Draft Water Quality Management Plan

Lower Columbia-Sandy Subbasin Total Maximum Daily Loads, Temperature and Bacteria

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State of Oregon
DEQ Department of Environmental Quality

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1. Introduction

The Oregon Department of Environmental Quality developed this draft Water Quality Management Plan to guide implementation of the Lower Columbia-Sandy River Subbasin temperature and bacteria Total Maximum Daily Loads. A WQMP is an element of a TMDL, as described by OAR 340-042-0040(4)(l), which provides the framework for management strategies to attain and maintain water quality standards and is designed to work in conjunction with detailed implementation plans prepared by persons responsible for TMDL implementation.

In March 2005, DEQ issued a TMDL and associated WQMP for temperature in the Sandy River Basin and bacteria in three creeks within the watershed; the US Environmental Protection Agency approved the TMDL and WQMP in April 2005. In 2013, EPA disapproved the Natural Conditions Criterion contained in Oregon's water quality standard for temperature due to the 2012 U.S. District Court decision for Northwest Environmental Advocates v. EPA. On October 4, 2019, the U.S. District Court issued a judgment in the lawsuit requiring EPA and DEQ to reissue 15 Oregon temperature TMDLs that were based on the Natural Conditions Criterion, including the Lower Columbia-Sandy Subbasin.

This Lower Columbia-Sandy Subbasin WQMP will be proposed for adoption by Oregon's Environmental Quality Commission, by reference, into rule as OAR 340-042-0090(2)(b). This WQMP is intended to provide comprehensive information for implementation of the temperature and bacteria TMDLs. This WQMP replaces the temperature elements and carries forward the bacteria elements from the 2005 WQMP for the Designated Management Agencies identified in the 2005 WQMP as responsible for implementing bacteria management strategies. This WQMP will be amended, as needed, upon issuance of any future new or revised TMDLs within the Lower Columbia-Sandy Subbasin.

1.1 Condition assessment and problem description

The first element of the WQMP, per OAR 340-042-0040(l)(A), is an assessment of water quality conditions in the Lower Columbia-Sandy Subbasin and a problem description. There are assessment units in the Lower Columbia-Sandy WQMP listed as impaired (category 5 or 4A) for temperature in Oregon's 2022 Integrated Report, which was approved by US Environmental Protection Agency on September 1, 2022. There were portions of Beaver Creek, Kelly Creek and Cedar Creek listed as impaired for bacteria on Oregon's 2002 Section 303(d) list of impaired waterbodies. As required by Section 303(d) of the federal Clean Water Act, DEQ developed Total Maximum Daily Loads for pollutants causing temperature (2023) and bacteria (2005) water quality impairments of waters within the Lower Columbia-Sandy Subbasin. These pollutants are solar radiation and heat from various sources and conditions, which contribute to impairments of the temperature criteria established to support aquatic life beneficial uses; and fecal bacteria, including E. coli bacteria, which contribute to impairments of the bacteria criteria established to support water contact recreation.

1.2 Goals and objectives

OAR 340-042-0040(4)(I)(B) requires identification of the goals and objectives of the WQMP.

The goal of this WQMP is to provide the framework for TMDL implementation to achieve and maintain the temperature and bacteria water quality standards within the Lower Columbia-Sandy Subbasin.

The primary objectives of this WQMP are to describe: responsibilities for implementing the TMDLs; management strategies and actions necessary to reduce excess pollutant loads in order to meet the TMDL allocations; and, a strategy to evaluate progress towards attaining relevant water quality standards throughout the Lower Columbia-Sandy Subbasin.

2. Proposed management strategies

As required by OAR 340-042-0040(I)(C), the following section presents proposed management strategies, by pollutant source or category, that are designed to meet the load and wasteload allocations required by the Lower Columbia-Sandy Subbasin temperature and bacteria TMDLs.

OAR 340-042-0030(6) defines management strategies as “measures to control the addition of pollutants to waters of the state and includes application of pollutant control practices, technologies, processes, siting criteria, operating methods, best management practices or other alternatives.”

Table 1 includes proven strategies (and practices within the strategies) summarized by pollutant source. These strategies and practices are adapted from published sources. The bacteria sources and strategies are carried forward from the 2005 Sandy Basin bacteria TMDL and WQMP, without change. DEQ used the categories and terminology from Oregon Watershed Enhancement Board's Oregon Aquatic Habitat Restoration and Enhancement Guide and Oregon Watershed Restoration Inventory Online List of Treatments. Additional strategies included in Table 1 are supported by Oregon Department of Agriculture, U.S. Department of Agriculture Natural Resources Conservation Service, Oregon State University Extension Service, and other publicly available published sources. DEQ identified the strategies in Table 1 as appropriate for the conditions and sources within the subbasin. Therefore, these are considered priority strategies and practices that should receive special focus during implementation plan development.

DEQ expects that entities identified in Section 5.1 will develop implementation plans that incorporate strategies and practices in Table 1 that are applicable to their jurisdiction. Implementation plans must include specifics on where and when priority and other strategies and practices will be applied, along with measurable objectives and milestones for documenting their implementation and gaging their effectiveness.

Table 1: Management strategies by sources

Pollutant	Source or activity	Management strategies
Solar Radiation	Insufficient height, density, or width of riparian vegetation	Streamside tree planting (conifer and hardwood); streamside vegetation planting (shrub or herbaceous cover); streamside vegetation management (invasive thinning, removal or other treatment); voluntary streamside tree retention; streamside invasive plant control; streamside fencing (or other livestock streamside exclusion or management methods); identify and protect cold water refuges Increase site effective shade (combination of vegetation height, buffer width and canopy density) through streamside vegetation management strategies using regulatory programs and voluntary activities, including incentive-based projects; maintain plants until free to grow; monitor survival rates Develop, update and/or enforce streamside code/ordinance to ensure streamside native vegetation and intact bank conditions are protected or restored following site development; purchase, acquire, or designate conservation easements along streamside areas
Heat	Water withdrawals and flow alteration	Pursue instream water right transfers and leases; water right application reviews; irrigation conservation and management; repair or replace leaking pipes and infrastructure; provide incentives for water conservation; implement water consumption restrictions during the summer months, such as lawn watering
	Channel modification and hydromodification	Conduct whole channel restorations (e.g. enhance channel, wetlands, and floodplain interactions, reduce width to depth channel ratios, bank stabilization, large wood placement, create/connect side channels, etc.); streamside road re-construction/obliteration activities; streamside fencing or water gap development (or other livestock exclusion or management methods); protect and enhance cold water refuges; develop dam management strategies for temperature; remove in-channel ponds or modify pond structures to reduce temperature increases downstream; protect areas that do not require restoration actions
Bacteria	Urban stormwater	Implement stormwater management practices, including managing construction site runoff, implementing public education and outreach activities, and managing stormwater at new development and redevelopment projects Managing pet waste Implement additional best management practices for livestock manure and pasture management and reduce livestock access to streams to reduce organic matter mobilization in runoff and direct deposition into surface waters Implement bacteria source tracking to identify the source of bacteria in surface waters Improve pastures and streamside zones to reduce surface erosion and provide adequate filtration capacity for organic matter and nutrients
	Nonpoint sources and background	

Pollutant	Source or activity	Management strategies
		Assess onsite septic systems to identify those at the highest risk of malfunction or failure and connect to public sanitary sewer systems where possible

2.1 Streamside vegetation management strategies

DEQ's water quality analysis and modeling concluded that streamside vegetation planting and management are the strategies necessary to meet water quality standards in the temperature impaired sections of streams in the Lower Columbia-Sandy Subbasin. This is because streamside overstory vegetation reduces solar radiation loads to streams by providing shade. Protecting and restoring streamside overstory vegetation is essential to achieving the TMDL surrogate measure of effective shade.

The primary streamside vegetation planting and management strategies are summarized as follows:

- **Vegetation planting and establishment:** This strategy addresses locations that have little or no shade producing overstory vegetation and are therefore important locations for streamside tree and shrub planting projects. These sites may currently be dominated by invasive species.

- **Vegetation protection (enhancement, maintenance and growth):** This strategy addresses streamside areas that have existing vegetation that needs to be protected from removal to maintain current shade levels. In some cases, protection is needed because effective shade can only be achieved with additional growth. Protecting and maintaining existing vegetation ensures that it can grow and mature, enhances vegetation success and survival, and provides for optimal ecological conditions.

- **Vegetation thinning and management:** This strategy addresses streamside areas that may need vegetation density reduction to achieve optimal benefits of shade in the long term. Current site conditions at some riparian areas have been shown to be overly dense with trees or dominated by invasive species that inhibit a healthy streamside community. In these situations, thinning may be an option to promote development of a healthy mature streamside forest. However, it must be ensured that riparian thinning and management actions will result in limited (i.e., quantity, duration, and spatial extent) stream shade loss. TSD Appendix G presents material describing potential shade and temperature impacts resulting from riparian buffer management and actions to limit these effects.

2.2 Flow management strategies

DEQ's modeling, evaluation of water quality data, and research found that water withdrawals decrease the capacity of streams to assimilate pollutant loads (DEQ 2023a). Because temperature is a flow-related parameter, water withdrawals can result in increased pollutant concentrations and warmer stream temperatures. In waterbodies where temperatures are already known to exceed standards, further withdrawals from the stream will reduce the stream's heat capacity and cause greater fluctuation in daytime and nighttime stream temperatures.

Water conservation is a best management practice that directly links the relationship between water quantity and water quality. Leaving water instream functions as a method to protect water quality from flow-related parameters of concern, such as temperature. Under state law, the first person to file for and obtain a water right on a stream is the last person to be denied water in times of low stream flows. Therefore, restoration of stream flows may require establishing instream water rights. One way this can be accomplished is by donating or purchasing out-of-stream rights and converting these rights to instream uses.

2.3 Hydromodification strategies

Hydromodification refers to alterations of natural hydrological processes which affect characteristics of a waterbody and impact water quality. Examples of hydromodification include the construction of dams and levees and modifying stream channel morphology. Hydromodification can affect the loading, timing, and delivery of nonpoint source pollutants, including temperature (EPA 2007).

Altering channel morphology can impact stream temperature (Galli and Dubose, 1990). For example, streams with high width to depth ratios (i.e. wide, shallow streams) can allow solar radiation to increase stream temperature compared to channels that are narrow and deep (Larson and Larson, 1996). Activities that make streams more prone to bank erosion, such as uncontrolled livestock access, can also result in shallower streams and increased stream temperatures. Channelization can impact stream morphology by disconnecting streams from their floodplains due to activities such as urban development or road construction. Streams that have been disconnected from floodplains are not able to slow and store floodwaters during the rainy season or recharge groundwater to support summer flows (EPA 2017).

Hydromodification management strategies can include streamside restoration, livestock fencing, flow augmentation, and reservoir operations, as well as channel or floodplain restoration projects. Note that permits are often needed to conduct stream restoration work involving removal and fill activities, and to ensure activities occur during the in-water work period to avoid harming fish. In addition, responsible persons, including DMAs need to conduct site-specific evaluations of streams to determine what specific channel modifications are appropriate to meet the desired future condition. For more information about hydromodification sources and impacts, see EPA's, *National Management Measures to Control Nonpoint Source Pollution from Hydromodification* (epa.gov), as well as a DEQ's study, *Water Temperature Impacts from In-Channel Ponds in Portland Metro and Northwest Region*.

2.3.1 Large Dam Owners and Reservoir Management

There are approximately 12 reservoirs located in the Lower Columbia-Sandy project area that are large enough to require evaluation for dam safety. DEQ compiled this list of dams (Appendix A) from the U.S. Army Corps of Engineers National Inventory of Dams (NID) database and a similar database maintained by the Oregon Water Resources Department (OWRD), dam safety program. The OWRD prescribes dam safety rules that apply to large dams 10 feet or higher, or store 9.2 acre-feet or more (OAR 690-020-0000). "Dam" means a hydraulic structure built above the natural ground line that is used to impound water. Dams include all appurtenant structures, and together are sometimes referred to as "the works". Dams include wastewater lagoons and other hydraulic structures that store water, attenuate floods, and divert water into canals.

Dams of all sizes can increase stream temperatures, depending on factors such as specific dam and stream characteristics, and the location and number of dams in a watershed. For these reasons, DEQ expects all dam owners to manage their reservoirs to meet water quality standards, including standards for temperature. For details on reservoir operator implementation requirements, see Section 5.3.7.

