Draft Total Maximum Daily Loads for the Rogue River Basin

Water Quality Management Plan Temperature

Feb. 26, 2026

State of Oregon
DEQ Department of Environmental Quality

This document was prepared by:
Bill Meyers

Oregon Department of Environmental Quality
Water Quality Division
700 NE Multnomah Street, Suite 600
Portland Oregon, 97232
Contact: Steve Mrazik
Phone: 503-229-5983 x267
www.oregon.gov/deq

State of Oregon
DEQ Department of Environmental Quality

Non-discrimination statement

DEQ does not discriminate on the basis of race, color, national origin, disability, age, sex, religion, sexual orientation, gender identity, or marital status in the administration of its programs and activities.

Visit DEQ's Civil Rights and Environmental Justice page.

Table of contents

List of tables

List of figures

1. Introduction

The Oregon Department of Environmental Quality developed this Water Quality Management Plan to support implementation of the Rogue River Basin Total Maximum Daily Load for Temperature. A TMDL sets a pollution budget called the loading capacity, which is the most pollution a waterbody can receive and still meet water quality standards. The budget is divided into allocations for point sources, such as wastewater treatment plants discharging directly into rivers or streams through a pipe or outfall, and nonpoint sources, which include diffuse contributions like stormwater runoff from land surfaces and natural background conditions.

A WQMP is an element of a TMDL, as required by Oregon Administrative Rule 340-042-0040(4)(l). It describes strategies to meet TMDL allocations and provides the framework for meeting water quality standards. The WQMP sets expectations for named responsible persons, including Designated Management Agencies. Designated Management Agencies are public entities formally designated by DEQ to implement TMDLs. Under OAR 340-042-0030(2), DMAs are federal, state, or local agencies with authority over pollutant sources and designated by DEQ in a TMDL. This WQMP also identifies other responsible persons, including utilities, dam and reservoir operators, special districts, and private entities. These entities affect water quality but are not formally designated as DMAs. For purposes of this WQMP, a 'responsible person' is any entity accountable for sources of pollution addressed by the TMDL.

The WQMP guides the preparation of implementation plans that these entities must develop and carry out. The WQMP also outlines accountability and adaptive management to ensure progress over time.

This temperature WQMP will be proposed for adoption by the Oregon Environmental Quality Commission as Oregon Administrative Rule 340-042-0090(5)(a). DEQ may amend the WQMP as it updates or adopts new TMDLs for the Rogue River Basin. References to administrative rules include any future amendments, revisions, or renumbered versions.

- The Rogue River Basin encompasses a group of five subbasins (HUC8) that collectively make up the drainage area for the Rogue River: Applegate Subbasin (17100309), Illinois Subbasin (17100311), Lower Rogue Subbasin (17100310), Middle Rogue Subbasin (17100308) and Upper Rogue Subbasin (17100307). This area is collectively referred to as the Rogue River Basin in this WQMP. EPA previously approved DEQ's temperature TMDLs covering all five subbasins as listed below in order of the issuance year. However, 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 Rogue River Basin.

    - Upper Sucker Creek (1991)
    - Lower Sucker Creek (2002)
    - Lobster Creek Watershed (2002)
    - Applegate Subbasin (2004)
    - Bear Creek Watershed (2007)
    - Rogue River Basin (2008)

This TMDL and WQMP replaces all the listed temperature TMDLs in the Rogue River Basin. This TMDL applies to all waters of the state in the subbasins listed in Table 1. The subbasins and associated waterbodies listed in Table 1 will hereafter be referred to as the "Rogue River Basin."

Table 1: Waterbodies included in Rogue River Basin TMDL and WQMP

Subbasin	Waterbodies Included
1. Applegate Subbasin (17100309)	All waters of the state.
2. Illinois Subbasin (17100311)	All waters of the state.
3. Lower Rogue Subbasin (17100310)	All waters of the state.
4. Middle Rogue Subbasin (17100308)	All waters of the state.
5. Upper Rogue Subbasin (17100307)	All waters of the state.

