2023-2027

TMDL Implementation Plan

Credit: Nettle Creek, Lake Oswego, OR (S. Johnson)

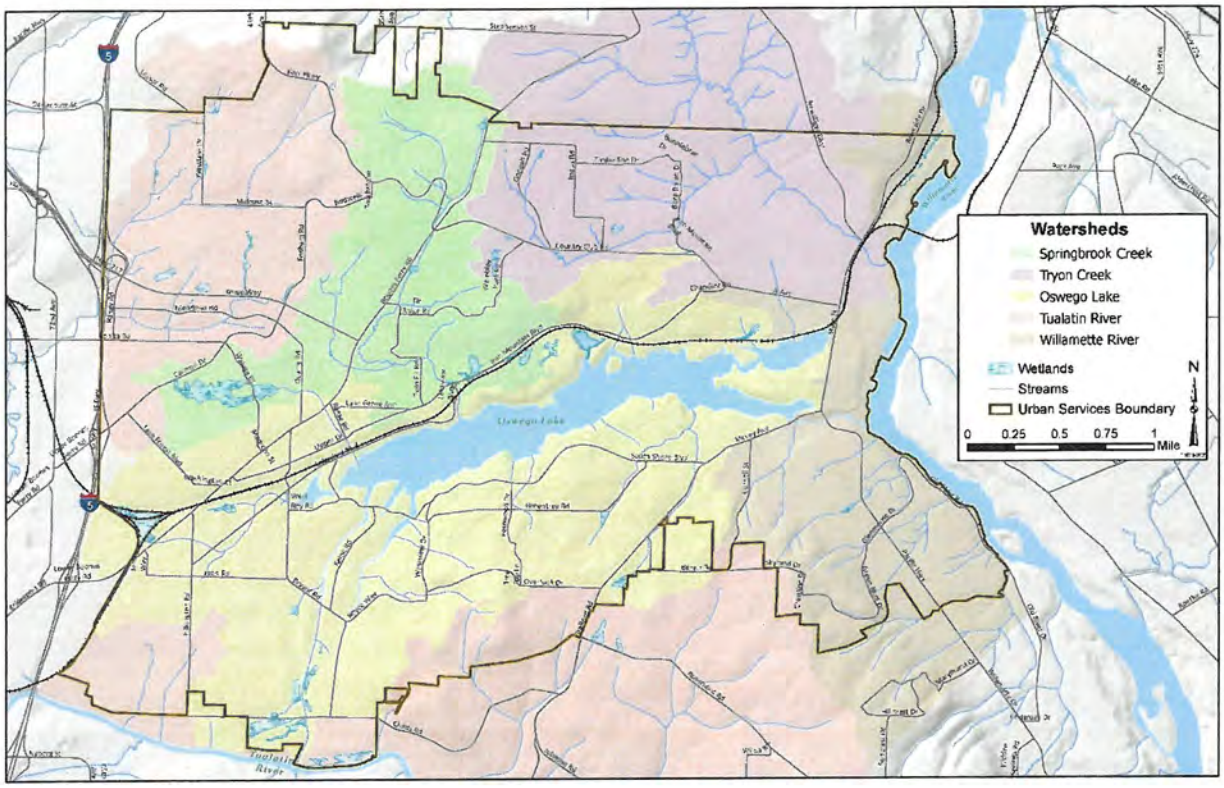
December 1, 2023

City of Lake Oswego

TMDL Implementation Plan 2023-2027

Prepared for the Oregon Department of Environmental Quality

November 30, 2023



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Martha Bennett, City Manager

Nov 20, 2023

Date

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ABBREVIATIONS

BMP Best Management Practice
City City of Lake Oswego
CWA Clean Water Act
CWR Cold Water Refugia
DEQ Oregon Department of Environmental Quality
DMA Designated Management Agency
DO Dissolved Oxygen
DSL Oregon Department of State Lands
EMC Event Mean Concentration
HEP Habitat Enhancement Program
IDDE Illicit Discharge Detection and Elimination
LA Load Allocation
LID Low Impact Development
LiDAR Light Detection and Ranging
LOC Lake Oswego Code
MS4 Municipal Separate Storm Sewer System
NPDES National Pollutant Discharge Elimination System
OAR Oregon Administrative Rules
ODFW Oregon Department of Fish and Wildlife
SSO Sanitary Sewer Overflow
SWMM Stormwater Management Manual
SWMP Stormwater Management Program
TMDL Total Maximum Daily Load
TSS Total Suspended Solids
USB Urban Services Boundary
USEPA United States Environmental Protection Agency
VSS Volatile Suspended Solids

WLA Waste Load Allocation

WQMP Water Quality Management Plan

1 INTRODUCTION

The Clean Water Act (CWA) is the regulatory driver for the determination of a Total Maximum Daily Load (TMDL). Under Section 303(d) and Section 305(b) of the CWA, the Oregon Department of Environmental Quality (DEQ) is required to assess the State's waterways every two years to determine if they are meeting water quality standards and beneficial uses.

1.1 INTEGRATED REPORT

DEQ analyzes water-quality data collected throughout the State, determines which waterways are impaired based on the data and the designated beneficial uses, and issues an integrated report every two years with a summary of the assessment required by Section 303(d) of the CWA. The most recent assessment completed by DEQ was approved by the US Environmental Protection Agency (USEPA) in 2022.

In the integrated report, water bodies are placed into categories according to their level of impairment; Category 1 waters are not impaired and Category 5 waters require a TMDL. A TMDL is the maximum amount of a pollutant that the water body can receive and still meet water quality standards and the designated beneficial uses.

1.2 DESIGNATED MANAGEMENT AGENCIES

After a water is identified as needing a TMDL for a particular pollutant, DEQ determines the amount of the pollutant in the waterway versus the maximum amount that can be in it without exceeding water-quality standards. The difference is the amount of excess loading.

Next, DEQ determines potential point and nonpoint sources of the pollutant and which agency has jurisdiction over those sources. These designated management agencies (DMAs) are responsible for reducing the pollutant loading to the point at which the waterway meets water-quality standards and can provide its beneficial uses.

A water quality management plan (WQMP) is included with issued TMDLs to provide a framework to reduce the pollutant and a list of management strategies to be incorporated into the DMA's TMDL Implementation Plan ("Plan"). The DMA submits its Plan to DEQ within 18 months of a TMDL issuance or revision. The Plans must include the management strategies in the WQMP, or reasonable substitutions, with measurable goals, metrics for tracking progress towards the goal, and timelines. Timelines can be a deadline, e.g. July 2024, or a continual basis, e.g. ongoing. Most maintenance metrics are ongoing whereas many document revision metrics are a deadline.

1.3 TMDL IMPLEMENTATION HISTORY

In 1988, the State set criteria (OAR 340-41-470) for ammonia and phosphorous in the Tualatin River. DEQ subsequently issued TMDLs for phosphorous and ammonia which were approved by the USEPA in 1990 and created one of the first TMDL-regulated watersheds in the United States (DEQ, 2001). The City of Lake Oswego ("City") was listed as a DMA for phosphorous in the 1988 Tualatin River TMDL (see Table 1).

In 2001, DEQ revised the 1988 TMDLs and issued new TMDLs for stream temperature, bacteria, volatile suspended solids (VSS), and dissolved oxygen (DO). The VSS and DO TMDLs were targeted to meet aquatic life criteria. The bacteria TMDL was targeted to protect the beneficial use of recreational contact and the stream temperature TMDL protected salmonid health.

Table 1. City of Lake Oswego Total Maximum Daily Loads (TMDLs)[1]

Year	Water Body	Affected Streams	Parameter	Beneficial Use Targeted
1988[2]	Tualatin River	Mainstem and all tributaries _____ Oswego Lake	Chlorophyll α (phosphorous)[3] pH[3]	Aquatic Life
2001	Tualatin River	Mainstem and all tributaries _____ Oswego Lake and all tributaries (phosphorous only)	Stream Temperature[4]	Salmonid Requirements
			Bacteria	Recreational Contact
			Chlorophyll α, revised (phosphorous)[3]	Aquatic Life
			pH (revised)[3]	
			DO[5], VSS	
2006	Willamette River	Mainstem and all tributaries	Bacteria	Recreational Contact
			Stream Temperature[4]	Salmonid Requirements
			Mercury	Human Health
2012[6]	Tualatin River	Mainstem and all tributaries _____ Oswego Lake and all tributaries	Chlorophyll α, revised (phosphorous)	Aquatic Life
2019	Willamette River	Mainstem and all tributaries	Mercury (revised)[5]	Human Health

1 – City is a designated management agency (DMA) for these TMDLs. 2 – An ammonia TMDL was also issued but only affected WWTPs; 3 – WLA is for phosphorous (a surrogate measure); 4 – LA is for effective shade (surrogate measure; 5 – Total Suspended Solids (TSS) can be used as a surrogate measure; 6 – The ammonia TMDL was also revised but did not affect the City of Lake Oswego; DO=Dissolved Oxygen, VSS=Volatile Suspended Solids

In 2006, the City was listed as a DMA in the Willamette River TMDL (DEQ, 2006). DEQ issued TMDLs in the Willamette River watershed for stream temperature based on salmonid requirements, bacteria based on recreational contact, and mercury based on human health criteria.

DEQ amended the 2001 Tualatin River TMDLs for phosphorous and ammonia in 2012. The City was affected by the phosphorous TMDL amendment. The TMDL was revised to include maximum daily phosphorous concentrations. Previously, the phosphorous TMDL addressed median concentrations and seasonal stormwater loads (pounds/season).