2.4 Point source priority management strategies

Point sources may be assigned wasteload allocations and/or other requirements under the TMDL. These point sources are required to have National Pollutant Discharge Elimination System (NPDES) permits for any wastewater discharges. Under federal rules, effluent limits within NPDES permits are required to be consistent with the assumptions and requirements of any available wasteload allocation.

The primary way DEQ addresses numeric wasteload allocations is by including effluent limits in permits (though different mechanisms may be used if they are consistent with the TMDL). There are a number of available pathways that may be used to achieve compliance with these limits and requirements. These include immediate compliance with the limits, the use of compliance schedules, water quality trading, and other pathways allowed under state and federal rules.

3. Timelines for implementing strategies

OAR 340-042-0040(I)(D) requires a WQMP address schedules for implementing management strategies including permit revisions, achieving appropriate incremental and measurable water quality targets, implementing control actions and completing measurable milestones. DEQ's water quality permitting program has responsibility for revising permits to comply with TMDLs. Timelines for implementation of management strategies by responsible persons are discussed separately. Figure 1 presents a typified timeline for TMDL implementation in a five-year increment, adjusted for the longer time allowed for development or revision of implementation plans for the Lower Columbia-Sandy Subbasin TMDL.

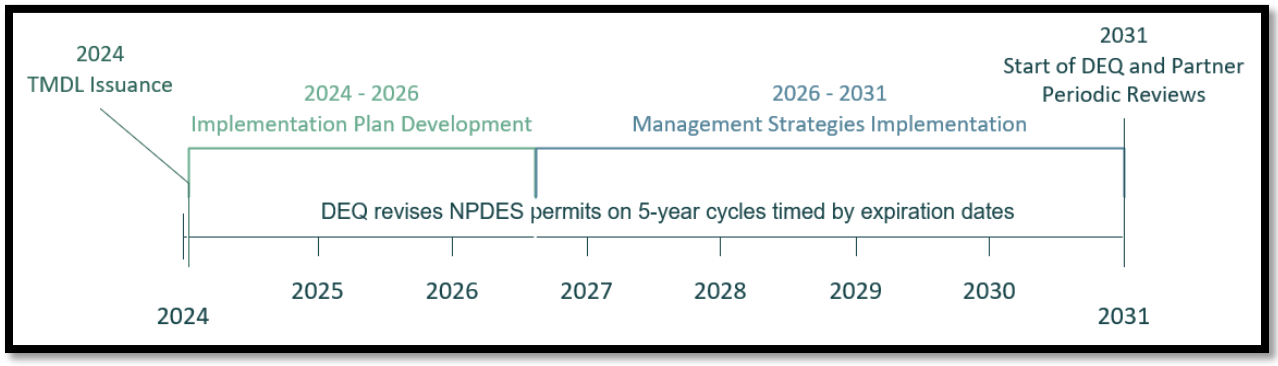

Figure 1: Lower Columbia-Sandy Subbasin TMDL implementation timeline

3.1 DEQ Permit revisions

NPDES permits have five year terms. Table 2 includes a list of NPDES permittees in the Sandy Basin and their next expected permit renewal date. DEQ will include any updates to TMDL wasteload allocations in the permittee's next NPDES renewal permit after the TMDL has been approved.

The City of Sandy WWTP currently holds an NPDES permit for discharge to Tickle Creek (Clackamas Subbasin) but is under an EPA consent decree to upgrade and add treatment capacity. At this time, the City has provided DEQ with an NPDES permit application for the upgrade and construction of a new outfall to the Sandy River. The discharge to the Sandy River is estimated to be a significant source of thermal load, and has been allocated a portion of the cumulative human use allowance. Additional information regarding the new outfall is in the TMDL Rule, Sections 7.1 and 9.1.

Table 2: Sandy Subbasin permits and timelines

Permittee	Permit Type	DEQ file number	EPA permit number	Planned Issuance Date
Government Camp STP	NPDES-Dom-Da	34136	OR0027791	2025
Water Environment Services Hoodland STP	NPDES-Dom-Da	89941	OR0031020	2027
City of Troutdale WPCF	NPDES-Dom-C2a	39750	OR0020524	2023
OR Dept of Fish and Wildlife Sandy River Fish Hatchery	300-J	64550	ORG130009	TBD

3.2 Management strategies implemented by responsible persons

DEQ uses multiple sources to establish current conditions and track implementation progress in the Lower Columbia-Sandy Subbasin project area. One of these sources is the Oregon Watershed Enhancement Board's Oregon Watershed Restoration Inventory, which is a repository for storing watershed restoration activities. OWRI contains project level information from watershed councils, landowners and other groups who have implemented restoration projects to improve aquatic habitat and water quality conditions. Data available from OWRI indicate approximately 39 stream miles have been planted since 2005 in the project area.

For this TMDL, DEQ also conducted modelling across specific areas within the project area to assess current streamside shade. Where DEQ completed modeling, effective shade targets were calculated for specific water bodies. An effective mean shade was then calculated for DMAs where this modeling occurred, and a shade gap assessment was completed. A shade gap assessment was not completed for all DMAs. For the areas where a shade gap assessment was not completed, effective shade targets are determined through shade curves based on stream site characteristics. The shade gap results for the modeled areas include shade conditions that may have been impacted by streamside planting projects that were completed following the approval of the 2005 Sandy River Basin TMDL.

While DEQ was not able to directly quantify the impact that these planting projects had on modeled streamside shade gaps, available data demonstrate that the pace and scale of streamside planting will need to increase to meet shade targets for this TMDL (See section 3.3).

3.3 Timeline for implementation of management strategies

This section of the WQMP includes an estimate of the timeline for implementation of management strategies that will be sufficient to support attainment of water quality standards. Estimating timeframes for meeting shade targets across the project area is influenced by several factors, including:

- The project area is large and the percent effective shade targets to be met are developed at a small scale or through shade curves.
- A shade gap analysis is unavailable for all streams in the Lower Columbia-Sandy Subbasin to gage what percent of streamside areas across the project area are not currently meeting effective shade targets.
- DEQ is unable to determine whether the rate of previous streamside plantings will be similar to planting efforts following the adoption of this TMDL.
- DMAs that have a large percentage of private property within their jurisdiction will have challenges in meeting effective shade targets. It will likely take additional time to develop more protective streamside ordinances or regulations, work with landowners, or partner with other organizations to conduct streamside planting and restoration projects in these areas.
- It is unclear how much future planting will be targeted in priority shade gap areas, as opposed to implementing more opportunistic planting projects.
- The scale of implementation, location, and water quality benefits from future in-stream restoration and flow augmentation projects are unknown.
- It is unclear what impacts climate change and forest pests, such as the emerald ash borer, will have on tree species.

DEQ expects responsible persons, including DMAs to consider the timeline projections and interim targets presented below in Table 3 in establishing commitments for streamside planting and protection in TMDL implementation plans. Based on DEQ analysis of the number of stream miles that will need restoration, and the pace of restoration logged in the Oregon Watershed Restoration Inventory database over the previous years of implementation, restoration will need to occur at an accelerated pace to meet the targets below. Timelines for attainment of percent cumulative effective shade are generally based on time for trees to grow to heights sufficient to provide effective shade, and in considerations of the factors described above. Table 3 gives projections for meeting 10 percent of shade targets across the basin every 10 years beginning in 2030, which will result in meeting all shade targets in 90 years. It is important to note that meeting shade targets on all waterbodies may not be possible.

Table 3: Projected timelines to meet percent shade targets in the Lower Columbia-Sandy Subbasin TMDL in 10-year increments

Assessment Year	Percent Cumulative Shade Targets Met in Lower Columbia-Sandy Subbasin
2030	10%
2040	20%
2050	30%
2060	40%
2070	50%
2080	60%
2090	70%
2100	80%
2110	90%
2120	100%

4. Attaining water quality standards

Based on the TMDLs analyses, achieving the excess load reductions identified will result in attainment of water quality standards. Each management strategy identified in this WQMP and in responsible persons' implementation plans represents part of a system of measures and practices that collectively reduce pollutant loads and improve water quality.

4.1 How management strategies support attainment of water quality standards

OAR 340-042-0040(l)(E) requires an explanation of how implementing the proposed management strategies will result in attainment of water quality standards.

4.1.1 Implementation of vegetation management, flow management and hydromodification strategies for temperature reduction

DEQ identified priority implementation management strategies and specific practices in Table 1 and Section 2. DEQ expects these strategies and practices to increase site effective shade and address the excess solar radiation and shade deficits calculated along streams within the Lower Columbia-Sandy Subbasin. DEQ focused on the vegetation strategies described in Section 2.1 to estimate reasonable timelines for achieving surrogate effective shade targets (Table 3), and by extension solar radiation load reductions to meet temperature water quality standards. Some of these vegetation management strategies have been implemented at various locations over the past 18 years by responsible persons, including Designated Management Agencies, that were identified in the 2005 TMDL.

DEQ developed site-specific effective shade targets and effective shade curves to meet temperature load allocations in the TMDL Rule (Section 9 in the TMDL Rule). Shade curves

identify the relationship between stream width, orientation, and effective shade for specific streamside vegetation types. Effective shade curves are applicable to any stream that does not have site specific shade targets. Effective shade curves represent the maximum possible effective shade for a given vegetation type.

Landowners, foresters, restoration professionals and horticulturists have the expertise and experience needed to develop site-specific planting prescriptions that will ensure that the best combination of streamside species are planted. Site-specific planting prescriptions will typically contain a higher diversity of shrub and overstory species than the vegetation types used in developing the shade curves. The overall goal is to establish and protect streamside vegetation to meet shade targets established for that site. Maintenance activities, such as removal of invasive species and watering newly established trees and shrubs will be important for trees to become fully established (free to grow).

In addition to streamside shading strategies, significant water quality benefits can be achieved through implementation of stream restoration and flow augmentation management strategies.

4.1.2 Continued implementation of bacteria management strategies

DEQ's 2005 TMDL and WQMP required strategies for managing bacteria from urban stormwater, pet waste, livestock and pastures, septic areas and sanitary sewer discharges in areas that discharge to Beaver, Kelly and Cedar Creeks. DEQ did not revise the 2005 bacteria TMDL and requires the relevant responsible persons, including DMAs, to include these strategies in updated implementation plans, as appropriate to their jurisdictions, and continue to implement them and report on their effectiveness.

4.2 Timelines for attaining water quality standards

OAR 340-042-0040(l)(F) requires an estimated timeline for attaining water quality standards through implementation of the TMDL, WQMP and associated TMDL implementation plans.

Based on DEQ's source assessment and TMDL analyses (DEQ, 2023a), point sources and nonpoint sources contribute pollutant thermal loads in the Sandy River, Camp Creek, and Cedar Creek. Nonpoint sources contribute nearly all of the excess thermal pollutant loading associated with temperature water quality impairments to most other impaired waterbodies in the Lower Columbia-Sandy Subbasin. Therefore, it is critical for nonpoint sources to make timely progress toward meeting the TMDL load allocations.

Because the Temperature TMDL calculated NPS load allocations using a percent effective shade surrogate measure, the estimated timelines to meet water quality standards are primarily based on streamside planting activities. However, other management strategies, including stream channel restoration and increasing instream flows will also help improve stream temperature conditions. Based on the timeline to meet effective shade targets (Table 3), temperature water quality standards for the Lower Columbia-Sandy subbasin will be met by 2120. This is a target date, and is uncertain due to unknowns related to current conditions and the pace of future restoration activities. Achieving the identified timelines for cumulative effective shade and resulting water quality benefits will require active participation from all responsible persons, including DMAs, within the basin.

DEQ expects Designated Management Agencies responsible for implementing bacteria management strategies for Beaver, Kelly and Cedar Creeks to summarize evaluation of bacteria

strategy performance since 2005 when identifying and prioritizing actions in implementation plans.

5. Implementation responsibilities and schedule

5.1 Identification of implementation responsibilities

OARs 340-042-0040(4)(I)(G) and 340-042-0080(1) require identification of persons, including Designated Management Agencies, responsible for implementing management strategies and preparing and revising implementation plans.

OAR 340-042-0030(2) defines Designated Management Agency as a federal, state or local governmental agency that has legal authority over a sector or source contributing pollutants and is identified as such by DEQ in a TMDL.

