regulated by the Clackamas County MS4 Permit.

Willamette Watershed

Stormwater enters the Willamette River and tributaries (in the TMDL geographic area) from areas both regulated and not regulated by the MS4 program, as shown in Figures 1 and 2.

Molalla-Pudding River Watershed

There are no Clackamas County owned NPDES MS4 permitted stormwater outfalls within the Molalla-Pudding subbasin.

Sandy River Watershed

The Sandy River watershed is not included in the Clackamas County NPDES MS4 permit area.

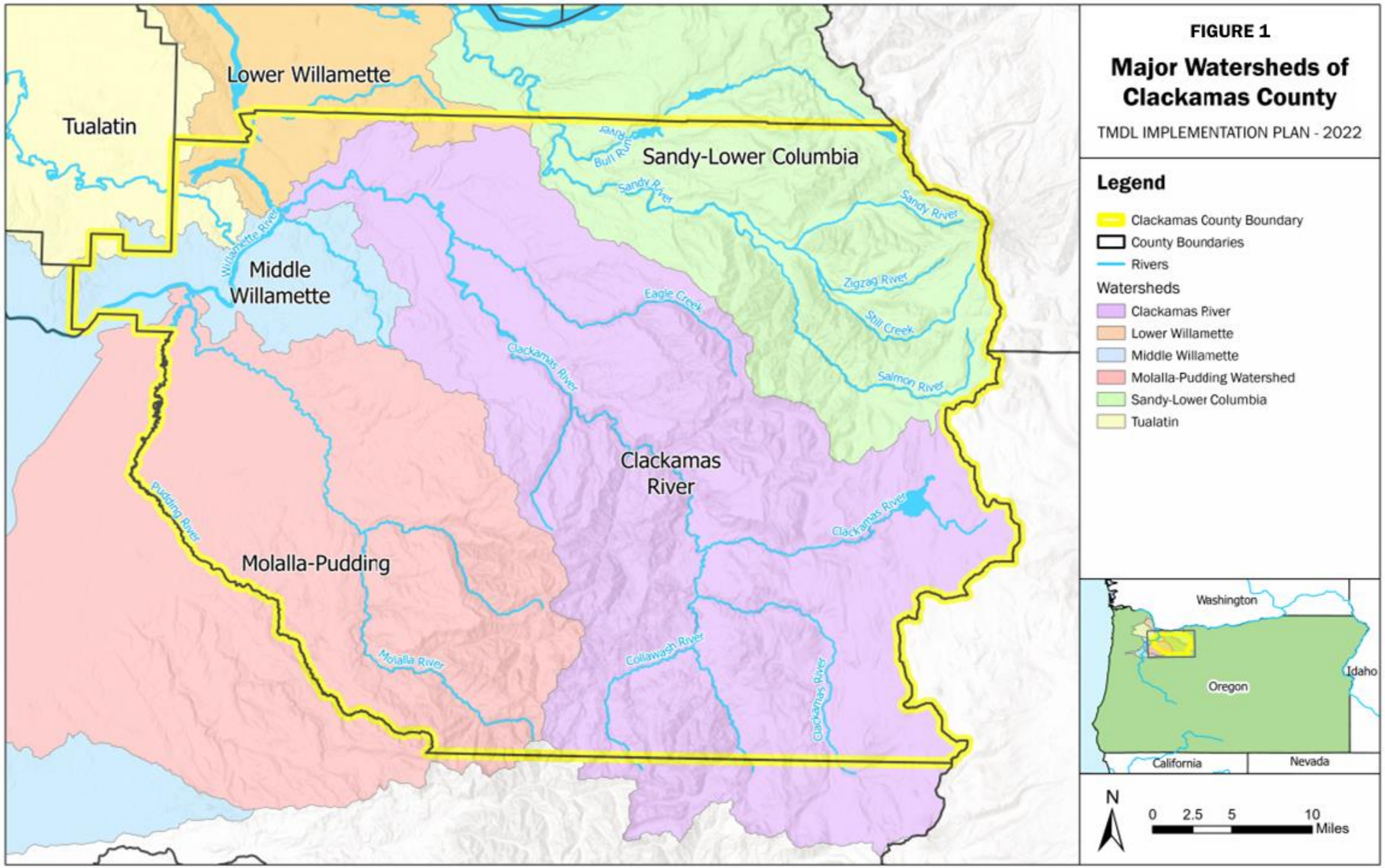

Figure 1. Major Watersheds of Clackamas County

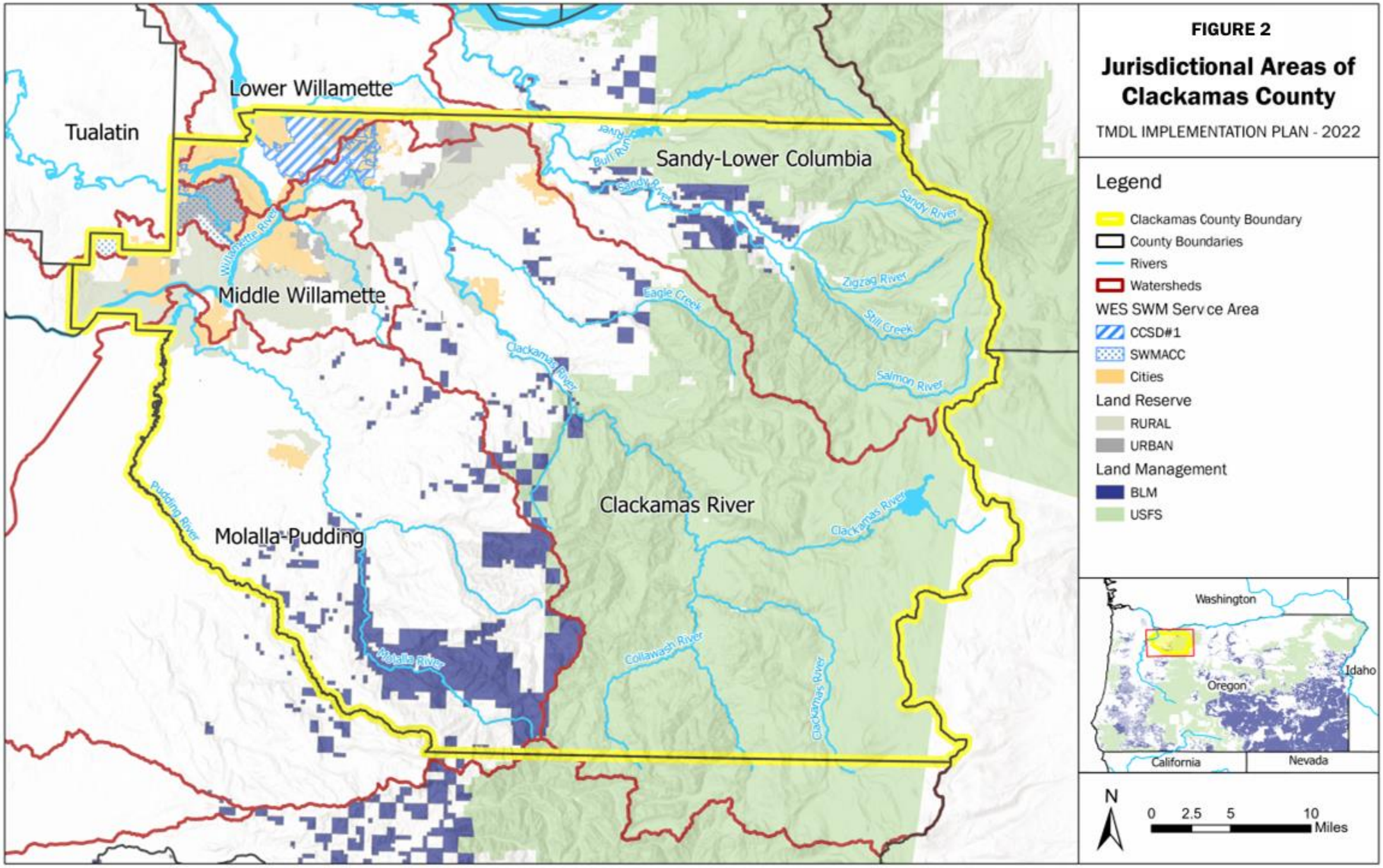

Figure 2. Jurisdicational Areas of Clackamas County

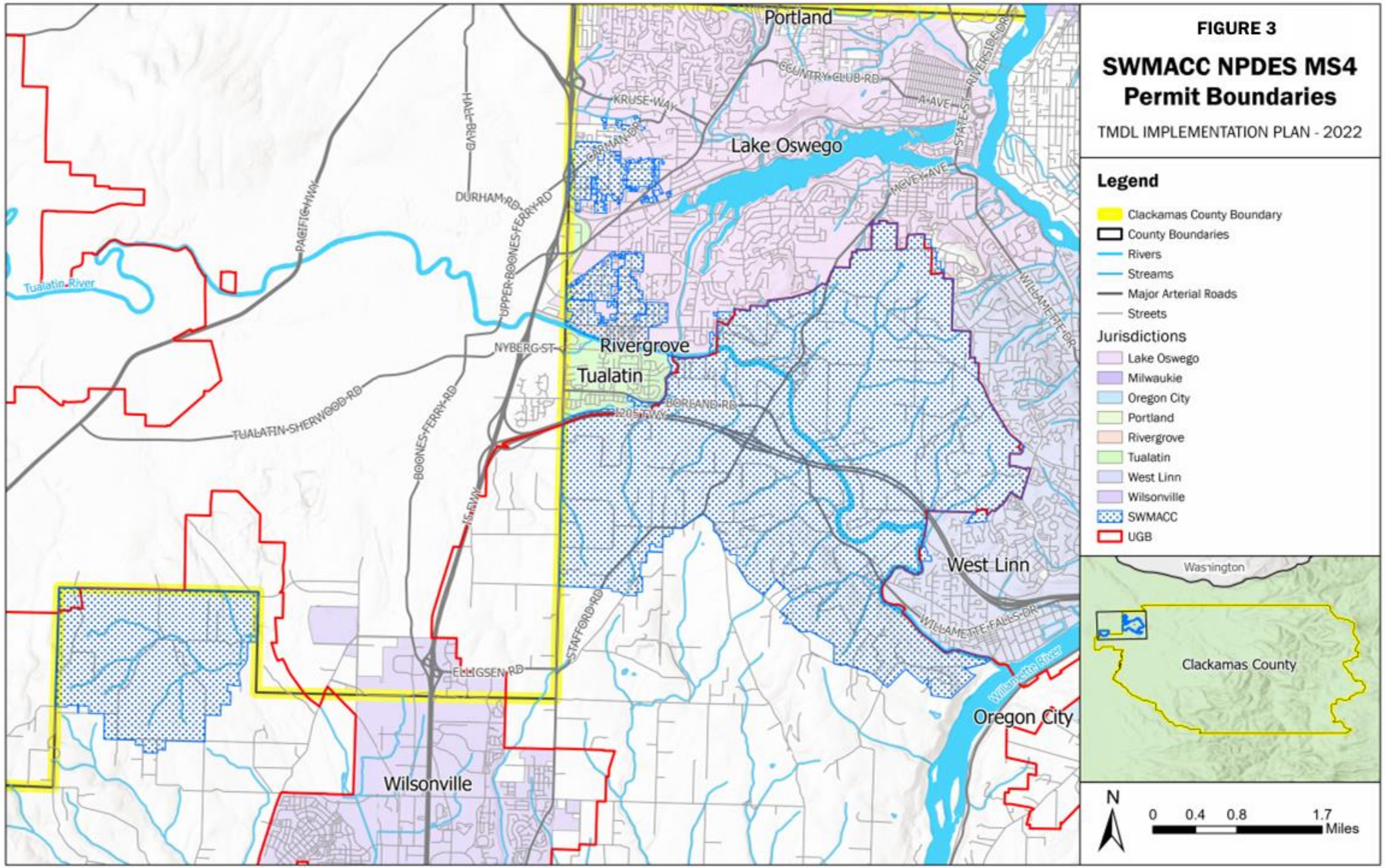

Figure 3. SWMACC NPDES MS4 Permit Bounadaries

