

Water Quality Management Plan – Columbia and Lower Snake Rivers Temperature TMDL

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Document information

This document was prepared by Oregon Department of Environmental Quality

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1. Introduction

This Water Quality Management Plan was developed to guide implementation of the Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load developed by the U.S. Environmental Protection Agency. A Water Quality Management Plan is an element of a TMDL, as described by Oregon Administrative Rule 340-042-0040(4)(I), which provides the framework for management strategies to attain and maintain water quality standards. The WQMP is designed to work in conjunction with detailed implementation plans prepared by persons responsible for TMDL implementation. This Columbia and Lower Snake Rivers Temperature WQMP will be adopted by DEQ order.

The Columbia and Lower Snake Rivers Temperature TMDL applies to the entire portion of the mainstem Columbia River in Oregon from river mile 0 to 309. Table 1 includes a list of all Oregon assessment units included in the 2022 Integrated Report approved by the EPA.



Figure 1. Geographic Scope of Oregon's Columbia River Temperature Water Quality Management Plan

Table 1. Oregon 2022 Integrated Report assessment units included in the Columbia and Lower Snake Rivers Temperature TMDL

AU ID	AU Name	AU Description
OR_LK_1707010102_88_100147	Columbia River	Lake Wallula (upstream from McNary, OR)
OR_LK_1707010102_88_100148	Columbia River	Lake Wallula (upstream from Switzler Canyon)
OR_LK_1707010102_88_100149	Columbia River	Lake Wallula (upstream from Spaw Canyon)
OR_LK_1707010102_88_100150	Columbia River	Lake Wallula (upstream from McNary Dam)
OR_LK_1707010106_88_100132	Columbia River	Lake Umatilla (upstream from Lwr Four Mile Canyon)
OR_LK_1707010106_88_100133	Columbia River	Lake Umatilla (upstream from East Paterson Ridge)
OR_LK_1707010106_88_100146	Columbia River	Lake Umatilla (upstream from Glade Creek)
OR_LK_1707010109_88_100144	Columbia River	Lake Umatilla (upstream from Sixmile Canyon)
OR_LK_1707010109_88_100145	Columbia River	Lake Umatilla (upstream from Crow Butte)
OR_LK_1707010114_88_100131	Columbia River	Lake Umatilla (upstream from Sand Spring Canyon)
OR_LK_1707010114_88_100140	Columbia River	Lake Umatilla (upstream from John Day Dam)
OR_LK_1707010114_88_100141	Columbia River	Lake Umatilla (upstream from Blalock Canyon)
OR_LK_1707010114_88_100142	Columbia River	Lake Umatilla (upstream from China Creek)
OR_LK_1707010114_88_100143	Columbia River	Lake Umatilla (upstream from Pine Creek)
OR_LK_1707010501_88_100139	Columbia River	Lake Celilo (upstream from Wishram, WA)
OR_LK_1707010504_88_100137	Columbia River	Lake Bonneville (upstream from Rowena Creek)
OR_LK_1707010504_88_100138	Columbia River	Lake Celilo (upstream from The Dalles Dam)
OR_LK_1707010511_88_100135	Columbia River	Lake Bonneville (upstream from Wind River)
OR_LK_1707010511_88_100136	Columbia River	Lake Bonneville (upstream from White Salmon River)

AU ID	AU Name	AU Description
OR_LK_1707010512_88_100134	Columbia River	Lake Bonneville (upstream from Bonneville Dam)
OR_LK_1708000605_04_100320	Columbia River	Estuary: Mainstem upper
OR_LK_1708000605_04_100323	Columbia River	Estuary: Mainstem lower
OR_LK_1708000605_04_107234	Columbia River	Estuary: Mainstem mouth
OR_SR_1708000108_88_100671	Columbia River	Bridal Veil Creek to Sandy River
OR_SR_1708000108_88_100672	Columbia River	Multnomah Creek to Bridal Veil Creek
OR_SR_1708000302_88_100669	Columbia River	Willamette River to Frogmore Slough
OR_SR_1708000302_88_100670	Columbia River	Sandy River to Willamette River
OR_SR_1708000309_04_100662	Columbia River	Puget Island to Quinns Island
OR_SR_1708000309_04_100663	Columbia River	Wallace Slough to Puget Island
OR_SR_1708000309_04_100664	Columbia River	Mill Creek to Wallace Slough
OR_SR_1708000309_04_100665	Columbia River	Green Creek to Mill Creek
OR_SR_1708000309_04_100666	Columbia River	Owl Creek to Green Creek
OR_SR_1708000309_04_100667	Columbia River	Kalama River to Owl Creek
OR_SR_1708000309_04_100668	Columbia River	Tide Creek to Kalama River
OR_SR_1708000309_04_100675	Columbia River	Frogmore Slough to Tide Creek