The TMDL rule includes numerous mentions of the term ‘responsible person’ with associated requirements. OAR 340-042-0025(2) indicates that responsible sources must meet TMDL load allocations through strategies developed in implementation plans. OAR 340-042-0030(9) defines ‘reasonable assurance’ as a demonstration of TMDL implementation by governments or individuals. OARs 340-042-0040(4)(I)(G) requires identification of persons, including DMAs, responsible for developing and revising implementation plans. OAR 340-042-0040(4)(I)(I) requires a schedule for submittal and revision of implementation plans by responsible persons, including DMAs. OAR 340-042-0080(4) reiterates the requirement for persons, including DMAs, responsible for development, submittal and revision of implementation plans, along with the required elements of those plans. For purposes of this Lower Columbia-Sandy Subbasin WQMP, for implementation of the temperature TMDL, ‘responsible person’ is defined as any entity responsible for any source of pollution addressed by the TMDL.

Unless otherwise specified, all responsible persons, including DMAs, are required to develop, submit, implement and revise, as needed, an implementation plan specific to the Lower Columbia-Sandy Subbasin TMDL that includes: management strategies; timelines for implementation; a schedule for achieving milestones; and a performance monitoring component with a plan for periodic review and plan revision. Table 4 contains the list of these responsible persons, along with summaries, where available, of their approximate jurisdictional land area percentages within the subbasin. Entities in Table 4 noted with a # were identified in the 2005 WQMP as being a DMA for bacteria.

Table 4: Persons responsible for developing implementation plans

Entity	Type	Approximate percentage of total subbasin area	Approximate percentage of acreage within 150' of streams
US Forest Service	Federal	70.38%	70.11%
Oregon Department of Forestry	State	12.88%	13.62%
US Bureau of Land Management	Federal	4.16%	5.11%
Oregon Department of Agriculture	State	3.81%	2.79%
Clackamas County #	County	2.93%	2.57%
Multnomah County #	County	1.11%	0.88%
City of Portland	City	0.82%	1.04%
Oregon Parks and Recreation Department	State	0.77%	0.65%
Oregon Department of Transportation	State	0.74%	0.40%
City of Gresham #	City	0.78%	0.54%
City of Troutdale #	City	0.50%	0.33%
City of Sandy #	City	0.17%	0.18%
Union Pacific Railroad *	Railroad	0.12%	0.07%
Oregon Department of Fish and Wildlife	State	0.06%	0.11%
Port of Portland *	Special District	0.04%	0.03%
Clackamas Water Environment Services	Special District	-	-
Oregon Department of State Lands *	State	-	-
Department of Geology and Mineral Industries *	State	-	-
Oregon Department of Environmental Quality	State	-	-
Metro *	Special District	-	-
Notes: * Indicates entity is not required to develop a TMDL implementation plan at this time # Indicates entity was previously identified as a DMA for bacteria in the 2005 Sandy WQMP			

The Oregon Department of Environmental Quality is the DMA for implementing point source wasteload allocations. DEQ is not included in Table 4 because DEQ implements waste load allocations through issuance of NPDES permits, which does not require preparation of an implementation plan. In addition, entities noted with an * in Table 4 are not required to develop an implementation plan for temperature at this time. DEQ made this determination through a review of currently available information, including land ownership and jurisdiction within the streamside area, as well as how lands are currently managed. However, if new information indicates these entities should develop an implementation plan, DEQ may revise the WQMP or issue individual orders to notify them of the required schedule for submitting an implementation plan.

Table 4 is not an exhaustive list of every individual that bears responsibility for improving water quality in the Lower Columbia-Sandy River Subbasin. It may be necessary for all people that

live, work and recreate in the watershed to take steps to reduce pollution and protect or restore water quality to attain standards and designated beneficial uses. Active participation may be needed to achieve long-term water quality improvements throughout the watershed.

Figure 2 is a map of the watershed showing areas by land use, ownership or jurisdiction with responsibility for implementation of management strategies by the entities indicated.

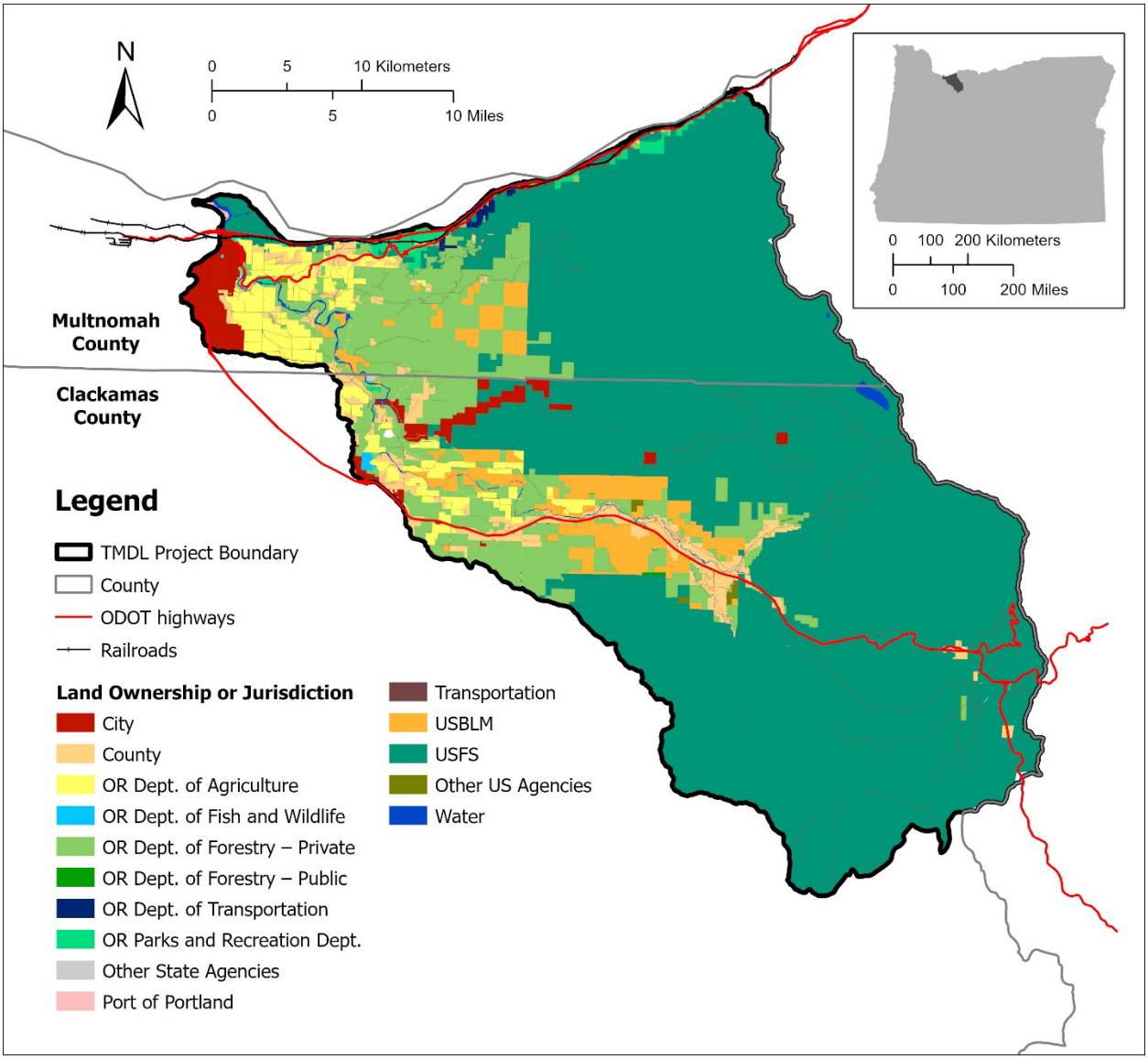

Figure 2: Lower Columbia-Sandy Subbasin land ownership or jurisdiction map

5.2 Existing implementation plans

OAR 340-042-0040(I)(H) requires identification of any source or sector-specific implementation plans available at the time of TMDL issuance. Following issuance of the 2005 Sandy Basin TMDL and Water Quality Management Plan, responsible persons, including DMAs, developed implementation plans that included specific management strategies and reporting requirements.

Table 5 identifies those entities with existing TMDL implementation plans. Existing DMAs that already have an implementation plan will need to update their current plan for temperature to ensure any new requirements in this WQMP are met.

Table 5: Entities with existing implementation plans

Multnomah County
Clackamas County
Clackamas Water Environment Services
City of Portland
City of Troutdale
City of Gresham
City of Sandy

Additionally, certain statewide rules, programs and management plans for the forestry and agricultural sectors are in place and are intended, in part, to reduce or control nonpoint sources of pollution. The programs described in OAR 340-042-0080(2)&(3) represent existing implementation plans for non-federal forest and agricultural lands, and their sufficiency is discussed below.

5.2.1 Oregon Department of Forestry: Adequacy of Forest Practices Act to meet TMDL load allocations

Waterway protection measures were established in 1994 for state and private forest practices in Oregon, as codified in Oregon Revised Statutes 527.610 through 527.992, Oregon's Forest Practices Act (OAR 629-600 through 629-665) and Oregon's Plan for Salmon and Watersheds (Executive Order 99-01). As provided in ORS 527.770, forest operations conducted in accordance with the Forest Practices Act and other voluntary measures are generally considered to be in compliance with water quality standards. However, as provided in OAR 340-042-0080(2), revisions to the Forest Practices Act rules may be required when DEQ determines that these rules are not adequate to implement load allocations in an approved TMDL. Periodic revisions to these rules occurred between the 1990s through 2022, with studies by ODF and DEQ showing that the rules adopted prior to 2022 were not adequate to meet the Oregon temperature criterion for protecting cold water. DEQ determined in this TMDL that the generally applicable Forest Practices Act rules in effect prior to 2022 were not adequate to implement the TMDL load allocations for excess solar radiation loading on small and medium fish-bearing streams to meet the temperature criteria.

With the publication of the Private Forest Accord Report and subsequent passage of Senate Bill 1501, 1502 and HB 4055, Forest Practices Act rule revisions were adopted by the Board of Forestry in October 2022 and additional amendments are anticipated through 2025. Implementation of these rules, which include increased riparian widths and additional tree retention, may be effective at meeting shade allocations. In addition, as revised rules become effective, implementation of more stringent measures to protect water quality on private forestlands are anticipated to be applied, including in the Sandy River Subbasin. These rules are not expected to result in after-the-fact restoration of riparian areas harvested under previous rules. Therefore, effective shade is likely to be deficient for those riparian areas adjacent to small and medium salmon, steelhead and bull trout streams that were harvested prior to implementation of the new rules. The trajectory for providing future riparian shade on these streams is highly variable because it is based on the rules in effect at the time of harvest and the date of replanting. Multiple years will be needed for potential water quality improvements to be realized so that DEQ can evaluate adequacy of the revised rules in meeting the load allocations and surrogate measures required by the Sandy River Subbasin Temperature TMDL.

For these reasons, ODF is required to develop a TMDL implementation plan to be submitted to DEQ for review and approval.

As agreed to in the 2021 Memorandum of Understanding between DEQ and ODF, DEQ will work with ODF to identify additional regulatory or non-regulatory measures that could be implemented by rule revisions, stewardship agreements, incentive programs or other means to provide reasonable assurance of achieving TMDL solar radiation load allocations. Collaboration on these additional measures will occur during development of ODF's implementation plan.

5.2.2 Oregon Department of Agriculture: Adequacy of Agricultural Water Quality Management programs in attaining TMDL load allocations and effective shade surrogate measures

The Agricultural Water Quality Management Program was established in 1993 under ORS 568.900 to 568.933, ORS 561.191 and OAR chapter 603, divisions 90 and 95. Subsequently, the Oregon Department of Agriculture led the development of 38 watershed-based Agricultural Water Quality Area Rules and Area Plans intended to implement the rules, with the Sandy Subbasin rules and plan established in 2001. Despite implementation of the area rules and plans, including required biennial review and revision of the Area Plan and implementation of other voluntary agricultural initiatives, water quality impairments continue in the Sandy River Subbasin. DEQ's 2020 Water Quality Status and Trends Report shows a degrading trend for temperature in the Sandy Subbasin (more than half the monitoring locations where data were assessed).