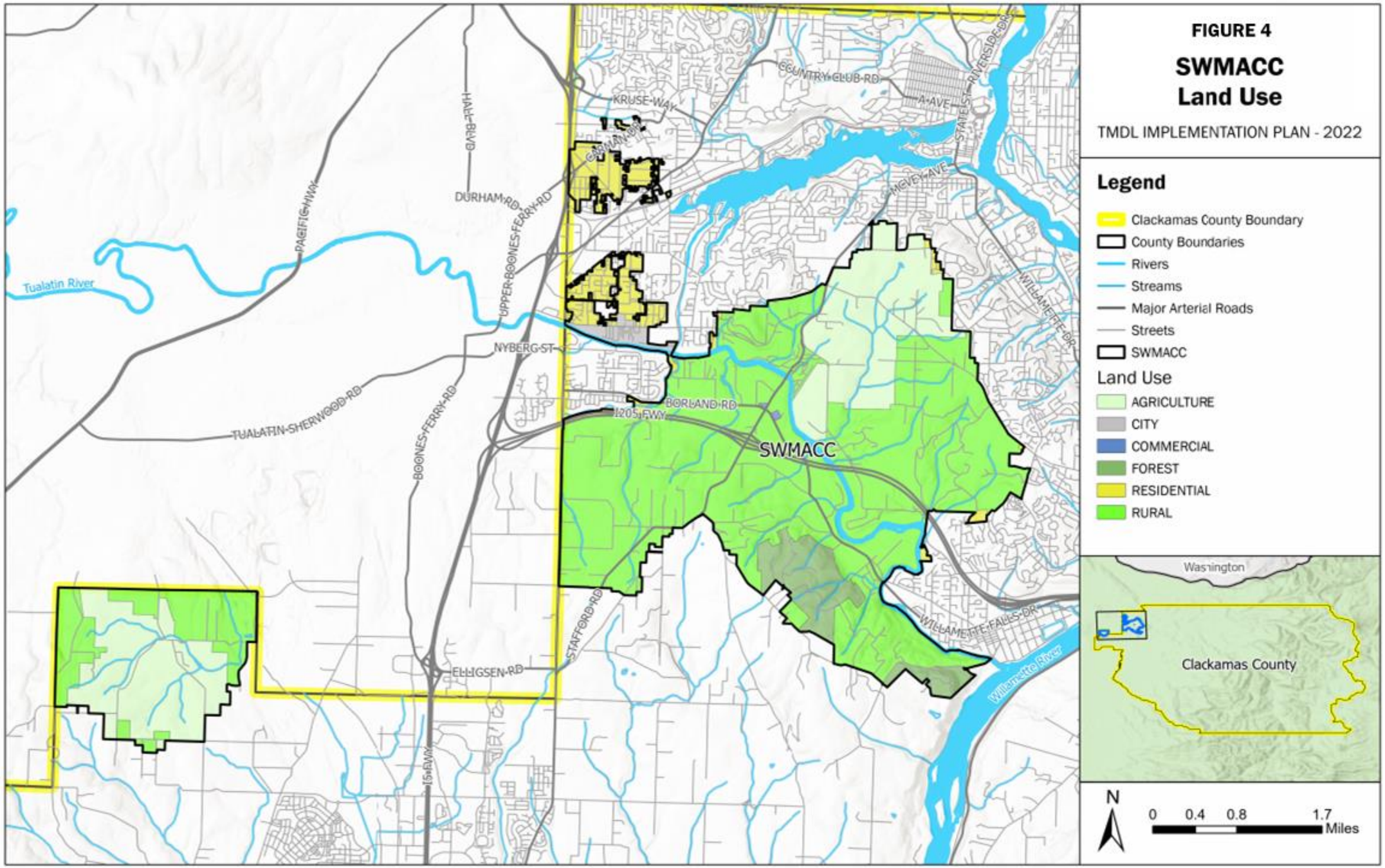

Figure 4. SWMACC Land Use

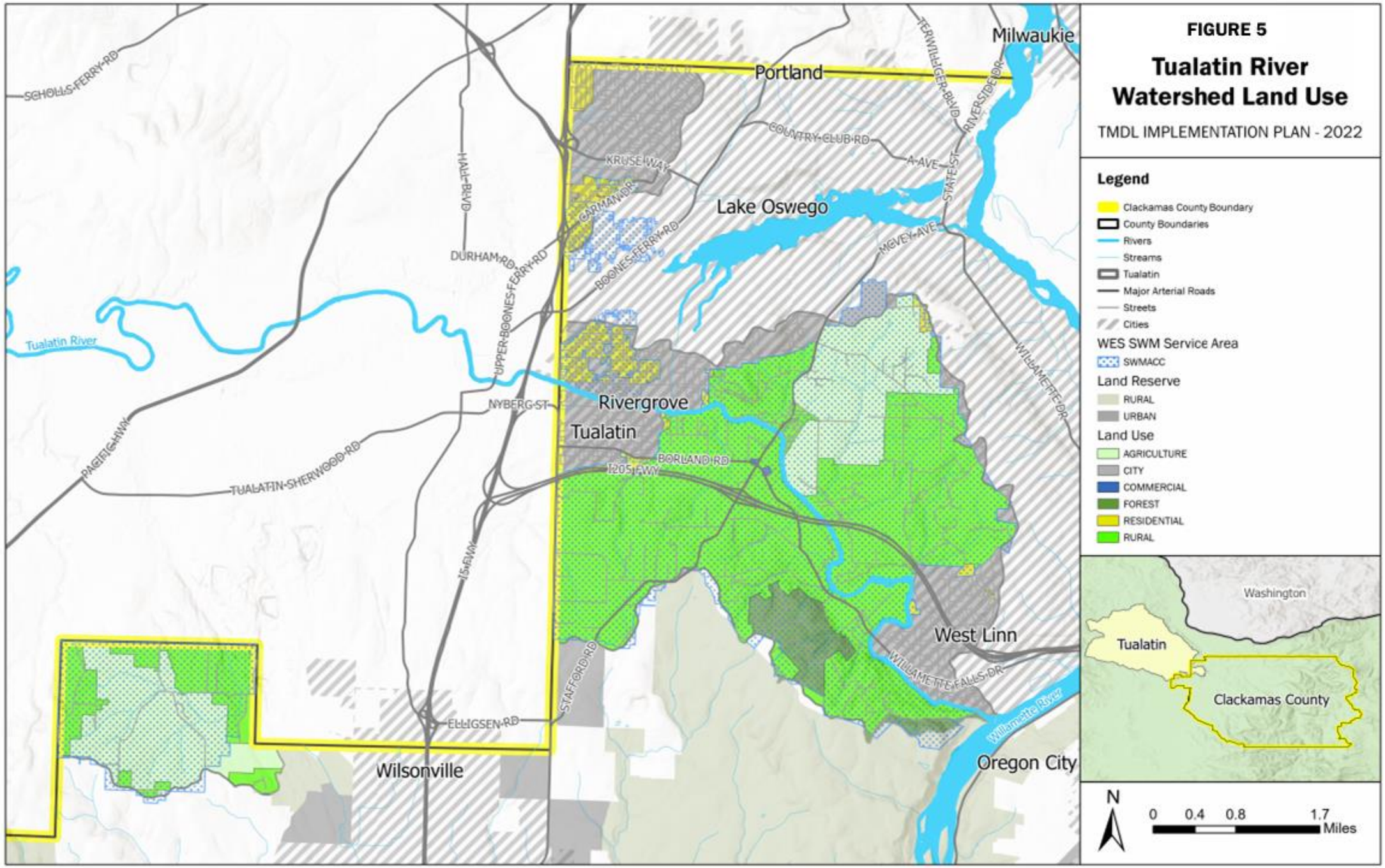

Figure 5. Tualatin River Watershed Land Use

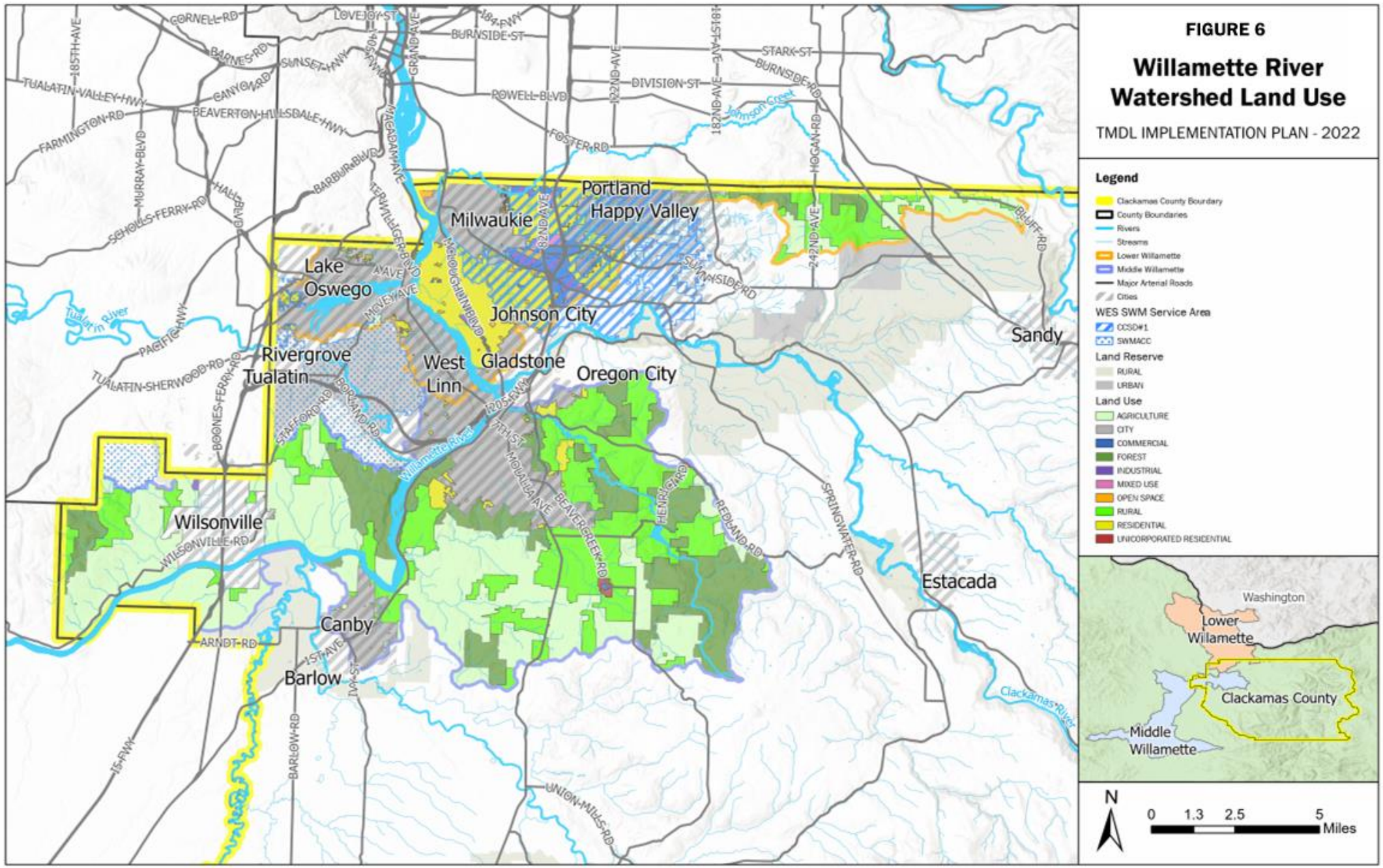

Figure 6. Willamette River Watershed Land Use

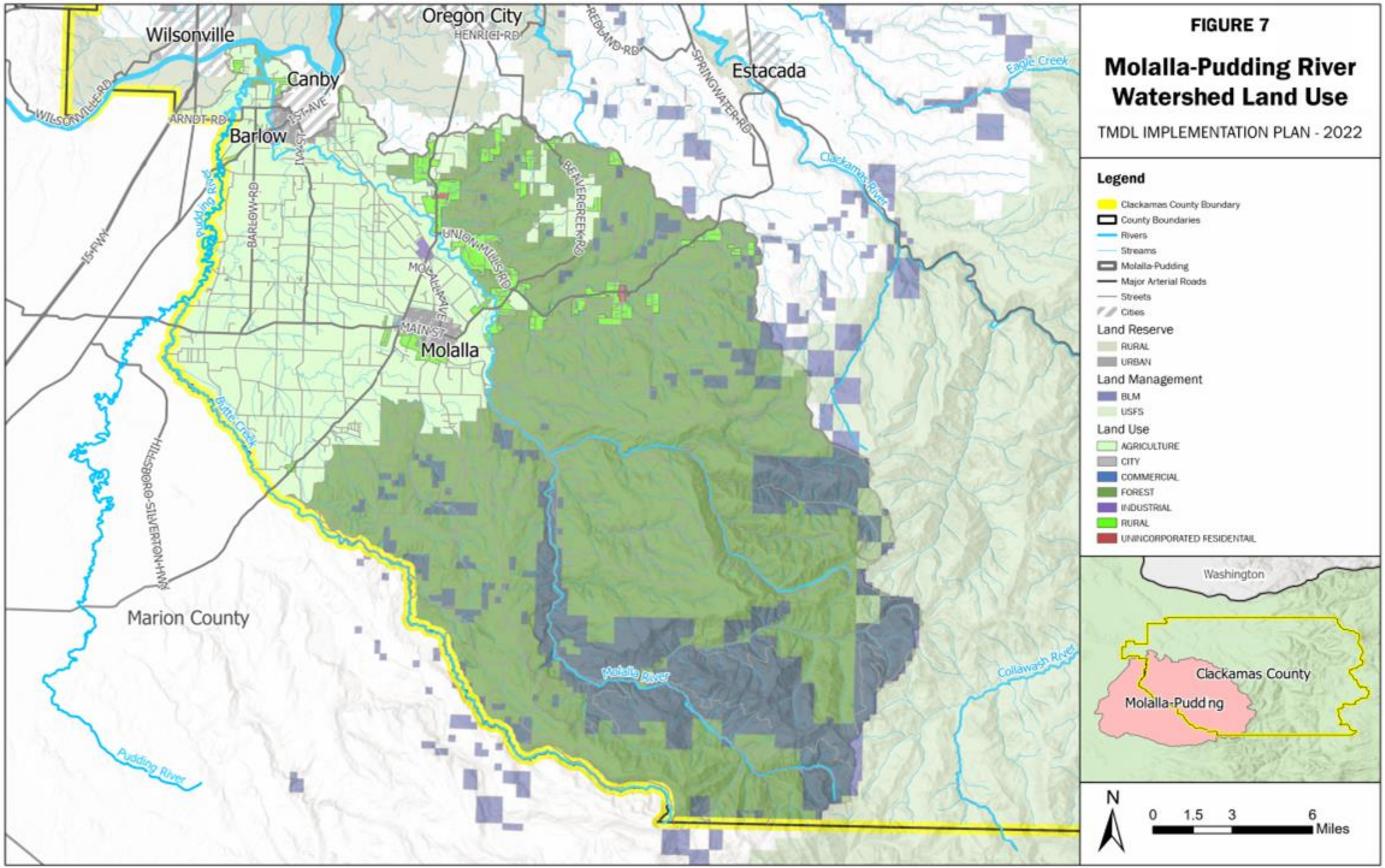

Figure 7. Molalla-Pudding River Watershed Land Use

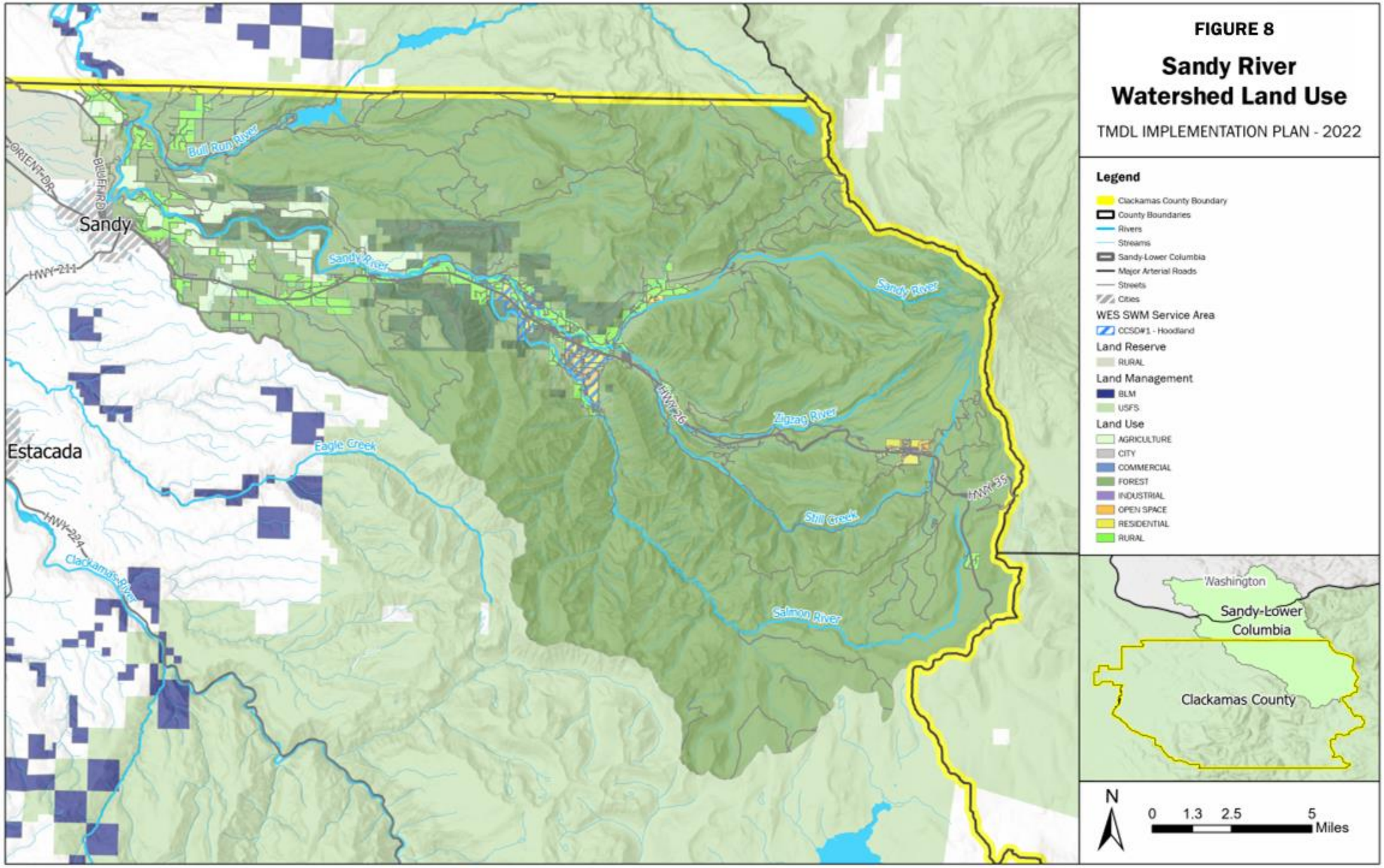

Figure 8. Sandy River Watershed Land Use

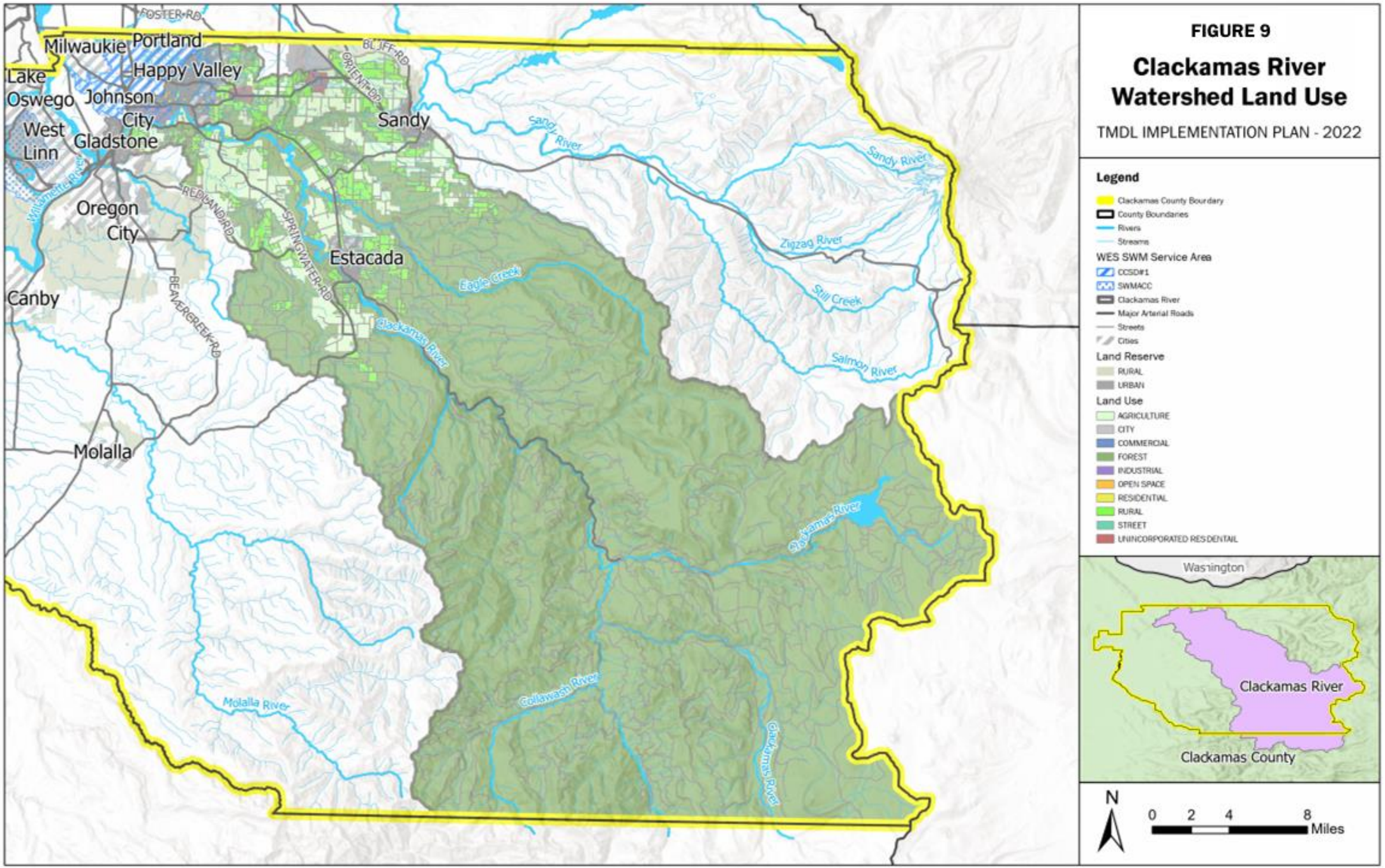

Figure 9. Clackamas River Watershed Land Use

3. TMDL Parameters and Allocations

Water quality impairments have been identified in the Willamette, Tualatin, Molalla-Pudding, and Sandy

River Watersheds, which prompted the development of TMDLs addressed in this IP for each of the watersheds as summarized in Table 4.