DEQ updated the mercury TMDL for the Willamette Basin in 2019 to conform with the methylmercury human health criterion of 2011. It was approved by the USEPA in 2021 (USEPA, 2019).

OAR 340-042-0040(5)(b) allows DEQ to use surrogate measures ***to estimate allocations for*** (TMDL) ***pollutants. DEQ may use one or more surrogate measures for a pollutant that is difficult to measure or highly variable. Typically, a surrogate measure will be closely related to the pollutant, and may be easier to monitor and track.*** (DEQ, 2019). DEQ has determined that the surrogates in Table 2 may be used to determine compliance with a TMDL or to measure progress towards compliance.

2 ALLOCATIONS

Allocations depend on whether the DMA is a point source or nonpoint source of the pollutant. DMAs who are point sources and already regulated by a DEQ permit are assigned wasteload allocations (WLAs) based on the amount of excess loading, a reserve capacity, and a margin of safety. DMAs who are nonpoint sources and not regulated by a DEQ permit are assigned a load allocation (LA) based on the same components as the WLAs.

TMDL = WLA + LA +Reserve + Margin of Safety

Because point sources, such as stormwater outfalls, are regulated under the NPDES program, the WLAs are incorporated into the next DEQ NPDES permit. Nonpoint sources, such as a water flowing off a pasture or forest road, are diffuse and assigned a load allocation. Background sources are included in the calculation for nonpoint sources.

Table 2. TMDL Allocations

TMDL	Waterbody	OAR	Parameter/Surrogate	Season/Target	Wasteload Allocation
Bacteria	Tualatin River[1] (all tributaries)	OAR 340-041-0009	E. Coli	Maximum Summer Stormwater Winter Stormwater	406 Col/100 mL 12,000 Col/100 mL (EMC) 5,000 Col/100 mL (EMC)
	Springbrook Creek[2]			All Year	406 Col/100 mL Winter Geomean/Median: 208/172 Winter Min/Max: 13/2,419[3] Summer Geomean/Median: 365/388 Summer Min/Max: 34/2,420[3]
	Willamette River[2] (all tributaries)			All Year	Maximum: 406 Col/100 mL[7] 78% Reduction[4] dependent on Stream
Dissolved Oxygen[5]	Tualatin River (all tributaries)[1]	OAR 340-041-0016	TSS and VSS[5]	Summer	50% Reduction (Fanno Creek) 20% Reduction (Other Tributaries)
			DO[8]	Summer	Minimum of 6.5 mg/L
Chlorophyll α	Fanno Creek (all tributaries)[1]	OAR 340-041-0345	Phosphorous	Summer Maximum Summer Median	0.46 mg/L 0.13 mg/L
Phosphorous	Tualatin River (all tributaries)[1]	OAR 340-041-0345		Summer Maximum Summer Median	0.49 mg/L 0.14 mg/L
	Oswego Lake (all tributaries)[1]	OAR 340-041-0345		Summer Maximum Winter Maximum	0.09 mg/L 0.15 mg/L
				Summer Baseflow Summer Runoff Winter Baseflows Winter Runoff	272 lb/season 139 lbs/season 986 lb/season 858 lbs/season
pH		OAR 340-041-0345	pH	All Year	6.5 – 8.5
Mercury[6]	Lower Willamette River (all tributaries)	OAR 340-041-8033	TSS	All Year	97% Reduction
	Tualatin River (all tributaries)				75% Reduction
Temperature	All tributaries of the Tualatin River and the Willamette River[9]	OAR 340-041-0028 (Figures 340A/340B)	Temperature and Effective Shade	Oct 15-May15 April 1 to Oct 31	Tryon Creek (all tributaries): 12.8°C Willamette Tributaries: 17.8°C

1- Summer=May 1-Oct 31, Winter=Nov 1 to Apr 30; 2 – Summer=June 1-Sept 30, Winter=Oct 1 to May 31; 3 – Alternative: 80% reduction based on 1997-2003 data; 4 – Based on 1996-2002 data; 5 – TMDL was for pre-1998 concentrations. TSS and DO City data starts in Jul 1997-Jun 1999 and, for VSS, Aug 2012 to Jul 2014; 6 Based on a total mercury concentration of 0.14 ng/L in water. Reduction based on 2019 concentrations; 7 – Alternative: 30-day log mean of 126 E. Coli col/100 ml for at least 5 sample; 8 – Ball Creek and Carter Creek are considered cool-water habitat (absolute minimum DO of 4 mg/L and a 7-day average minimum of 5 mg/L); 9 – Willamette River includes fish-bearing intermittent streams.

The City has an NPDES MS4 permit which is a DEQ permit for stormwater discharges, i.e., outfalls. The TMDLs for which the City is a DMA have been assigned WLAs (see Table 2) except for the temperature TMDLs.

DEQ's TMDL documents apply to perennial and, for temperature, fish-bearing intermittent streams. The CWA defines perennial streams as streams that flow all year during years of normal precipitation (EPA, 2011; Appendix A). Intermittent streams are those which do not flow all year but have some flow due to groundwater as opposed to stormwater.

The Oregon Department of Fish and Wildlife (ODFW) currently publishes fish distribution maps for salmonids, Pacific lamprey, and sturgeon (see OAR 340-041-028(4) Figures 340(A) and 340(B)). Until the ODFW determines that intermittent streams within the City are not fish-bearing, the City will consider all streams mapped within its jurisdiction as being subject to the WLAs and LAs associated with the Willamette River and the Tualatin River TMDLs.

3 SOURCES AND SURROGATES

During the development of a TMDL, DEQ determines potential sources of each parameter and the DMA who has jurisdiction over those sources. It also determines whether surrogate measures can be used by the DMA to determine progress.

Goals, management strategies, and tracking measures are formulated by the DMA with the knowledge of the TMDL sources and how the pollutants are being discharged to the stream. Water-quality monitoring by the DMA can be used to determine progress towards attaining the TMDL allocations.

3.1 MERCURY

Air deposition is a major mercury source for the Pacific Northwest. ***Significant reductions of atmospheric sources of mercury may not be possible by DEQ because most sources originate outside of Oregon and DEQ's regulatory control. However, atmospheric deposition is the primary source of mercury in surface runoff and limiting the amount ....in surface runoff can be addressed in the Willamette Basin*** (DEQ, 2019). Other nonpoint sources of mercury identified by DEQ include soil and groundwater

TMDL modeling indicated that the major pathway for mercury entering waters of the state is through runoff and erosion of (soil) ***containing mercury*** (DEQ, 2019). When mercury in soil is released to a waterway, it can partition to methylmercury as dissolved oxygen decreases and stream temperatures, nutrients, and organic matter increase. Because one of the more important factors affecting the amount of methylmercury in the aquatic environment is the

amount of inorganic mercury available for methylation, DEQ has prioritized the removal of inorganic mercury (DEQ, 2019). DEQ anticipates that a decrease of inorganic mercury released to waterways will decrease the amount of methylmercury in fish tissue thereby protecting human health.

DEQ found that stormwater from DMAs with MS4 permits, such as the City, contributed 3.1% of the mercury load to waterways in the Willamette River watershed. Nonpoint sources contributed 94% of the mercury load in the Willamette River watershed.

Mercury analyses are expensive and the target of 0.14 ng/L is low enough that accidental contamination of water samples is likely even with stringent handling and sampling methods. Surrogates with a correlation to a TMDL pollutant can be used to measure progress in attaining the allocations of the pollutant (OAR 340-042-0040(5)). DEQ determined that total suspended solids (TSS) could be used as a surrogate measure for the purposes of annual reporting. It is a relatively inexpensive and simple analytical method and it is difficult to contaminate samples collected for analysis. Inorganic mercury is collected for the City under the Clackamas MS4 permit by Water Environment Services. It is collected quarterly for instream sites and three timer per year at stormwater sites. Two of the instream sites are located in the City. The stormwater sites are located in other cities who are part of the Clackamas MS4 permit.

3.2 TEMPERATURE

Elevated water temperature is a common problem in many tributaries in the Willamette Valley and has resulted in temperature TMDLs for the Tualatin River and Willamette River watershed to protect salmonid health. Salmonids require cool and well-oxygenated water to survive and warm temperatures can negatively impact them ranging from decreased spawning success to death (USEPA, 2003).

For optimum health, juvenile and adult salmon require streams that are 12.8° to 17.8°C (55° to 64°F); warmer water may not adversely affect salmonids if the spike in temperature is brief and there is abundant food. The maximum temperature that salmonids can tolerate varies with species, life-stage (e.g., fry, fingerling, or adult), prior acclimation, oxygen availability, duration of warmer temperature, and the presence of pollutants, however it has been found that temperatures in the range of 23° to 25°C (73° to 77°F) are lethal to salmon and steelhead (Washington Department of Ecology, 2000).

A 7-day moving average of daily maximum temperatures was adopted by DEQ as the measure of the stream temperature standard and absolute numeric criteria were created based on biological standards for salmonids (DEQ, 2006). They include a maximum spawning temperature of 12.8°C and a rearing and migration maximum temperature of 17.8°C. For the

Willamette River TMDL, the City has rearing and migration corridors for all tributaries except Tryon Creek which is a salmon and steelhead spawning area from October 15th to May 15th. Staff measure temperatures in streams monthly. Stormwater is measured during stormwater sampling events.