1.1 Condition assessment and problem description

The first element of the WQMP, per OAR 340-042-0040(I)(A), is an assessment of water quality conditions in the mainstem Columbia River and a problem description. EPA developed a TMDL in 2020 for temperature, a pollutant causing water quality impairments of the mainstem Columbia and lower Snake Rivers. The Columbia and Lower Snake River Temperature TMDL Tables 3-2 to 3-8, and Appendix B: Temperature Data Compilation, Quality Assurance and Analysis provide details on the location(s) and times of year that water temperatures exceed Oregon’s water quality criteria for aquatic life beneficial uses in the mainstem Columbia River.

As described in the Columbia and Lower Snake River Temperature TMDL Section 1, water temperature impairments pose a variety of adverse impacts that impair physiological health and survival of salmon and steelhead, including multiple populations listed as threatened or endangered under the Endangered Species Act.

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 an implementation framework for the Columbia and Lower Snake Rivers Temperature TMDL. Implementing the TMDL is designed to achieve and maintain

the temperature water quality standards in the mainstem Columbia River in Oregon. The primary objectives of this WQMP are to describe responsibilities for implementing the TMDL; identify management strategies and actions necessary to reduce excess pollutant loads to meet the TMDL targets; and, to provide a strategy to evaluate progress towards attaining water quality standards throughout the entire mainstem Columbia River in Oregon.

2. Proposed management strategies

As required by OAR 340-042-0040(l)(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 Columbia and Lower Snake Rivers Temperature TMDL.

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 2: Management strategies by allocated sources

Source	Reduction Needed to Meet Allocation	Management Strategies
Non-point Source Dam Impacts	0 - 4.6 °C	Systems operations and management changes
National Pollutant Discharge Elimination System (NPDES) permitted point sources in Oregon	0 - 0.1°C	Issuance and enforcement of NPDES permits
Major Tributaries in Oregon	0 - 0.1 °C	<p>Implementation of basin-specific temperature TMDLs:</p> <ul style="list-style-type: none"> • Umatilla River Basin Total Maximum Daily Load and Water Quality Management Plan (2001) • John Day River Basin TMDL and WQMP (2010) • Western Hood Subbasin Temperature TMDL (rev. 2018) • TMDLs for the Lower Columbia-Sandy Subbasin: Temperature (2024) • Willamette River Basin TMDL and WQMP (rev. 2025) <p>Development of basin-specific temperature TMDLs and issuance of a water quality certification for hydropower projects:</p> <ul style="list-style-type: none"> • Lower Deschutes River

DEQ expects that entities identified in Section 4.1 will develop implementation plans that incorporate strategies and practices in Table 2 and in Section 2.1. 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.

Although not specifically detailed in this WQMP, climate change is another important factor affecting temperature. Potential climate change impacts to waterbodies in Oregon may include:

- Higher air temperature;
- Decreased snowpack leading to less water in reservoirs, streams and groundwater; and

- Large-scale wildfires, which can reduce effective shade in streamside areas.

Continued efforts across multiple scales (including local, state, federal, and international) will be required to address the causes of, adapt to, and mitigate the impacts of climate change and support attainment of temperature water quality standards

2.1 Nonpoint source dam management strategies

Section 3.3.2 of the TMDL Appendix D summarizes the impacts mainstem dams have on temperature. Dams create a backwater effect that extends upstream, slowing the flow and causing a large impoundment of water behind the dam. As a result, depths and channel widths increase behind the dams, and water travel times decrease. The existence and operation of the mainstem dams also cause a temporal shift in the seasonal temperature regime. The Columbia River is cooler in the early summer and warmer during the late summer and early fall compared to what its temperature would be without the mainstem dams.

The TMDL considers heat contributed by impounding the river in reservoirs behind the mainstem Columbia and Snake River dams a nonpoint source of pollution and gives a cumulative load allocation to all upstream dams contributing excess heat to a given reach per month. Discharges from a dam's cooling water structures, transformers, and sump pumps are considered a point source in the TMDL – refer to Section 2.2 for a discussion of how permitted point sources will be managed to achieve the wasteload allocation.