Table 4. TMDL Summaries Affected Waters

	Tualatin River Watershed TMDL	Willamette River Watershed TMDL IP	Molalla-Pudding River Watershed TMDL	Sandy River Watershed TMDL IP
TMDL Parameters	• Temperature • *E. coli* (bacteria) • Mercury • pH and chlorophyll A (total phosphorus) • DO	• Temperature • *E. coli* (bacteria) • Mercury • Dichlorodiphenyltrichloroethane [DDT] and dieldrin in the Johnson Creek watershed • Cold water refugia in the Willamette River	• Temperature • *E. coli* (bacteria) • Mercury • DDT and dieldrin • Nitrates [a] • Iron	• Temperature • *E. coli* (bacteria) only in the Cedar Creek sub-watershed

[a] The nitrate TMDL applies only to Zollner Creek. None of Zollner Creek, nor any portion of the contributing area, is within the Clackamas County boundary. Therefore, nitrate will not be addressed as part of this TMDL implementation plan.

Table 5 summarizes each TMDL parameter, load allocation, measurement method, and DMA relevant to this plan.

Table 5. TMDL Parameters and Load Allocations for Affected Waters

Affected Waters	Parameters	Measurement Method	Allocation Type	LA	DMA
Tualatin River TMDL					
All	*E. coli*	*E. coli*	LA	Summer (May 1–Oct 31): 12,000 colonies/100 ml during storms AND 406 colonies/100 ml during all other times. Winter (Nov. 1–April 30): 5,000 colonies/100 ml during storms AND 406 colonies/100 ml during all other times.	CC, SWMACC and Rivergrove
	Total phosphorus (pH and chlorophyll A)	Lab: Total Phosphorus	LA	0.14 mg/L in most instances. Only applies from May 1 to Oct. 31	CC, SWMACC, and Rivergrove
	DO	Lab: Winkler method, or field meter. A surrogate (TSS) may be used	LA	20% or 50% reduction in "Settleable Volatile Solids in Runoff".	CC, SWMACC, and Rivergrove
	Mercury	Lab: Mercury	LA	97% reduction from nonpoint sources: runoff, soil erosion, air deposition, etc.	CC, SWMACC, and Rivergrove

Table 5. TMDL Parameters and Load Allocations for Affected Waters					
	In-stream temperature	Surrogate: Shade	LA	Attaining "system potential vegetation" conditions	CC, SWMACC and Rivergrove
Willamette River TMDL					
All [a]	In-stream temperature	Surrogate: shade	LA	Attaining "system potential vegetation" conditions	CC, CCSD #1, Happy Valley
Mainstem Willamette River (RM 50 to RM 0)	Cold water refugia	Restoration of refugia	None	Restore where feasible	CC
All [a]	*E. coli*	Direct	LA	78 percent reduction (83 percent and 89 percent in Bargfield and Delano)	CC, CCSD #1, Happy Valley
Johnson Creek	DDT/dieldrin	Surrogate: TSS	LA	94 percent reduction in DDT (< 15 mg/L TSS)	CC, CCSD #1, Happy Valley
All [b]	Mercury	Direct	LA	Lower and Middle Willamette: 97% reduction Clackamas 88% reduction	CC, CCSD #1, Happy Valley
Molalla-Pudding TMDL					
Molalla-Pudding: Beaver Creek, Butte Creek, Drift Creek, Molalla River, Pine Creek, Pudding River, Silver Creek, S. Fork Silver Creek, Table Rock Fork Creek, Teasel Creek, Zollner Creek*	In-stream temperature	Surrogate: shade	LA	Attaining "system potential vegetation" conditions	CC
Molalla, Pudding, W. Fork Little Pudding River*	*E. coli*	Direct	LA	Variable [d]	CC
Little Pudding River*, Pudding River, Zollner Creek*	DDT	Surrogate: TSS	LA	TSS < 15 mg/L (Pudding & Zollner); TSS < 7 mg/L (Little Pudding)	CC
Pudding River, Zollner Creek*	Dieldrin	Surrogate: TSS	LA	TSS < 15 mg/L (Pudding & Zollner)	CC
Little Pudding*, Zollner Creek*	Chlordane	Surrogate: TSS	LA	TSS < 15 mg/L (Pudding & Zollner); TSS < 7 mg/L (Little Pudding)	CC
Zollner Creek*	Nitrates	Direct	LA	Loading capacity minus 10% for margin of safety	CC
Pudding River, Zollner Creek*	Iron	Surrogate	LA	79% reduction for Iron (Pudding); 96% reduction for Iron (Zollner)	CC
All	Mercury	Direct	LA	88% reduction	CC
Sandy River TMDL					
All	Instream Temperature	Surrogate: shade	LA	Attaining "system potential vegetation" conditions	CC

Table 5. TMDL Parameters and Load Allocations for Affected Waters					
Cedar Creek	*E. coli*	Direct	LA	86% reduction	CC

[a] Does not include the Tualatin, Molalla, and Pudding Rivers

[b] Does not include the Molalla and Pudding Rivers

[c] Assigned to broad categories of discharges, not to individual cities or counties

[d] Percent reductions vary for each compliance point and/or land use.

*No portion of the Zollner Creek watershed and the Little Pudding River watershed are in Clackamas County.

3.1 *E. coli*

Bacteria has been implicated in water quality impairments throughout the watersheds covered in this IP. Load allocations for *E. coli* are described in the following sections.

Tualatin River

According to the January 2001 Tualatin TMDL, the following *E. coli* LAs apply to all River and tributary segments in SWMACC:

- Summer (May 1–Oct 31): 12,000 colonies/100 ml during storms AND 406 colonies/100 ml during all other times
- Winter (Nov. 1–April 30): 5,000 colonies/100 ml during storms AND 406 colonies/100 ml during all other times

Willamette River

The Load Allocations (LAs) in the Willamette TMDL specify that a 78 percent reduction in in-stream *E. coli* loads is needed in all streams and tributaries in the portion of the Lower Willamette Subbasin that is in Clackamas County, including the Clackamas River watershed. The only exceptions are Bargfield and Delano Creeks in the Clackamas River watershed where the LAs call for 83 percent and 89 percent reductions, respectively.

Molalla-Pudding

Stream specific percent load reductions were determined for each 303 (d) listed stream in the Molalla-Pudding Subbasin, which apply to their tributaries as well. Reduction requirements for streams within Clackamas County are outlined below by compliance point:

- Pudding River at Hwy. 211 (river mile 21): 75 percent reduction
- Pudding River at 99E (river mile 7.3): 70 percent reduction
- Molalla River at Knights Bridge Road (river mile 2.8): 81 percent reduction

Sandy River

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 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.

3.2 Dissolved Oxygen

The DEQ established a TMDL in 2001 for DO, with the primary goal of reducing the levels of settleable volatile solids (SVS) in the Tualatin River watershed. Levels of SVS are believed to play in role in contributing to the amount of instream DO that bed sediments take up as organic material is consumed or decomposes. The DO TMDL's LAs that were issued are for SVS.

The DO TMDL's LAs are expressed in terms of a required percent reduction of SVS in stormwater runoff. For the roughly 20 acres of lands in the SWMACC that drains into Carter Creek, a Fanno Creek tributary, the required SVS reduction is 50 percent from May 1 to October 31. For all other streams in SWMACC, including the mainstem Tualatin River, the required reduction is 20 percent from May 1 to October 31.

3.3 Mercury

The Willamette River watershed's mercury TMDL was recently revised and was approved by the USEPA in 2021. This revised TMDL replaced the previous one that was issued in 2006. The Willamette TMDL for mercury also applies to the Tualatin River and the Molalla-Pudding River because they are tributaries of the Willamette River

The stated objective of the mercury TMDL is to reduce average fish tissue mercury concentrations in the Willamette River so that all fish species will eventually be safe for human consumption. The fish consumption advisories for mercury in the Willamette Basin show that this beneficial use is not currently being met.

The 2021 update established the following load allocations from non-point sources (agricultural, forest, shrub, developed, other, which includes runoff and sediment) as applicable to DMAs:

- Lower & Middle Willamette River and the Tualatin River: 97 percent reduction
- Molalla-Pudding and Clackamas Rivers: 88 percent reduction

3.4 Temperature

Temperature impairment affects each of the watersheds covered by this IP. TMDLs are described below for each watershed.

Tualatin River

All stream and river reaches in SWMACC are regulated by the Tualatin River's temperature TMDL. The Oregon DEQ has established percent effective shade (PES), a measurement of the shade-yielding capacity of a riparian area, as the TMDL's surrogate for in stream heat load. Conditions described as "system potential vegetation" represent areas with a high PES value. These "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." Shade curves, developed by DEQ for the Willamette basin based on potential vegetation growth under different soil conditions, display the shade coverage that could potentially be present at given locations; these curves could be useful for efforts to increase riparian shade in the SWMACC, which includes a portion of the City of Rivergrove (the portion which is located in Washington County is not in the SWMACC).

Willamette River

Numerous stream and river reaches in Clackamas County are part of the Willamette temperature TMDL including: the Willamette and Clackamas Rivers and Johnson and Cow Creeks. DEQ has established PES as the TMDL's surrogate for instream heat load. "System potential vegetation" conditions represent areas with a high PES value. Shade curves, developed by DEQ for the Willamette basin based on potential vegetation growth under different soil conditions, display the shade coverage that could potentially be present at given locations.

Molalla-Pudding River

Several stream and river reaches in Clackamas County are part of the Molalla-Pudding Subbasin temperature TMDL including: the Molalla River, Pine Creek, Table Rock Fork Creek, Beaver Creek, Butte Creek, and Teasel Creek. DEQ has established PES as the TMDL's surrogate for instream heat load. "System potential vegetation" conditions represent areas with a high PES value. The Molalla-Pudding Subbasin TMDL establishes site-specific shade targets for the Molalla and Pudding River, and basin-wide "shade curves" that can be used to establish shade targets for all other streams in the basin.

Sandy River

DEQ has established PES as the TMDL's surrogate for instream heat load. "System potential vegetation" conditions represent areas with a high PES value. 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 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 most likely show significant temperature improvements by increasing mature stream side vegetation.

Cold Water Refugia

As a requirement of the 2006 Willamette River TMDL, DMAs located along the mainstem Willamette River from river mile 50 downstream to the confluence with the Columbia River need to address cold water refugia (CWR) within their TMDL Implementation Plans. This reach of the river has been designated as a migration corridor for salmonids. CWR are needed along this reach to offer migrating salmonids relief from the warmer river temperatures found in the summer months. Plans shall look at identifying existing CWR and provide options for protecting or enhancing such areas. Wherever localized CWR have been altered through channel modification or by other means, consideration should be given to exploring options for restoring or enhancing these areas of CWR where feasible. See Management Strategy 7.12 for more information.

3.5 Total Phosphorus (pH and Chlorophyll A)

Total phosphorus is implicated in eutrophication and is elevated due to agricultural activities in addition to naturally phosphorus rich groundwater. The Tualatin River basin is the only Clackamas County watershed with a TMDL for total phosphorus.

Tualatin River

The EPA approved TMDLs for total phosphorus in the Tualatin River in 1988, 1994, 2001, and again in 2012. The 2012 TMDL LAs are for total phosphorus which are expected to benefit instream pH and reduce the levels of chlorophyll a.

In the 2012 total phosphorus TMDL, the summer (May 1 to October 31) instream median concentration representing the LA for total phosphorus in creeks in the SWMACC is 0.14 or 0.13 milligrams per liter

(mg/L), depending on the specific location. The summer instream median concentration for total phosphorus in the Tualatin River at SW Stafford Road, which is also in the SWMACC, is 0.10 mg/L.

3.6 DDT and Dieldrin in Johnson Creek

This DDT and dieldrin TMDL is specific to the Johnson Creek watershed which drains a small portion of Clackamas County near the cities of Milwaukie and Happy Valley. Less than 1,000 acres (less than 3 percent) out of a total watershed area of about 55 square miles of the entire Johnson Creek watershed is within Clackamas County Service District No. 1 (CCSD #1) and/or the City of Happy Valley. Additional acreage in Clackamas County's portion of the watershed lies in a rural area in the Boring, Oregon area.

The TMDL has assigned a LA for all non-point sources in the watershed of a 94 percent reduction over time from current DDT levels. DEQ has assumed that reducing DDT levels will also yield sufficient reductions in the level of dieldrin (and breakdown products) within Johnson Creek.

Dieldrin and DDT, when they are present in stormwater or creek water, may be attached to or associated with small, suspended solid particles. As part of the Willamette TMDL development, DEQ has established a reduction of total suspended solids (TSS) as a measurement of overall DDT reduction. The TMDL's TSS target is 15 mg/L for non-point sources, thus if stormwater runoff contains 15 mg/L or less TSS, it is assumed that the level of DDT has been reduced by 94 percent or more. Complying with the DDT LA constitutes compliance with the dieldrin TMDL as well.

3.7 Pesticides (DDT, Dieldrin, Chlordane)

The DDT and dieldrin TMDL is specific to the Pudding River and Zollner Creek. The chlordane TMDL applies only to Zollner Creek. Approximately 20 miles of the Pudding River are located within Clackamas County, and approximately 7 miles of the Pudding are located along the County Boundary (Figure 1). No portion of the Zollner Creek's watershed is within Clackamas County. Therefore, chlordane will not be addressed as part of this TMDL implementation plan.

The Molalla-Pudding Subbasin TMDL has assigned a 30 percent reduction in long-term average Total DDT (t-DDT) concentrations for all non-point sources in the Pudding River watershed to meet the target. This reduction is based on attaining the fish tissue criteria but does not meet water column criteria. The reductions of DDT metabolite long term average concentrations are 61 percent and 97 percent to meet human health water column criteria.

Dieldrin and DDT, when they are present in stormwater or creek water, may be attached to, or associated with small, suspended solid particles. As part of the TMDL development, DEQ has established reduction of TSS as a surrogate measurement of overall DDT and dieldrin reduction. The TMDL's TSS target is 15 mg/L for non-point sources. The 15 mg/L TSS target in the Pudding River is sufficient to meet t-DDT water column targets and prevent exceedances of fish tissue action levels in the Pudding River.

3.8 Nitrate

The nitrate TMDL applies only to Zollner Creek. None of Zollner Creek, nor any portion of the contributing area, is within Clackamas County. Therefore, nitrate will not be addressed as part of this TMDL IP.

3.9 Metals (Iron, Manganese, Arsenic)

The iron and manganese TMDL is specific to the Pudding River and Zollner Creek. The arsenic TMDL applies only to Zollner Creek. As previously mentioned, none of Zollner Creek is within Clackamas

County. Therefore, arsenic will not be addressed as part of this TMDL implementation plan.

As indicated in the Molalla-Pudding TMDL report, based on the manganese analyses, DEQ concluded that a TMDL for manganese is not necessary and recommended delisting. Therefore, manganese will not be addressed as part of this TMDL implementation plan. Iron in the Pudding River is addressed in this TMDL IP.

4. Goal and Objective of the Plan

The goal of this Implementation Plan is to identify the ongoing and planned management strategies to improve watershed health and address requirements of the applicable TMDLs related to the non-point sources of TMDL pollutants. The objective of this Non-Point Source IP is to apply the Plan's Management Strategies for water pollution reduction and prevention (e.g., erosion control program for construction sites).

To achieve this goal and objective, this Implementation Plan's Co-Owners (Clackamas County, Clackamas WES' SWM service area, and the Cities of Happy Valley and Rivergrove) 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

POTENTIAL POLLUTANT SOURCES, IMPLEMENTATION RESPONSIBILITIES, AND MANAGEMENT STRATEGIES

5. Potential Sources of Pollutants

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

5.1 *E. coli* (Willamette, Molalla-Pudding and Tualatin River Watersheds and the Sandy River's Cedar Creek sub-watershed)

E. coli bacteria can enter surface water bodies from many sources, including the feces of wild mammals, tame and wild waterfowl, wild songbirds, pets, livestock, and from improperly functioning (i.e., failed) septic systems.

Studies conducted in the Clarks Creek watershed in Puyallup, Washington (Brown and Caldwell, 2005) and the Tualatin River watershed in Oregon (Clean Water Services, 2005) indicate that stormwater washing over fecal matter that had been deposited by a variety of wild animals, including birds and rodents, appears to be the main source of most *E. coli* contamination in urban stormwater.

In rural areas where no public sanitary sewer infrastructure exists, failed or failing septic systems and cesspools can be a significant source of *E. coli* bacteria given the right circumstances. Potentially significant sources of *E. coli* bacteria in rural areas include:

- Livestock waste
- Wild bird and mammal feces
- Pet waste

5.2 Dissolved Oxygen (Tualatin River Watershed only)

A DO test measures the amount of oxygen that is dissolved in the water. Low DO levels can be harmful or even fatal to many forms of aquatic life.

The DEQ established a TMDL for DO in 2001 with a goal of reducing the levels of SVS in the Tualatin River watershed. Levels of SVS are believed to play a role in contributing to the amount of instream DO that bed sediments take up as organic material is consumed or decomposes. The DO TMDL's Load Allocations are for SVS.

Examples of materials which do, or can, contain SVS include, but are not limited to, leaves & other pieces of vegetation, the upper organic layer of soil, and discarded food. Programs which reduce the instream presence of SVS, such as sweeping leaves from roadsides, are expected to yield lower SVS levels in stormwater runoff.

Since a laboratory method does not exist for SVS, documenting compliance with this requirement is unusually complex. A combination of the following alternative water quality measurements can be used: TSS, volatile solids (VS), and direct measurements of DO instream using a DO meter in the field or using the Winkler method for laboratory analysis.

Levels of lower DO in stream water can be affected by pollutants discharged by human activities which exert oxygen demand on the oxygen dissolved in surface waters. An example would be rinsing a lawn mower in the street with a garden hose after mowing the lawn. If grass clippings are washed into the nearest stream, their decomposition will reduce the amount of oxygen that is dissolved in the water of the stream.

Another example might involve fertilizer which contains phosphorus that is washed into the creek by a storm event. This additional phosphorus can increase instream algal populations. A larger instream algae population tends to have a larger adverse impact on the oxygen levels that are dissolved in surface waters.