Since 2001 and through the present, the Sandy Subbasin Agricultural Water Quality Area Rules and Plan do not identify quantitative targets for effective shade in riparian areas based on site specific factors, including stream width or orientation (nor for bacteria reduction). DEQ letters during biennial reviews of the Area Plan in 2012, 2015, 2017, 2019 and 2021 identified protecting, maintaining and establishing riparian vegetation to provide water quality functions as the highest priority for the Sandy Subbasin. Although ODA was not identified in the 2005 TMDL as an entity responsible for implementing bacteria reductions, DEQ's letters recommended actions that ODA could take to assist landowners in achieving the TMDL bacteria reduction targets. DEQ's letters each recommended establishment of measurable objectives, milestones and timelines to achieve TMDL load allocations for effective shade and bacteria reduction.

DEQ concluded that current Ag WQ program Area Rules, combined with implementation of Area Plan voluntary measures, are not adequate in all locations to provide the riparian vegetation requirements and targets that are necessary to meet TMDL effective shade targets, load allocations and temperature water quality criteria.

Therefore, ODA is required to develop a TMDL implementation plan for temperature to be submitted to DEQ for review and approval. DEQ encourages ODA to include management strategies with measurable objectives and timelines for bacteria reductions in the implementation plan.

5.2.3 U.S. Bureau of Land Management: Adequacy of streamside management strategies in attaining TMDL load allocations and effective shade surrogate measures

Table 6 provides a summary of the riparian buffer distance for different types of waterbodies. BLM calls these areas riparian reserves. The reserve distance is defined based on the site-

potential tree height. The site-potential tree height is the average maximum height of the tallest dominant trees (200 years or older) for a given site class. BLM states that site-potential tree heights generally range from 140 feet to 240 feet, depending on site productivity. Within the riparian reserve, clearcut harvesting is prohibited. Some tree removal or thinning activities are allowed based on certain circumstances such as to protect public safety, or to keep roads and other infrastructure clear of debris. Tree removal for yarding corridors, skid trails, road construction, stream crossings, and road maintenance or improvement are allowed where there is no operationally feasible and economically viable alternative. On fish bearing streams and perennial streams, between 0 and 120 feet slope distance there is no thinning except for treatments related to sudden oak death or for individual tree cutting or tipping that achieve restoration or habitat enhancement objectives. On intermittent, non-fish bearing streams, the same management strategy is applied but only from 0 to 50 feet.

Table 6. Summary of BLM riparian reserve buffer distance for different waterbody features

Feature	Riparian Reserve Distance measured as slope distance
Fish-bearing streams and perennial streams	One site-potential tree height distance from the ordinary high water line or from the outer edge of the channel migration zone for low-gradient alluvial shifting channels, whichever is greatest, on each side of the stream
Intermittent, non fish-bearing streams	Class I and II subwatersheds: One site-potential tree height distance from the ordinary high water line on each side of the stream
	Class II subwatersheds: 50 feet from the ordinary high water line on each side of a stream
Unstable areas that are above or adjacent to stream channels and are likely to deliver material such as sediment and logs to the stream if the unstable area fails	The extent of the unstable area; where there is stable area between such an unstable area and a stream, and the unstable area has the potential to deliver material such as sediment and logs to the stream, extend the Riparian Reserve from the stream to include the intervening stable area as well as the unstable area
Lakes, natural ponds and reservoirs > 1 acres, and wetland > 1 acres	100 feet extending from the ordinary high water line
Natural ponds < 1 acres, wetlands < 1 acres (including seeps and springs), and constructed water impoundments (e.g. canal ditches and pump chances) of any size	25 feet extending from the ordinary high water line

DEQ finds that BLM's streamside vegetation management strategies on fish-bearing streams, perennial streams, and intermittent, non-fish bearing streams in Class III subwatersheds are adequate and will likely lead to achievement of the TMDL load allocation and effective shade targets. Riparian reserves located on intermittent, non-fish bearing streams in Class I and Class II subwatersheds may not be adequate to achieve the load allocation or effective shade targets. At these locations thinning is authorized between 50 and 120 feet slope distance. The thinning must maintain at least 30 percent canopy cover and 60 trees per acre expressed as an average. Thinning at these levels within 120 feet slope distance from the stream may reduce effective shade and contribute to stream warming. The amount of effective shade reduction and temperature response will depend on the thinning intensity and spacing of thinning treatments (Roon et al 2021).

For these reasons, BLM is required to develop a TMDL implementation plan to be submitted to DEQ for review and approval.

5.2.4 U.S. Forest Service: Adequacy of streamside management strategies in attaining TMDL load allocations and effective shade surrogate measures

Streamside vegetation on USFS lands in the Lower Columbia-Sandy Subbasin are currently managed based on Northwest Forest Plan (USFS and BLM 1994). As part of the plan, the Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems, including salmon and steelhead habitat on federal lands managed by USFS. Maintaining and restoring water quality is one of the stated objectives of the Aquatic Conservation Strategy. These aquatic ecosystems and the streamside adjacent areas are called riparian reserves. Many of the reserve distances are defined based on the site-potential tree height. The Northwest Forest Plan states a site-potential tree height is the average maximum height of the tallest dominant trees (200 years or older) for a given site class. The following is a description of the riparian buffer distance for different types of waterbodies. The text was extracted from USFS and BLM (1994), Attachment A, Standards and Guidelines, Section C, pages C-3- through C-31.

Fish-bearing streams - Riparian Reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest.

Permanently flowing nonfish-bearing streams - Riparian Reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest.

Constructed ponds and reservoirs, and wetlands greater than 1 acre - Riparian Reserves consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than 1 acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.
Lakes and natural ponds - Riparian Reserves consist of the body of water and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

Seasonally flowing or intermittent streams, wetlands less than 1 acre, and unstable and potentially unstable areas - This category applies to features with high variability in size and site-specific characteristics. At a minimum, the Riparian Reserves must include:

- The extent of unstable and potentially unstable areas (including earthflows),
- The stream channel and extent to the top of the inner gorge,

- The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation, and
- Extension from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest.

DEQ's finds that USFS's streamside vegetation management strategies on fish-bearing streams, perennial non-fish bearing streams, constructed ponds and reservoirs, lakes and natural ponds, and wetlands greater than 1 acre are adequate and will likely lead to achievement of the TMDL load allocation and effective shade targets. Vegetation management strategies on intermittent streams, and wetlands less than one acre may not be adequate to achieve the load allocation or effective shade targets.

For these reasons, USFS is required to develop a TMDL implementation plan to be submitted to DEQ for review and approval.

5.3 Implementation plan requirements

As required in OAR 340-042-0080(4)(a)(A)-(E), implementation plans must include:

- Management strategies that the entity will use to achieve load allocations and reduce pollutant loading;
- Timeline for strategy implementation and a schedule for completing measurable milestones;
- Performance monitoring and a plan for periodic review and revision of implementation plans; and,
- Any other analyses or information specified in the WQMP.

The following subsections provide detail on each component required by this WQMP that must be included in implementation plans. Some implementation requirements vary depending on the responsible person or DMA. DEQ will work with each entity required to develop a TMDL implementation plan to ensure that all required elements are included with sufficient detail for the plan to be approved on the schedule required in Section 5.4. 5.3.1 Management strategies Each entity required to develop a TMDL implementation plan must include applicable priority management strategies from Table 1 and/or other practices and actions appropriate for activities and landscape conditions specific to the entities' pollutant sources or source sectors. Implementation plans must identify all streamside areas or streamside activities within an entity's jurisdiction or responsibility.

5.3.2 Streamside Evaluation

Responsible persons including DMAs that are required to submit an implementation plan must complete a streamside evaluation. The streamside evaluation will use a review of current conditions to support implementation measurable objectives and milestones. The streamside evaluation must be included in the TMDL implementation plan. Entities that have a DEQ shade gap analysis, and entities that must complete a shade gap analysis (see Section 5.3.4), must account for the shade gap analysis results in their streamside evaluation. The streamside evaluation must also include, and take into account the following data and information:

a. Quantify the streamside area in acres that needs enhancement (e.g., areas that do not currently meet shade targets, are comprised of non-native vegetation, need additional planting).
b. Quantify the streamside area in acres that may not need action beyond protection.
c. Quantify the streamside area in acres where physical constraints exist (e.g., buildings) that preclude implementation of vegetation management strategies that provide stream shade.
d. Quantify the streamside area in acres where jurisdictional constraints (e.g., private ownership) limit implementation of vegetation management strategies that provide stream shade.
e. Opportunities that may exist to address constraints to implementing vegetation management strategies that provide stream shade.
f. Any areas within your jurisdiction where there is the potential to implement best management practices such as in-stream restoration, flow augmentation projects, experimental temperature management techniques, as well as enhancing and protecting cold water refuges.
g. An evaluation of the data from (a-f) to prioritize implementation.

DEQ acknowledges that factors such as climate change and local geology, geography, soils, climate, legacy impacts, wildfires and floods may hinder achieving the target effective shade. Where natural disturbances have occurred, DEQ expects responsible persons, including DMAs to assess these areas for streamside restoration following an event.

The streamside evaluation must be completed according to the timeline assigned in Table 8. The streamside evaluation will be utilized during the five-year review (see Section 5.3.9.2) to help assess progress in meeting implementation timelines, milestones, and measurable goals in subsequent five-year implementation cycles.

5.3.3 120-foot slope streamside buffer as an alternative to a streamside shade gap analysis

The entities that are required to complete a shade gap analysis (Section 5.3.4) and those that choose not to use DEQ's shade assessment (where available) for their prioritization framework (Section 5.3.2) may instead choose to establish and protect overstory, woody vegetation within a 120-foot slope width buffer zone from the stream bank. The buffer zone must be established through development of enforceable ordinances or regulations. The literature review found in the TSD (Appendix G) indicates that potential shade loss associated with a 120-foot buffer will not cause stream temperature increases for most waterbodies. For this option, responsible persons, including DMAs, must ensure that any activity occurring within the 120-foot slope buffer would result in limited stream shade reduction and ensure that stream shade targets are still achieved at that location following management actions. Entities that choose this option must also complete a streamside evaluation (Section 5.3.2).

5.3.4 Streamside Shade Gap Analysis Requirements

DEQ conducted a vegetation height and shade gap analysis within approximately 150-ft of specific modeled waterbodies in the Lower Columbia-Sandy Subbasin, as detailed in Section 9.1.4.3 of the TMDL Rule. This analysis calculates the shade gap between current (i.e. assessed) effective shade versus the target effective shade. Where DEQ calculated a shade gap analysis, DEQ averaged the percent shade gap across all waterbodies within a DMA's jurisdiction. DEQ will provide the site-specific shade results upon request. Where DEQ was unable to conduct a shade gap analysis, DEQ developed general shade curves for specific

vegetation types (Section 9.1.4.4 of the TMDL Rule); shade curves allow users to find target percent effective shade values for streams based on several stream characteristics. Unlike the shade gap analysis, shade curves do not calculate current effective shade.

5.3.4.1 Streamside Shade Gap Analysis Methods for Responsible Persons and DMAs

If DEQ has provided a shade gap analysis for a jurisdiction, then DMAs must either use DEQ's analysis to inform their streamside evaluation (Sec. 5.3.2), or location specific methods to assess the current effective shade within their jurisdiction and whether effective shade allocations along Lower Columbia-Sandy Subbasin assessment units are met. These methods are described below.

1. Measure current effective shade at the stream surface using monitoring equipment, such as the Solar Pathfinder™, or using a hemispherical camera system and imagery analysis software.
    a. Determine vegetation type, canopy density, stream width and stream orientation.
    b. Compare current effective shade results to either target effective shade from DEQ's shade gap analysis, or to the target percent effective shade values derived from the shade curves in the TMDL to assess the percent effective shade gap.
    c. Entities choosing to use this methodology must submit their assessment strategy to DEQ for approval. Assessments should conform to guidelines outlined in OWEB's Water Quality Monitoring Technical Guidebook (OWEB, 2000)
2. Conduct modeling using the Heat Source model (as used in this TMDL).
3. Another method approved by DEQ through the TMDL implementation plan approval process.

A project plan which includes a description of the assessment methodology must be submitted to DEQ for review and approval according to the timeline assigned in Table 8. Method documentation for Solar Pathfinder™ can be accessed at https://www.solarpathfinder.com/pdf/pathfinder-manual.pdf and in OWEB's Addendum to Water Quality Monitoring Technical Guide Book, Ch. 14: https://www.oregon.gov/oweb/Documents/Stream-Shade-Canopy-Cover-WQ-Monitoring-Guidebook-addendum-ch14.pdf .