Management strategies to address the cumulative nonpoint source excess heat impact from mainstem dams potentially include a range of structural improvements and operational changes, including but not limited to:

- reduction in water withdrawals
- coordination with upstream mainstem Columbia River dams to reduce water temperature flowing into dam reservoirs
- changes to flow routing through dams
- lower minimum operating pool elevations
- reservoir drawdown or dam breach
- installation and operation of structural improvements, such as:
 - selective withdrawal systems
 - mechanical chillers
 - thermal curtains
 - artificial shading devices or structures
 - airlift/upswelling mixing systems
 - geothermal heat exchangers
 - evaporative cooling towers
 - managed aquifer recharge
 - spraying/misting

2.2 Point source 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 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 many ways to achieve compliance with these limits and requirements, which can be incorporated into NPDES permits during renewal or issuance. These include, but are not limited to, immediate compliance with the limits, the use of compliance schedules, and other pathways allowed under state and federal rules.

2.3 Major tributaries priority management strategies

DEQ has developed water quality management plans to implement the five temperature TMDLs for major tributaries in Oregon. Each of the TMDLs includes specific management strategies to address excess thermal loading to the streams. For detailed information on the priority management strategies for specific waterbodies, refer to the TMDLs included in Table 2.

Table 3 includes proven strategies (and practices within the strategies) summarized by source of thermal loading. These strategies and practices are adapted from published sources and represent general approaches for addressing contributions of heat to tributary streams that discharge into the Columbia River. 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 3 are supported by Oregon Department of Agriculture, the U.S. Department of Agriculture Natural Resources Conservation Service, Oregon State University Extension Service, Oregon Plan for Salmon and Watersheds, and other available published sources.

Table 3: Priority temperature management strategies for major tributaries by source

Pollutant Source/Activity	Management Strategies
Insufficient riparian vegetation height, density or width	<p>The primary goal is to 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.</p> <p>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 methods; identify and protect cold water refuges.</p> <p>Maintain plants until free to grow; monitor survival rates.</p> <p>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, designate conservation easements along streamside areas.</p>
Water withdrawals, flow alteration	<p>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</p>
Channel modification and hydromodification	<p>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 reconstruction/obliteration activities;</p> <p>streamside fencing or other livestock exclusion methods; protect and enhance cold water refuges; remove in-channel ponds or modify pond structures to reduce temperature increases downstream; and protect areas that don't require restoration actions</p>

3. Timelines for implementing strategies

OWR 340-042-0040(I)(D) requires 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 is discussed separately.

3.1 DEQ permit revisions

NPDES permits have five-year terms. DEQ incorporates any required TMDL wasteload allocations into NPDES permits when they are renewed. Applicable effluent limits for point sources are available in the TMDL document in Tables 6-11 and 6-12. The tables include permit numbers, the location (expressed as the river mile, or RM), flow, temperature, and heat loads for each permitted point source.

Since the TMDL was finalized and approved, DEQ has issued NPDES permits to McNary Dam (permit number OR0055001) and John Day Dam (permit number OR005500) with heat load allocations consistent with the TMDL.

3.2 Management strategies implemented by responsible persons

This section of the WQMP includes an estimate of the timeline for implementation of management strategies that will be sufficient to attain water quality standards.

Significant uncertainty exists in estimating the timeline for the modeling, evaluation, and implementation of management strategies to address the dam sector load allocation. DEQ anticipates the need for a comprehensive water quality modeling approach at the onset (and on an ongoing, iterative basis to inform adaptive management) to identify and prioritize potential management strategies. The expected time to implement different potential management actions likely ranges considerably. Structural improvements at dams (such as the installation of artificial shade structures or thermal curtains), for example, are likely to take longer to implement than operational measures (such as modifications to minimum pool elevations or altering how water is routed through dams).

For tributary-specific implementation timelines, refer to each waterbodies respective TMDL and WQMP identified in Table 2.

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 DMA 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(I)(E) requires an explanation of how implementing the proposed management strategies will result in attainment of water quality standards.