Section 2.1 of the Rogue River Basin Temperature TMDL contains a listing of all Category 5 temperature impairments from the 2022 Integrated Report (DEQ, 2024). The TMDL Technical Support Document (TSD) contains a complete listing of all the Assessment Units included in this rulemaking (DEQ, 2024a).

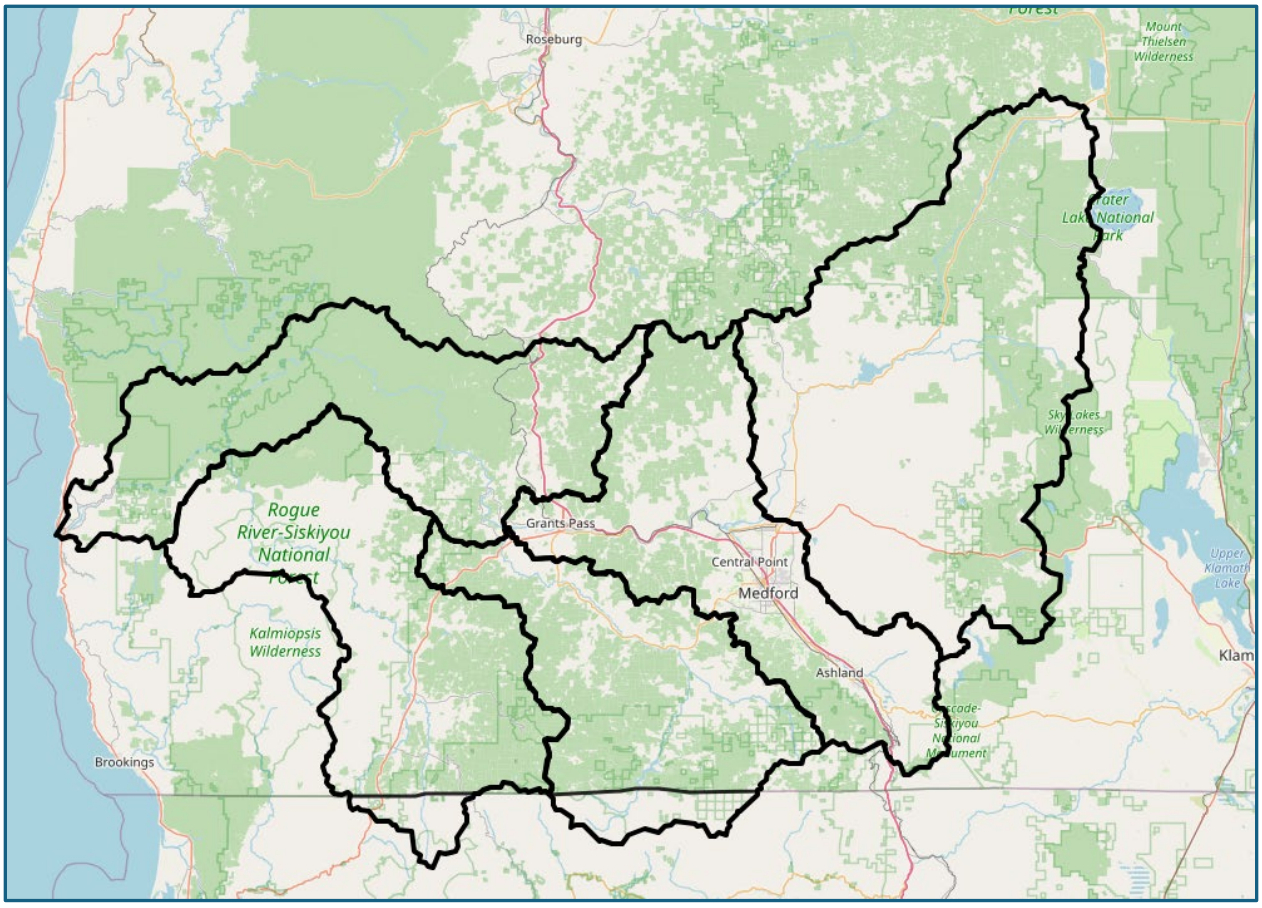

Figure 1. Map of the 2026 Rogue River Basin TMDL for Temperature project area and HUC 8 subbasins