Several factors contribute to elevated stream temperatures such as hydromodification, climate, soil type, the amount and diversity of riparian vegetation and canopy cover, and the presence of lakes, ponds, and point sources such as industrial or commercial stormwater (DEQ 2006). DEQ calculated the theoretical thermal impact of instream ponds on temperature given a specific flow rate (see Figure 1). The City has several detention ponds, wetlands, and canals in its boundaries as well as Oswego Lake.

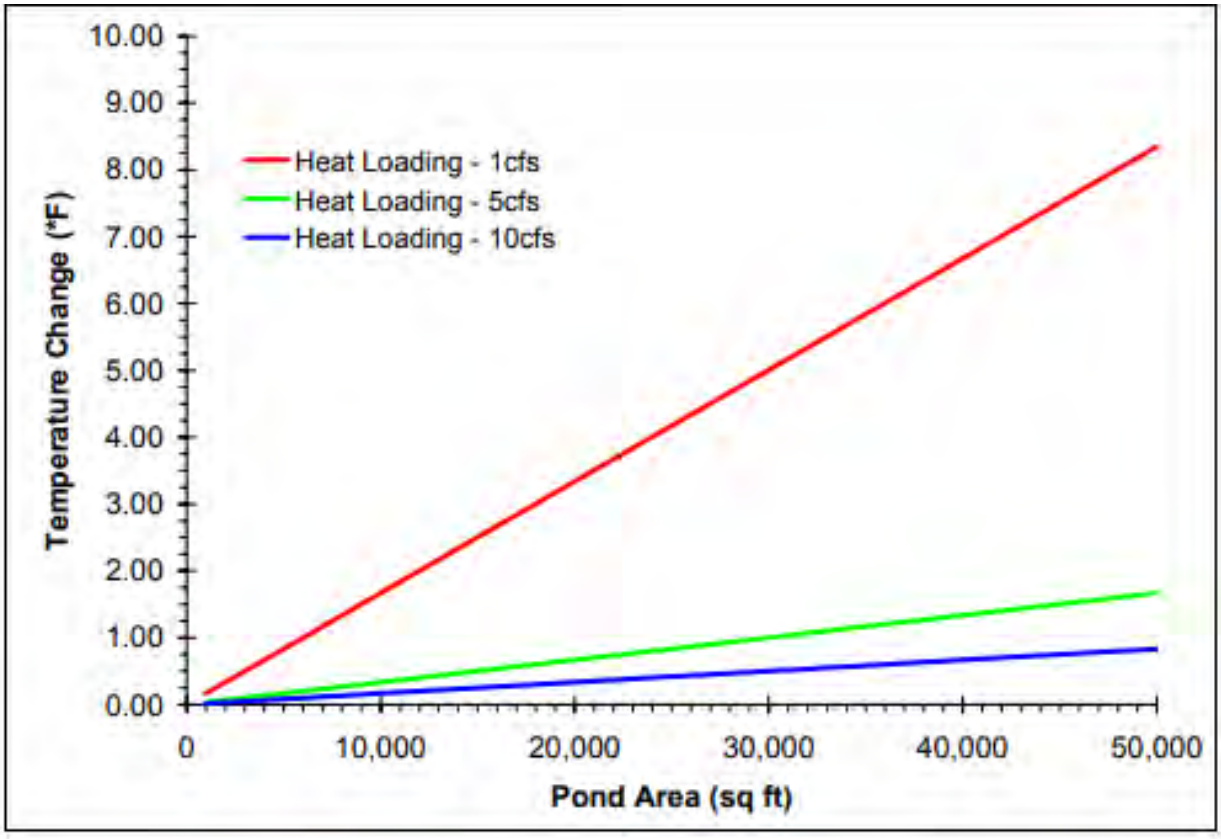
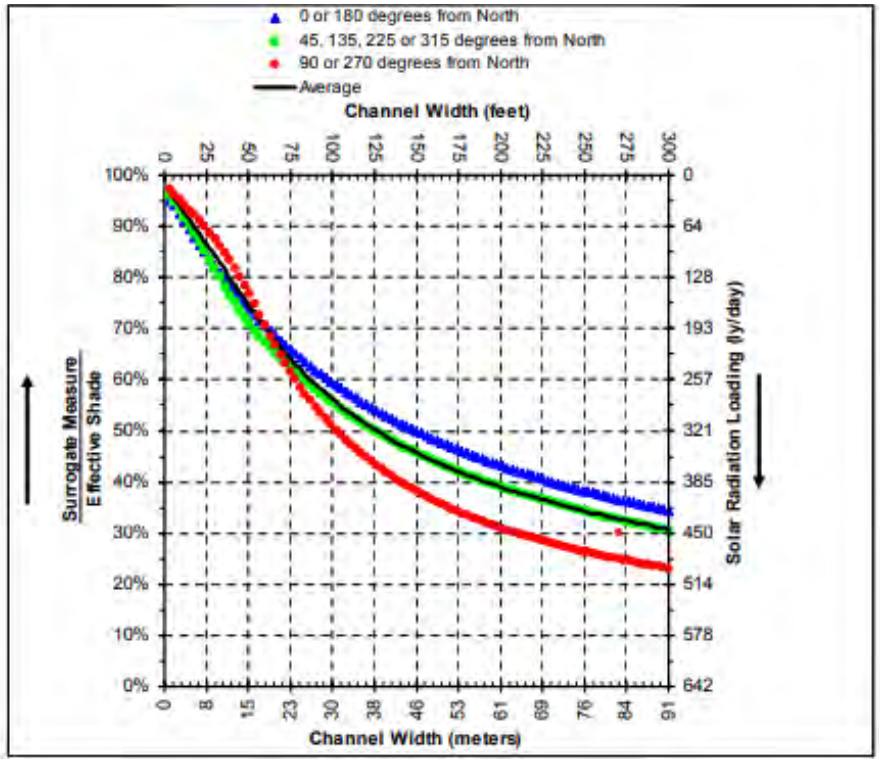
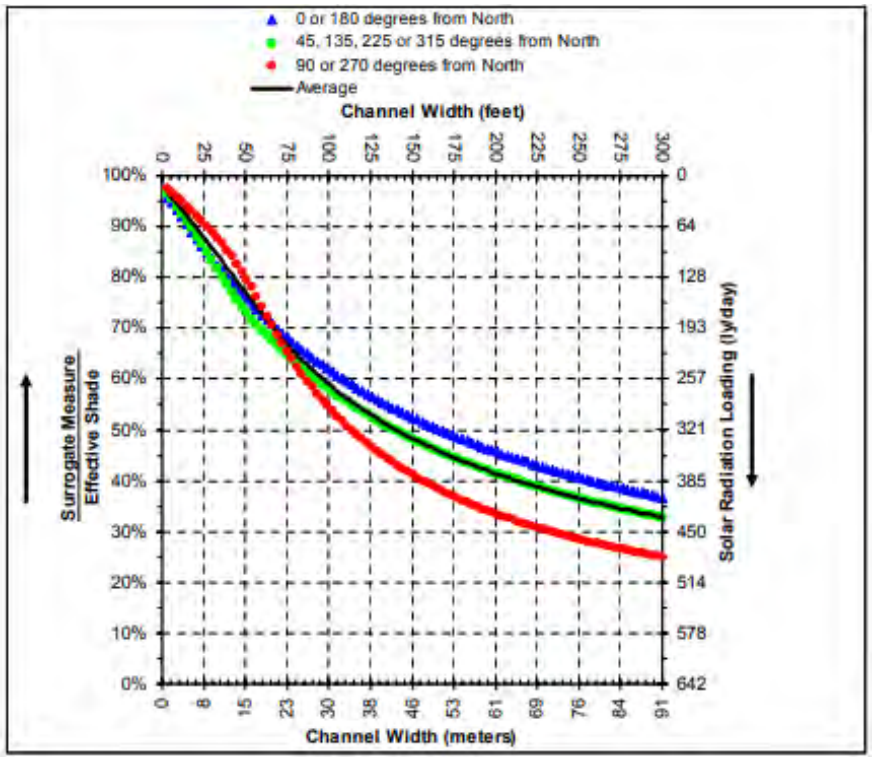


Figure 1. Thermal Impact of Instream Ponds (DEQ, 2006)

DEQ determined that the decrease in shade from disturbed or removed riparian vegetation is the largest contributor to elevated temperature in small streams. DEQ uses effective shade as a surrogate measure for addressing temperature TMDLs. Effective shade is determined by the



Willamette Valley Foothills Effective Shade Curve



Prairie Terraces Effective Shade Curve

Figure 2. Effective Shade Curves (DEQ, 2006)

height of the riparian canopy, stream orientation, and stream width (DEQ, 2006). Shade is more effective on narrow streams than wide streams because the canopy cover of a narrow stream will cover a larger percentage of the stream's surface. Shade is more effective on the southern and western sides of a stream because of the orientation of the sun in the summer.

The Prairie Terraces and Willamette Valley Foothills eco-region curves are applicable for use in the city (see Figure 2). Prairie Terraces are characterized by elevations from 115 to 200 feet and are predominantly Oregon ash, Western red cedar, Douglas fir, red alder, and big leaf maple. The Willamette Valley Foothills are characterized by elevations from 200 to 1800 feet and are predominantly Oregon white oak, Douglas fir, red alder, and big leaf maple.