The implementation of dam operations and/or management changes is expected to reduce nonpoint source heat contributions from the existence and operations of the mainstem dams. EPA's analysis of the relative contributions of excess heat from allocated sources demonstrates that the cumulative nonpoint source heat loading from dam impoundments have a substantially greater impact than point sources and tributaries (TMDL Section 6.5). At certain times of the year, the dam impact exceeds the full allowable loading capacity (0.3°C) by a substantial margin. DEQ identified priority dam management or structural improvement strategies in Section 2.1. DEQ expects dam operators to evaluate and implement one or more of these strategies or other strategies developed by dam operators and approved by DEQ to reduce contributions of heat caused by the operation and existence of the dams.

The issuance and enforcement of heatload allocations to permitted NPDES dischargers will result in achievement of the cumulative wasteload allocation for point sources.

The TMDL allocates a cumulative temperature increase of 0.1°C to 23 major tributaries (refer to TMDL Table 6-23 for a complete list of the major tributaries). Table 2 identifies the six major tributaries that discharge into the mainstem Columbia River in Oregon. The TMDL analysis indicates that the temperature impact at each of the major tributary mouths needs to be at or below 0.5°C warmer compared to the background condition to achieve the sector load allocation in the mainstem. If the major tributaries met their respective applicable numeric temperature criteria at their mouths during the summer months, the TMDL's sensitivity analysis indicates the cumulative impact would result in a maximum improvement (i.e., decrease in temperature) of 0.2 °C in the Columbia River.

[Placeholder: text describing how management strategies support attainment of cold water refuges narrative water quality standard]

4.2 Timelines for attaining temperature water quality standards

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

DEQ expects attainment of the numeric and narrative water quality standards will require the adaptive management of temperature actions to address the impacts across all of the allocated sources: dams, major tributaries, and permitted point sources. Based on EPA's analysis, dams have a substantially greater temperature impact than permitted point sources and tributaries and reductions in current impacts will be needed to achieve the allocation. DEQ anticipates the need for temperature reduction actions to be modeled, evaluated for feasibility, and then implemented across the TMDL extent to address the cumulative impacts of the mainstem dams. Given the high degree of uncertainty related to potential range of actions and their potential effectiveness, DEQ anticipates that it could take years or decades to fully attain the numeric and narrative water quality criteria in Oregon's waters.

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.

Although not specifically included in the definition section (OAR 340-042-0030), the TMDL rule provides 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. And 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.

Therefore, for purposes of this Columbia and Lower Snake Rivers Temperature WQMP and for implementation of the temperature TMDL, 'responsible person' is defined as any entity responsible for any source of pollution addressed by the TMDL, whether or not they have regulatory authority or other legal controls over the pollution causing lands or activities. Unless otherwise specified, all responsible persons, including DMAs, are required to develop, submit, implement and revise, as needed, an implementation plan specific to the Columbia and Lower Snake Rivers Temperature TMDL that includes: management strategies; timelines for implementation; a schedule for achieving milestones; and a performance monitoring component with a plan for period review and plan revision. Table 4 contains the list of these responsible persons in Oregon waters.

Table 4. List of responsible persons including designated management agencies

Entity	Jurisdiction in Oregon Waters
U.S. Army Corps of Engineers	McNary Dam; John Day Dam, The Dalles Dam, Bonneville Dam

Table 4 is not an exhaustive list of every individual that bears responsibility for improving water quality to achieve temperature targets on the mainstem Columbia River. In the TMDL area, there are 11 other dams on the mainstem Columbia and Snake Rivers owned and operated by federal agencies (U.S. Army Corps of Engineers and Bureau of Reclamation) and public utility

districts. For the major tributaries in Oregon, refer to the TMDLs listed in Table 2 for a list of designated management agencies and responsible persons who must implement actions to address excess thermal loads. All citizens that live, work and recreate in the watershed can take steps to reduce pollution and protect or restore water quality to attain standards and designated beneficial uses. Active participation is required to achieve long-term water quality improvements throughout the watershed.

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.

No implementation plans to address the nonpoint source of heat from mainstem dams were developed prior to issuance of the Columbia and Lower Snake Rivers Temperature TMDL.

[Placeholder: insert description of the Water Quality Attainment Plans scheduled to be sent to Washington State Department of Ecology and DEQ in March 2026. The water quality attainment plans are intended to provide a schedule for analysis and implementation of actions to address the nonpoint source dam impacts from the operation of each lower four Columbia River dams]

For the major tributaries with EPA-approved TMDLs, refer to the respective tributary-specific WQMP for additional information on source or sector-specific implementation plans that have been developed and approved by DEQ.