The level of DO in stream/river water is affected by many other factors and processes, including water temperature, photosynthesis, and plant respiration. For example, daily variations in DO can occur in streams and rivers having significant algal populations, with the highest values usually occurring in the afternoon after the sun has been up for many hours, and the lowest values usually occurring in the early morning after it has been dark for many hours. Prolonged periods of darkness slow the oxygen-producing photosynthetic process to its lowest levels, while algal respiration – the oxygen-consuming process that burns sugars – continues.

The DO levels in stream water also tend to be diminished when water flows slowly without turbulence. Turbulence (i.e., water flowing over rocks) increases the rate of mixing of water and air, increasing DO levels.

5.3 Mercury (Willamette, Molalla-Pudding and Tualatin River Watersheds)

Mercury is a naturally occurring element found in high concentrations in mercury (II) sulfide deposits, also known as cinnabar. The intent of reducing mercury is to protect aquatic life and human health from mercury exposure from fish consumption. The two most common sources of mercury include:

- Soil erosion and resuspension of mercury-laden sediment
- Atmospheric deposition

In Oregon, mercury was mined commercially and used extensively in gold and silver amalgamation (Brooks, 1971; Park and Curtis, 1997). Mercury is present in other rock types and soil types in Clackamas County, given the role that volcanoes have played in our geologic history. Mercury is also naturally present in geothermal areas and in many types of native vegetation; significant amounts can be released into the atmosphere during forest fires.

Mercury was historically in fungicide formulations and can still be found in many commercial products, including fluorescent lights, thermometers, automobile switches and dental amalgam. Illegal dumping of solid waste containing mercury can also be a source.

Mercury is in fossil fuels such as coal, natural gas, diesel fuel, and heating oil. The mercury present in these fuel sources is often released into the atmosphere upon combustion. Atmospheric mercury can be transported great distances and is known to be deposited on the landscape via either wet or dry deposition (Sweet et al., 1999, 2003). Research has shown that a majority of the mercury that enters the Willamette River was deposited in the watershed from the atmosphere.

Mercury can be present in various physical and chemical forms in the environment (Ullrich et al., 2001; USEPA, 2001b). Most of the mercury found in the environment is in the form of inorganic or elemental mercury, but these forms of mercury can be converted to organic or methyl mercury by sulfate reducing bacteria. Methyl mercury production is affected by a host of physical and chemical factors including

temperature, redox potential, DO levels, organic carbon, sediment particle size, alkalinity, sulfate concentration, and pH. Methyl mercury, once formed, represents the most bioaccumulative form of mercury in fish tissue and the most toxic form of mercury for human consumers (USEPA, 2001a). The primary route of human exposure to mercury is via the consumption of freshwater fish, saltwater fish, and other seafood containing mercury (USEPA, 2001a).

Mercury can enter surface water bodies in many ways. For example, DEQ estimated in the 2021 Willamette River mercury TMDL that 8 percent of the mercury in the Tualatin River is contributed from groundwater. Another way that mercury can be transported to surface waters is through stormwater runoff. Some of the mercury in stormwater runoff may be washed from impervious surfaces after having been deposited on the surface from the atmosphere. Stormwater runoff can also carry mercury if it erodes mercury-containing soils.

At this time, Clackamas County, WES, and the City of Rivergrove are not aware of any specific known non-point sources of mercury, although suspected or general (i.e., non-specific) sources include:

- Erosion of soils, including from lands used for agricultural, forest, urban/commercial/industrial areas purposes
- Illegal dumping of some solid wastes
- Spills and illicit discharges of certain materials

5.4 Temperature (Willamette, Molalla-Pudding, Tualatin, and Sandy River Watersheds)

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
- Streambed advection
- 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 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 are 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 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 of water (for agricultural irrigation, for example)
- Release of water from the upper warmer layer of reservoirs and man-made ponds
- Reduction of groundwater recharge (via paving land, and building homes, and then directing the stormwater runoff directly to a nearby surface water body, for example), which then could reduce, or even eliminate, the flow from one or more springs which had been fed by the infiltrating stormwater

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.

CWR are areas within rivers and creeks that maintain cooler temperatures in summer when water temperature elsewhere in the river increases – are regulated by the 2006 Willamette temperature TMDL in the lower mainstream Willamette River. CWR offer migrating salmonids and other native fish and aquatic species relief from the warmer river temperatures. Alteration to river channel and riparian structure, including removal or lack of large woody debris and modifications to deep pools and overhanging bank areas, can diminish the size and/or quality of the CWR. Reductions in stormwater infiltration and groundwater inputs, and the resulting reduction in discharges from springs which feed tributary streams, can also diminish the size and/or quality of the CWR.

5.5 Total Phosphorus (pH and Chlorophyll A) (Tualatin River Watershed only)

Phosphorus enters the waters of the Tualatin River and tributaries in various ways. At this time, Clackamas County, Clackamas WES, and the City of Rivergrove are not aware of any specific known excessive sources of phosphorus in the Tualatin River watershed, although general (i.e., non-specific)

sources include:

- Stormwater runoff from agricultural, forested, and rural residential lands (for example, soil erosion from new development and redevelopment)
- Illegal dumping of some types of solid waste
- Illicit discharges of some types of wastewaters, such as sewage from a failed septic system
- Groundwater, that feeds the Tualatin River and creeks through springs, is known to contain a significant concentration of total phosphorus.

Until summer 2008, excessive phytoplankton growth (i.e., algal "blooms") had not been observed in the Tualatin River during the summer and autumn seasons for many years. Scientific review of the very substantial bloom in summer 2008 indicated that phosphorus-rich waters pumped into the Tualatin River from Wapato Lake's bed near Gaston in Washington County was the primary factor. During a bloom, algae become much more abundant due to a variety of factors. One factor which contributes to algal blooms is the presence of phosphorus-containing molecules (including phosphate) in the water column where algae are present. Algal blooms are aesthetically unpleasant; they also can produce elevated pH levels and very low levels of DO.

Naturally occurring (i.e., "background") levels of phosphorus in the waters of the Tualatin River Watershed are known to be relatively high due to the large amount of phosphorus-rich groundwater which enters the river and tributaries from springs. According to Tables 42 and 48 in the 2001 TMDL document's total phosphorus section (as referenced to in the 2012 TMDL), the estimated background levels of phosphorus in the watershed are identical to the load allocations that were granted by DEQ to nonpoint sources (storm water running off of a field into the creek is a nonpoint source, for example), so there is no allowance in the TMDL for additional discharge of phosphorus beyond background levels.

5.6 DDT and Dieldrin (Johnson Creek of the Willamette River Watershed)

DDT and dieldrin are organochlorine insecticides that were banned in the 20th century. Historically, DDT and dieldrin were both used extensively. Examples of typical usage included killing mosquitoes in urban areas and killing insects in farmed lands. Both compounds are long-lived in soils and can be toxic to animals. They are also highly hydrophobic, which means they tend to bind to soil particles and the fatty tissues of animals and do not readily dissolve in water. Due to the extensive past use and the long-lived nature of these compounds, these materials are ubiquitous in the environment and have been detected in virtually all media (e.g., water, soil, and animal tissue).

The use of dieldrin in the United States was restricted in 1970 and all uses of products containing dieldrin were banned in 1983. In addition to being an insecticide, dieldrin is also a long-lived oxidation breakdown product of aldrin, another organochlorine pesticide. Aldrin is known to quickly break down—typically within a matter of days—into dieldrin in an animal's body or in the environment. Thus, the concentration of dieldrin in the environment is often a cumulative result of the historic use of both aldrin and dieldrin. Dieldrin is very stable in the environment and, unfortunately, does not easily break down into harmless by-products. Since dieldrin and aldrin are no longer being used, the transport of dieldrin to surface water bodies is believed to be due, in large part, to stormwater runoff. It is believed that dieldrin is also able to be dispersed in the environment by wind and volatilization as well. In upland areas, these molecules preferentially bind to soil.

DDT was banned from use in the United States in 1972. Over time, DDT breaks down to form the metabolites DDE and DDD, which are also associated with toxicological effects in animals. Transport of these molecules (DDD, DDT, and DDE) to surface water bodies is believed to be due, in part, to stormwater runoff. They can also be dispersed in the environment by wind and volatilization. In upland areas,

these molecules preferentially bind to soil. In water, they tend to bind to sediment, volatilize, photodegrade, or be taken up into the food chain.

Several studies have been conducted in the Johnson Creek watershed by the USGS and by the Inter-Jurisdictional Committee for Johnson Creek; WES is an Inter-Jurisdictional Committee member. Through these studies, it has been determined that:

- The bulk of the loading of DDT (and breakdown products) and dieldrin was already in the creek at the point where it entered Gresham's city limits. The watershed above this point is rural, dominated by agricultural and rural residential land uses. Much of the time, the concentration of these insecticides in the creek's water is actually diluted as it flows through the urban portion of the watershed.
- DDT (and breakdown products) can be discharged into Johnson Creek from publicly owned, MS4-permitted storm sewer systems in the urban area, although in many instances, DDT cannot be detected, or if present, the concentration is so low that the in-stream water quality standard isn't exceeded.
- Dieldrin can be discharged into Johnson Creek from publicly owned, MS4-permitted storm sewer systems in the urban area, although in nearly all instances, dieldrin is either undetectable or is only present at low levels that do not exceed the in-stream water quality standard.

At this time, Clackamas County, Clackamas WES, and the City of Happy Valley are not aware of any specific known sources of DDT and dieldrin in the Johnson Creek watershed, although suspected or general (i.e., non-specific) sources include stormwater runoff from agricultural, forest, and rural residential lands if this runoff includes any eroded soil.

5.7 DDT, Dieldrin and Iron (only the Pudding River in the Molalla-Pudding River Watershed)

Iron is a naturally occurring substance and particularly prevalent in soils deriving from eroded volcanic rocks. Iron enters surface water bodies primarily through stormwater runoff and eroding stream banks. Although a naturally occurring material, iron concentrations in groundwater and surface water, stream flow, and precipitation may be contributed in unnatural concentrations through runoff and erosion (DEQ, 2008). At this time, Clackamas County is not aware of any specific known sources of iron in the Molalla-Pudding subbasin, although suspected or general (i.e., non-specific) sources include:

- Stormwater runoff from agricultural, forest, and rural residential lands, and
- Soil erosion from new development and redevelopment.

For dieldrin, please see the "Johnson Creek DDT and dieldrin" section above. At this time, Clackamas County is not aware of any specific known sources of dieldrin anywhere in the Molalla-Pudding River watershed, although suspected or general (i.e., non-specific) sources includes stormwater runoff from agricultural, forest, and rural residential lands if this runoff includes any eroded soil.

6. TMDL Implementation Responsibilities

Responsibility for implementing non-point source pollution control programs in response to these TMDLs has been assigned by DEQ to several DMAs, including the four co-owners of this IP: The Cities of Happy Valley and Rivergrove, Clackamas WES' SWM Service Area (i.e., SWMACC and CCSD#1), and Clackamas County.

6.1 City of Happy Valley

The City of Happy Valley has held a DEQ-issued MS4 Permit since 1995. As a TMDL DMA, the City of Happy Valley provides many services which are relevant to this IP, including erosion control permitting

for construction sites, Parks, and Land Use Planning. Because Happy Valley holds a MS4 permit, some other services which the city provides, such as road maintenance, are inherently addressed by the MS4 permit, because any City-owned road is defined by the MS4 Permit as being part of the MS4, so there cannot be any non-point source stormwater pollution from their roadways.

6.2 City of Rivergrove

The City of Rivergrove has held a DEQ-issued MS4 Permit since 1995. As a TMDL DMA, the City of Rivergrove provides only a few services, such as Land Use Planning, which are relevant to this IP. Some of the other relevant services, such as erosion control permitting for construction sites, are provided by Clackamas WES. And the remaining services, such as road maintenance, are provided by Clackamas County. Given that the City of Rivergrove holds a MS4 Permit, there are, by definition, few types of non-point sources of water pollution here.

6.3 Clackamas County

Clackamas County has held a DEQ-issued MS4 Permit since 1995. But the County's MS4-Permitted geographic area is small compared to the large, mostly rural unincorporated area in the County which is regulated by the TMDLs. As a NPS TMDL DMA, Clackamas County has many programs and departments that are, or could be, involved in implementing portions of this IP, including:

Department of Transportation & Development

- Land Use Planning
- Transportation Maintenance & Engineering
- Code Compliance
- Solid Waste Management and Recycling

Business & Community Services

- Economic Development
- Clackamas County's Parks, such as Barton Park (Note that the thousands of acres of County-owned forest land are NOT addressed in this IP; any non-point source water pollution on these lands is regulated by Oregon's Dept. of Forestry)
- Property Resources, which manages "surplus" lands (for example, they manage several pieces of submerged and riparian area lands which extend for at least a mile of the length of the Tualatin River in the SWMACC)

Clackamas WES

- Clackamas WES is a Department of Clackamas County which administers three Clackamas County Service Districts, including the two Districts which comprise WES' SWM service area.

Clackamas County's Facilities Management Dept.

- Clackamas County's Facilities Management Department operates and maintains many County-owned buildings and some County-owned lands as well.

North Clackamas Parks & Recreation District

- The North Clackamas Parks & Recreation District (NCPRD) is a Department of Clackamas County. It is also a Clackamas County Service District which provides parks and recreation services in the Willamette River's watershed.

6.4 Clackamas WES' SWM Service Area

Clackamas WES' SWM service area – which is comprised of the following two Clackamas County Service Districts – SWMACC and CCSD#1 – is the fourth DMA.

6.5 Implementation Plan Exclusions

This Implementation Plan only addresses non-point sources of water pollution.

Discharges from and into surface-discharging storm sewer systems which are regulated by the MS4 Permit are not addressed by this Implementation Plan.

Stormwater runoff directed to 1) subsurface discharge through shallow injection systems, such as drywells, and 2) infiltration systems are not addressed by this Implementation Plan.

Lands subject to ODF and Oregon's Dept. of Agriculture (ODA) jurisdiction are not addressed by this Implementation Plan.

This Implementation Plan does not address runoff from lands owned by the state (including State highways and their storm sewer systems) or the federal government. See Chapters 1 and 2 for previous discussion on jurisdictional authority and responsibility coverage.

6.6 Areas where this Implementation Plan Applies

This IP addresses stormwater runoff-related TMDL pollutants that are discharged by these three types of stormwater drainage systems:

- Clackamas County, Happy Valley, Rivergrove and Clackamas WES-owned/maintained surface-discharging storm sewer systems that are not subject to the MS4 Permit requirements. (See the areas outside the MS4 Permit boundaries in Figures 2 and 3). These storm sewer systems, which are defined as non-point sources of pollution, are typically ditches which serve Clackamas County-maintained/owned roads in rural areas. Note that Clackamas County's, Clackamas WES', and the City of Happy Valley and Rivergrove's authority to control sources of pollution from storm sewer systems which they own is limited, especially when these systems are in rural areas, but reasonable efforts will continue to be made to control and reduce their discharge of TMDL pollutants.
- Privately-owned storm sewer system 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. Note that Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove often have no authority whatsoever to control sources of pollution from storm sewer systems which they do not own, if these systems discharge directly to waters of the State of Oregon, but reasonable efforts will continue to be made to control and reduce their discharge of TMDL pollutants.
- Overland sheet flow of stormwater which does not flow through any type of storm sewer system. These are also defined as non-point sources of pollution and are found on lands with every type of land use. These flows which are not found in agricultural and timber management areas are addressed in this Implementation Plan. Note that Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove typically have no authority whatsoever to control pollution in these types of flows on private property, but reasonable efforts will continue to be made to control and reduce their discharge of TMDL pollutants.

If Clackamas County, Clackamas WES, and/or the City of Happy Valley or Rivergrove are aware of a discharge, that does not flow through a storm sewer system which they own, which is a significant known or suspected source of TMDL pollution, the matter will be referred to DEQ if public education

and/or technical assistance fail to yield the necessary water quality improvement.

Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove cannot and do not accept sole responsibility for reducing TMDL pollutant loads in any river or tributary in order to attain any TMDL LA. All of the sources of a TMDL pollutant need to do their part to solve the problem if the LA will ever be attained.

Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove do accept some of the responsibility for reducing the fraction of the TMDL pollutant loading which:

- Originates on those private lands which they have the authority to regulate, and
- Which is generated by the specific land uses or activities that they have the authority to regulate, or
- Originates on land they own.

This Implementation Plan also addresses riparian areas on lands owned by Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove. An exception to this is the acres of timberland which Clackamas County owns; non-point source water pollution on these lands is regulated by ODF and is not addressed in this IP. Finally, this IP addresses riparian areas on privately owned land which is not in an agricultural or timber management area, and reasonable effort will be made by our public education program to try to persuade these private property owners to protect and enhance their riparian areas. Refer to Management Strategies 7.4 and 7.11 for more information about this IP's role in managing riparian areas on privately owned lands.

7. Management Strategies

A variety of Management Strategies are employed by Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove to improve and protect water quality and overall watershed health. This portion of the Implementation Plan complies with OAR 340-042-0080(4)(a)(A) and (B), which state, *"The implementation plan must…Identify the management strategies the DMA or other responsible person will use to achieve load allocations and reduce pollutant loading"* and *"(B) Provide a timeline for implementing management strategies and a schedule for completing measurable milestones."*

The Management 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 Stormwater Regulations for New/Redevelopment and for capital improvement projects (CIPs)
- 7.2 Operation and Maintenance for Publicly Owned Storm Sewer Systems
- 7.3 Regulated Private Storm Sewer System Inspection and Maintenance Program
- 7.4 Riparian Area Shade: Other Development-Related Regulations
- 7.5 Erosion Prevention and Sediment control
- 7.6 Public Education
- 7.7 Septic System Management
- 7.8 Illegal Dumping Management
- 7.9 Respond to Reports of Impaired Stormwater Quality
- 7.10 Illicit Discharge, Detection, and Elimination Program, which includes Spill Response

- 7.11 Riparian Area Assessment and Management
- 7.12 Cold Water Refugia Assessment and Management

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 Section C: Implementation.