2. Condition assessment and problem description

OAR 340-042-0040(4)(I)(A) requires each WQMP to include a condition assessment and problem description. The TMDL addresses temperature impairments documented in Oregon's 2022 Integrated Report (category 5 or 4A). These waters exceed state numeric temperature criteria established to protect fish and aquatic life beneficial uses, including salmon and trout spawning, core cold water habitat, and salmon and trout rearing and migration. The TMDL identifies excess heat from point and nonpoint sources as the pollutant of concern and establishes thermal wasteload allocations, load allocations, and surrogate measures to address thermal loading.

The TMDL uses a watershed approach, so its allocations and surrogate measures apply to all Waters of the State in the TMDL project area, not only to impaired waters. As a result, it also covers unimpaired and unassessed categories and supports addressing future temperature concerns unless new information requires an amendment.

3. Goals and objectives

OAR 340-042-0040(4)(I)(B) requires the WQMP to identify goals and objectives. The goal of this WQMP is to implement the 2026 Rogue River Basin TMDL for Temperature and meet numeric temperature criteria. The objectives of this WQMP are to provide a framework of temperature management strategies to reduce excess heat loads, assign implementation responsibilities to responsible persons, including DMAs, and establish performance monitoring to track progress, support adaptive management, and ensure consistency with antidegradation requirements.

4. Proposed management strategies

OAR 340-042-0040(4)(I)(C) requires the WQMP to propose management strategies designed to meet wasteload and load allocations in the TMDL. Under OAR 340-042-0030(6), "management strategies" are measures to control the addition of pollutants to Waters of the State, including pollutant control practices, technologies, processes, siting criteria, operating methods, best management practices, or other alternatives.

This WQMP identifies strategies to support attainment of temperature criteria, wasteload and load allocations, and surrogate measure targets such as effective shade. Responsible persons, including DMAs, must include strategies in their implementation plans and apply those suited to their jurisdiction, land use, and stream conditions. Alternative or additional practices may be used if they achieve equivalent outcomes and comply with applicable rules.

4.1 Point sources

Point source permitting is the primary means of achieving the wasteload allocations assigned in the TMDL. DEQ incorporates these WLAs into National Pollutant Discharge Elimination System permits during issuance, renewal, or modification. Under federal rules, effluent limits in NPDES permits must be consistent with the assumptions and requirements of the TMDL. Permits

translate WLAs into enforceable effluent limits and permit conditions under federal and state regulations. Section 9.1.2 of the TMDL describes thermal WLAs for point sources.

Permits may include narrative or numeric effluent limits, temperature monitoring requirements, and conditions requiring additional pollutant reduction strategies. Facilities can meet their WLA through direct discharge controls, extended compliance schedules, water quality trading, or other mechanisms allowed under state and federal rules.

DEQ encourages NPDES permit holders to work with responsible persons, including DMAs, to develop water quality trading programs that meet assigned allocations and support effective shade targets. Water quality trading is available as a compliance option under Oregon's water quality trading rules (OAR 340-039). Trading allows permitted sources to secure equivalent or greater pollutant reductions from other sources in the watershed, most often through riparian restoration that increases effective shade. Programs must use DEQ-approved methods to quantify reductions, demonstrate equivalency, and verify performance through monitoring. Green infrastructure established through trading can also improve watershed resilience to climate change.

For more information, see DEQ's Water Quality Trading page. Additional information supporting NPDES permit development is included in TMDL Appendix EXX.

4.2 Nonpoint sources

Nonpoint sources contribute to thermal loading from land uses that affect streamside vegetation and stream surface heating. The practices summarized below include proven approaches recommended by the Oregon Department of Agriculture, USDA Natural Resources Conservation Service, Oregon State University Extension, Oregon Watershed Enhancement Board, EPA, US Bureau of Reclamation, and other partners. These practices support adaptive implementation and reflect the range of conditions across the basin. Table 2 summarizes nonpoint source strategies proposed to meet load allocations and surrogate measure targets. This list is not exhaustive; alternative or additional practices may be used if they achieve equivalent outcomes and comply with applicable rules.