5.3.4.2 Shade Gap Analysis Requirements for ODF, ODA, BLM, and USFS

Together, the ODF, ODA, BLM, and USFS collectively have jurisdiction of more than 90 percent of the land area within 150 feet of streams within the Lower Columbia-Sandy Subbasin project area. Increasing shade on streams within the extensive areas within their jurisdictions is important to achieving the surrogate shade measures of this TMDL. Therefore, ODF, ODA, BLM and USFS must complete a streamside evaluation (Section 5.3.2), as well as a shade assessment for streamside areas within their jurisdiction. The assessment must use location-specific methods as given in Section 5.3.4.1 for determining whether effective shade allocations along the temperature impaired Lower Columbia-Sandy/Subbasin assessment units are met. A shade assessment is not needed for those areas where DEQ has completed a shade gap analysis, or for those areas where DEQ has determined the management strategies are sufficient (Sections 5.2.3 and 5.2.4). A project plan which includes a description of the assessment methodology must be submitted to DEQ for review and approval according to the timeline assigned in Table 8.

5.3.5 Percent consumptive use

The TMDL Rule includes a percent consumptive use surrogate measure, which can be used to ensure that water management and water withdrawal activities meet the portion of the human use allowance assigned to such uses in the TMDL. The percent consumptive use is the percent of natural surface flow that does not return to surface water after it has been withdrawn for a water use activity. As modeled for the Sandy River at the location of USGS gage 14142500, the TMDL indicates that a consumptive use flow rate reduction of 1.90% will maintain the human use allowance associated with water withdrawal activities. DEQ anticipates using the consumptive use surrogate measure when reviewing new applications for water rights in the Lower Columbia-Sandy Subbasin. Additional detail regarding this surrogate measure is included in Section 9.1.4.5 of the TMDL Rule.

5.3.6 TMDL implementation plan requirements for dam owners

DEQ is not focusing implementation requirements on dams owned and operated by individuals or businesses, or those operated to manage seasonal flow to sustain ecological benefits associated with wetlands or manage stormwater. DEQ encourages partnerships between DMAs and individual dam operators within their jurisdictions to evaluate ways in which these dams could be managed to reduce temperature impacts.

In most cases, large dam owners that are a public utility or a government agency are required to monitor and potentially develop TMDL implementation plans that include reservoir-specific management strategies to mitigate temperature increases that happen between the inflow and outlet of the dam. DMAs must identify specific measurable objectives with milestones and associated implementation timelines for implementing these strategies. The requirements in sections 5.3.2 and 5.3.4 also apply to those areas where dam owners have jurisdiction over the management of streamside vegetation. Table 7 includes a list of dams and dam owners that are responsible for developing a monitoring plan and may be required to develop a TMDL implementation plan. Appendix A includes the entire list of large dams in the Lower Columbia-Sandy Subbasin project area.

Table 7: Large dam owners responsible for monitoring and that may be required to submit an implementation plan that includes reservoir management strategies.

Dam Name	Owner	Reservoir Storage (acre-ft)
Bull Run Lake Dam	City of Portland	14500
Trillium Lake	Oregon Dept. of Fish and Wildlife	380
Wahkeena Rearing Reservoir	Oregon Dept. of Fish and Wildlife	180
Development No. 1 Dam	City of Portland	33760
Spillway Dam	City of Portland	25000
Development No. 2 Dam	City of Portland	25000

5.3.6.1 Monitoring requirements for dam owners

The nature of dam and reservoirs is to alter solar radiation flux and seasonally increase surface temperatures compared to free-flowing stream segments. Increased temperatures may lead to violations of water quality temperature standards and impact aquatic life. Water released from the hypolimnion of stratified reservoirs may cool downstream reaches during the summer leading to attainment of water quality standards. In the fall, a reservoir may become isothermal and contribute to stream warming downstream of the reservoir.

Section 9.1.4.1 of the TMDL rule identifies a temperature surrogate measure target for dam and reservoir operations. Attainment of this target requires assessment of temperatures up and downstream of the dam and reservoir.

Dam owners in Table 7 will collect temperature data and potentially assess temperature dynamics associated with their dam and reservoir operations using a mechanistic model, empirical model, and/or analysis of continuous temperature data collected upstream, downstream, and in the reservoir. The assessment shall include:

(1) Collection of continuous temperature data to characterize reservoir inflow and outflow temperatures;
(2) Reservoir temperature profiles to characterize timing and extent of thermal stratification, and
(3) Collection of reservoir water level fluctuations and outflow rates.

All data collected from items 1-3 will be submitted to DEQ or available in an online publicly accessible database. These data will establish baseline conditions for use in adaptive management and will inform evaluations of site-specific approaches to reduce temperature impacts. DEQ recommends dam owners develop a mechanistic or empirical model allowing prediction or comparison of inflow temperature to outflow temperatures. This will provide invaluable information on effective management strategies to reduce temperature. Responsible persons, including DMAs may also be required to submit a TMDL implementation plan that includes specific measurable objectives with milestones and an associated implementation timeline for implementing best management practices that address any altered temperature regimes observed downstream from reservoirs.

The “protecting cold water” criterion in OAR 340-041-0028(11) applies to waters of the state that have summer seven-day-average maximum ambient temperatures that are colder than the biologically based criteria. With some exceptions, these waters may not be warmed cumulatively by anthropogenic point and nonpoint sources by more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) above the colder water ambient temperature. Reservoir operators on reaches where protecting cold water apply must meet the cold water criterion and do not have the option to conduct modelling; see the TMDL Rule Section 9.1.4.1 for additional information. Additional information on protecting cold water is found in the TSD.

For reservoirs on reaches where DEQ has determined protecting cold water does not apply, operators are required either to ensure that discharges meet the temperature target surrogate measure (TMDL Rule Section 9.1.4.1) or complete a DEQ approved cumulative effects analysis to demonstrate that releases of temperatures that exceed the biologically based numeric criteria during some periods would not contribute to cumulative warming above water quality standards at downstream locations. Reservoir operators who choose to complete a cumulative effects analysis to demonstrate that their releases would not contribute to cumulative warming above water quality standards will be required to submit a QAPP to DEQ for review and approval that outlines which dataset and cumulative effects approach will be used to assess impacts of their releases.

If DEQ determines sufficient data is available to demonstrate that stream temperature does not increase from upstream of dam to downstream of dam, then the reservoir operator may not be required to develop a TMDL implementation plan for dam management.

5.3.6.2 City of Portland

The TMDL Rule includes a stream temperature surrogate measure for use by the City of Portland to implement the load allocation for dam and reservoir operations for the Bull Run project. Additional detail regarding this surrogate measure is included in Section 9.1.4.2 of the TMDL Rule.

5.3.7 Timeline and schedule

Each implementation plan must include a commitment to enact specific management strategies on a reasonable timeline, with a schedule specified for meeting measurable milestones to demonstrate progress. To meet the intent of this requirement and be useful for the requirement to track and report progress, entities should develop management strategies using the SMART elements: Specific, Measurable, Achievable, Relevant, Time-bound (Doran, 1981).

Timelines and milestone schedules should be informed by the streamside evaluation, as described in Section 5.3.2 above, and should consider all relevant factors of an entity's specific situation. Identification of management strategy implementation timelines that differ from those estimated by DEQ to be effective in achieving load allocations must include an explanation of why the revised timelines are reasonable and how the timelines will be met.

Table 8: Due dates for implementation plans and analyses

Requirement	Due Date / Timeframe
TMDL implementation plan	18 months after EQC adoption of Willamette Mainstem TMDL*
Streamside Evaluation (Section 5.3.2)	18 months after EQC adoption of Willamette Mainstem TMDL
Project plan and description of the assessment methodology to be used to complete a shade gap analysis (Section 5.3.4)	18 months after EQC adoption of Willamette Mainstem TMDL
Streamside shade gap analysis (Section 5.3.4) and updated streamside evaluation **OR** **120 ft. streamside buffer that establishes and protects overstory, woody vegetation (Section 5.3.3)**	Four years after implementation plan submission deadline
Reservoir operators named in Table 7 (Sec. 5.3.6)	Submit a Quality Assurance Project Plan for temperature monitoring for each reservoir 18 months after EQC adoption of Willamette Mainstem TMDL. Following the temperature assessment, the DMA will consult with DEQ on a timeframe for submitting a cumulative effects analysis, or TMDL implementation plan as needed.
***The Willamette Mainstem TMDL is a separate temperature TMDL to be developed and approved following the Lower Columbia-Sandy Subbasin TMDL.	

5.3.8 Reporting of performance monitoring and plan review and revision

5.3.8.1 Reporting on performance monitoring

Each implementation plan must include a commitment to prepare annual reports on performance monitoring and a date by which they will be submitted to DEQ. These reports must include implementation tracking for each of the identified management strategies, progress toward timelines and measurable milestones specified in the implementation plan, and evaluation of the effectiveness of the strategies.

DMAs should track implementation actions by accounting for the number, type and location of projects, best management practices, education activities, or other actions taken to improve or protect water quality. While most DMAs will track implementation actions they are directly responsible for completing, some may need to track and report on actions that they implement through their support of other land managers, e.g. private landowners.

Oregon Watershed Restoration Inventory Reporting Requirement

Projects that implement temperature related practices listed in OWEB's OWRI Online List of Treatments must be reported once by DMAs to the OWRI database (OWEB 2023, OWEB 2023a) upon project completion. DEQ utilizes OWRI's database to track implementation activities for various reporting requirements. Responsible persons, including DMAs, must also include implementation activities in annual reports to DEQ to document progress and track implementation actions over time.

DEQ will also consider reporting on restoration activities to other publicly accessible databases approved by DEQ during the TMDL implementation phase.

Adaptive Management

Implementation plans must include a commitment to use adaptive management to evaluate the effectiveness of implementation activities in improving water quality conditions. Annual reports must summarize the status and results of these evaluations on the relevant time scale. Reports in year five must summarize implementation and effectiveness over the proceeding four years.

5.3.8.2 Implementation plan review and revision

Implementation plans must be reviewed, revised as appropriate, and approved by DEQ every five years. DEQ will use implementation and effectiveness evaluations from annual reports, combined with any results of environmental monitoring, for this review. If implementation plan revisions are needed to correct deficiencies or otherwise ensure the plan is effective following the year five review, DEQ will identify a date for submission of the revised plan for DEQ approval.

5.3.9 Implementation public involvement

As required in OAR 340-042-0040(l)(L), implementation plans prepared by designated management agencies must include a plan to involve the public in implementation of management strategies. Public engagement and education must be included to meet this requirement.

5.3.10 Maintenance of strategies over time

As required in OAR 340-042-0040(I)(M), implementation plans should include discussion of planned efforts to maintain management strategies over time.

5.3.11 Implementation costs and funding

As required in OAR 340-042-0040(I)(N), this section provides a general discussion of costs and funding for implementing management strategies. Implementation of management strategies to reduce and prevent pollution into waters of the state may incur financial capital or operating costs. These costs vary in relation to pollutant sources and loading, proximity to waterways and type or extent of preventative controls already in place. Certain management practices, such as preventative infrastructure maintenance, may result in long-term cost savings to responsible persons, including DMAs, or landowners.

OAR 340-042-0040(I)(N) also indicates that sector-specific or source-specific implementation plans may provide more detailed analyses of costs and funding for specific management strategies in the plan. DEQ requires each DMA to provide a fiscal analysis of the resources needed to develop, execute, and maintain the programs and projects described in implementation plans to the extent that these costs can be accounted for or estimated. DEQ recommends that all responsible persons prepare the following level of economic analysis.

- Staff salaries, supplies, volunteer coordination costs, regulatory fees
- Installation, operation and maintenance of management measures
- Monitoring, data analysis and plan revisions
- Public education and outreach efforts
- Ordinance development (if needed to implement a management strategy)

This analysis should be in five-year increments to estimate costs, demonstrate sufficient funding is available to begin implementation or that there is a plan for obtaining the necessary funding, and identify potential future funding sources to sustain management strategy implementation.

There are multiple sources of local, state and federal funds available for implementation of pollutant management strategies and control practices. Table 9 provides a partial list of financial incentives, technical assistance programs, grant funding, and low interest loans for public entities available in Oregon that may be used to support implementation of assessment, pollution controls, and watershed restoration actions or land condition improvements that improve water quality in the Lower Columbia-Sandy Subbasin. Soil and water conservation districts and watershed councils are additional resources that may support responsible persons and DMAs in implementation of pollutant management strategies and control practices through the programs listed in Table 9.