7.1 Stormwater Regulations for New/Redevelopment and for CIPs

Stormwater policies, regulations, and administrative procedures are essential for implementing the TMDL. This portion of the Implementation Plan describes the planning procedures for developing, implementing, and enforcing controls to reduce the discharge of TMDL parameters from storm sewers which collect stormwater runoff from lands that has been significantly developed or redeveloped.

TMDL parameters addressed:

- ✓ E. coli
- ✓ Total phosphorus and DO in the Tualatin River watershed
- ✓ Mercury
- ✓ DDT and dieldrin in the Johnson Creek watershed
- ✓ Dieldrin and iron in the Pudding River watershed.

Description of the potential sources: After construction has been completed on a property, the storm sewer system and landscaping–related planning procedures and regulations that were followed during site design and construction can influence the amount of non-point sediment-bound and other pollutants that are washed from the property into the nearest surface water body over the lifetime of the property's improvements.

Description of the Management Strategy:

This Management Strategy refers to the planning procedures for developing, implementing, and enforcing controls to reduce the discharge of TMDL parameters from storm sewers that collect runoff from areas that have experienced land development or redevelopment. Specific strategies are described below. These post-construction controls are applied to:

- Development on private property
- Capital improvement projects including road and building construction projects which are funded by the Co-Owners of this IP.

Erosion Control Permitting for construction site runoff is addressed in Management Strategy 7.5.

Properties within the: I) WES SWM Service area, II) rural portion of the City of Happy Valley, and III) CCSD#1's Boring, Hoodland, and Fischer's Forest Park subunits

Within the WES SWM Service area and these three CCSD#1 subunits, new/redevelopment construction projects are expected to infiltrate (if possible), treat, and detain stormwater runoff generated. Unless a waiver is granted, significant new/redevelopment is required to infiltrate most of the runoff that is generated in any given year (the requirement is to infiltrate 100 percent of the first 0.5 inch of rain in every 24-hour period). This reduces potential pollutant loads, limits the increase in runoff volume that is created by development, and provides groundwater recharge. Full credit towards satisfying the infiltration requirement is routinely granted by WES for projects that use shallow injection, such as through drywells, instead of infiltration. Reducing stormwater runoff volumes appears to be among the most effective techniques to reduce instream loading of TMDL parameters such as *E. coli* from upland areas.

WES' stormwater treatment requirements also apply, unless a waiver is granted. Most stormwater treatment technologies, which are generally designed to reduce TSS, are also expected to reduce discharges some other pollutants, such as mercury and phosphorus. Many treatment technologies also reduce the loading of *E. coli* through filtration and/or infiltration provided by many rain gardens, bioswales, and by pervious pavement.

Properties in the rural portion of the City of Happy Valley which receive rural-style development (these properties do not have public sanitary sewer service) are authorized by the City of Happy Valley. Please contact The City of Happy Valley for their stormwater management requirements for low density rural development.

Much of the WES SWM Service area, plus the rural portion of Happy Valley, fall within the MS4 Permit's geographic coverage area. Happy Valley and Clackamas WES apply their stormwater management controls on all real estate development sites in their service areas whether they do, or don't discharge to their MS4. For detailed information about Management Strategy 7.1, please see the MS4 Permit Stormwater Management Plans (SWMPs) for more information about these controls. Current SWMPs were approved by DEQ in 2012, which are still being implemented at this time. In December 2022, Clackamas WES and Happy Valley expect to submit an updated SWMP to DEQ for DEQ's review and approval; after this revised SWMP has been approved, please see this SWMP for more information about the specific stormwater controls which are implemented via Management Strategy 7.1. And finally, for the three CCSD#1 subunits, although they are not in the WES SWM service area, WES also implements Management Strategy 7.1 here.

Other properties NOT within these areas:

The Oak Lodge Water Services District:
For non-point source stormwater runoff generated by real estate development in the Oak Lodge Water Services District (OLWSD), see the OLWSD's TMDL IP.

Real Estate development in unincorporated rural areas:
For development in unincorporated rural areas, Clackamas County prescribes the stormwater management requirements. In June of 2020, Clackamas County made improvements related to Low Impact Development and onsite stormwater management for areas outside of the MS4 Permit geographic area.

Per Clackamas County Roadway Standards section 420.1 (Best Management Practices & Low Impact Development Approaches), Clackamas County Engineering acknowledges the need for Best Management Practices (BMP) and/or Low Impact Development Approaches (LIDA) for land development and encourages engineers to submit LIDA designs for review to meet the water quality and infiltration requirements outlined in Clackamas WES' stormwater standards. Calculations are required to illustrate how a given LIDA provides water quality benefit. Private improvements in rural areas may work with DTD to provide a simplified approach to stormwater management that utilizes vegetation and infiltration if the site conditions warrant it. The City of Portland's Simplified Approach for infiltration testing and typical details for stormwater management may be used in the rural area.

Additionally, Clackamas County Roadway Standards section 420.2 allows for the use of Acreage as a BMP. Development outside of the MS4 Permitted area is predominated by larger lot sizes. The applicant must demonstrate that water quality, detention, and/or infiltration requirements are met using the acreage BMP if this approach is proposed. Clackamas County Roadway Standards section 420.3 (Surface Water Management Applicability) requires Surface water management plans for any of the following:

- When 5,000 square feet or more of new or reconstructed impervious surface is proposed within

the Portland Metro Area's UGB.

- When 10,000 square feet or more of new or reconstructed impervious surface is proposed outside the Portland Metro Area's UGB.
- When grading or any new or reconstructed impervious surface is proposed or replaced within 50 feet of a perennial stream, creek, wetland, or lake, or within 10 feet of a property line.

Capital Improvement Projects funded by the Co-Owners of this IP:

When a CIP, including road and building construction projects, funded by one or more of the Co-Owners of this IP, are designed, they are expected to comply with the stormwater management requirements—infiltration (if possible), water quality treatment, and detention—of the community in which the CIP is proposed. For example, when a CIP is proposed to be constructed in the WES SWM Service Area, it is expected to comply with the same stormwater management requirements and riparian area setback/buffer requirements which would be applied to development on any nearby piece of private property.

Measurable milestones (if any): None.

Fiscal analysis: This management strategy is currently funded.

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

7.2 Operation and Maintenance for Publicly Owned Storm Sewer Systems

A key strategy for protecting receiving water quality from nonpoint source pollution is thorough and adequate operation and maintenance (O&M) of publicly owned stormwater infrastructure to confirm that systems are functioning properly, and issues are addressed before they become problematic.

TMDL parameters addressed:

- ✓ Mercury
- ✓ Total phosphorus
- ✓ DO (i.e., SVS) in the Tualatin River watershed
- ✓ DDT and dieldrin in Johnson Creek
- ✓ Dieldrin/DDT & iron in the Pudding River Watershed

Description of the Management Strategy:

The O&M of publicly owned storm sewer systems in this TMDL IP's geographic area reduces the amount of non-point source pollution that is discharged to creeks, wetlands, and rivers from these systems. Typically, these storm sewer systems are roadside ditches along the edges of Clackamas County-maintained/owned roads in rural areas. Potential sources of pollution could be the road itself (e.g., automotive fluids dripped onto the road as the vehicle drives by), but most of the pollution is believed to be from adjacent and nearby properties, which are typically privately owned. This MS encourages the optimization of the water pollution removal and stormwater infiltration function of these storm sewer systems are typically ditches. Examples of this may include:

- Retrofitting one or more ditches through the addition of one or more rock "check dams" to trap some sediment that can be removed later and properly disposed of.
- There are a few catch basins, and some other types of storm sewer system structures, in the geographic area which is covered by this IP, and these structures will be cleaned on an as-needed basis.

- When ditches are cleaned with a Gradall machine, if the ditch was constructed in a soil which is more erode-able, consider installing erosion control measures (such as a hydroseed mulch) after the ditch has been cleaned.

The Clackamas County DTD-Transportation Maintenance Division occasionally disturbs soil in their road rights-of-way while performing routine road maintenance and repair work. The TM adheres to the Oregon Department of Transportation's (ODOT) Routine Road Maintenance, Water Quality and Habitat Guide, Best Management Practices, Revised June of 2020 (ODOT Guide). Proper erosion prevention and sediment control methods are addressed under several activities within the ODOT Guide, including but not limited to Activity #120 (Ditch Shaping and Cleaning), Activity #112 (Shoulder Rebuilding/Blading/Erosion Repair), and Activity #081 (Stockpiling). In addition, DTD has been issued a 1200-CA permit (a version of the 1200-C permit that is solely for local agencies). CIPs are performed by DTD in accordance with the requirements of the 1200-CA.

Geographic Area Where this MS is Implemented:

The City of Happy Valley-owned surface-discharging storm sewer systems are regulated by the MS4 Permit. Therefore, this MS only applies to those Clackamas County-maintained/owned surface-discharging storm sewer systems which are not regulated by the MS4 Permit. Note: If Clackamas WES owns or operates any surface-discharging storm sewer systems in the rural portion of the SWMACC sub-section of the WES SWM Service Area, this MS will also apply to these systems because they are also not regulated by the MS4 Permit.

Measurable milestones:

- **MM#1:** Consider installing one or more new rock check dams in one or more ditches. If any are installed, provide in that year's TMDL IP annual report, the road mile(s) or mile point(s), as well as the road's name(s), where one or more new rock check dams were installed. An example could be *"Clackamas County installed check dams on XX miles of road in 2023-24. They were installed in ditches along sections of these roads: ACME Street, Anvil Court, and Roadrunner Blvd."*

- **MM#2:** Clackamas County's Transportation Maintenance Division can perform "skip-ditching," which is when solids and vegetation are only removed from a section of ditch, while the adjacent sections of ditch are left untouched. In the untouched sections, the vegetation and soil are left undisturbed, which provides potentially significant treatment for stormwater runoff, and potentially better infiltration and/or evapotranspiration of stormwater runoff. This MM is the annual number of miles of ditches which were "skip-ditched" during the July 1 to June 30 TMDL IP year.

- **MM#3:** If any section of ditch is discovered which provides a reasonably good stormwater infiltration rate, provide this information in that year's TMDL IP annual report.

Fiscal analysis: This management strategy is currently funded.

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

7.3 Regulated Private Storm Sewer System Inspection and Maintenance Program

Inspection of privately owned storm sewer systems helps improve receiving water quality by ensuring that detention, infiltration, and water quality treatment facilities are being maintained and are functioning properly.

Geographic Area Implemented:

This Management Strategy (MS), which is only provided within the WES SWM service area, is expected to reduce stormwater runoff rates, volume, and pollution by verifying that regulated privately-owned storm sewer systems are operated to maintain their pollutant removal, stormwater infiltration/retention, and flow control functions. This strategy applies to privately-owned storm sewer systems with a signed WES Maintenance Agreement, which typically are those that serve multi-family residential properties, commercial and industrial properties, or institutions (religious, civic, etc.). This MS has been included in this TMDL IP because some of these privately owned storm sewer systems discharge directly to waters of the state, and as a result, are non-point sources of pollutants.

TMDL parameters addressed:

- ✓ E. coli
- ✓ Mercury
- ✓ Total phosphorus and DO in the Tualatin River watershed
- ✓ DDT/dieldrin in the Johnson Creek Watershed

Description of the Management Strategy:

Operators/owners of these regulated storm sewer systems are required to self-report inspection and maintenance of their systems annually. The maintenance agreements require them to inspect and maintain the property's stormwater facilities and to report their activities annually to Clackamas WES.

Stormwater from commercial, industrial, residential, institutional land uses can be non-point sources of TMDL pollutants such *E. coli*, phosphorus, or mercury. Potential sources of contamination at these sites include land deposition of air pollutants, spills, fertilizer applied to landscaped areas, poor housekeeping practices, and leachate which leaks from solid waste dumpsters. The most common sources of *E. coli* at these sites may be feces deposited on impervious and landscaped surfaces from wild birds and mammals.

WES participates in the voluntary regional Storm Drain Cleaning Assistance Program (SCAP) with its partners in the Portland-Metro area. This program uses voluntary measures paired with an inspection and enforcement program to verify and track maintenance of regulated private stormwater systems. This MS contains two elements – SCAP and Inspection/Enforcement – that WES may use interchangeably or in combination at its discretion.

Storm Drain Cleaning Assistance Program

WES will continue to cooperate with partners to implement the SCAP to help regulated private system operators maintain their storm sewer system catch basins. SCAP implementation will include notification, cleaning assistance, and report tracking. SCAP partner agencies will negotiate with vendors – the companies who would actually clean the catch basins – and obtain the lowest qualifying price quote for inspection and cleaning of catch basins. WES will send an annual maintenance reminder and SCAP invitation to its private facility maintenance agreement holders and other commercial and industrial facilities that operate regulated storm sewer systems. This reminder/invitation may or may not include the name of the selected vendor and its quoted price per catch basin cleaned. The reminder/invitation may list the types of storm sewer system structures on the property which are not included in the SCAP offer, such as ponds, swales, and low impact development features, such as a vegetated stormwater infiltration box, which must also be maintained.

Property owners who respond to WES' reminder/invitation will be referred to the vendor. The vendor will inspect and clean structures and report the number of facilities visited, number, and type of structures maintained, and the volume of material removed.

Inspection and Enforcement

WES implements an inspection and enforcement program to verify operation and maintenance of regulated privately owned storm sewer systems. WES' Watershed Protection group inspects regulated private storm sewer systems at selected sites. Inspectors evaluate the maintenance condition of each site's storm sewer system. If a regulated private storm sewer system fails an inspection, WES follows an escalating enforcement strategy that begins with education and technical assistance.

***Measurable Milestone*:** Implement the SCAP program each year and provide the following information in annual TMDL IP reports to DEQ: 1) The number of SCAP Program participants, and 2) The total number of catch basins/drains which were cleaned. This data to be reported to DEQ will include all program participants in the entire WES SWM service area, and all catch basins/drains which were cleaned, including those basins/drains which are non-point sources of pollutants

Fiscal analysis: WES has budgeted the funds necessary to implement this program in the WES SWM service area.

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

7.4 Riparian Area Shade: Other Development-Related Regulations

Riparian vegetation provides shading and can reduce river/stream warming from direct sunlight, in addition to providing a myriad of water quality improvement and bank stabilization benefits. Protection and restoration of riparian areas can be encouraged and enforced through real estate development-related regulations. Reduction of the riparian canopy can also change the microclimate near streams, increasing air flow and heat exchange with the stream and thereby further elevating water temperatures.

TMDL parameters addressed:

✓ Temperature

✓ Mercury (because stream bank stabilization provided by this MS reduces stream channel erosion)

✓ DO in the Tualatin River watershed (because cooler stream water can hold more DO)

Description of the Management Strategy:

Protection and restoration of system potential vegetation and effective shade in riparian areas is one of the primary mechanisms for achieving load allocations for temperature. These watershed protection regulations that protect streamside vegetation are implemented by Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove.

Many lands that include at least some riparian areas are subjected to "riparian area buffer regulations" when these lands are developed or re-developed in a significant manner under Clackamas County's, Clackamas WES', and the City of Rivergrove's and Happy Valley's building permitting process. These regulations include:

Metro Title 3

- Clackamas County's Planning Department administers WES' equivalent of Metro Title 3 regulations in the WES SWM service area through an agreement with WES. Clackamas County's Planning Department administers these regulations in the other unincorporated areas within the Portland metro area's UGB in Clackamas County, such as the Oak Lodge Water Services District. 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.

- Rivergrove and Happy Valley. The cities of Rivergrove and Happy Valley have their own equivalent of Metro Title 3 regulations which they apply within the city limits.

Zoning and Development Ordinance 709

Clackamas County's Zoning and Development Ordinance (ZDO) 709 applies in unincorporated, urban areas. The provisions regulate disturbances and specify setback distances for wetlands and riparian areas (also known as Water Quality Resource Areas). Disturbances and setbacks to these areas 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 709 is administered by Clackamas County's DTD. Wetlands are included here in this Implementation Plan, for many wetlands discharge their waters directly to creeks and rivers.

Metro Title 13 (Goal 5)

Clackamas County's ZDO 706 is the County's version of the Metro Title 13 (Goal 5) model ordinance and associated maps and plans. It was adopted in January 2009. 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 HCAs, next to minimize impacts on HCAs and water quality, and finally to mitigate the impacts to these areas

"Willamette River Greenway, ZDO 705

The Willamette River Design Plan, described in the Clackamas County Comprehensive Plan, provides policy for reducing pollutants and protecting water quality outside of WES District. Those policies are codified through Section 705 of the Zoning and Development Ordinance. The purpose statement of Section 705 (Willamette River Greenway), includes, in part "to maintain the integrity of the Willamette River by minimizing erosion, promoting bank stability and maintaining and enhancing the water quality and fish and wildlife habitats." While the specific pollutants considered through the TMDL process are not directly considered, one effect of the limitations on development provided through Section 705 is reduction/elimination of those pollutants. All intensification or change in use, or "development" requires a Greenway Conditional Use permit. Conditions of such permit include minimum setbacks of 100-150 feet (depending on slope, soils, density of existing vegetation, etc.), along with provision for/enhancement of a vegetative buffer of the same width. In addition, private noncommercial docks and moorages in the limited use rural portions of the Greenway are prohibited."

River and Stream Conservation Area, ZDO 704

This ordinance applies to all unincorporated private lands in Clackamas County which are outside the Portland metro area UGB, outside the Metro Service District boundary, and outside the Willamette River Greenway. It 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 which are on or 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" (70 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 all lands within the Special Flood Hazard Area. This ZDO section may in some instances limit the scope of development within the floodplain. This ZDO section 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.