3.3 BACTERIA

Bacterial sources include animal waste (including pets), improper disposal of RV and portable toilet waste, failing septic systems, cross-connections, and wastewater overflows (SSOs). Organic material in the stormwater system tends to contain bacteria which can create a bacterial surge when the winter rains return in the fall. Septic systems may contribute bacteria when groundwater tables rise in the winter and, if systems fail, may leach into nearby streams in the summer. Cross-connections may not impact overall stream concentrations in the winter but can have an outsized effect in the summer during low stream flows.

Bacterial analyses are fairly simple and samples are difficult to contaminate using normal sampling methods. E. Coli is associated with human fecal contamination and is the parameter required by DEQ to monitor for progress tracking. Bacterial samples are collected monthly by staff and during stormwater sampling events.

3.4 PHOSPHOROUS

Phosphorous is found naturally in the soil. It moves through a stream system through streambank and upland erosion, sediment transport, and hyporheic flows. Anthropogenic sources include the overuse of fertilizer on lawns and natural areas as well as spillage in area nurseries and garden centers.

Phosphorous is a limiting nutrient for plant growth and it tends to bind to sediment. As stream temperatures rise in a waterway, however, phosphorous will disengage from sediments and enter the water column where it can cause algal blooms in quiescent low-oxygen waters (Cheng, et.al, 2022). When the algae die, they sink to the bottom of the waterway, decay, release the phosphorous back to the sediments, and the cycle continues during the next high temperature and low-oxygen cycle. Algal blooms can cause elevated pH levels and decreased oxygen levels which adversely affect aquatic life.

The Tualatin River is a watershed with large areas of agricultural land that uses fertilizer. In addition, the soil in the Tualatin River watershed has soil that is naturally high in phosphorous. Oswego Lake has high phosphorous concentrations due, in part, to historic inflows from the Tualatin River. Lake sediments release phosphorous because of oxygen deficits at the lake bottom and elevated temperatures in the top layer of the lake combine with the phosphorous to create algal blooms.

While the Tualatin River inflows to Oswego Lake have stopped, it can be difficult to remove phosphorous from the lake sediments because of the phosphorous cycle. In addition, the lake is fed by many tributaries with parks, natural areas, and residential areas that use fertilizers. Phosphorous is collected monthly at streams and during stormwater sampling.

3.5 Dissolved Oxygen

Dissolved oxygen is influenced by stream temperature, organic matter decay, and nitrification. Elevated stream temperatures result in a loss of a stream's capacity to carry oxygen resulting in decreased dissolved oxygen concentrations. Organic matter decay is caused by leaf litter, algae, sediment, and from trash and detritus mixed with stormwater from impervious surfaces. The decay process results in elevated volatile suspended solids which reduce oxygen in a waterway.

Nitrification is caused by the oxidation of ammonia to nitrate and sources include animal waste (including pets), failing septic systems, and fertilizers. For every mg/L of ammonia that is nitrified, 4.33 mg/L of oxygen is consumed by the bacteria (DEQ, 2001).

Dissolved oxygen is measured monthly at streams and during stormwater sampling events.

4 STRATEGIES AND TRACKING MEASURES

DEQ is required to provide a WQMP with a TMDL issuance. Strategies for achieving TMDL allocations are based on those stipulated by DEQ in the Willamette River and Tualatin River WQMPs and on the requirements of the City's NPDES MS4 Phase I permit. Tracking measures are used to show interim progress towards meeting the TMDLs within a reasonable timeframe. Tracking measures can be ongoing measures that are reported in the annual report or they can be milestones with a specific deadline.

4.1 Strategies

The City has identified several strategies that provide an increase in water-quality across several TMDLs (see Table 3). The tracking measures and implementation periods may differ

Table 3. Strategies to reach TMDL Allocations

Strategy	MS4 Minimum Measure	Affected TMDL
Reduce Erosion	Construction Site Runoff Post-Construction Site Runoff Illicit Discharge Detection and Elimination Municipal Operations/Maintenance Industrial and Commercial Facilities Retrofits Public Education/Outreach	DO[1], VSS Chlorophyll α and pH[2] Mercury[1] Temperature[3]
Reduce Sediment Movement	Construction Site Runoff Post-Construction Site Runoff Illicit Discharge Detection and Elimination Municipal Operations/Maintenance Retrofits Public Education/Outreach	DO[1], VSS Chlorophyll α and pH[2] Mercury[1] Bacteria Temperature[3]
Source Control	Construction Site Runoff Illicit Discharge Detection and Elimination Municipal Operations/Maintenance Industrial and Commercial Facilities Public Education/Outreach	DO[1], VSS Chlorophyll α and pH[2] Mercury[1] Bacteria
Decrease Untreated Impervious Area	Post-Construction Site Runoff Retrofits	DO[1], VSS Chlorophyll α and pH[2] Mercury[1] Bacteria Temperature[3]
Protect and Restore Natural Areas	Construction Site Runoff Post-Construction Site Runoff Retrofits Public Education/Outreach	DO[1],VSS Chlorophyll α and pH[2] Mercury[1] Temperature[3]
Increase Canopy Cover and Effective Shade	Municipal Operations/Maintenance Retrofits Public Education/Outreach	DO[1], VSS Chlorophyll α and pH[2] Mercury[1] Temperature[3]

1 – Surrogate measure is total suspended solids (TSS); 2 – Surrogate measure is total phosphorous; 3 – Surrogate measure is effective shade

between TMDLs, however the overall strategies appear to be comprehensive and very effective based on current progress.

The strategies include:

- Reducing erosion in streams, on land, and at construction sites
- Reducing sediment movement through watersheds and from impervious areas
- Reducing sources such as accidental spills and cross-connections

- Reducing untreated impervious area through retrofits and stormwater management requirements
- Protecting natural areas from disturbances
- Restoring public and private natural areas
- Increasing canopy cover throughout the streams
- Increasing effective shade in riparian areas

By including riparian restoration metrics, impervious area analyses, and updates to the Urban Forestry planning documents, the City meets the requirements of the Willamette River WQMP. The 2001 Tualatin River WQMP recommended the protection and planting of trees along riparian areas.

4.1.1 Reducing Erosion and Sediment Movement

The City implements this strategy through implementation of its erosion and sediment control (ESC) program, maintenance of private and public stormwater infrastructure, inclusion of best management practices (BMPs) in its capital improvement program and compliance with its stormwater management manual (SWMM).

The erosion and sediment control (ESC) program is the workhorse for these two strategies. Minimizing erosion and sediment discharges from construction sites reduces the amount of suspended solids discharged to streams.

Maintaining conveyance and flow-control infrastructure reduces sediment in streams as does sweeping streets. Properly maintained water-quality facilities (vegetated and non-vegetated) reduce sediment through filtration and stormwater velocities through detention which, in turn, reduce sediment movement in streams. Reducing ditch slopes (side slopes and longitudinal) will reduce erosion. Retrofitting catchbasins to have sumps and snouts reduces sediment discharges to streams as does providing energy dissipation to outfalls.

The SWMM requires infiltration of stormwater created by impervious area. It reduces stormwater volume discharged to streams, reduces hydromodification, and stabilizes summer baseflows in streams. Where infiltration is not feasible, the treatment of runoff reduces sediment loads to nearby streams.

Decreasing sediment discharges to streams decreases mercury, phosphorous, bacteria, organic material (volatile suspended solids), and hydromodification. Decreasing sediment discharges increases dissolved oxygen and provides better habitat for aquatic life.

Complementary strategies are 1) protecting and restoring riparian and riparian-adjacent areas and 2) decreasing impervious area.

4.1.2 Source Control

The City's MS4 permit requires outfall monitoring for illicit discharges and a response to spill complaints as part of an illicit discharge detection and elimination (IDDE) program. In addition, it requires that staff identify and notify businesses that may be subject to the requirements of DEQ's industrial stormwater program. Because illicit discharges, illegal connections, and industrial stormwater have a potential for containing pollutants, the continued implementation of the IDDE program and the commercial/industrial inspection program will result in fewer non-stormwater discharges to the public stormwater system.

Street sweeping reduces solid material that can contain metals, trash, and organic material such as bacteria and leaves. Construction site inspections ensure that proper disposal occurs for concrete waste, trash, and toilet waste. The Park and Recreation Department's (Park's) provides pet waste disposal stations and public outreach including signs at its parks and natural areas which should result in less bacteria being released to the stream.

Effective source control should result in a reduction of bacteria, sediment, and solid material; decreased phosphorous and mercury; increased dissolved oxygen; and stabilization of stream temperatures.

4.1.3 Decrease Untreated Impervious Area

The goal for this strategy is to monitor changes in impervious area within the City and ensure that stormwater treatment occurs for projects exceeding the City's stormwater thresholds. Treating stormwater from impervious areas and ensuring that stormwater facilities remain functional should result in a decrease of sediment being discharged to streams and, frequently, a reduction in stormwater velocity from outfalls thereby decreasing erosion in streams. These measures should help to decrease stream temperatures and increase dissolved oxygen in streams through stabilization of streambanks.

Previously untreated impervious area is decreased through three techniques. A primary method for decreasing impervious area is compliance with the SWMM requirements for projects that redevelop 3,000 sq ft or more of impervious area. In addition, public stormwater facilities are frequently required as a condition of private development and construction of them result in treatment of previously untreated street runoff. Finally, many capital improvement projects include treatment of stormwater from untreated impervious area such as streets or public parking lots.