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 to be included in implementation plans. 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 below.

5.3.1 Management strategies

Each entity required to develop a TMDL implementation plan is expected to include priority management strategies from Section 2.1 and potentially other practices and actions appropriate for activities and landscape conditions specific to the entities' pollutant sources or source sectors.

The TMDL assigns a cumulative load allocation to the nonpoint source impacts from the operation and existence of mainstem dams. TMDL Tables 6-6 through 6-10 detail the cumulative allocation exceedance at each monitoring location. In most cases, multiple upstream dams are contributing excess thermal loads. For a given monitoring location, the dams contributing to the cumulative impairment are those that are located at or upstream of the monitoring location that have a reach impact in Column E greater than zero. DEQ expects designated management agencies to detail coordination activities undertaken by upstream mainstem dams in the TMDL geographic area, including at a minimum each of the contributing dam reaches and to include a description, timeline, and schedule of the priority management strategies from Table 2 and Section 2.1 or other appropriate practices and actions that have been completed or planned to be implemented to achieve the cumulative load allocation.

5.3.2 Timeline and schedule

Each implementation plan must include commitment to implementation of specific actions to achieve implementation of specified management strategies on a reasonable timeline, which includes a schedule specified for meeting measurable milestones to document progress. To meet the intent of this requirement and be useful for the requirement to track and report progress, each management strategy action must be described using the SMART elements: Specific, Measurable, Achievable, Relevant, Time bound.

5.3.3 Performance monitoring, reporting and plan review and revision

Each implementation plan must include a commitment to prepare and a date to submit to DEQ annual reports on performance monitoring. These reports must include tracking of implementation of the management strategies, timelines and measurable milestones specified in the implementation plan as well as evaluation of the effectiveness of the implementation.

Implementation actions should be tracked by accounting for the numbers, types and locations of projects, best management practices, education activities or other actions taken to improve or protect water quality.

Implementation plans must include periodic assessment of whether implementation activities, which may include structural and non-structural best management practices or BMPs, are effective in improving management practices, land condition or sector community behaviors. Annual reports must summarize the status and results of these evaluations on the relevant time scale.

Implementation plans must be reviewed, revised as appropriate, and approved by DEQ every five years. The annual reports of activities tracked and effectiveness evaluations can be used for this review. If a revised plan is required following the five-year review, DEQ will identify a date for submission of the revised plan for DEQ approval.

5.3.4 Implementation public involvement

As required in OAR 340-042-0040(I)(L), implementation plans prepared by responsible persons must include a plan to engage and educate the public in implementation of management strategies. This component must align with the nine key elements for watershed-based plans, as described in EPA's Handbook for Developing Watershed Plans to Restore and Protect Our Waters (EPA, 2008). Implementation plans and future amended versions must be posted to a publicly accessible website.

5.3.5 Maintenance of strategies over time

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

5.3.6 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 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 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 expects each DMA to provide a fiscal analysis of the resources needed to develop, execute and maintain the programs and projects described in implementation plans. This analysis should be in five-year increments to estimate costs, demonstrate sufficient funding is available to begin implementation and identify potential future funding sources to sustain management strategy implementation. DEQ recommends that all responsible persons including DMAs prepare the following level of economic analysis:

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

5.4 Schedule for implementation plan submittal

OAR 340-042-0040(4)(I)(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 notification of issuance of the WQMP, persons, including DMAs, responsible for developing implementation plans must submit implementation plans to DEQ for review and approval. DEQ may coordinate with responsible parties and the State of Washington to align relevant reporting deadlines related to the implementation of the Columbia and Lower Snake River TMDL.

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.

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 scope of these particular TMDLs.

Once approved, DEQ expects implementation plans to be fully implemented according to the timelines and schedules for achieving measurable milestones specified within the plans. As required in Section 5.3 above, reports on tracking and evaluation of implementation progress must be submitted annually, on the date specified in the approved implementation plan. And implementation plans must be reviewed and revised as appropriate for DEQ approval every five years, submitted on the date specified in the approved 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 these TMDLs.

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. This required reporting from each responsible entity on tracking of management actions implemented, milestones met and periodic evaluation of performance monitoring, fulfills the first fundamental component of DEQ's approach and makes up the primary monitoring information DEQ reviews in gaging progress toward meeting TMDL goals.