River and Stream Corridors, ZDO subsection 1002.05

Within rural Clackamas County, but only in the Sandy River basin on Mount Hood Assigns variable width buffers (based upon soil type, vegetative cover, bank stability, slope, flood hazards, etc.) to streams not regulated by Section 704, prohibiting most new development within those buffers.

Significant Natural Areas, ZDO Subsection 1002.8

Significant natural Areas. Protects only four, key water resources (Williams Lake Bog, the Land at Marmot, Multorpor bog, and Wilhoit Springs) that are designated as Scenic & Distinctive Resources.

Standards for Flood Hazard Areas, ZDO Subsection 1003.03. Augments regulations of ZDO section 703 during the development process, by limiting clearing, vegetation removal, construction of roads and structures, etc. within all areas of the floodplain to be sited in a manner that minimizes alteration of terrain and other natural features

Additional Riparian Area Protection Regulation Administered by the City of Happy Valley:

Natural Resources Overlay Zone

The Natural Resources Overlay Zone (NROZ) implements natural resource, open space and environmental goals/policies within the Happy Valley Comprehensive Plan and provides compliance with portions of Statewide Planning Goals 5 and 6 as well as Titles 3 and 13 of Metro's Urban Growth Management Functional Plan. The NROZ protects and improves the natural resource functions and values by discouraging most development near intermittent/perennial creeks, rivers, streams, wetlands, natural lakes, springs, or other significant features. Applicants identify the location of protected features, vegetated corridors surrounding the features, and HCAs before applying environmental protections including mitigation when most development occurs. Unless exempt, applications are subject to a public land use review process to assure compliance as well as provide awareness.

Measurable milestone: Continue to implement the applicable riparian area protection regulations (see above) when properties are permitted to develop by Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove. Were these applicable regulations implemented? In each TMDL IP annual report, a simple "Yes" or "No" answer will be provided for each of the Co-Owners of this IP.

Fiscal analysis: This management strategy is currently funded.

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

7.5 Erosion Prevention and Sediment Control

Temporary and permanent sediment erosion and sediment control at construction sites can help reduce pollutant-laden stormwater from entering receiving waters.

TMDL parameters addressed:

- ✓ Total phosphorus
- ✓ DO (i.e., SVS) in the Tualatin River watershed)
- ✓ Mercury
- ✓ DDT/dieldrin in Johnson Creek
- ✓ Dieldrin/DDT and iron in the Pudding River watershed

Description of the Management Strategy:

Erosion control is addressed through the issuance of erosion control permits for construction sites undergoing significant development or redevelopment. These permits require measures, such as catch basin silt sacks, to reduce the amount of soil leaving the site, and subsequent mercury, TSS, and/or SVS, DDT, etc. in stormwater washing from the property. By reducing TSS in stormwater, it is presumed that the concentration in stormwater of TMDL parameters adhered to soil (such as DDT and mercury) or mixed with soil (such as organic matter with high SVS level), if present, is also reduced.

Geographic Areas Implemented:

Sites within the: I) rural portion of the City of Happy Valley, II) WES' SWM Service Area, including SWMACC, and III) CCSD#1's Boring, Hoodland, and Fischer's Forest Park subunits:
Because many of these areas are within the MS4 Permit's geographic coverage area, Happy Valley and Clackamas WES issue and administer EPSC Permits for real estate development to all qualifying construction sites whether they do or don't discharge to their MS4. To avoid duplication, please see the MS4 Permit Stormwater Management Plans for more information about these programs. At the present time (September 2022), the SWMPs to review were approved by DEQ in 2012; these SWMPs are still being implemented. In December 2022, Clackamas WES and Happy Valley expect to submit an updated SWMP to DEQ for DEQ's review and approval; after this revised SWMP has been approved by DEQ, please see this SWMP for more information about these programs. For the portions of this geographic area which are not in the WES SWM service area and are not in the City of Happy Valley, WES provides the same EPSC Permit program which WES provides in the MS4 Permit Area.

Sites not within the rural portion of the City of Happy Valley, the WES SWM Service Area, and CCSD#1's Boring, Hoodland, and Fischer's Forest Park subunits:
For the construction sites in this geographic area, a comprehensive and Clackamas County-wide erosion control permitting, inspection and enforcement program is currently under development. It is anticipated that responsibilities related to this program will be shared among Building Codes and Development Engineering staff. A written policy is being developed, which will include erosion control permit triggers, inspection requirements, associated fees, and escalating enforcement procedures. This program is being created with the intent of complying with new Willamette River mercury TMDL requirements, as well as with the intent of facilitating improved tracking & documentation. These changes will need to be updated in the Clackamas County Code and ultimately must be approved by the Board of Clackamas County Commissioners. The erosion control permitting, inspection and enforcement plan will apply to:

- Construction activities including clearing, grading & excavation that will disturb ½ acre (21,780 sq. ft.) or more and may discharge to surface waters or conveyance systems leading to surface waters of the state.
- Construction activities including clearing, grading & excavation that will disturb less than 1/2 acre but are part of a common plan of development or sale that will ultimately disturb 1/2 acre or more and may discharge to surface waters or conveyance systems leading to surface waters of the state.
- Construction activities including clearing, grading & excavation that will disturb 500 square feet or more within 50 feet of surface waters of the state.

All development activity within Clackamas County which disturbs 1 acre or greater is required to obtain a DEQ 1200-C Construction Stormwater (Erosion Control) Permit or obtain coverage from WES under their 1200-CN Permit and, as a result, these sites will not receive an erosion control permit from CCDTD.

Timeline for implementation: For the WES SWM service area, the CCSD#1 subunits, and Happy Valley, this management strategy is currently being fully implemented and is an ongoing activity. For the other geographic area, this program is being developed and will be fully implemented no less than 3 years from August 2022, as authorized in Table 13-15 in the Final Revised Willamette Basin Mercury TMDL and WQMP.

Measurable milestones: In the City of Happy Valley, Clackamas WES' SWM Service Area, and the CCSD#1 subunits:

- The number of active EPSC Permits in each jurisdiction during the TMDL's July 1st to June 30th year: HV and WES (the CCSD#1 subunits shall be included in WES' number).
- The number of inspections performed during each TMDL IP year in each jurisdiction: HV and WES (the CCSD#1 subunits shall be included in WES' number).
- The number of enforcement actions take, if any, in each TMDL IP year in each jurisdiction: HV and WES (the CCSD#1 subunits shall be included in WES' number).

Fiscal analysis: This management strategy is currently funded.

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

7.6 Public Education

Public education is a key component of reducing the community's non-point source pollution. This section addresses efforts which are believed to be effective in informing the public and encouraging behavioral change to reduce pollutant loading. WES regularly provides, and expects to continue to provide in the future, riparian area enhancement and protection messaging and stormwater management messaging to the public through its extensive public involvement and education program. Educating the public about the way their practices can negatively or positively impact the health of the watershed is an important component in managing non-point source water pollution.

TMDL parameters addressed:

- ✓ E. coli
- ✓ Mercury
- ✓ Temperature
- ✓ Total phosphorus and DO in the Tualatin River watershed

Selected messages, such as those for erosion control/prevention, are also expected to be provided by Clackamas County from time to time for DDT/dieldrin in Johnson Creek and dieldrin & iron in the Pudding River.

Description of the Management Strategy:

Clackamas County DTD, Clackamas WES, and the Cities of Rivergrove and Happy Valley provide public involvement and education to encourage citizens to work and live in ways that protect or improve water quality. Public involvement and education are relevant to many of this IP's Management Strategies, including but not limited to, public education about proper care for septic systems, responding to and preventing illegal solid waste dumping, and public education about the important of notifying the appropriate government agency when a spill occurs.

To avoid duplication, specific public education activities which are employed to reduce potential sources of TMDL pollutants are described in the MS4 Permit Stormwater Management Plans; they aren't described here. For more information, at the present time (September 2022), the SWMPs to review were approved by DEQ in 2012; these SWMPs are still being implemented. In December 2022, Clackamas WES, Clackamas County, and the Cities of Rivergrove and Happy Valley expect to submit an updated SWMP to DEQ for DEQ's review and approval; after this revised SWMP has been approved by DEQ, please see this new SWMP for more information about this public education programs. These MS4 Permit educational messages are typically equally relevant to residents and businesses whether they do or don't discharge to the MS4 (for example, "Please pick up your dog's poop" is relevant everywhere where people reside).

Other messages which are tailored specifically for rural residents and/or businesses, such as tips for the management of horse manure, are already provided by partners such as the Clackamas County Soil & Water Conservation District, but Clackamas County may choose to also share messages which are tailored for rural residents and/or businesses. For more information about non-point source water pollution messaging provided by Clackamas County in the rural area, please contact Clackamas County's Devin Patterson at DevinPat@clackamas.us

Measurable milestones: During the TMDL IP year, was the Public Education program which is required by the MS4 Permit implemented? A Yes/No answer shall be provided in each TMDL IP annual report.

Fiscal analysis: This management strategy is currently funded.

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

7.7 Septic System Management

A potential source of bacteria, mercury, SVS, and total phosphorus to surface waters is failing and failed septic systems and cesspools. A septic system or cesspool that is failing or has failed can discharge improperly treated or untreated sewage directly into a surface water body, or the wastewater can be pushed into the surface water body by stormwater runoff.

TMDL parameters addressed:

- ✓ E. coli
- ✓ Mercury
- ✓ Total phosphorus and DO in the Tualatin River watershed

Description of the Management Strategy:

Clackamas County's Dept. of Transportation & Development administers the Onsite Sewage Treatment and Disposal (Onsite) Program as an agent of DEQ throughout Clackamas County; this Management Strategy is administered in the entire geographic area which is addressed by this Implementation Plan. The Onsite Program is for the most common and smaller types of septic systems and cesspools; the largest septic systems in Clackamas County, such as those which serve restaurants and schools, are directly regulated by DEQ through their WPCF Permit Program.

The goals of Clackamas County's program are to have no septic system/cesspool failures, and for all septic systems and cesspools to be in a properly functioning condition. To achieve these goals, Clackamas County implements a process to address suspected failed or failing septic systems and cesspools when they have been referred to Clackamas County. When septic systems and cesspools fail in an area where a public sanitary sewer system is not within 300 feet of the property, and if this has been reported to Clackamas County, a site visit is performed to verify that the septic system/cesspool has indeed failed, steps for needed correction are identified and a process for implementation of corrective actions 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.

If a public sanitary sewer system is within 300 feet of a property with a failed septic system or cesspool, it cannot be replaced, and the dwelling and/or other structures with plumbing fixtures (such as a kitchen sink) must be connected to the public sanitary sewer system, according to the State of Oregon requirements.

Discharges from failed/failing septic systems and cesspools to the ground's surface and into waterways are not allowed and these systems are given the shortest time that is feasible for construction of repairs and for the implementation of short-term 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.

Code Violations

Clackamas County DTD's Code Compliance group brings violators into compliance if initial efforts to do so are unsuccessful. Initial efforts that are made encourage voluntary compliance. All failing septic systems and cesspools are an enforcement priority. Clackamas County has the ability to levy both fines and fees for code violations.

Measurable milestones:

- **MM#1:** The number of reports of failing/failed septic systems and cesspools received by Clackamas County during the TMDL IP year.
- **MM#2:** The number of confirmed septic systems and cesspools which failed during the TMDL IP year.
- **MM#3:** The number of repair permits issued for septic systems and cesspools during the TMDL IP year.
- **MM#4:** The number of septic systems and cesspools which were decommissioned during the TMDL IP year, with the property then subsequently connected to any public sanitary sewer system (including, but not limited to, those owned by Clackamas WES, Oak Lodge Water Services District, and the Cities of Lake Oswego, West Linn, Oregon City, Milwaukie, Wilsonville, Canby, Molalla, Estacada, and Sandy).

Fiscal analysis: This management strategy is currently funded.

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

7.8 Illegal Dumping Management

Solid waste can be illegally dumped on public and privately owned and lands, which can contribute TMDL pollutants to surface waters if not cleaned up properly in a timely manner.

TMDL parameters addressed:

✓ E. coli

✓ Mercury

✓ Total phosphorus and DO in the Tualatin River watershed

Description of the Management Strategy:

Illegal dumping of selected types of solid waste can cause TMDL pollutants to be transported via storm-water runoff into surface waters. Examples include:

- *E. coli* from soiled disposable diapers.
- Mercury from some fluorescent light bulbs, batteries, thermometers, and electronics.
- SVS, which can cause instream DO levels to be depleted, from items such as discarded food and yard debris.
- Total phosphorus in items such as discarded food, soiled diapers, and yard debris.

Illegal dumping of solid waste is addressed by different programs and regulations depending on the place where the solid waste was dumped in Clackamas County.

Metro's Regional Illegal Dumping program

Illegal solid waste dump sites can be cleaned up by the regional illegal dumping program if it is dumped on public land and within the Portland metro area's UGB. The Co-Owners of this IP will continue to refer these sites to the regional illegal dumping program when they're reported or discovered, unless the public landowner chooses to clean it up without assistance.

Public Roads which receive full Clackamas County maintenance

Solid waste which is illegally dumped on roads which receive full Clackamas County maintenance can be reported to Clackamas County's Transportation Maintenance Division.

The Dump Stoppers Program

This program is provided in forested areas in the Easternmost portion of Clackamas County in these TMDL watersheds: Molalla-Pudding, Willamette, and Sandy River. It is not available in the Tualatin River watershed. The portion of this program which is administered by Clackamas County is housed within the Business and Community Services Department's County Parks Program. Dump Stoppers can be contacted to clean up the refuse on federal, county, or industrial timber company-owned lands at 503-650-3333.

Illegal solid waste dump sites on other private properties

If the dumped solid waste is private land, cleanup is the responsibility of the landowner, although law enforcement can play a role if the person(s)/business who dumped the material can be identified. For illegal solid waste dump sites within the urban area, Clackamas County Code Enforcement Division can be contacted. They administer 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 Clackamas County Code Enforcement Division uses to resolve certain types of solid waste issues that cause a condition of unsightliness on private property.

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

Measurable Milestones:

- **MM#1:** The number of reports of illegal solid waste dumping received by Clackamas County Code Enforcement during the TMDL IP year.
- **MM#2:** The number of solid waste-related enforcement actions conducted by Clackamas County Code Enforcement during the TMDL IP year.
- **MM#3:** Estimated number of pounds of illegally dumped solid waste which was removed by the Dump Stoppers program during the TMDL IP year. If available, the number of dumping sites cleaned up will also be provided.

Fiscal analysis: This management strategy is currently funded.

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

7.9 Respond to Reports of Impaired Stormwater Quality

This Management Strategy applies to all properties throughout this TMDL IP's geographic area.

TMDL parameters addressed:

- ✓ E. coli
- ✓ Mercury
- ✓ DO and total phosphorus in the Tualatin River watershed
- ✓ DDT and dieldrin in Johnson Creek's watershed
- ✓ Dieldrin and DDT and iron in the Pudding River watershed

Description of the Management Strategy:

All facilities and properties that are the subject of a stormwater quality complaint or request for service will be contacted, if possible, in a timely manner by staff from Clackamas County, Clackamas WES, or Happy Valley. The decision about whether or not to conduct a site visit will be made by staff at his/her/their discretion. Note that staff may choose to refer the complaint or request for service to a partner organization, such as the Clackamas Soil & Water Conservation District, or Oregon DEQ, for follow-up and resolution. Staff will refer the complaint or request for service to ODA if it pertains to agricultural stormwater, or to Oregon's Dept. of Forestry if it pertains to stormwater runoff from forested privately owned lands.

For those complaints or requests for service which pertain to construction site runoff, an erosion control inspector is likely to be the person who responds (see Management Strategy 7.5).

For properties and facilities which are in the WES SWM service area, the implementation of control measures for non-point source stormwater discharges from these facilities will be deemed necessary by WES if the presence of excess levels of a TMDL pollutant can be confirmed to be present in a facility's discharge. In these instances, and when a discharger's initial attempts to improve their non-point source stormwater quality do not produce the required improvement, WES personnel will continue to provide guidance and technical assistance until the facility's stormwater quality improves. If efforts by WES staff fail to achieve these goals, WES staff will contact the DEQ and request their support. The DEQ has the authority to compel most non-point source stormwater dischargers to halt or modify their discharge if it contains a significant concentration of TMDL parameters and flows, or is likely to flow,

directly to Waters of the State.

Measurable Milestone: Did the Co-Owners of this IP respond to all complaints and requests for service which pertain to allegedly impaired non-ERCO/EPSC program stormwater quality? In each TMDL IP annual report, a Yes/No answer shall be provided by Clackamas County DTD, Clackamas WES, and the City of Happy Valley. For this MM, a field visit or site inspection is not required to "respond" in a satisfactory manner.

Fiscal analysis: This management strategy is currently funded.

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

7.10 Illicit Discharge Detection & Elimination Program (includes spills)

Illicit discharges can contain several different non-point source TMDL pollutants. Stopping and preventing illicit discharges is an extremely effective strategy for protecting receiving water.

TMDL parameters addressed:

- ✓ E. coli
- ✓ Mercury
- ✓ Total phosphorus and DO in the Tualatin River watershed

Description of the Management Strategy:

The illicit discharge of certain liquid substances, such as wastewater, containing NPS TMDL pollutants such as *E. coli* or mercury can cause watershed health impairment. Potential sources of this contamination include:

- *E. coli* in sewage spilled from a privately owned sanitary sewer lines due to pipe failure, etc.
- Mercury can be introduced from a broken older thermometer that contained mercury.
- Total phosphorus from illicitly discharged sewage, such as from a recreational vehicle.
- Settleable volatile solids from illicitly discharged sewage, such as from a recreational vehicle.