Complementary strategies are the 1) protection and restoration of natural areas and 2) increasing canopy cover and effective shade.

4.1.3.1 Stormwater Management Manual

The City's 2020 SWMM requires that projects provide stormwater treatment if they create 1,000 sq ft or more of impervious area, re-develop 3,000 sq ft or more of impervious area, or surpass these thresholds through multiple projects over three years. Both private and public, e.g. capital improvement projects, are subject to these requirements.

Projects in the city are required to infiltrate a 10-yr 24-hr design storm or, if infiltration is not technically feasible, treatment of a water-quality storm event. All projects that are unable to infiltrate will be required to treat stormwater and remove 80% of TSS before discharging it offsite starting in 2024. Properties with 3,000 sq ft or more of new and/or redeveloped impervious area are required to show that post-construction flows are less than or equal to the pre-construction flows. It is assumed that matching pre-construction and post-construction flows will reduce stream erosion caused by fluctuations in stream velocity and peak flow durations.

4.1.3.2 Retrofits

As part of the its capital improvement program, the City has committed to replace, whenever feasible, existing catch basins in a project's boundaries with catch basins that have 3-ft sumps and water-quality snouts especially in areas that will not have a stormwater infrastructure upgrade for several years. Ditch retrofits into swales will occur within project boundaries whenever feasible. Outfalls within project boundaries are projected to be retrofit with velocity reduction measures or, when feasible, consolidated with other outfalls.

4.1.3.3 Stormwater Facility Inspections

The City's MS4 permit requires that stormwater facilities built as a condition of development be inspected and maintained whether they are public or privately-owned. Public facilities are inspected and maintained through contracts that are managed by staff. While regular inspections and maintenance of private facilities are completed by the private owner, staff routinely inspect these facilities to ensure their functionality.

4.1.4 Riparian Areas and Canopy Cover

DEQ has determined that the most effective method for reducing or stabilizing stream temperature in the Willamette River and the Tualatin River is by increasing shade on their tributaries. Since most tributaries to the Willamette River and Tualatin River are 20 feet wide or less in the City's jurisdiction, it is expected that the most effective strategies for stabilizing or reducing stream temperatures are expanding canopy cover and protecting or restoring riparian areas.

4.1.4.1 Protect Natural Areas

The City's Sensitive Lands regulations discourage development in areas designated as riparian, riparian-adjacent, and directly-connected uplands. Projects on sites with a sensitive lands overlay are required to delineate the riparian and wetland areas and provide mitigation for any development encroaching into these areas.

The City's Urban Forestry program and tree code includes protection of trees that with diameters greater than 6 inches (DBH). Removal of invasive tree species require a permit but are automatically approved for removal. When applying for a removal permit of other trees, citizens are required to include an arborist's assessment of the tree's health and whether it is hazardous to adjacent property. Removal of trees without a permit can result in mitigation of the tree loss and/or payment of a fine.

While not a frequent type of project in the City, riparian projects and riparian-adjacent projects are required to provide a copy of the Department of State Lands decision prior to City approval of the ESC permit. Removal of invasive vegetation by volunteers is not subject to these requirements but they will be expected to replant and stabilize the site.

By protecting natural areas, stream temperatures should be stabilized, erosion should be decreased, sediment movement decreased, and aquatic habitat quality increased in streams.

4.1.4.2 Restore Natural Areas

The City encourages participation in the Audubon Society's Backyard Habitat program by providing funds to the program. The program provides education and technical advice to homeowners who want to landscape with native species and reduce pesticide use. Many of these projects are upland areas but they can provide canopy cover and reduce the temperature of impervious areas like driveways and roofs. They can stabilize soil in areas that used to have invasive species, turf, or impervious area reducing erosion and sediment discharge to local streams.

Parks administers private restoration as part of the Habitat Enhancement Program (HEP). The three local watershed councils apply for funds each year to restore private riparian and riparian-adjacent areas. These projects reduce erosion and sediment movement by removing invasive vegetation and replanting native species and they also provide or increase long-term canopy coverage in riparian areas.

The City contains 645 acres of parkland that are maintained by Parks. Of these, 460 acres are considered natural areas. Many of the natural areas are adjacent to or include streams and directly-connected upland habitat that are being restored by staff. As part of its long-range planning efforts, Parks has created a natural areas habitat management plan to categorize the

natural conditions and identify restoration priorities. It will provide a framework to support the long-term health and resiliency of the City's natural areas. The plan has eight objectives which range from noxious weed control to the enhancement of hydrologic functions in riparian areas.

Through restoration of riparian and riparian-adjacent habitat, the City expects to reduce erosion and sediment transport and stabilize stream temperatures.

4.1.4.3 Increase Canopy Cover and Effective Shade

Effective shade is a surrogate measure for temperature and can be measured using LiDAR data (collected every 5 years) and DEQ's HeatSource model. Temperature measurements at instream monitoring sites can be used as a spot-check on temperatures between effective shade analyses. Stream temperatures should stabilize, dissolved oxygen should increase, and erosion and sediment movement should decrease thereby increasing the quality of aquatic habitat.

Complementary strategies include 1) reducing erosion and 2) protecting and restoring natural areas.

4.2 TRACKING MEASURES

Tracking measures are detailed in Appendix A. The following discussion is a summary of the tracking measures and highlights how the City will implement the strategies.

4.2.1 Reduce Erosion and Sediment Movement

The City's ESC program is the primary method for reducing erosion and sediment movement. Construction sites are tracked by the number of permits issued and the number of inspections completed. Sites with steep slopes, riparian areas, and riparian-adjacent areas onsite are required to provide additional measures to reduce erosion and to protect streams and natural areas. Certified ESC professionals are required for City-initiated projects and for private development of complex projects such as commercial sites or subdivisions.

Another method for reducing sediment movement is through street sweeping and the inspection and maintenance of stormwater infrastructure. Debris collected as a result of these activities is analyzed for toxicity before disposal in a landfill. Sand used as part of winter event procedures is removed as soon as possible after an event to minimize transport to streams. These volumes and the number of maintained stormwater structures are tracked in the infrastructure database.

The SWMM requires projects creating or creating and redeveloping 3,000 sq ft or more of impervious area to match post-construction flow rates to pre-construction flow rates. To

comply with the 2021 MS4 permit, the City will require stormwater to be treated with extended filtration prior to discharges offsite when the SWMM is updated in 2024. Metrics used to monitor progress include the number of large projects obtaining construction plan approval and the number of projects with an offsite discharge.

4.2.2 Source Control

Source control progress will be tracked through documentation of industrial and commercial screening and inspections. Wastewater overflows and spill responses are documented through the City's infrastructure maintenance database and reported annually. Cross-connections and illicit discharges are generally discovered during outfall inspections and video inspection of the City's infrastructure. They are tracked through the infrastructure database and reported on an annual basis. The City tracks the number of septic systems that are decommissioned, the number of SSOs that occurred during the year, and the areas where the I/I program identified wastewater repairs.

4.2.3 Decrease Untreated Impervious Area

The primary method for decreasing untreated impervious area is through compliance with the SWMM. City-initiated and private development must provide treatment of stormwater from new impervious area if it is 1,000 sq ft or greater and redeveloped impervious area if the new plus redeveloped area is 3,000 sq ft or greater. Extended filtration is required by the 2021 MS4 permit and will be enforced when the revised SWMM is implemented in 2024.

Changes due to development will be tracked through the impervious area treated by stormwater facilities and public improvements required through the land-use process. The City also tracks progress for this strategy by documenting the number of capital projects that have completed retrofits of ditches, outfalls, and catch basins and those which have replaced culverts. The City ensures that stormwater facilities, public and private, remain functional through stormwater facility inspections.

The City tracks qualitative measures of impervious area through annexations and land-use changes e.g. zoning changes or partitions. When new LiDAR becomes available, the City will update its impervious area analysis to quantify changes in impervious area.

4.2.4 Protect Natural Areas

The City tracks progress of this strategy through changes in its sensitive lands layer, tracking violations of the Sensitive Lands code, Tree Code, and monitoring mitigation plantings. Tracking the number of projects needing DSL approval will provide information on the number of in-stream or near-stream projects completed each year. The City also requires projects with steep

slopes, riparian areas, or riparian-adjacent areas to stabilize disturbed areas with coconut coir blankets.

4.2.5 Restore Natural Areas

Restoration is tracked by acreage for public restoration and by number of work parties or volunteer hours completed through its Friends of Parks program. Parks created the Natural Areas Habitat Management Plan in 2022 which prioritizes areas needing restoration and can help to decrease stream temperatures through the restoration.

For private restoration, staff track the number of projects approved through the HEP and the funds disbursed to the watershed councils to complete those projects. As a requirement of the application, the watershed councils provide an annual report to staff documenting the number of volunteer work-hours or matching hours completed by property owners of a project. The Backyard Habitat program provides staff with the number of properties that participate in the program every year.

4.2.6 Increase Canopy Cover and Effective Shade

The City measures progress of this strategy through the Sensitive Lands and tree code violations. When new LiDAR data becomes available, staff update the watershed-level analyses of canopy cover and effective shade. In addition, staff will update the Urban Forest Report using the new LiDAR data and, using information from that document, update the Urban and Community Forestry Plan.