DEQ also expects the responsible persons named in Section 5.1 to undertake monitoring actions in areas within their jurisdiction or ownership to help determine the status of instream

water quality. This effort will be progressive, starting with review of existing data and monitoring locations, then adjusted as needed to improve understanding of current water quality status.

6.2 Plan and schedule for reviewing monitoring information

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 implementation.

Adaptive management is a process that acknowledges and incorporates improved technologies and practices over time in order to refine implementation. A conceptual representation of the TMDL adaptive management process is presented in Figure 2.

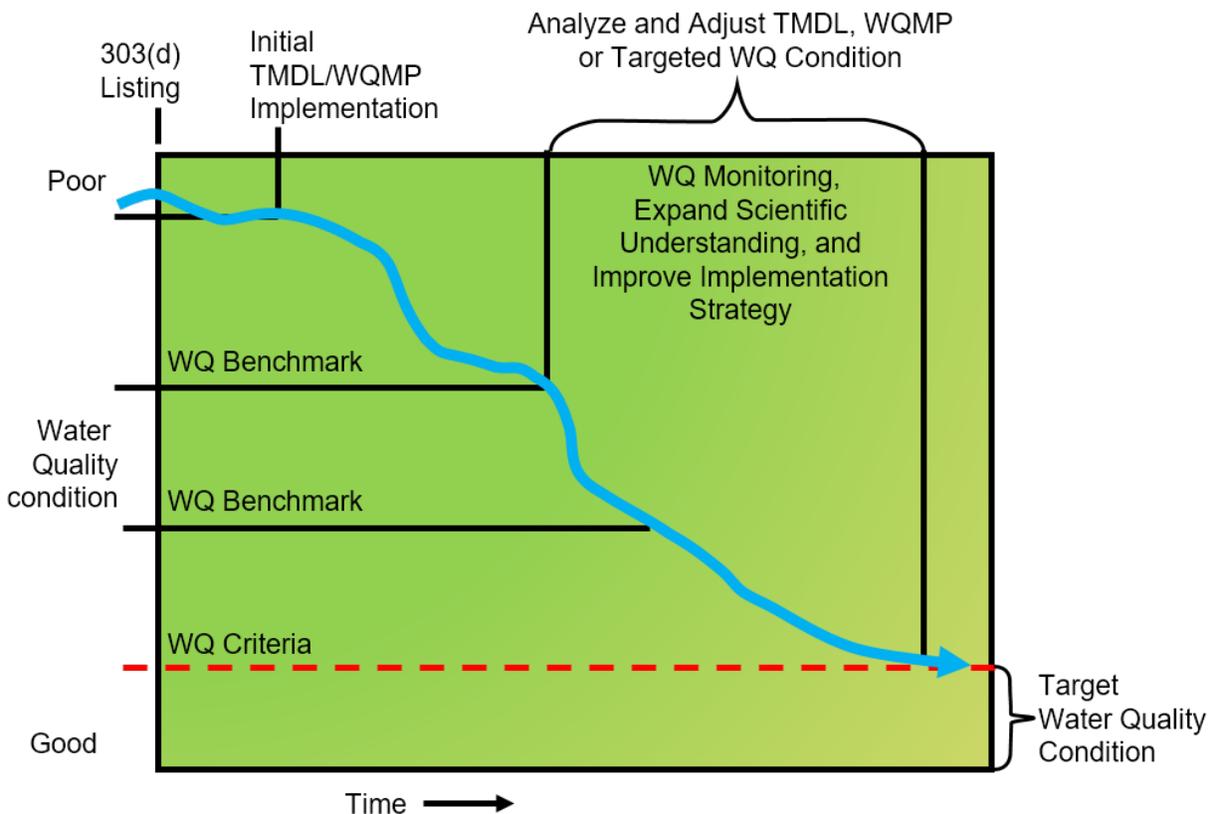


Figure 2. Conceptual representation of adaptive management

DEQ considers entities complying with DEQ-approved TMDL implementation plans to be in compliance with the TMDLs. The information generated by each of the DMAs or other entities compiling annual reports and gathering data 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.

Annually, DEQ will review annual reports, participate with DMAs and other responsible persons in review of monitoring information and participate in implementing the 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.

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)(I)(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.

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)].

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 and EPA’s best professional judgment as to reasonable assurance that the TMDL’s load allocations will be achieved. EPA past practice directs that these determinations include consideration of whether 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.