Stopping the discharge and overseeing the cleanup by the responsible party, if cleanup is feasible and appropriate, and if the responsible party (RP) is known, is one of the primary functions of this program. A Co-Owner of this IP can choose to clean it up at their expense, if this is deemed appropriate, and if the RP is unknown. A second function is to try to prevent illicit discharges from occurring in the future.

The IDDE program work described here is limited to illicit discharges that:

- Flow into, pass through, or move towards privately owned storm sewer outfalls,
- Move by overland sheet flow on private property, and
- Flow into, pass through, or move towards Clackamas County-owned/maintained storm sewer systems (most of which are ditches in rural areas) which are not regulated by the MS4 Permit or the Stormwater/UIC WPCF Permit. Nearly all of these publicly owned, surface-discharging non-point source storm sewer systems are along County-maintained roads in rural areas.

Geographic Area Implemented:

Portions of this IDDE Management Strategy are implemented by Happy Valley, Clackamas County DTD, and WES.

Areas not within the WES SWM Service Area and not within the rural portion of the City of Happy Valley:
This portion of the Management Strategy is administered by Clackamas County DTD-Transportation Maintenance Division. If materials that potentially contain harmful pollutants (such as *E. coli* or mercury) are spilled or illicitly discharged onto a Transportation Maintenance-maintained road right-of-way (i.e., the impacted road segment is eligible for "full County maintenance"), personnel will respond if they are notified about the incident, and it is determined that a response is appropriate. They'll ensure that the release of the material is halted, if still ongoing, and the material is subsequently cleaned up in a manner that prevents harmful substances from entering waters, if possible, or minimizes the amount of pollution which enters the nearest 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 (e.g., *E. coli* from animal manure), ODA may be asked to assume the lead role in responding to the report and resolving the matter. The Clackamas County Transportation Maintenance Division 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.

The WES SWM Service Area and the rural portion of the City of Happy Valley:
Most commonly, IDDE program services in this NPS geographic area are provided by Clackamas WES, but Happy Valley provides some services in some instances, such as in the rural portion of the city. WES staff make reasonable efforts during regular business hours to try to halt the release of spilled and illicitly discharged material in non-point source areas, and to persuade/motivate the responsible party to clean up their material. The goal is to prevent or to minimize the release of TMDL pollutants and other pollutants into waterways or into groundwater. If efforts by WES staff fail to halt the release of the material and the material contains TMDL pollutants that are likely to enter surface waters and/or storm sewers, WES staff will contact the DEQ and request their support. DEQ has the authority to compel most dischargers to halt or modify their illicitly discharged material if it contains a significant amount of pollution and is likely to flow to Waters of the State.

Timeline for implementation: This management strategy is currently being implemented.

Measurable milestone: The number of illicit discharges which were verified to have occurred during the TMDL IP year in the non-point source water pollution locations in the WES SWM service area. Also, for these incidents, provide the type of material spilled (e.g., sewage), and if any of the material entered a creek, wetland, or river, and provide an estimated volume which entered the water body, and the name of the responsible party, if known.

Fiscal analysis: This management strategy is currently funded.

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

7.11 Riparian Area Assessment and Management

Riparian area assessment and management can provide shading and can reduce river/stream warming from direct sunlight, in addition to providing a myriad of water quality improvement and bank stabilization benefits. Reduction of the riparian canopy can also change the microclimate near streams, increasing air flow and heat exchange with the stream and thereby further elevating water temperatures.

TMDL parameters addressed:

✓ Temperature

✓ Mercury (because stream bank stabilization provided by this MS reduces stream channel erosion)

✓ DO in the Tualatin River watershed (because cooler stream water can hold more DO)

Description of the Management Strategy:

Protection and restoration of riparian areas along the rivers and their tributaries in the TMDL IP's geographic area is conducted to hopefully, eventually attain the load allocations for temperature. Management Strategy 7.4 (named "Riparian Area Shade: Other Development-Related Regulations) also addresses riparian area shade, but it only applies to properties which are being developed/re-developed under a permit issued by Clackamas County or the Cities of Rivergrove and Happy Valley. This Management Strategy applies to all of the other privately owned and publicly owned properties with riparian areas.

Geographic Area Where Implemented:

Tualatin River watershed – WES SWM Service area:

Beginning in February 2018, WES has continuously maintained written contracts with the Tualatin River Watershed Council (TRWC) which have included a task with at least $5,000 available per year from WES to pay for their work to plant trees and other native vegetation in privately owned riparian areas in the SWMACC portion of the WES SWM service area. Since that time, riparian area trees have been planted during each Winter on at least one of these private properties in the following areas:

- Two properties (The "Our Table Farm" and the Douglas Ferry family's lands) along Rock Creek-South in the SW Morgan Road area (Sherwood/97140).
- Property along Fields Creek near 23321 SW Bosky Dell Lane (West Linn/97068)

The current contract w/the TRWC (which is for their recently awarded WES RiverHealth Program grant) will expire on June 30, 2023. In addition, as of August 2022, in the future, the TRWC expects to plant some trees in the riparian areas of Wilson and Pecan Creek. Initial outreach to landowners along these two creeks has been conducted and two future planting sites have been identified.

Land owned by the City of Rivergrove and Clackamas County in the Tualatin River Watershed:

- The City of Rivergrove owns some natural area land – Heritage Park at 5036 SW Dogwood Drive (Lake Oswego, 97035) – which is managed to eventually generate maximum system potential shade, but its effect is expected to be minimal, since this land is next to the Tualatin River (which is very wide) on the North bank, which will generate less river shade than an identical site that would be on the South bank of the river.
- Clackamas County owns some natural area lands in the SWMACC portion of the WES SWM service area. Some of these lands are mostly submerged beneath the waters of the Tualatin River (tax lot 21E28 07100, which is 21 acres in size and extends both upriver and downriver from the I-205 bridge across the Tualatin River is an example). But some of the edges of these mostly submerged lands are riparian areas, and in the future, Clackamas County might choose to plant native trees in these slices of riparian area. A few other pieces of land which contain slightly larger riparian areas are also owned by Clackamas County in the SWMACC portion of the WES SWM service area; these lands are next to County-maintained roads; examples are the places where SW Borland and Stafford Road bridges cross the Tualatin River. Although some native trees were planted a few years ago in at least one of these places, in the future, Clackamas County might choose to plant additional native trees in these riparian areas.

Other watersheds in WES' SWM Service Area:

Other watersheds in the WES SWM area include Kellogg-Mt. Scott Creek, Johnson Creek, and the Clackamas River. Beginning in 1993, many trees and other native plants have been planted, supported by funds from WES, in many privately owned riparian areas in the WES SWM Service Area. Additional funding from WES has supported tree planting on many pieces of publicly owned land, including some

lands which are owned by Clackamas WES, Clackamas County, and the City of Happy Valley. The sum total of this work is too extensive to summarize here, but many thousands of trees have been planted at dozens of riparian area sites over the years with funding or other support from Clackamas WES.

Enforcement of riparian protection regulations in the WES SWM Service Area, including Happy Valley:
When a privately owned property has a riparian area which is already permanently protected – either with a conservation easement, or by being in a separate tract of land which is dedicated to riparian area and water resource protection – if WES is notified when inappropriate tree removal, land clearing, etc. has occurred or is occurring on the land, WES will strive to promptly resolve the matter and attempt to persuade/motivate the responsible party to mitigate the damage and re-plant in the places where removal occurred. For enforcement of alleged violations of riparian area protection regulations in the City of Happy Valley, they will respond to the allegation; WES will coordinate with and provide support to the City if the City chooses to take a leadership role in addressing the matter. In many instances, signage such as this (Figure 10) has been installed along the edges of these riparian areas which notifies the reader that the riparian area behind the sign is protected; this signage is believed to prevent most instances of inappropriate tree removal, land clearing, etc. from ever occurring on these lands.

Figure 10. WES Protect Your Watershed Public SIgnage

Enforcement of riparian area protection regulations in areas which are not within the WES SWM Service area and aren't in the rural portion of Happy Valley:

In these places, when alleged violations of riparian area protection regulations are reported to Clackamas County's Code Enforcement Division, they will respond to the allegation.

Other Lands in Clackamas County:
Clackamas County's Parks Department and the NCPRD both strive to protect and enhance the riparian areas, if possible, which are on the lands they own and operate. And from time to time, Clackamas County provides public education about the importance of protecting and enhancing the riparian areas which are on private property.

Measurable milestones:

- **MM#1:** During the TMDL IP plan year, the number of project sites where WES provided funding

when native vegetation was planted in riparian areas in the WES SWM Service Area.

- **MM#2:** The number of native plants which were planted (either the total number, or the number at each of the sites in Management Strategy 1, or both).

Fiscal analysis: This management strategy is currently funded.

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

7.12 Cold Water Refugia Assessment and Management

CWR are areas within rivers that maintain cooler temperatures in late Spring, Summer, and early Fall when water temperature elsewhere in the river is significantly warmer. For example, a CWR can be a place where a colder tributary stream enters a river. CWR offer migrating salmonids, and other native fish and aquatic species, relief from the warmer water in the other parts of the river.

TMDL parameters addressed:

✓ Water Temperature/CWR

Description of the potential sources:

The 2006 Temperature TMDL includes requirements to assess and protect CWR in the Willamette River in Clackamas County. Alteration to river channel structure including removal or lack of large woody debris and modifications to deep pools and overhanging bank areas can reduce the presence of CWR or potentially eliminate it. Reductions in infiltration of stormwater from development, farming, etc. in upland areas, and the resulting reduction in groundwater replenishment, is expected to increase temperatures of tributary streams, which can also reduce the quality and size of a CWR.

Description of the Management Strategy:

Clackamas County does not own, control, or regulate the CWR in the Willamette River. And the other Co-Owners of this IP (Clackamas WES' SWM Service Area and the Cities of Rivergrove and Happy Valley) do not own or regulate any lands near CWR. However, this Management Strategy does describe work that the Co-Owners of this IP expect to have a positive influence on the enhancement and protection of these CWR.

The Willamette River from its confluence with the Columbia River upstream approximately to the City of Newberg (RM 0 to RM 50) has been designated as a salmon and steelhead migration corridor. The biologically based numeric temperature criteria here is 20 degrees Celsius (68 degrees Fahrenheit) and applies throughout the year. The following narrative temperature criteria for salmon/steelhead migration use also apply to this section of the Willamette River: CWR shall be *"sufficiently distributed to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body."*

According to OAR 340-041-0002, CWR are defined as those portions of the water body where, or at times during the diel temperature cycle when, the water temperature is at least 2°C colder than the daily maximum temperature of the adjacent well mixed flow of the water body. These refugia include habitats and locations where temperature-sensitive cold-water species may find refuge when ambient stream temperatures are stressful. The DEQ's 2006 Willamette Temperature TMDL includes a CWR section. In the TMDL, DEQ states:

- DMAs could or should play a role in 1) locating and protecting existing CWR, and 2) improving/enhancing the function of existing CWR. In this instance, the DEQ's precise expectation for Clackamas County (a DMA) is unclear.

- Cold Water Refuges in the Willamette River can be created by colder water from perennial creeks which join the Willamette River. Tryon Creek is an example. Protection and enhancement of riparian areas and floodplains along these tributaries is important for maintaining and restoring CWR in the Willamette River.
- Cold water refuges in the Willamette River can also be created by hyporheic flow and groundwater inflows (aka Springs) into the main channel and side channels.

The 2015 NMFS Endangered Species Act Biological Opinion:

On November 3, 2015, NOAA's National Marine Fisheries Service issued an Endangered Species Act Biological Opinion (BO) which addressed Oregon's water quality standards for temperature. The BO concluded that the continued existence of wild chinook salmon and steelhead in the Willamette River and many other water bodies is jeopardized. It also concluded that some of their critical habitat has been destroyed or modified. The BO says DEQ shall develop and implement a CWR Plan for the lower 50 miles of the Willamette River, which DEQ completed in March 2020 (see below). The purpose of the CWR Plan is to adequately interpret the narrative temperature criterion to allow for implementation of the criterion through DEQ's Clean Water Act Authorities. More information about the CWR Plan is below:

- In the CWR Plan, DEQ characterized: 1) the current spatial and temporal distribution of CWR, and 2) potential locations for the restoration or enhancement of CWR.
- DEQ assessed whether the spatial and temporal extent of CWR present meets the CWR narrative criterion (i.e., whether CWR are "sufficiently distributed to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body").

In March 2020, DEQ published a study which listed and described the known Cold-Water Refuges in the lowest 50 miles of the Willamette River. The study identified 20 large CWRs suitable for use by migrating adult salmon and steelhead (note that the confluence of the Clackamas and Willamette Rivers is the largest one). In addition, the study identified 27 other small-scale CWRs suitable for rearing and migrating juvenile salmon and steelhead but likely too small to accommodate adults.

Action Items in this MS for the Co-Owners of this IP:

- Continue to try to obtain more infiltration and shallow injection (with drywells, for example) of stormwater in upland areas to replenish the supply of groundwater. This can increase the discharge of cool water from springs which then flow into creeks and rivers.
- Continue to try to have more trees planted in riparian areas of creeks and rivers in the Tualatin, Clackamas, Molalla-Pudding and Willamette River watersheds. And continue to try to protect the existing riparian area trees which are in these places.
- Administrators of the Clackamas County-DTD and/or Happy Valley Floodplain Management Program may choose to assess their options for potential CWR-related changes to the administration of their programs to protect and/or enhance colder water in creeks in rivers, including the enhancement or protection of hyporheic flows.

Measurable milestones: None. See above for Action Items.

Fiscal analysis: This management strategy is currently funded.

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

SECTION C

IMPLEMENTATION

8. TMDL Implementation

This TMDL Implementation Plan addresses how Management Strategies will be implemented and includes some potential barriers to implementation as well as timelines for implementation:

8.1 Barriers to Implementation

Land ownership categories that are potential non-point sources of pollutants which Clackamas County, Clackamas WES, and the Cities of Happy Valley and Rivergrove 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
- Lands within the other cities in the TMDL's geographic area, such as West Linn and Estacada
- Highways, such as I-205, and other State-owned lands

Specific barriers include, but are not limited to:

- The bacteria Load Allocations may be exceedingly difficult and prohibitively expensive to attain if much of the in-stream *E. coli* loading is from the feces of wild birds and mammals.
- The source of nearly all of these TMDL pollutants are privately owned lands, and the Co-Owners of this IP, as units of local government typically have little or no authority to compel these thousands of residents and businesses to reduce their contributions of these pollutants by significant amounts. In many or most instances, their right to use their privately owned property as they wish outweighs and outranks the local government's power to regulate their use of their land.

8.2 Implementation Monitoring and Evaluation Reports

According to OAR 340-042-0080(4)(a)(C), this IP shall *"Provide for performance monitoring...."* The definition of performance monitoring, as provided in OAR 340-042-0030(7) is *"…monitoring implementation of management strategies, including sector-specific and source-specific implementation plans, and resulting water quality changes."*

Implementation monitoring will be conducted by Clackamas County, Clackamas WES, and/or the Cities of Happy Valley and Rivergrove to confirm that this IP's Management Strategies were implemented as described. From time to time, when deemed appropriate, this Implementation Plan will be revised to reflect our enhanced understanding of our program's effectiveness and to reflect current watershed conditions

8.3 Adaptive Management Approach to Attaining Load Allocations

Our goal is to attain the load allocations which have been issued to us for each TMDL parameter through an Adaptive Management process. We are committed to investing in activities and programs that contribute to overall watershed health. We are 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. 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 allocations given the barriers to implementation described above. As progress is made toward pollutant reduction, we will adaptively manage our activities and programs in order to work toward attaining the load allocations.

Mercury

Research has shown that much of the mercury which enters the creeks and rivers in the Willamette river watershed has been deposited in the watershed by the atmosphere. It is Clackamas County's, Clackamas County WES,' and the City of Happy Valley and Rivergrove's understanding that we are not legally responsible for preventing and/or controlling the portion of the mercury load that had been deposited by the atmosphere. We will reduce mercury contributions to waterways to the extent possible where we have the authority to regulate stormwater discharges from the locations where mercury is deposited.

The stated objective of the updated 2021 mercury TMDL is to reduce average fish tissue mercury concentrations in the Willamette River so that all fish species are safe for human consumption. It will certainly take many years for the community to ultimately achieve the desired reduction of mercury in fish tissue.

Given that Clackamas County's portion of the watershed possesses many land uses in large rural and urban areas, numerous agencies share jurisdiction over some of the activities which may cause in-stream mercury contamination. Other activities, such as those which cause the atmosphere to deposit substantial amounts of mercury in the watershed, or certain ways that mercury-containing soil is disturbed and eroded, such as row crop agriculture, only receive minimal regulation. Unfortunately, unregulated and thinly regulated sources of mercury appear to account for the vast majority of the Willamette River's annual mercury loading. For comparison, all the publicly owned wastewater treatment plants in the entire watershed combined discharge about 0.8% of the Willamette River's annual mercury loading.

E. coli

It is expected to take longer to attain the load allocations in areas where a larger share of the in-stream *E. coli* loading is from the feces of wild birds and mammals. The load allocation may be exceedingly difficult and prohibitively expensive to attain in many of those water bodies where much of the in-stream *E. coli* loading is from the feces of wild birds and mammals.

Total Phosphorus (Tualatin River watershed)

It is expected to take longer to attain the load allocations in areas where a large share of the in-stream total phosphorus loading enters the stream in phosphorus-rich spring water. The total phosphorus load allocation will be exceedingly difficult, and expensive– to attain during the TMDL season if large amounts of phosphorus-rich groundwater continue to enter the Tualatin River and tributaries. This is due, in part, to the small amount of rain which typically falls during these months.