5 COLD WATER REFUGIA

The Willamette River WQMP requires that TMDL Implementation Plans for DMAs located below River Mile 50 analyze, identify, protect, and enhance areas of cold water refugia (CWR) because it has been designated as a migration corridor. CWR are defined as areas within a stream system that are cooler than the ambient stream temperature and which can provide critical habitat for salmonids. CWR are associated with different aspects of stream morphology including side channels, alcoves, lateral seeps, and floodplain springs and brooks (Ebersole, 2003).

Small, perennial tributaries are distributed throughout the Willamette River migration corridor and some are sources of cooler water during the peak summer period. Hyporheic flow and groundwater seeps (interflow) ***may also provide local refugia. Protection of riparian areas and floodplains along tributaries and the mainstem river itself is necessary for the maintenance and restoration of refugia and the processes that create them.*** (modified from: DEQ, 2006)

The City worked with the USGS, City of Wilsonville, Meyer Memorial Trust, and Benton County Soil and Water Conservation District to map CWR along the mainstem of the Willamette River in 2016 and 2017 (USGS, 2018). Four sites within the City's jurisdiction were monitored for water temperature: Tryon Creek, Oswego Creek, Glenmorrie Dr seep, and Arbor Creek seep. Two sites, Tryon Creek and the seep at Glenmorrie Dr, showed some promise as cold-water refugia with temperatures between 15 and 17° C from June to mid-September (see Figure 3). The seep at Arbor Creek, while somewhat cooler than the Willamette River, neared or exceeded 20°C several times between June and mid-September. Oswego Creek did not provide consistent temperature recordings, however the temperatures that were recorded showed temperatures that were consistently near or exceeding 20°C.

The City completed a Natural Areas Management Plan in 2022 which includes, in part, restoration of public areas that could decrease stream temperatures or provide stabilization. In addition, staff work with the watershed councils on private riparian restoration through its Habitat Enhancement Program.

6 TIMELINES

Because the City has been a DMA for its TMDLs for several years, there are few milestones or deadlines in the tracking measures. Many of the practices being used by the City are ongoing except for updates to documents when outside resources become available such as LiDAR data.

7 ADAPTIVE MANAGEMENT AND ANNUAL REPORTS

Using monitoring data from its instream monitoring sites and stormwater sites, the City will review its progress each year against the wasteload allocations and load allocations assigned to it as a DMA. Strategies and tracking measures will be reviewed each year and changes proposed in annual reports, when warranted, using adaptive management.

Annual reports are required by the TMDL program and the City is a DMA for the Willamette River TMDLs and the Tualatin River TMDLs. Wasteload allocations for these TMDLs have been assigned to the City for all except the temperature TMDL. The City is subject to a NPDES MS4 permit and the TMDL program considers compliance with the MS4 permit to indicate compliance with the TMDL allocations.

Because annual reports are required for the NPDES MS4 permit, the Willamette River TMDL Plan, and the Tualatin River TMDL Plan, DEQ has allowed the City to provide a combined annual report that summarizes the reporting metrics for each of these documents. The City will continue to combine the reports for submittal to DEQ each year.

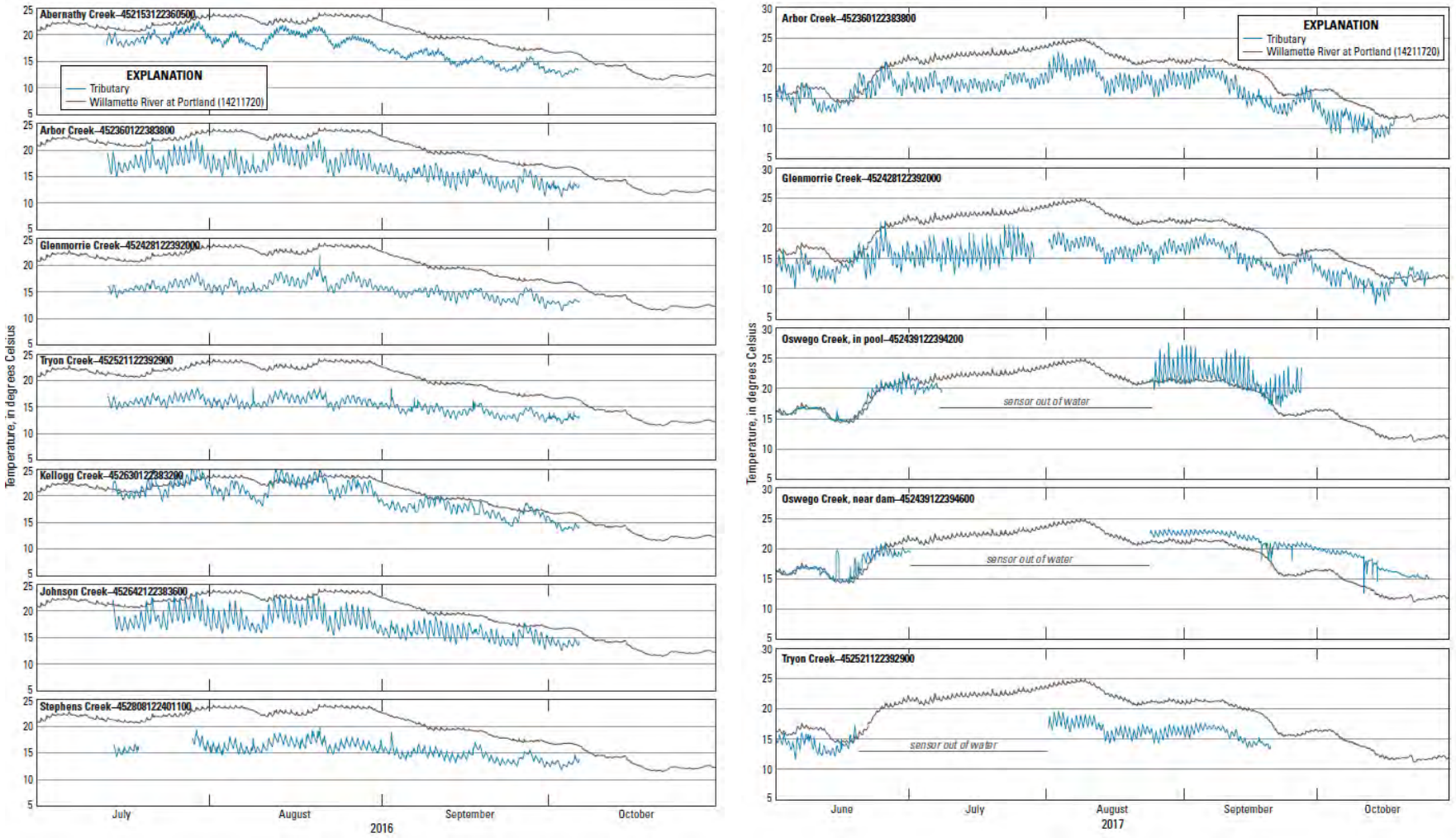


Figure 3. Temperatures of Potential Cold-Water Refugia, June 2016 to September 2016 (USGS, 2018)

8 LEGAL AUTHORITY

The City municipal code prohibits illicit discharges, cross-connections, protects riparian areas and canopy cover, and covers requirements for erosion control and post-construction stormwater management. The City's SWMM includes requirements for stormwater management and implements the stormwater chapter of the municipal code. The City's SWMP implements the strategies and requirements from the City's NPDES MS4 permit. These documents and legal requirements provide authority for actions described in this Plan to address the TMDL allocations determined by DEQ.

The City implements the requirements of Metro Title 3 and Title 13 through the Sensitive Lands Overlay in the City's development code. These code provisions provide authority to implement management strategies proposed by the City to address the TMDL parameters within its jurisdiction.

The annual reports required by the City's NPDES MS4 permit are submitted to DEQ and include a demonstration of continued legal authority.

9 LAND USE REQUIREMENTS

OAR 340-042-0080(3)(a)(D) requires TMDL Implementation Plans to include evidence of compliance with applicable statewide land-use requirements especially Goal 5 (Natural Resources, Scenic and Historic Areas, and Open Spaces), Goal 6 (Air, Water and Land Resources Quality), and Goal 7 (Areas Subject to Natural Hazards). Because of its proximity to the Willamette River, Goal 15 (Greenway Management Overlay) also applies to the City's TMDL requirements.

9.1 STATEWIDE GOAL IMPLEMENTATION

In general, Goal 15 is implemented through the enforcement of the Willamette Greenway Overlay and development standards that preserve habitat and vegetation near the river and by preserving the visual experience of people on the river through open spaces and access. The Willamette Greenway Overlay requires that significant fish and wildlife habitats be protected which would encompass the cold water refugia protections required by the Willamette temperature TMDL.

Goals 5, 6, and 15 are covered under the Healthy Ecosystems Chapter of the City's Comprehensive Plan. While the Comprehensive Plan was updated in 2013, the Ecosystems

chapter was deferred until the Sensitive Lands overlay and regulations could be updated in 2016 and incentives for habitat protection and enhancement could be implemented such as the HEP. In 2015, the HEP started supplementing the funding for private restoration of riparian areas begun in 2011 by the City's partnership in the Backyard Habitat Program.

9.2 COMPREHENSIVE PLAN ACTIONS

The Comprehensive Plan is implemented by the City's municipal code which governs land use. The chapters of the municipal codes that implement Comprehensive Plan policies relating to Goals 5 and 6 include the Willamette Greenway Overlay District (LOC 50.05.009), the Sensitive Lands Overlay District (LOC 50.05.010), Hillside Protection (LOC 50.06.006), Flood Management Area (LOC 50.05.011), Erosion Control (LOC 52), and Stormwater Management (LOC 38.25).