Table 9: Partial list of funding programs available in the Lower Columbia-Sandy Subbasin

Program	General Description	Contact
Clean Water State Revolving Fund	Loan program for below-market rate loans for planning, design, and construction of various water pollution control activities.	DEQ
Conservation Reserve Enhancement Program (CREP)	Provides annual rent to landowners who enroll agricultural lands along streams. Also cost-shares conservation practices such as riparian tree planting, livestock watering facilities, and riparian fencing.	NRCS

Program	General Description	Contact
Conservation Reserve Program (CRP)	Competitive CRP provides annual rent to landowners who enroll highly erodible lands. Continuous CRP provides annual rent to landowners who enroll agricultural lands along seasonal or perennial streams. Also cost-shares conservation practices such as riparian plantings.	NRCS
Conservation Stewardship Program (CSP)	Provides cost-share and incentive payments to landowners who have attained a certain level of stewardship and are willing to implement additional conservation practices.	NRCS
Drinking Water Source Protection Fund	These funds allow states to provide loans for certain source water assessment implementation activities, including source water protection land acquisition and other types of incentive-based source water quality protection measures.	Oregon Health Authority
Emergency Watershed Protection Program (EWP)	Available through the USDA-Natural Resources Conservation Service. Provides federal funds for emergency protection measures to safeguard lives and property from floods and the products of erosion created by natural disasters that cause a sudden impairment to a watershed.	NRCS
Emergency Forest Restoration Program (EFRP)	Available through the USDA-Natural Resources Conservation Service. Helps owners of non-industrial private forests restore forest health damaged by natural disasters.	USDA
Oregon 319 Nonpoint Source Implementation Grants	Fund projects that reduce nonpoint source pollution, improve watershed functions and protect the quality of surface and groundwater, including restoration and education projects.	DEQ
Environmental Quality Incentives Program (EQIP).	Cost-shares water quality and wildlife habitat improvement activities, including conservation tillage, nutrient and manure management, fish habitat improvements, and riparian plantings.	NRCS
Agriculture Water Quality Support Grant	Provides capacity to support voluntary agricultural water quality work in small watersheds and to meet the goals of the Agricultural Water Quality Management Area Plans and the SIA initiative.	ODA
Farm and Ranchland Protection Program (FRPP)	Cost-shares purchases of agricultural conservation easements to protect agricultural land from development.	NRCS, SWCDs, ODF
Federal Reforestation Tax Credit	Provides federal tax credit as incentive to plant trees.	Internal Revenue Service
Grassland Reserve Program (GRP)	Provides incentives to landowners to protect and restore pastureland, rangeland, and certain other grasslands.	NRCS
Landowner Incentive Program (LIP)	Provides funds to enhance existing incentive programs for fish and wildlife habitat improvements.	U.S. Fish and Wildlife Service
Oregon Watershed Enhancement Board (OWEB)	Provides grants for a variety of restoration, assessment, monitoring, and education projects, as well as watershed council staff support. 25 percent local match requirement on all grants.	OWEB
Oregon Watershed Enhancement Board Small Grant Program	Provides grants up to $10,000 for priority watershed enhancement projects identified by local focus group.	OWEB

Program	General Description	Contact
Partners for Wildlife Program	Provides financial and technical assistance to private and non-federal landowners to restore and improve wetlands, riparian areas, and upland habitats in partnership with the U.S. Fish and Wildlife Service and other cooperating groups.	U.S. Fish and Wildlife Service
Public Law 566 Watershed Program	Program available to state agencies and other eligible organizations for planning and implementing watershed improvement and management projects. Projects should reduce erosion, siltation, and flooding; provide for agricultural water management; or improve fish and wildlife resources.	NRCS, SWCDs
Resource Conservation & Development (RC & D) Grants	Provides assistance to organizations within RC & D areas in accessing and managing grants.	Resource Conservation and Development
ODF Small Forestland Investment in Stream Habitat (SFISH) Grants	Provides funding for Small Forestland Owners (SFO's) to improve road conditions and stream crossings as part of forest operations.	ODF
State Forestation Tax Credit	Provides for reforestation of under-productive forestland not covered under the Oregon Forest Practices Act. Situations include brush and pasture conversions, fire damage areas, and insect and disease areas.	ODF
Forest Stewardship Program	Provides cost share dollars through USFS funds to family forest landowners to have management plans developed.	ODF
Western Bark Beetle Mitigation	ODF administers a cost share program for forest management practices pertaining to bark beetle mitigation for forest health and is funded through the USFS.	ODF
State Tax Credit for Fish Habitat Improvements	Provides tax credit for part of the costs of voluntary fish habitat improvements and required fish screening devices.	ODFW
Wetlands Reserve Program (WRP)	Provides cost-sharing to landowners who restore wetlands on agricultural lands.	NRCS
Wildlife Habitat Tax Deferral Program	Maintains farm or forestry deferral for landowners who develop a wildlife management plan with the approval of the Oregon Department of Fish and Wildlife.	ODFW
Funding Resources for Watershed Protection and Restoration	EPA's Funding Resources for Watershed Protection and Restoration (EPA, 2023) contains links to multiple funding sources	Various

5.4 Schedule for implementation plan submittal

OAR 340-042-0040(4)(l)(I) specifies that the WQMP contain a schedule for submittal of implementation plans. As stated in OAR 340-042-0080(4)(a), entities identified in the WQMP with responsibility for developing implementation plans are required to prepare and submit an implementation plan for DEQ approval according to the schedule in the WQMP.

Within 18 months of EQC adoption of the Willamette Basin mainstem TMDL (planned for February 2025), persons, including DMAs, responsible for developing implementation plans must submit implementation plans to DEQ for review and approval.

OAR 340-012-0055(e) identifies failure to timely submit or implement a TMDL implementation plan, as required by DEQ order or rule, as a Class II violation. OAR 340-012-0053(1) identifies failure to report by the reporting deadline, as required by DEQ order or rule, as a Class I violation.

Should a sector or sector-wide DMA fail to submit an approvable TMDL implementation plan or fail to timely implement the plan, DEQ may pursue enforcement under OAR 340-012-0055(e) or identify individual sources (landowners/operators) as persons responsible for developing and implementing TMDL implementation plans to address the load allocations relevant for the sector. DEQ may revise the WQMP or issue individual orders to identify additional responsible persons and notify them of the required schedule for submitting source-specific implementation plans.

Following the issuance of the TMDL and this WQMP, DEQ may determine that nonpoint source implementation plans are not necessary for certain entities identified in the WQMP based on available information or new information provided by those entities. For these entities, DEQ will provide a written determination why a plan is not necessary. This determination could be based on a variety of factors, such as inaccurate identification within the geographic scope of the TMDLs, or documentation that an entity is not a source of pollution or does not discharge pollutants to a waterbody within the geographic scope of a TMDL.

Once approved, DEQ expects implementation plans to be fully implemented according to the timelines and schedules for achieving measurable milestones specified within the plans. Implementation plans must be reviewed and revised as appropriate for DEQ approval every five years and submitted on the date specified in DEQ's approval letter for an implementation plan.

6. Monitoring and evaluation of progress

OAR 340-042-0040(4)(l)(K) requires that the WQMP include a plan to monitor and evaluate progress toward achieving the TMDL allocations and associated water quality standards for the impairments addressed in the TMDL. Additional objectives of monitoring efforts are to assess progress towards reducing excess pollutant loads and to better understand variability associated with environmental or anthropogenic factors. This section summarizes DEQ's approach, including the required elements of identification of monitoring responsibilities and the plan and schedule for reviewing monitoring information to make TMDL revisions, as appropriate.

There are two fundamental components to DEQ's approach to monitoring and evaluating TMDL progress:

1) Tracking the implementation and effectiveness of activities committed to by responsible persons in DEQ-approved implementation plans, and

2) Periodically monitoring the physical, chemical and biological parameters necessary to assess water quality status and trends for the impairments that constitute the basis for this TMDL.

All responsible persons, including DMAs, are responsible for tracking the implementation and effectiveness of their actions and meeting milestones where established. Progress in implementing streamside actions prioritized through the prioritization framework, as well as other restoration efforts to improve stream temperature (e.g. channel morphology and stream flow restoration, protection and enhancement of cold water refuges, etc.) will form the basis against which implementation progress will be assessed. Although DEQ encourages responsible persons, including DMAs, to conduct physical, chemical or biological monitoring to better evaluate how implementation actions may impact water quality conditions, DEQ is only requiring the DMAs listed under section 6.1 to conduct water column monitoring associated with this TMDL.

With input from partners, DEQ will develop an overarching sampling and analysis plan to finalize the first iteration of the Lower Columbia-Sandy Subbasin Monitoring Strategy, after the issuance of the Willamette Basin Mainstem Temperature TMDL and WQMP. DEQ will continue to work with partners to implement the sampling and analysis and refine the strategy as needed.

6.1 Persons responsible for monitoring

Section 5.1 identifies the Designated Management Agencies and other persons responsible for developing TMDL implementation plans and implementing the management strategies described on the timelines committed to in approved plans. Section 5.3 details the content required in implementation plans and annual reports, as well as the schedules for their submittal.

DEQ is requiring USFS, BLM, ODF, and ODA to undertake monitoring actions in areas within their jurisdiction or ownership to help determine the status of instream water quality and landscape conditions associated with water quality. Combined, the USFS, BLM, ODF, and ODA have jurisdiction over more than 90% of the streamside areas within the Lower Columbia-Sandy Subbasin. For this reason, DEQ considers it appropriate for these agencies to collaborate with DEQ on the Monitoring Strategy. DEQ encourages other DMAs, including those that collect temperature data as part of TMDL implementation or other programs, to collaborate with DEQ on collecting water quality data.

This effort will be iterative, starting with the review of existing data and monitoring locations, then adjusted as needed to improve understanding of current water quality status and to develop a trend monitoring network.

Objectives for monitoring and assessment will be described in DMA implementation plans and will include, but are not limited to:

1. Provide information necessary to determine locations for applying management strategies or to assess the effectiveness of those strategies.
2. Refine information on source-specific or sector-specific pollutant loading.
3. Provide information necessary to demonstrate progress towards meeting load allocations.
4. Provide information used to identify roles and participate in a collaborative effort among responsible persons to characterize water quality status and trends.

5. Provide information integral to an adaptive management approach to inform and adjust management strategies over time.

Environmental media and water column monitoring activities conducted by DMAs to meet TMDL objectives must be performed in adherence to Quality Control procedures and Quality Assurance protocols established by DEQ, U.S. EPA, or other appropriate organizations. This requirement will be met through developing or adapting Quality Assurance Project Plans and/or project-specific Sampling and Analysis Plans, and submitting the plans to DEQ for review and approval based on a schedule determined by DEQ once development of the Monitoring Strategy has been initiated. USFS, BLM, ODF, ODA, or other DMAs can also agree to participate in a collaborative monitoring plan under an umbrella QAPP. DEQ staff will coordinate QAPP development with USFS, BLM, ODF, and ODA upon request in advance of submission. Resources for developing QAPPs and sampling and analysis plans are available on DEQ's water quality monitoring website (DEQ, 2023).

USFS, BLM, ODF, and ODA must acknowledge in their implementation plans their responsibility in collaborating with DEQ to develop the Lower Columbia-Sandy Subbasin Temperature Monitoring Strategy. DEQ encourages these agencies to begin evaluating their existing temperature monitoring networks, if any, and explore opportunities to establish future long-term monitoring sites. Data collected by DMAs participating in the monitoring strategy must be in a format accessible to DEQ.

The City of Portland is responsible for reservoir management of the Bull Run project, and manages flow releases to meet temperature standards. Implementation and assessment of the temperature surrogate measure in TMDL Section 9.1.4.2 requires collection of stream temperature and discharge data. DEQ requires the City of Portland to establish a continuous temperature monitoring site at the lamprey barrier downstream of Bull Run reservoir #2, maintain a continuous discharge and temperature monitoring site at the location of USGS gage 14141500 if that gage is discontinued or until DEQ approves an alternative approach to calculate the free flowing no dam temperatures, develop a monitoring QAPP for DEQ's approval, and make the data publicly available or be submitted annually to DEQ.

6.2 Plan and schedule for reviewing monitoring information and revising the TMDL

DEQ recognizes that it will take time before management practices identified in a WQMP are fully implemented and effective in reducing and controlling pollution. DEQ also recognizes that despite best efforts, natural events beyond the control of humans may interfere with or delay attainment of the TMDL. Such events include, but are not limited to, floods, fire, insect infestations, and drought. In addition, DEQ recognizes that technology and practices for controlling nonpoint source pollution will continue to develop and improve over time. As implementation, technology and knowledge about these approaches progress, DEQ will use adaptive management to refine TMDL implementation.