Dissolved Oxygen (Tualatin River watershed)

As was previously noted in this Plan, the DEQ established a new TMDL for DO—this one based on reducing the levels of SVS—in the Tualatin River watershed in 2001. Levels of SVS are believed to play in role in contributing to the amount of instream DO that bed sediments remove as organic material is consumed or decomposes. The DO TMDL's LA that were issued are for SVS. The LAs are expressed in terms of a required percent reduction of SVS in stormwater runoff. For the approximately 27 acres of land in SWMACC which can drain into Carter Creek, a Fanno Creek tributary, the required SVS reduction is 50 percent from May 1 to October 31. For all other streams in SWMACC, including the mainstem Tualatin River, the required SVS reduction is 20 percent from May 1 to October 31.

Temperature

The Co-Owners of this IP implement several management strategies to reduce water temperature, as described in Chapter 7. 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 previously. We will address the temperature TMDL by focusing on the acquisition of an increase in riparian shading. It will take many years for enough 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 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. System Potential shade conditions cannot be attained within 100 percent of the riparian area on non-ODA/ODF privately owned lands due to private property rights, historic land use decisions, and other factors. It is expected that the eventual attainment of improved riparian area condition will be the product of a series of partnerships between Clackamas County, Clackamas WES, the Cities of Happy Valley and Rivergrove in addition to 1) Citizens, 2) Non-profit organizations (the watershed councils, Friends of Trees, etc.), 3) The for-profit companies who own land in the watershed, and 4) The Clackamas County Soil & Water Conservation District.

- DDT/dieldrin in Johnson Creek, and DDT/Dieldrin and iron in the Pudding River:
- DDT and dieldrin are believed to be residing in the soil in upland areas in these watersheds.

When this soil is eroded, if the eroded soil reaches a creek or river, much or all of these pesticides, which were banned long ago, will also enter the water body. Prevention and control of erosion is believed to be the most effective strategy for reducing these discharges. If all property owners in these watersheds do their part to prevention and control erosion, these TMDL LAs will be met.

- The fate and transport if iron in the Pudding River is complex and is still under investigation.

Some of the iron is dissolved and originates from natural springs.

9. Mercury TMDL Implementation Update

In September 2006, DEQ issued a TMDL for the entire Willamette River Basin to protect and restore the beneficial uses of the Willamette River. Chapter 14 of the TMDL includes a WQMP, which provides the framework of management strategies to attain and maintain water quality standards. Given data limitations for mercury at that time, load and waste load allocations were not provided for mercury. In 2019, DEQ issued the revised Willamette River Mercury TMDL and associated WQMP. After revising some of the load and waste load allocations, EPA approved the revised Mercury TMDL on February 4, 2021. Updated Load Allocations for mercury are provided in Table 5 (Section 3) of this document. This Willamette River TMDL pertains to all sub-basins in the 11,500 square mile watershed, including 12 major sub-basins. DEQ gave DMAs 18 months from TMDL issuance to submit updated TMDL IPs to address mercury requirements in the WQMP. This September 3 TMDL update was prepared to address this requirement.

9.1 Management Strategies

In the revised Willamette River Mercury TMDL WQMP, DEQ established four minimum measures for County's to control nonpoint sources of mercury. Table 6 below references those minimum measures and includes the management strategies from Sections 7.1 through 7.12 that the County is implementing to address the measure.

Table 6. Minimum Mercury Requirements for Counties		
Stormwater Measure	**Requirements**	**Measures Implemented and Described**
Pollution Prevention and Good Housekeeping for County Operations	Counties must properly operate and maintain lands, properties, and facilities using prudent pollution prevention and good housekeeping measures, and through appropriate staff training reduce the discharge of mercury-related pollutants to waterbodies. Counties must maintain records for meeting these requirements and include a descriptive summary of their activities in the TMDL annual report.	O&M for Publicly Owned Storm Sewer Systems (7.2)
Public Education and Outreach	Counties must conduct public education and outreach to reduce mercury and mercury-related pollutants, such as sediment, on county lands and properties, as applicable. Such activities should include outreach to property owners adjacent to county roads and ditches. In addition, public outreach must include efforts to encourage and facilitate reporting of sediment related issues or concerns from the public. Public outreach should be tailored to meet the needs and diversity of the county population (e.g., signs, social media, website presence, etc.). Counties must track implementation of the public education and outreach requirements and describe all activities in the TMDL annual report.	Public Education (7.6)
Enforcement of Prohibited Pollutants	Counties must reduce conveyance of mercury and mercury-related pollutants to waterbodies from county lands and properties and have capability of enforcing on other entities that contribute mercury-related pollutants, such as sediment, to county property and assets. DEQ recognizes that county ordinances already in place or that must be adopted will likely be more comprehensive and prohibit discharges of other pollutants, rather than only those pollutants associated with mercury. The program must also maintain a procedure or system to document all complaints or reports of mercury and mercury-related pollutant discharges to county lands and properties and to water bodies from county lands and properties. In each TMDL annual report, counties must track implementation of their enforcement program and describe all activities	Illegal dumping management. (7.8) Respond to reports of impaired stormwater quality from any location (7.9) Illicit Discharge Elimination Program (7.10)
Construction Site Runoff Control	To minimize mercury and control potential sediment runoff from construction sites, counties must incorporate erosion control requirements into county building and grading permit applications. Permit language must require erosion, sediment, and waste material management controls to be used and maintained at construction sites from initial clearing through final stabilization. Counties may prioritize where these building and grading permit requirements are applied, for example where increased development is occurring, according to county zoning regulations, or where large subdivisions or large-scale dense development is allowed. Through an ordinance or other regulatory mechanism, counties must be able to pursue enforcement and technical assistance, as appropriate, at construction sites where pollutants could discharge to waters of the state, either directly to stream or through a conveyance system. In each TMDL annual report, the county must track implementation of its construction site runoff control program and describe all activities.	Erosion prevention and sediment control. (7.5) Riparian assessment and management. (7.11)

Adapted from Final Revised Willamette Basin Mercury TMDL and WQMP.

In addition to the minimum measures addressed above, the following mercury reduction recommendations will be implemented (adapted from Table 13-13 of the Final Revised Willamette Basin Mercury TMDL and WQMP, 2019). Table 7 includes a summary of recommendations and our applicable Management Strategies.

Table 7. Sediment-Bound Mercury Reduction Measures	
	Applicable Management Strategy we are Implementing that is Relevant to this Recommendation
Roads	
Identify and prioritize county roads and ditches that contribute sediment and runoff to waterbodies. Best practices could include planting/retaining vegetation in ditches and reducing use of pesticides when appropriate to site conditions. Special attention should be focused on the following situations: unimproved/gravel roads in higher traffic areas; roads where traffic consists of heavy machinery use; near quarries or other activities that can exacerbate dust and track-out concerns.	O&M for Publicly Owned Storm Sewer Systems (7.2)
Develop and implement an operation and maintenance program with a schedule of regular and long-term inspection and maintenance ensuring the proper operation and effectiveness of both structural and source controls, e.g., stormwater system maintenance and/or road maintenance actions that prevent erosion of road surfaces	O&M for Publicly Owned Storm Sewer Systems (7.2)
Riparian Buffers	
Retain or plant adequate riparian buffers along waterbodies on county properties, such a park to provide natural filtering of sediment. Percent effective shade targets to meet the 2006 Willamette Basin TMDL for temperature are available in the 2006 TMDL document. Meeting shade targets will help provide shade for reducing heat impacts, as well as buffers to filter runoff. Counties that were identified as DMAs in the 2006 TMDL should already be conducting activities in support of this goal.	Riparian Area Assessment and Management (7.11)
Develop an enforceable ordinance that establishes a minimum buffer along streams, wetlands, lakes, and other waterbodies.	Riparian Area Shade: Other Development-Related Regulations (7.4)
Onsite Stormwater Management	
Strive to reduce the percent of new impervious surfaces by prioritizing onsite stormwater infiltration on county-owned properties for existing properties, new development, and redevelopment.	Stormwater Regulations for New/Re-Development and for CIPs (7.1)
Encourage and incentivize developers to implement low-impact design standards on large development sites.	Stormwater Regulations for New/Re-Development and for CIPs (7.1)

10. Review and Revision of Plan

While the need for this NPS Implementation Plan (IP) update was specifically to address the requirements of the 2021 revised Willamette River Mercury TMDL, the Co-Owners of this IP used the opportunity to conduct a comprehensive update of their IPs that included consolidating four TMDL IPs into one; updating information regarding jurisdictional authorities; and reviewing, revising, and updating all of the non-point source Management Strategies as necessary - two new MSs were added, and three MSs that are no longer applicable were removed. The 2006 Willamette River TMDL Water Quality Management Plan (WR TMDL Chapter 14) states the following on page 14-6:

> *"DMAs will be expected to prepare an annual report and undertake an evaluation of the effectiveness of their plans every five years to gauge progress toward attaining water quality standards."*

Given this 2022 comprehensive update, the Co-Owners of this IP expect to conduct their next five-year review in 2027. According to OAR 340-042-0080(4)(b), Clackamas County DMAs shall also *"Implement and revise the plan as needed."* If updates are identified prior to the five-year review period, revisions may be made earlier. It is assumed that the next five-year review will be conducted in 2027 as scheduled, assuming that this document is approved by DEQ in 2022. If it is approved in 2023, then the five-year review will be conducted in 2028. Annual reports will be provided to DEQ in association with the MS4 Permit annual reports due on December 1 of each year.

11. Statewide Land Use Requirements

Oregon Administrative Rule 340-042-0080(4)(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, Clackamas WES' SWM Service area, including the SWMACC and CCSD#1, and the Cities of Happy Valley and Rivergrove 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, and with the City of Rivergrove's and Happy Valley's Comprehensive Plans 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.

We have concluded that the City of Rivergrove's, the City of Happy Valley's, and 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

The co-owners of this IP have the legal authority to implement TMDL management strategies as provided by relevant Oregon State Constitution sections, Oregon state statutes, and charter and code. Specific orders, codes and authorities associated with TMDL implementation are listed below:

- **Surface Water Management Agency of Clackamas County.** Organized under ORS 451 in 1992, SWMACC was empowered with surface/stormwater management authority by Clackamas County Board Order No. 92-289 on March 19, 1992. This Order authorizes SWMACC 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 within the *Water Environment Services Rules & Regulations,* revised July 2018 Clackamas WES, a Clackamas County Department, administers the SWMACC through WES' administration of the WES Municipal Partnership, which is organized under ORS 190.
- **Clackamas County Service District No. 1.** Organized under ORS 451 in the late 1960s or early 1970s, CCSD#1 was empowered with surface/stormwater management authority by Clackamas County Commissioners in 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 within the *Water Environment Services Rules & Regulations,* revised July 2018. Clackamas WES, a Clackamas County Department, administers the CCSD#1 through WES' administration of the WES Municipal Partnership, which is organized under ORS 190.
- **Clackamas County Comprehensive Plan, ZDOs, and Other Board Orders.** The Clackamas County 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, which can be viewed here, provides authority to adopt measures that protect surface/stormwater quality:

  https://www.clackamas.us/planning/comprehensive.html

  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)
- Willamette River Greenway (Section 705)
- Habitat Conservation Area District (Section 706)
- Water Quality Resource Area District (Section 709)
- Protection of Natural Features (Section 1002)
- Utilities, Street Lights, Water Supply, Sewage Disposal, Surface Water Management, and Erosion Control (Section 1006)
- Open Space and Parks (Section 1011)
- Lot Size and Density (Section 1012)
- Planned Unit Developments (Section 1013)
- Open Space Review (Section 1103).

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"), as amended pursuant to Ordinance No. 05-2000 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. *City of Rivergrove's Comprehensive Plan and Codes:* The City of Rivergrove's Comprehensive Plan's last major update occurred in 2011(The portion for Goal #12, titled "Transportation" was updated in 2014) 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.

The City of Rivergrove Land Development Ordinance provides the regulations that implement the goals and policies of the Comprehensive Plan. The specific Development Code sections that serve to protect surface/stormwater quality are:

- Subdivision/PUD design and improvement standards (Section 6.130 and Sec. VI, Ord. #70-2001)
- Significant Natural Resource Lands (Section 5.070 and Sections I-IV, Ord. #70-2001)
- Water Quality and Flood Management (Sections I-III and V-VII, Ord. #70-2001)
- Tree Cutting and Preservation (Section 5.100 as amended by Ord. #74-2004)
- Surface Water Runoff and Detention (Section IV, Ord. #70-2001)

Ordinance and associated HCA map adoption requirements necessary to implement Metro's Title 13 (mandated in part by State of Oregon Goal 5 regulations) were approved in 2008 to provide additional protection for riparian shade.

The Comprehensive Plan, codes, and City Council Orders apply during new/redevelopment and during times when development is not proposed or occurring. If a property is not being developed or redeveloped, the City administers the applicable portions of the City's Municipal Code. If a property has been proposed to be developed/redeveloped, all Plans are checked for conformance with the following:

- Conditions of Approval associated with the pertinent land use approval
- Provisions of the Development Code
- The Engineering Design Standards Manual
- WES Rules and Regulations, but only if the tax lot is in SWMACC (the portion of the City of Rivergrove that is in Washington County is not in SWMACC). Developers may be required to provide stormwater detention, erosion control, post-construction stormwater treatment, and a streamside or wetland setback area.

City of Happy Valley's Comprehensive Plan and Codes. The City of Happy Valley's Comprehensive Plan's last major update occurred in 1991. 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.

Title 16 of the City of Happy Valley Municipal Code (Development Code) provides the regulations that implement the goals and policies of the Comprehensive Plan. Particular Development Code sections that serve to protect surface/stormwater quality are:

- Subdivision/PUD design and improvement standards (Sections 16.16.110-16.16.120)
- Significant Natural Resource Lands (Sections 16.16.270-16.16.440)
- Water Quality and Flood Management (Sections 16.16.430-16.16.500)
- Tree Cutting and Preservation (Section 16.20.090)
- Surface Water Runoff and Detention (Section 16.20.170)

Regulations necessary to implement Metro's Title 13 (mandated in part by State of Oregon Goal 5) are expected to be approved in 2008 that will provide additional protection for riparian shade.

Existing regulations that prohibit illicit connections – a toilet, for example – 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") provide Clackamas County with the authority to enforce regulations which prevent and control illicit connections.

The Comprehensive Plan, codes, and City Council Orders apply during new/ redevelopment and during times when development is not proposed or occurring. If a property is not being developed or redeveloped, the City's Community Services Department administers the applicable portions of the City's Municipal Code. If a property has been proposed to be developed/redeveloped, all Plans are checked for conformance with the following:

- Conditions of Approval associated with the pertinent land use approval
- Provisions of the Development Code
- The Engineering Design Standards Manual

- 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.

13. Oregon Administrative Rules 340-042-0080: "Implementing a Total Maximum Daily Load"

The Oregon Department of Environmental Quality (DEQ) is the entity responsible for implementing portions of the U.S. Clean Water Act in Oregon, including the development of TMDLs and issuing them as orders. The full set of Oregon Administrative rules in 340-042-0080, which is titled "Implementing a Total Maximum Daily Load," is provided below:

(1) Management strategies identified in a WQMP to achieve wasteload and load allocations in a TMDL will be implemented through water quality permits for those sources subject to permit requirements in *ORS 468B.050 (Water quality permit)* and through sector-specific or source-specific implementation plans for other sources. WQMPs will identify the sector and source-specific implementation plans required and the persons, including DMAs, responsible for developing and revising those plans.

(2) Nonpoint source discharges of pollutants from forest operations on state or private lands are subject to best management practices and other control measures established by the Oregon Department of Forestry under the *ORS 527.610 (Short title)* to *527.992 (Civil penalties)* and according to *OAR chapter 629*, divisions 600 through 665. Such forest operations, when conducted in good faith compliance with the Forest Practices Act requirements are generally deemed not to cause violations of water quality standards as provided in *ORS 527.770 (Good faith compliance with best management practices not violation of water quality standards)*. Where the department determines that there are adequate resources and data available, the department will also assign sector or source specific load allocations needed for nonpoint sources of pollution on state and private forestlands to implement the load allocations. In areas where a TMDL has been approved, site specific rules under the Forest Practices Act rules will need to be revised if the department determines that the generally applicable Forest Practices Act rules are not adequate to implement the TMDL load allocations. If a resolution cannot be achieved, the department will request the Environmental Quality Commission to petition the Board of Forestry for a review of part or all of Forest Practices Act rules implementing the TMDL.

(3) In areas subject to the Agricultural Water Quality Management Act the Oregon Department of Agriculture (ODA) under *ORS 568.900 (Definitions for ORS 568.900 to 568.933)* to *568.933 (Civil penalties)* and *561.191 (Program and rules relating to water quality)* and according to *OAR chapter 603*, divisions 90 and 95 develops and implements agricultural water quality management area plans and rules to prevent and control water pollution from agricultural activities and soil erosion on agricultural and rural lands. Where the department determines that there are adequate resources and data available, the department will also assign sector or source specific load allocations needed for agricultural or rural nonpoint sources to implement the load allocations. In areas where a TMDL has been approved, agricultural water quality management area plans, and rules must be sufficient to meet the TMDL load allocations. If the department determines that the plan and rules are not adequate to implement the load allocation, the department will provide ODA with comments on what would be sufficient to meet TMDL load allocations. If a resolution cannot be achieved, the department will request the Environmental Quality Commission to petition ODA for a review of part or all of water quality management area plan and rules implementing the TMDL.

(4) Persons, including DMAs other than the Oregon Department of Forestry or the Oregon Department of Agriculture, identified in a WQMP as responsible for developing and revising sector-specific or source-specific implementation plans must:

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

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

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

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

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

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

(b) Implement and revise the plan as needed.

(5) For sources subject to permit requirements in *ORS 468B.050 (Water quality permit)*, wasteload allocations and other management strategies will be incorporated into permit requirements.

14. References

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