Some of the actions applicable to the Willamette River and Tualatin River TMDL Plans are:

- Continue funding the HEP for restoration and enhancement of riparian and upland habitat on public and private lands,
- Continue funding for the Backyard Habitat Program
- Continue supporting "Friends of Parks" groups to provide community volunteer stewardship of parks and natural areas,
- Encourage the preservation and planting of trees
- Preserve the wooded character of the City of Lake Oswego by continuing to protect significant trees and tree groves
- Continuing to ensure adequate right-of-way to allow sufficient space for tree growth
- Update the Tree Code to emphasize retention of the overall tree canopy and maintain the diversity of the urban forest,
- Update the State of the Urban Forest Report every 5 years

The Comprehensive Plan assists the goals of the City's TMDL Implementation Plan in the following ways:

- The ***Willamette Greenway Overlay*** applies special setbacks and standards to development located within 150 feet of the Willamette River margin at ordinary low water. It requires that development in this area protect water quality.
- The ***Sensitive Lands Overlay*** restricts development in wetlands and stream corridors and requires vegetated buffers. These vegetated areas filter runoff and prevent erosion thereby reducing bacterial, mercury, and phosphorous loads and increasing dissolved oxygen.

- The ***Erosion Control Code (Chapter 52)*** requires erosion control permits for any activities within 50 feet of a watercourse or wetland. It reduces total suspended solids and loads from mercury, bacteria and phosphorous.
- The ***Hillside Protection Code*** requires that development minimize soil disturbance and vegetation removal on sloped properties which reduces erosion and promotes shade canopy. Land disturbance or development is limited on undisturbed steep slopes thereby reducing erosion, total suspended solids, and loads from mercury and phosphorous.
- The ***Stormwater Management Code (Chapter 38)*** requires new development to maximize onsite infiltration, provide water quality treatment for stormwater leaving a site, and maintain pre-development flowrates. These requirements promote infiltration which increases summer baseflows and stabilizes stream temperatures; reduces the volume of stormwater released into streams; and reduces stream velocities during storm events.
- The ***Flood Management Area Code*** limits development in the floodplain thereby reducing potential discharges of pollutants in the event of a flood.

10 FUNDING

The City's Plan is funded primarily through monthly stormwater fees, system development charges, demolition fees, and general funds. Monthly stormwater fees are used for program implementation while system development charges are used for capital improvement projects. Demolition fees and general funds are used for code enforcement and restoration of private and public natural areas.

Since FY1819, the City has spent an average of $5.5 million annually on stormwater operations and management, capital projects, parks facilities, and natural resource management (Backyard Habitat program and public/private restoration). This average does not include funds from programs such as the Urban Forestry programs and code enforcement; and the Park and Recreation Department's Master Plans, and park maintenance (not related to natural resource management). These programs positively affect water quality and are used for stormwater education as well as other objectives.

11 IMPLEMENTATION PLAN REVISIONS AND REPORTS

After each issuance or a revision of a TMDL for which it is a DMA, the City is required by OAR 34-042-0080 to revise its TMDL Implementation Plan ("Plan") and submit it to DEQ within 18-months for approval. Once approved, the strategies and best management practices detailed

within the revised Plan are implemented by the City and summarized in the annual report submitted to DEQ. Most recently, the City revised its Plan in 2022 to include additional strategies for mercury minimization which has been approved by DEQ. This update, required as part of the routine 5-yr update will be effective from December 2023 to December 2027 after DEQ approval.

12 REFERENCES

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13 DEFINITIONS

Background Source means a pollutant source that is attributed to naturally elevated concentrations of a pollutant due to non-human causes such as geology or volcanic eruptions.

Beneficial Use means the purpose or benefit to be derived from a water body as designated by the Water Resources Department or the Water Resources Commission

BMP (Best Management Practices) means methods and practices to manage processes and activities which minimize pollution or reduce pollutant loads.

City means the City of Lake Oswego

Cold Water Refugia means portions of a waterway, or times during which, the water temperature is at least 2°C colder than the daily maximum temperature of the well-mixed flow of the adjacent waterway. Refugia include habitats and locations where temperature-sensitive cold-water aquatic species may find refuge when stream temperatures are stressful (above 20°C).

Designated Management Agency (DMA) means an agency that has legal authority over a source contributing pollutants which is identified by DEQ and must initiate practices to reduce pollutant loading to an impaired waterway.

Effective Shade means the percentage of direct sunshine attenuated and scattered before reaching the ground or stream surface. It is a surrogate measure for temperature.

Event Mean Concentration means the average pollutant concentration for a stormwater event. It is the flow multiplied by the concentration for samples collected throughout a time period, such as a storm event, divided by the flow multiplied by the total time period.

Geomean is a statistical method for determining an average that indicates the central tendency of a set of numbers. It is used in environmental statistics because it is less sensitive to outliers and non-detection values.

Hyporheic means the water present in the alluvial sediments next to or below a stream bed where a mixing of shallow groundwater and surface water occurs.

Illicit Discharge means a discharge to the public stormwater system or a stream through accidental or intentional intent.

Illegal Connection means a non-stormwater connection to a stormwater pipe or structure.

Interflow means the lateral movement of groundwater or recently infiltrated surface water in the unsaturated zone due to a confining soil layer that retards vertical movement. Interflow continues until it resurfaces as a spring or combines with hyporheic flow.

Load Allocation means the portion of the receiving water's loading capacity that is allocated to nonpoint sources including background sources.

Nonpoint source is a pollutant source that is diffuse or unconfined and which can either enter, or be conveyed by stormwater into waterways (OAR 340-41-0002 (42))

NPDES Permit means a permit issued by DEQ for sources that discharge to surface waters according to OAR 340-045- 0015. They include wastewater treatment plants, industrial stormwater, construction stormwater, and municipal stormwater.

Point Source means a discernible, confined, and discrete conveyance including, but not limited to, a pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or leachate collection system from which pollutants are or may be discharged but does not include agricultural storm water discharges and return flows from irrigated agriculture (OAR 340-041-0002(46))

Salmon and Steelhead Spawning means waters that are or could be used for salmon and steelhead spawning, egg incubation, and fry emergence.

Salmon and Trout Rearing and Migration means suitable habitat for salmon, steelhead, rainbow trout, and cutthroat trout

Salmonids means native salmon, trout, mountain whitefish and char including bull trout.

Seven-Day Moving Average Temperature means a calculation of the average of the daily maximum temperatures from seven consecutive days made on a rolling basis.

Stormwater means precipitation falling on impervious surfaces which does not infiltrate and which is conveyed to waterways

Strategies means measures to control the discharge of an impaired waterway.

Surrogate Measure means a substitute method or analyte with a positive correlation to the TMDL pollutant and is used to represent it

Total Maximum Daily Load (TMDL) means the total pollutant load to a waterbody that a waterway can receive and still meet the most stringent water-quality standard of its beneficial uses (assimilative capacity). It is calculated as the sum of wasteloads from point sources,

wasteloads from nonpoint sources, loads from background sources, a reserve capacity, and a margin of safety.

TMDL Plan means a quantitative plan written by DEQ including an analysis for attaining and maintaining water quality standards.

TMDL Implementation Plan is a written plan by a DMA which includes strategies and trackable measures for reducing pollutants in stormwater and meeting the allocations assigned to the DMA in the DEQ TMDL Plan.

Wasteload Allocation means the portion of the receiving water's loading capacity that is allocated to existing point sources of pollution, including all point sources regulated under the Federal Water Pollution Control Act Section 402 (33 USC Section 1342).

Water Quality Management Plan means the strategies identified by DEQ for each DMA category to achieve the allocations assigned in the issued TMDL.

Waterway means lakes, bays, ponds, springs, wells, rivers, streams, creeks, canals, and all other bodies of surface or underground waters, natural or artificial, that are located wholly or partially within the City or for which it has jurisdictional authority as determined by DEQ.

APPENDIX A TRACKING MEASURES

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Program Management	Provide funds to partners who provide stormwater education.	Track the amount of funds targeting stormwater education that were disbursed to external groups.	√	√	√	√	√	√	√
Program Management	Provide funds for private and public restoration of natural areas	1. Track the amount of funds disbursed to groups providing restoration of private natural areas. 2. Track the amount of funds disbursed for restoration of public natural areas							
Reduce Erosion and Sediment Movement	Erosion control responsibilities will be completed by certified professionals.	Track the number of City staff that are certified ESC professionals.	√		√	√	√	√	
Reduce Erosion and Sediment Movement	Erosion control responsibilities will be completed by certified professionals.	Track the number of City-initiated projects with a certified ESC Professional and whether the project is completed or under construction	√		√	√	√	√	
Reduce Erosion and Sediment Movement	Erosion control responsibilities will be completed by certified professionals.	Track the number of ESC Plans submitted by a certified ESC Professional for developers of complicated projects.	√		√	√	√	√	