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 Columbia and Lower Snake Rivers Temperature TMDL was 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. 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.

The rationale described in this document stems from robust evaluations, implements an accountability framework and provides opportunities for adaptive management to maximize pollutant reductions. In addition, DMAs and other groups have been continuing to implement on-the-ground actions since the establishment of the respective temperature TMDLs in the Major Tributaries identified in Table 2. NPDES permitted discharges have, or will incorporate during the next five-year permit revision cycle, wasteload allocations consistent with the TMDL. Together this approach provides reasonable assurance to meet state and federal requirements, including for antidegradation, and attain the goals of the TMDL.

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. Figure 2 presents the accountability framework elements, which are intended to work in concert to demonstrate reasonable assurance of implementation.



Figure 3. 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 2. 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.

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, discharge monitoring and instream monitoring. DEQ also periodically evaluates water quality data collected through ambient and specific monitoring programs, including the fixed temperature monitoring stations accessible through the Columbia River Data Access in Real Time (DART) database, as documented in TMDL Table 3-1. 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 targeted and sustained management strategies and practices across the watershed to reduce levels of excess heat to the Columbia River, regardless of source origination.

The nonpoint sources of heat to the Columbia River associated with water quality impairments include some contributions from background sources and climate change. The management strategies and practices that must be employed are spatially distributed and involve multiple responsible persons.

Human alteration of the earth's atmosphere has changed the timing, amounts, temperature, and quality of precipitation worldwide. This global phenomenon may produce localized changes to water quality in the Columbia River Basin. Implementing policies and projects that reduce and mitigate GHG releases will support efforts to adapt to climate change and the goals of this temperature TMDL.

Oregon has goals to reduce GHG emissions 75 percent below 1990 levels by 2050. The Oregon Climate Action Commission is responsible for preparing detailed forecasts of GHG emissions and submits these data in a biennial report to the Legislature. The OCAC uses data

provided from DEQ, and other state agencies, to track trends in GHG emissions and recommend strategies for meeting the state's emissions reduction goals.

Oregon Governor Kate Brown signed Executive Order 20-04 in 2020, directing state agencies to take action to reduce and regulate GHG emissions. Following this executive order, 24 state agencies participated in developing the 2021 State Agency Climate Change Adaptation Framework. This framework is meant to support planning and coordination between state agencies, and in collaboration with local government and community partners, in implementing actions to achieve climate change adaptation in Oregon.

DEQ continues to work toward the goals of Executive Order 20-04, and in 2024 DEQ's Environmental Quality Commission adopted the Climate Protection Program. The CPP is a climate mitigation program that sets an enforceable declining cap on GHG emissions from fossil fuels used throughout Oregon, including diesel, gasoline, and natural gas. The program is designed to reduce fossil fuel emissions by 50 percent by 2035 and 90 percent by 2050. As part of this program, DEQ is developing carbon emissions intensity targets for energy-intensive trade-exposed industries (EITEs are primarily manufacturing industries that release high amounts of GHG and face a lot of national and global competition for their products), and direct natural gas sources. The program also prioritizes equity by promoting benefits and alleviating burdens for communities of color, tribal communities, rural communities, and communities experiencing lower incomes. More information about this program and other DEQ Office of Greenhouse Gases programs can be accessed on DEQ's website. A comprehensive summary of Oregon's efforts related to climate change mitigation and adaption can be found in OCAC reports online.

While state level programs will reduce GHG emissions from within Oregon, the complex impacts of climate change on temperature loadings to Columbia River mainstem and its tributary rivers and streams will require concurrent actions at multiple scales to address the causes and mitigate the effects of global climate change. Urgent and ongoing action is required at the federal level to support large scale and long-term reductions of GHG emissions. DEQ also recognizes that work around climate change can shift depending on the political environment and priorities of the federal administration

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)(I)(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 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 statutes, 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 Willamette Basin include OAR 603-095-2100 to 1160, OAR 603-095-2300 to 2360, OAR 603-095-2600 to 2660, and OAR 603-095-3700 to 3760.

Local ordinances

Local governments are expected to describe in their implementation plans their specific legal authorities to carry out the management strategies necessary to meet the TMDL allocations. If new or modified local codes or ordinances are required to implement the plan, the DMA will identify code development as a management strategy. Legal authority to enforce the provisions of a city's NPDES permit would be a specific example of legal authority to carry out specific management strategies.