Table 2. Priority temperature management strategies

Thermal Source	Management Strategies
Riparian habitat removal	Plant native trees and shrubs in riparian areas; maintain until free-to-grow, monitor survival
	Protect existing canopy with fencing, easements, or ordinances; prioritize sites meeting effective shade targets
	Thin overly dense stands and remove invasive species to promote riparian vegetation; minimize shade loss during treatment (see TMDL Appendix C)
	Install off-channel watering systems or fencing to exclude livestock and prevent trampling of riparian vegetation
	Apply riparian setbacks, overlay zones, or design standards to limit vegetation removal during development
	Relocate or modify infrastructure (culverts, roads, utilities) that restrict riparian growth or contribute to warming
	Support landowners with planting programs, cost-share incentives, outreach, and partner technical assistance
Modifications to flow/discharge	Improve irrigation efficiency through measures such as converting open ditches to piped or pressurized systems
	Implement municipal water conservation; repair leaks; reduce summer demand
	Provide incentives for water conservation
	Restore wetlands and floodplains to support baseflow and groundwater recharge
	Lease or transfer water rights to instream use during the critical period
	Coordinate water rights reviews, drought planning, and flow agreements
	Apply seasonal water use restrictions during low-flow conditions

Thermal Source	Management Strategies
Channel modification and widening	Reconnect incised channels with floodplains to restore hydrologic exchange and reduce heating Restore side channels and off-channel wetlands to improve hydrologic complexity Place large wood or other structures to reduce solar exposure and create cool water refugia Stabilize eroding banks with native vegetation or bioengineering to limit channel widening and solar exposure Remove or modify levees, berms, culverts, ponds, tide gates, or other barriers restricting floodplain access Support natural beaver activity or install beaver dam analogs to promote overbank flow and channel complexity Modify or remove streamside roads that restrict channel function Protect channel areas that provide natural shade and floodplain connection and do not require active restoration
Dam and reservoir operations	Manage release to draw cooler water from deeper layers and adjust timing and volume to limit warming and support stream baseflow during critical periods Retrofit or modify outlets to allow selective withdrawal and improve temperature control Remove or modify small in-channel reservoirs and ponds where feasible to reduce thermal loading

4.2.1 Streamside vegetation

Loss of streamside vegetation is one of the largest contributors to excess solar loading in the basin (TMDL, Section 7.2). Overstory riparian vegetation reduces solar radiation by shading streams. Effective shade is the amount of sunlight blocked by vegetation and terrain and serves as the primary surrogate used to express load allocations in the TMDL. Effective shade targets represent another way to express the amount of solar loading that will meet the human use allowance and load allocations for entities managing streamside vegetation. TMDL Appendix CXX summarizes the factors that influence effective shade.

The primary vegetation management strategies to meet effective shade targets include:

1. **Vegetation planting and establishment**
   Plant native trees and shrubs in streamside areas with little or no shade-producing overstory to increase effective shade and improve riparian function. Many of these areas are dominated by invasive species that limit natural regeneration and canopy development.
2. **Vegetation protection, enhancement, and maintenance**
   Protect existing streamside vegetation from removal to maintain shade levels and support additional growth where needed to meet effective shade targets. Enhance and maintain vegetation to support growth and survival to meet effective shade targets.

3. **Vegetation thinning and management**
   Overly dense tree stands, or invasive species can limit the development of healthy, shade-producing forests. Thin or manage vegetation as needed to promote a healthy, mature riparian canopy and support long-term shade benefits. These actions must minimize the extent, duration, and severity of shade loss to protect long-term conditions and prevent significant or prolonged reductions.

4.2.2 Flow management strategies

Flow-related changes influence stream temperature by reducing stream volume, increasing water residence time, and limiting the cooling effect of groundwater inputs. The TMDL determined that reduced flows from withdrawals contribute to elevated temperatures during the critical period in several locations. Lower flows also reduce a stream's ability to dilute pollutants and increase daily fluctuations in temperature.