Adaptive management is a process that acknowledges and incorporates improved technologies and practices over to refine implementation. A conceptual representation of the TMDL adaptive management process is presented in Figure 3.

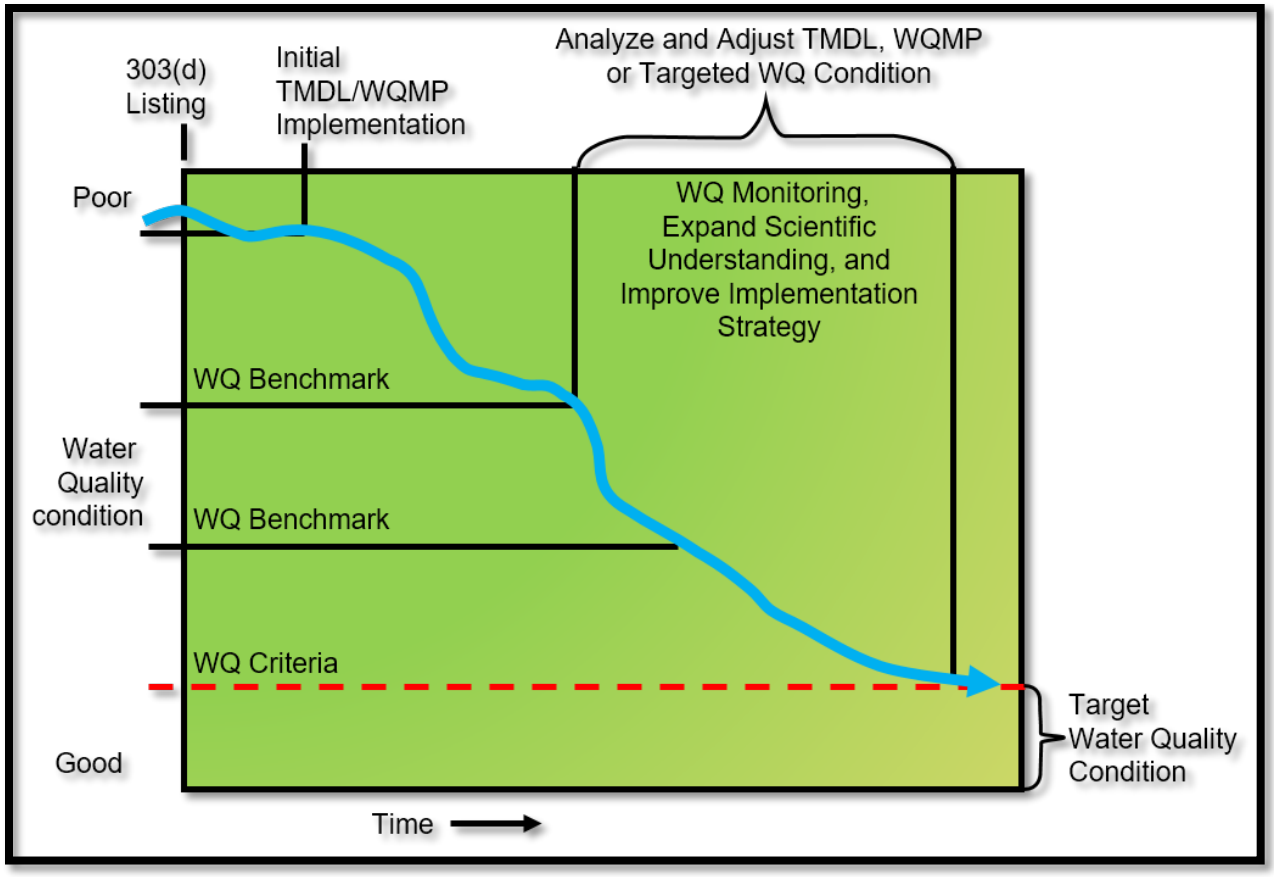

Figure 3: Conceptual representation of adaptive management

DEQ considers entities complying with DEQ-approved TMDL implementation plans to be in compliance with the requirements in the TMDLs. The information generated by each of the entities compiling annual reports and gathering data in the Lower Columbia-Sandy Subbasin will be evaluated individually and collectively to determine whether management actions are supporting progress towards TMDL objectives, or if changes in management actions and/or TMDLs are needed.

DEQ will review annual reports, participate with DMAs and other responsible persons in review of monitoring information, and participate in implementing the Lower Columbia-Sandy Subbasin Monitoring Strategy.

Every five years, DEQ will collectively evaluate annual reports and all available monitoring data and information to assess progress on meeting the goals of the TMDLs and WQMP.

- Where DEQ determines that implementation plans or effectiveness of management strategies are inadequate, DEQ will require DMAs and responsible persons to revise the components of their implementation plans to address these deficiencies.
- Where progress toward meeting Monitoring Strategy objectives is not being made, DEQ and partners will revise sampling and analysis plans or other aspects of the Monitoring Strategy.
- If DEQ's evaluation of water monitoring data and supporting information indicate that the TMDL load allocations for a given pollutant-impairment combination are insufficient to

meet state numeric or narrative criteria or to protect the designated beneficial uses, DEQ will consider TMDL revisions.

- Per OAR 340-042-0040(7), DEQ will follow all public participation requirements, including convening a local technical or rulemaking advisory committee to provide input on TMDL revisions.

7. Reasonable assurance of implementation

OAR 340-042-0030(9) defines Reasonable Assurance as “a demonstration that a TMDL will be implemented by federal, state or local governments or individuals through regulatory or voluntary actions including management strategies or other controls.” OAR 340-042-0040(4)(l)(J) requires a description of reasonable assurance that management strategies and sector-specific or source-specific implementation plans will be carried out through regulatory or voluntary actions. As a factor in consideration of allocation distribution among sources, OAR 340-042-0040(6)(g) states that “to establish reasonable assurance that the TMDL’s load allocations will be achieved requires determination that practices capable of reducing the specified pollutant load: (1) exist; (2) are technically feasible at a level required to meet allocations; and (3) have a high likelihood of implementation.” This three-point test is consistent with EPA past practice on determining reasonable assurance in the Chesapeake Bay TMDL (EPA, 2010) and supports federal antidegradation rules and Oregon’s antidegradation policy (OAR 340-041-0004).

The Clean Water Act section 303(d) requires that a TMDL be “established at a level necessary to implement the applicable water quality standard.” Federal regulations define a TMDL as “the sum of the individual wasteload allocations for point sources and load allocations for nonpoint sources and natural background” [40 CFR 130.2(i)]. For TMDL approval, EPA guidance documents and memos on the TMDL process requires determinations that allocations are appropriate to implement water quality standards and reasonable assurance that nonpoint source controls will achieve load reductions, when WLAs are based on an assumption that nonpoint source load reductions will occur (EPA, 1991, 2002 and 2012).

Although TMDL implementation is anticipated to improve rather than lower water quality, federal antidegradation rules at 40 CFR 131.12(a)(2), require states to “assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and cost-effective and reasonable best management practices for nonpoint source control,” when allowing any lowering of water quality.

When a TMDL is developed for waters impaired by point sources only, the existence of the NPDES regulatory program and the issuance of NPDES permits provide the reasonable assurance that the wasteload allocations in the TMDL will be achieved. That is because federal regulations implementing the Clean Water Act require that water quality-based effluent limits in permits be consistent with “the assumptions and requirements of any available [wasteload allocation]” in an approved TMDL [40 CFR 122.44(d)(1)(vii)(B)].

Where a TMDL is developed for waters impaired by both point and nonpoint sources, it is the state's best professional judgment as to the three-point test in OAR 340-042-0040(6)(g) on reasonable assurance that the TMDL's load allocations will be achieved.

Where there is a demonstration that nonpoint source load reductions can and will be achieved; a determination that reasonable assurance exists and, on the basis of that reasonable assurance, allocation of greater loads to point sources is appropriate. Without a demonstration of reasonable assurance that relied-upon nonpoint source reductions will occur, reductions to point sources wasteload allocations are needed.

The Lower Columbia-Sandy Subbasin TMDLs were developed to address both point and nonpoint sources with load reduction allocations proportional to estimated source contributions and in consideration of opportunities for effective measures to reduce those contributions. There are several elements that combine to provide the reasonable assurance to meet federal and state requirements, including for antidegradation. Education, outreach, technical and financial assistance, permit administration, permit enforcement, responsible person's implementation and DEQ enforcement of TMDL implementation plans will all be used to ensure that the goals of this TMDL are met.

7.1 Accountability Framework

Reasonable assurance that needed load reductions will be achieved for nonpoint sources is based primarily on an accountability framework incorporated into the WQMP, together with the implementation plans of persons responsible for implementation. This approach is similar to the accountability framework adopted by EPA for the Chesapeake Bay TMDL, which was adopted in 2010 (EPA, 2010). Figure 4 presents the accountability framework elements, which are intended to work in concert to demonstrate reasonable assurance of implementation.

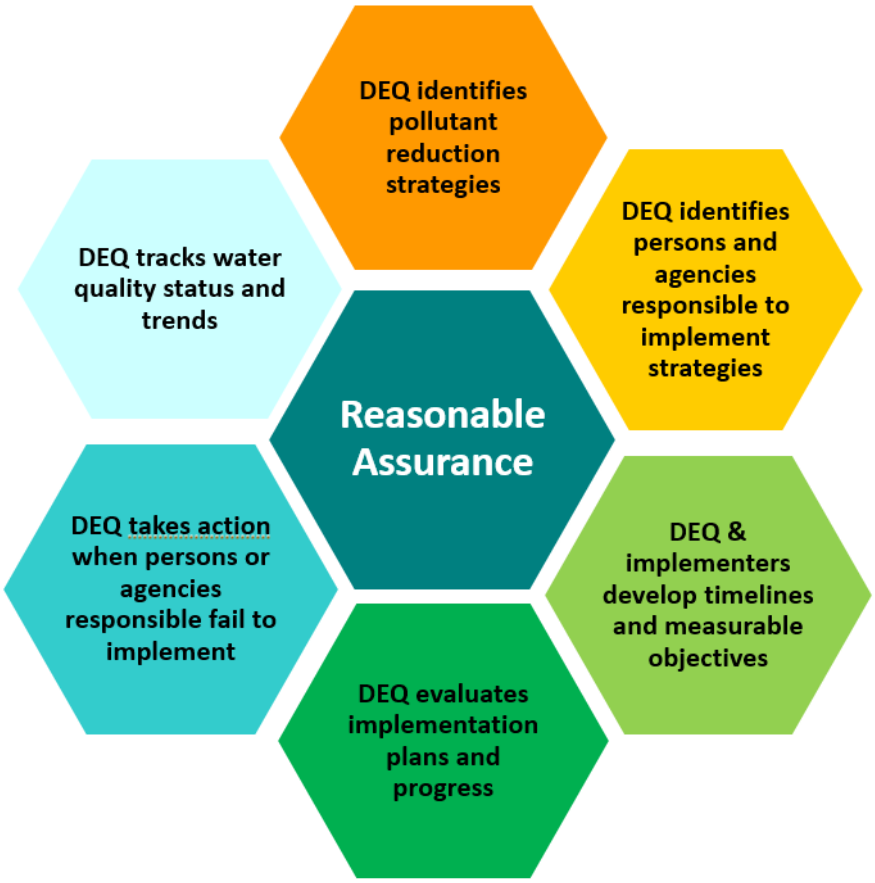

Figure 4: Representation of the Reasonable Assurance Accountability Framework Led by DEQ

Pollutant reduction strategies are identified in Section 2 and more specific strategies, practices and actions will be detailed in each required implementation plan, to be submitted per the timelines in Section 5.4. These strategies and actions are comprehensively implemented through a variety of regulatory and non-regulatory programs. Many of these are existing strategies and actions that are already being implemented within the watershed and demonstrate reduced pollutant loading. These strategies are technically feasible at an appropriate scale in order to meet the allocations. A high likelihood of implementation is demonstrated because DEQ reviews the individual implementation plans and proposed actions for adequacy and establishes a monitoring and reporting system to track implementation and respond to any inadequacies.