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Reduce Erosion and Sediment Movement	Construction sites and professional landscaping projects disturbing 500 sq ft or more of soil will provide erosion controls.	1. Track the number of ESC permits issued. 2. Track the number of pre-construction inspections (inspection code 6010) and the number of final inspections (inspection code 6050). 3. Track the number of additional inspections for projects exceeding a duration of 6 months.	√	√	√	√	√	√	
Reduce Erosion and Sediment Movement	Clean and inspect the public stormwater conveyance system.	1. Track the number of feet of City-owned stormline, ditches, and culverts that are inspected and cleaned each year. 2. Track the number of detention tanks, vaults, water-quality vaults, and other non-vegetated water quality structures that are inspected and maintained each year.	√	√	√	√	√	√	√
Reduce Erosion and Sediment Movement	Clean and inspect the public stormwater system	Track the number of catch basins that are inspected and cleaned each year.	√	√	√	√	√	√	√
Reduce Erosion and Sediment Movement	Properly dispose of the debris from street sweeping and asset cleaning.	1. Track the number of lane miles swept and the disposal method for the collected debris. 2. Track the estimated volume of debris sent to the landfill.	√	√	√	√	√	√	√

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Reduce Erosion and Sediment Movement	Ensure stormwater treatment for projects that discharge stormwater offsite	1. Track the number of projects with an offsite discharge. 2. Track the stormwater facilities constructed to decrease TSS before discharge offsite.	√		√	√	√	√	√
Reduce Erosion and Sediment Movement	Reduce hydromodification through City-initiated projects.	Track the number of City-initiated projects that provide a reduction in hydromodification.	√	√	√	√	√	√	√
Reduce Erosion and Sediment Movement	Reduce hydromodification through City-initiated projects	1. Track number of linear feet of retrofit conveyance ditches. 2. Track the linear feet of new conveyance ditches constructed to reduce stormwater velocities.	√		√	√	√	√	√
Reduce Erosion and Sediment Movement	Reduce hydromodification through City-initiated projects	1. Track number of outfalls retrofitted. 2. Track number of new outfalls constructed with erosion protection.	√		√	√	√	√	√
Reduce Erosion and Sediment Movement	Reduce hydromodification through City-initiated projects.	1. Track number of catch basins converted for City-initiated projects. 2. Track the number of new sumped and snouted catchbasins.	√	√	√	√	√	√	√

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Source Control	Balance road safety and water quality during winter storm events.	Track the number of gallons of magnesium chloride and the number of cubic yards of sand that are used annually.				√	√	√	
Source Control	Reduce potential pollutants of concern from entering waterways.	Track the number of Drug TakeBack events and the pounds of drugs that were collected.	√						
Source Control	Respond to spill complaints	1. Track the number of spills responded to by City staff. 2. Track the number of events where TVF&R was contacted for assistance.	√	√	√	√	√	√	
Source Control	Reduce number of active septic systems and illicit connections.	1. Track number of properties that decommissioned their septic system and connected to the wastewater system. Track the affected watershed. 2. Track the number of cross-connections discovered and the actions taken (warnings, enforcement, abandonment, or re-connection). Track the affected watershed.		√	√	√	√	√	
Source Control	Inspect each outfall at least once every 5 years and inspect each priority outfall at least once every 2 years.	Track the number of outfalls and priority outfalls inspected during dry weather (72-hr antecedent dry period) and the affected watersheds.	√	√	√	√	√	√	√

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Source Control	Reduce illicit discharges from wastewater.	1. Track wastewater basins inspected as part of the I/I program. 2. Track the watersheds where wastewater repairs were identified as part of the I/I program and summarize what was repaired.	√	√	√	√	√	√	
Source Control	Reduce potential pollutants of concern from entering waterways.	Track the number of approved Land Use applications and the affected watersheds for commercial and industrial projects.	√	√	√	√	√	√	
Source Control	Reduce potential pollutants of concern from entering waterways	1. Track the number of non-SFR project with construction plan review and the affected watersheds. 2. Track the number of projects completed and the stormwater facilities constructed.	√	√	√	√	√	√	
Source Control	Educate businesses about stormwater.	Track the type and number of messages targeted to businesses.	√	√	√	√	√	√	
Decrease Untreated Impervious Area	Monitor changes in impervious area.	Summarize municipal code changes that affected sensitive lands, increased density, or increased impervious area.	√		√	√	√		√
Decrease Untreated Impervious Area	Monitor changes in impervious area.	When new LiDAR data becomes available, complete an impervious analysis. Report on the amount of impervious area within the City and within the UGB.	√	√	√	√	√	√	√

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Decrease Untreated Impervious Area	Monitor changes in impervious are.	Track the number, acreage, and affected watershed for annexed properties.	√	√	√	√	√	√	√
Decrease Untreated Impervious Area	Monitor changes in impervious area.	1. Track changes in the UGB boundary and the planned zoning for the changes. 2. Track the number and type of approved changes in zoning and the affected watershed 3. Track the number of approved land use requests and the affected watershed.	√	√	√	√	√	√	√
Decrease Untreated Impervious Area	Ensure stormwater treatment for construction projects exceeding stormwater thresholds.	Track the number of land-use applications reviewed, the number required to manage stormwater, and the affected watersheds.	√		√	√	√	√	√
Decrease Untreated Impervious Area	Review construction plans that require public stormwater improvements.	Track the number of projects requiring public stormwater improvements	√		√	√	√	√	√
Decrease Untreated Impervious Area	Ensure stormwater treatment for construction projects exceeding stormwater thresholds.	1. Track the number of construction plans reviewed. 2. Track the number of subdivisions that were reviewed and the affected watershed.	√		√	√	√	√	√

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Decrease Untreated Impervious Area	Ensure stormwater treatment for construction projects exceeding stormwater thresholds.	Track the number of projects that do not provide stormwater treatment due to technical infeasibility, the affected watershed, and the reason for the exception.	√		√	√	√	√	√
Decrease Untreated Impervious Area	Ensure stormwater treatment for construction projects exceeding stormwater thresholds.	Track the amount of impervious area treated by constructed private stormwater facilities.	√		√	√	√	√	√
Decrease Untreated Impervious Area	Ensure stormwater treatment for construction projects exceeding stormwater thresholds.	Track the amount of impervious area treated by constructed public stormwater facilities.	√		√	√	√	√	√
Decrease Untreated Impervious Area	Ensure properly functioning stormwater facilities.	Track the number of each type of public vegetated stormwater facility that was inspected, the affected watershed, and if repair or restoration was required.	√	√	√	√	√	√	√
Decrease Untreated Impervious Area	Ensure properly functioning stormwater facilities.	1. Track the number of properties that were inspected. 2. Track the impervious area treated by the inspected private facilities.	√	√	√	√	√	√	√

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Protect Natural Areas	Enhance and protect riparian areas	1. Track the number of private properties with a sensitive-lands overlay that were developed. 2. Track the number of private properties within 50 ft of a stream that were developed.				√			√
Protect Natural Areas	Enhance and protect riparian areas	Track number of applications required to submit a DSL application and the affected watershed.	√		√	√	√	√	√
Protect Natural Areas	Enhance and protect riparian areas	Track the number of code enforcement cases due to sensitive lands violations and the number of citations.				√			√
Protect Natural Areas	Enhance and protect riparian areas	Track the number of riparian delineations and the watershed.				√			√
Protect Natural Areas	Stabilize riparian areas	Track the number of construction sites with slopes > 15% and the watersheds affected.	√		√	√	√	√	√
Protect Natural Areas	Stabilize riparian areas.	Track the number of riparian or riparian-adjacent projects required to use coconut coir blankets and the watersheds affected.	√		√	√	√	√	√
Restore Natural Areas	Work with neighborhood groups, i.e. Friends Groups, to restore natural habitat.	Track the number of volunteer events or volunteer hours	√		√	√	√	√	√

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Restore Natural Areas	Monitor stormwater education by the HEP	Track the number of volunteer work-hours or events completed by HEP projects	√		√	√	√	√	√
Restore Natural Areas	Enhance and restore riparian areas	1. Track changes to the HEP application process or project prioritization. 2. Track the acreage targeted for restoration by approved HEP projects each year	√		√	√	√	√	√
Restore Natural Areas	Enhance and restore riparian areas	Track the number of stream miles restored or the acreage restored for public natural areas	√		√	√	√	√	√
Restore Natural Areas	Enhance and restore riparian areas	Track the number of stream miles restored or the acreage restored for private natural areas	√		√	√	√	√	√
Restore Natural Areas	Enhance and restore riparian areas	Track the implementation of the Natural Areas Habitat Management Plan especially projects that could reduce stream temperatures.	√		√	√	√	√	√
Restore Natural Areas	Enhance and restore natural areas	1. Track the number (or acreage) of private properties that participated in the Backyard Habitat Program 2. Track the number (or acreage) of private properties that participated in the Backyard Habitat Program and had either a sensitive-lands overlay or were within 50 ft of a stream				√			√

Strategy	Goal	Tracking Measure	Mercury	Bacteria	Chlorophyll α	Dissolved Oxygen	Volatile Suspended Solids	pH	Temperature
Increase Canopy and Effective Shade	Enhance and protect tree canopy	Track the amount of canopy cover and effective shade when new LiDAR data becomes available	√		√	√	√	√	√
Increase Canopy Cover and Effective Shade	Enhance and protect tree canopy	When new LiDAR data becomes available, track changes in canopy cover and update the Urban Forestry Report				√			√
Increase Canopy Cover and Effective Shade	Enhance and protect tree canopy	Summarize changes to the Urban and Community Forestry Plan				√			√
Increase Canopy Cover and Effective Shade	Enhance and protect tree canopy	Track the number of code enforcement cases due to violations of the tree code, the number of citations, and the number of trees planted as mitigation.				√			√

LAKE OSWEGO

healthy watersheds

Stewardship for a Sustainable Future

THE RIVER STARTS HERE