The persons, including Designated Management Agencies, responsible for implementation of pollutant reduction strategies are identified in Section 5. General timelines for implementing management strategies and attaining the relevant water quality criteria are provided in Sections 3 and 4.2, respectively. More specific timelines, milestones and measurable objectives will be specified in each required implementation plan. These elements support timely action by both DEQ and other entities responsible for implementation so that enforcement and adaptive management actions can be triggered and evaluation of attainment of TMDL goals occurs.

DEQ periodically reviews reporting by persons and agencies responsible for implementing pollutant reduction strategies to track the management strategies and actions being implemented and evaluate achievements against established timelines and milestones.

Following up on reviews to track progress of implementation plans, DEQ will take appropriate action if the DMAs or responsible persons fail to develop or effectively implement their implementation plan or fulfill milestones. DEQ's actions can take two tracks, enforcement or engagement in voluntary initiatives. DEQ uses both, as appropriate within the process, to achieve optimal pollutant reductions. In some cases, DEQ can assist in facilitating the availability of incentives for meeting voluntary initiatives or providing education. DEQ will also take enforcement actions where necessary based on authorities listed in Section 8 or raise issues to the Environmental Quality Commission, as provided in OAR 340-042-0080.

DEQ tracks water quality status and trends concurrently with implementation of management strategies. DEQ relies on a system of interconnected evaluations, which include DMAs meeting measurable objectives, effectiveness demonstration of pollutant management strategies, accountability of implementation, periodically assessing progress on Oregon's Nonpoint Source Program Five-Year Plan Goals (approved by EPA), discharge monitoring and instream monitoring. DEQ also periodically evaluates water quality data collected through ambient and specific monitoring programs, including monitoring plans developed specifically for the Lower Columbia-Sandy Subbasin, as presented in Section 6. DEQ regularly prepares Status and Trends reports and conducts water quality assessments on status of all waterways with adequate data in Oregon every two years, as required by the Clean Water Act for submittal to EPA for approval as DEQ's Integrated Report. Together, these data and evaluations allow refinement of focus on specific geographic areas or water quality issues and appropriate implementation of adaptive management actions to attain, over time, the objectives of the TMDL.

7.2 Reasonable Assurance Conclusions

DEQ's implementation approach is multi-faceted and requires many targeted management practices across the entire basin to reduce anthropogenic pollutants, regardless of source origination.

The management strategies and practices that must be employed to reduce excess solar radiation loading are spatially distributed and involve multiple responsible persons. Also, highly variable lag times are anticipated following the establishment of shade-producing vegetation to decrease solar radiation reaching streams. For these reasons, there is some uncertainty about the pace of achieving the needed reductions necessary in the Lower Columbia-Sandy Subbasin to attain water quality criteria. DEQ's WQMP addresses this uncertainty by including an extensive monitoring, reporting, and adaptive component that is designed to match the accountability framework used by EPA in its Chesapeake Bay TMDL (2010).

The rationale described in this document stems from robust evaluations, implements an accountability framework and provides opportunities for adaptive management to maximize pollutant reductions. Together this approach provides reasonable assurance to meet state and federal requirements, including for antidegradation, and attain the goals of the TMDL.

8. Legal Authorities

As required in Oregon Administrative Rule 340-042-0040(4)(l)(O), this section cites legal authorities relating to implementation of management strategies.

Clean Water Act, Section 303(d)

The DEQ is the Oregon state agency responsible for implementing the Clean Water Act in Oregon. The EPA delegates many Clean Water Act authorities to the State of Oregon which is administered by the Oregon Environmental Quality Commission through Oregon Revised Statute. Section 303(d) of the 1972 Federal Clean Water Act as amended requires states to develop a list of rivers, streams and lakes that cannot meet water quality standards without application of additional pollution controls beyond the existing requirements on industrial sources and sewage treatment plants. These waters are referred to as “water quality limited.” Water quality limited waterbodies must be identified by the EPA or by a state agency which has been delegated this responsibility by EPA. In Oregon, the responsibility to delegate water quality limited waterbodies rests with DEQ and DEQ’s list of water quality limited waters is updated every two years. The list is referred to as the 303(d) list. Section 303 of the Clean Water Act further requires that TMDLs be developed for all waters on the 303(d) list. The Oregon Environmental Quality Commission granted the DEQ Director authority to develop TMDLs and issue them as orders (OAR 340-042-0060). DEQ was granted authority by the commission to implement TMDLs through OAR 340-042 with special provisions for agricultural lands and nonfederal forestland as governed by the Agriculture Water Quality Management Act and the Forest Practices Act, respectively. The EPA has the authority under the Clean Water Act to approve or disapprove TMDLs that states submit. When a TMDL is officially submitted by a state to EPA, EPA has 30 days to take action on the TMDL. In the case where EPA disapproves a TMDL, EPA must issue a TMDL within 30 days. A TMDL defines the amount of pollution that can be present in the waterbody without causing water quality standards to be violated. A WQMP is developed to describe a strategy for reducing water pollution to the level of the load allocations and waste load allocations prescribed in the TMDL, which is designed to restore the water quality and result in compliance with the water quality standards. In this way, the designated beneficial uses of the water will be protected for all citizens.

Endangered Species Act, Section 6

Section 6 of the 1973 federal Endangered Species Act, as amended, encourages states to develop and maintain conservation programs for federally listed threatened and endangered species. In addition, Section 4(d) of the ESA requires the National Marine Fisheries Service to list the activities that could result in a “take” of species they are charged with protecting. With regard to this TMDL, NMFS’ protected species are salmonid fish. NMFS also described certain precautions that, if followed, would preclude prosecution for take even if a listed species were harmed inadvertently. Such a provision is called a limit on the take prohibition. The intent is to provide local governments and other entities greater certainty regarding their liability for take.

NMFS published their rule in response to Section 4(d) in July of 2000 (see 65 FR 42421, July 10, 2000). The NMFS 4(d) rule lists 12 criteria that will be used to determine whether a local program incorporates sufficient precautionary measures to adequately conserve fish. The rule provides for local jurisdictions to submit development ordinances for review by NMFS under one, several or all of the criteria. The criteria for the Municipal, Residential, Commercial and Industrial Development and Redevelopment limit are listed below:

1. Avoid inappropriate areas such as unstable slopes, wetlands, and areas of high habitat value;
2. Prevent stormwater discharge impacts on water quality;
3. Protect riparian areas;
4. Avoid stream crossings – whether by roads, utilities, or other linear development;
5. Protect historic stream meander patterns;
6. Protect wetlands, wetland buffers, and wetland function;
7. Preserve the ability of permanent and intermittent streams to pass peak flows (hydrologic capacity);
8. Stress landscaping with native vegetation;
9. Prevent erosion and sediment run-off during and after construction;
10. Ensure water supply demand can be met without affecting salmon needs;
11. Provide mechanisms for monitoring, enforcing, funding and implementing; and
12. Comply with all other state and federal environmental laws and permits.

Oregon Revised Statute Chapter 468B

DEQ is authorized by law to prevent and abate water pollution within the State of Oregon. Particularly relevant provisions of this chapter include:

ORS 468B.020 Prevention of pollution

(A) Pollution of any of the waters of the state is declared to be not a reasonable or natural use of such waters and to be contrary to the public policy of the State or Oregon, as set forth in ORS 468B.015.

(B) In order to carry out the public policy set forth in ORS 468B.015, the Department of Environmental Quality shall take such action as is necessary for the prevention of new pollution and the abatement of existing pollution by:

a) Fostering and encouraging the cooperation of the people, industry, cities and counties, in order to prevent, control and reduce pollution of the waters of the state; and

b) Requiring the use of all available and reasonable methods necessary to achieve the purposes of ORS 468B.015 and to conform to the standards of water quality and purity established under ORS 468B.048.

ORS 468B.110 provides DEQ and the EQC with authority to take actions necessary to achieve and maintain water quality standards, including issuing TMDLs and establishing wasteload allocations and load allocations.

NPDES and WPCF Permits

DEQ administers two different types of wastewater permits in implementing Oregon Revised Statute (ORS) 468B.050. These are: the NPDES permits for waste discharge into waters of the United States; and Water Pollution Control Facilities permits for waste disposal on land. The NPDES permit is also a federal permit and is required under the Clean Water Act. The WPCF permit is a state program.

401 Water Quality Certification

Section 401 of the CWA requires that any applicant for a federal license or permit to conduct any activity that may result in a discharge to waters of the state must provide the licensing or

permitting agency a certificate from DEQ that the activity complies with water quality requirements and standards. These include certifications for hydroelectric projects and for 'dredge and fill' projects. The legal citations are: 33 U.S.C. 1341; ORS 468B.035 – 468B.047; and OAR 340-048-0005 – 340-048-0040.

USACE Dam Operation and Management

In association with other federal statues, including House Document No. 531 Volume V, the River and Harbor Act, the Flood Control Act, and the Water Resources Development Act, the USACE is charged with operating its projects in compliance with the federal Clean Water Act, and in accordance with all federal, State, interstate and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water quality pollution as per Title 1 Section 313 (33 U.S.C. 1323).

Oregon Forest Practices Act

The Oregon Department of Forestry is the designated management agency for regulating land management actions on non-federal forestry lands that impact water quality (ORS 527.610 to 527.992, and OAR 629 Divisions 600 through 665). The Board of Forestry has adopted water protection rules, including but not limited to OAR Chapter 629, Divisions 625, 630, and 635-660, which describe best management practices for forest operations. The Oregon Environmental Quality Commission, Board of Forestry, DEQ, and ODF have agreed that these pollution control measures will primarily be relied upon to result in achievement of state water quality standards. Statutes and rules also include provisions for adaptive management that provide for revisions to FPA practices where necessary to meet water quality standards. These provisions are described in ORS 527.710, ORS 527.765, OAR 629-035-0100, and OAR 340-042-0080.

Agricultural Water Quality Management Act

The Oregon Department of Agriculture is responsible for the prevention and control of water pollution from agricultural activities as directed and authorized through the Agricultural Water Quality Management Act, adopted by the Oregon legislature in 1993 (ORS 568.900 to ORS 568.933). It is the lead state agency for regulating agriculture for water quality (ORS 561.191). The Agricultural Water Quality Management Plan Act directs the ODA to work with local communities to develop water quality management plans for specific watersheds that have been identified as violating water quality standards and have agriculture water pollution contributions. The agriculture water quality management plans are expected to identify problems in the watershed that need to be addressed and outline ways to correct the problems. Water Quality area rules for areas within the Sandy Basin include OAR 603-095-1300 to 1380.

Local Ordinances

Local governments are expected to describe in their Implementation plans their specific legal authorities to carry out the management strategies chosen to meet the TMDL allocations. Legal authority to enforce the provisions of a city's NPDES permit would be a specific example of legal authority to carry out management strategies.

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Appendix A: List of Large Reservoirs in the Lower Columbia-Sandy Subbasin TMDL Project Area

DEQ compiled this list of dams from the U.S. Army Corps of Engineers National Inventory of Dams (NID) database and a similar database maintained by the Oregon Water Resources Department (OWRD), dam safety program. DEQ requires the dams in bold to conduct monitoring related to temperature. Depending on analytical or modeling results, reservoir owners or operators may be required to develop a TMDL plan for temperature.

Reservoir Name	NID ID	Owner Names	Owner Types	Primary Purpose	NID Reservoir Storage (Acre-Ft)
Mt. Hood Community College Dam	OR02466	Mt. Hood Community College	Local Government	Irrigation	25
Kelly Creek Regional Detention Pond	OR03793	City of Gresham	Public Utility; Local Government	Irrigation	67
Bull Run Lake Dam	OR00300	City of Portland	Local Government	Water Supply	14500
Belchers Dam	OR00726	Darrold Belcher/Dan Belcher	Private	Irrigation	30
Osburn Reservoir	OR00436	Tom Lehman	Private	Recreation	52
Trillium Lake	OR00350	Oregon Dept. of Fish and Wildlife	State	Recreation	380
Wahkeena Rearing Reservoir	OR00362	Oregon Dept. of Fish and Wildlife	State	Other	180
Diack Reservoir	OR01543	Samuel L. Diack	Private	Irrigation	20
Sester, William H. Reservoir 1	OR00450	William H. Sester	Private	Irrigation	55
Development No. 1 Dam	OR00327	City of Portland	Local Government	Water Supply	33760
Spillway Dam	OR00317	City of Portland	Local Government	Water Supply	25000
Development No. 2 Dam	OR00317	City of Portland	Local Government	Water Supply	25000