The TMDL allocates a portion of the human use allowance to thermal loading from flow modifications in some locations, but not across the entire basin (Consumptive use water management and withdrawals TMDL Tables 9-1 through 9-5). Strategies to improve baseflow, reduce seasonal withdrawals, and restore hydrologic function in critical conditions are needed throughout the basin to support temperature criteria and, where applicable, meet allocations.

Priority actions include irrigation efficiency improvements, instream flow protections, reconnection of wetlands and floodplains, infrastructure modification, and coordination with water providers. Water conservation links water quantity to water quality by leaving more flow instream. Restoring flows may also require establishing instream water rights through donation, purchase, or conversion of existing rights. Although DEQ does not regulate water rights, these strategies can improve stream conditions, support load allocations, and strengthen riparian and channel restoration efforts.

4.2.3 Channel modification strategies

Changes to channel form and complexity influence stream temperature by altering water depth, width, and exposure to solar radiation. Hydromodification activities that alter channel morphology can impact stream temperature (Galli and Dubose, 1990). Simplified or incised channels are often wider and shallower, increasing the surface area exposed to sunlight and reducing opportunities for hyporheic exchange which elevates thermal loading (Larson and Larson, 1996). These physical changes limit the effectiveness of riparian and flow restoration efforts. Activities such as uncontrolled livestock access, channelization, and floodplain disconnection contribute to these changes and raise stream temperatures. As streambanks erode and slough, sediments can accumulate on the streambed, further reducing depth and increasing solar exposure. Loss of riparian vegetation also diminishes shade and increases vulnerability to thermal loading (EPA, 2007, EPA 2017).

Loss of floodplain connection reduces groundwater recharge and summer baseflows, increasing stream temperatures (EPA, 2017). The TMDL incorporates thermal loading from channel modification into background loading rather than assigning separate allocations or surrogate measures. Restoring natural channel form supports attainment of temperature standards by reducing solar exposure and promoting physical processes that retain cold water. Restoration may include reconnecting incised streams with floodplains, stabilizing eroding banks with bioengineering, placing large wood to increase habitat complexity, and restoring side channels or off-channel habitats. Management of hydromodification activities may also include BMPs such as riparian restoration, livestock fencing, flow augmentation, reservoir operations, and site-specific channel restoration projects.

4.2.4 Dam and reservoir operation management strategies

Surface water impoundments contribute to elevated stream temperatures where reservoir operations increase exposure to warm surface water and reduce delivery of cold water during the critical period. The TMDL source assessment and thermal modeling identified large dams and reservoirs as sources of thermal loading under certain conditions. Dams of all sizes can increase stream temperature, depending on dam and stream characteristics, location, and watershed density.

The TMDL allocates a portion of the human use allowance to dam and reservoir operations in some locations and establishes requirements that no net warming occur below the dam beyond the assigned HUA during the critical period, expressed through upstream temperature surrogate measure targets (see TMDL Section 9.1.5.1XX). Implementation strategies include modifying outlet structures for selective withdrawal of cooler water, adjusting release timing and volume to avoid warming, and coordinating operations with downstream conditions.

4.2.5 Effects of climate change

The TMDL does not quantify thermal loading from climate change. TMDL Appendix DXX summarizes scientific studies showing increasing stream temperatures in Oregon and identifies contributing factors such as rising air temperatures, earlier snowmelt, declining summer flows, and more frequent wildfire. These impacts, including higher air temperatures, reduced snowpack and water availability, and loss of effective shade from wildfire, already affect the Rogue River Basin and are expected to increase in the future.

Implementation addresses climate change impacts through adaptive management that increases watershed resilience. Efforts at the local, state, federal, and international levels are needed. Accelerated restoration and multiple restoration approaches, coordinated across partners and land uses, help streams buffer against future warming.

4.2.6 Background sources

The TMDL identifies background sources such as channel form, vegetation, groundwater inputs, tributary inflows, and weather conditions as contributors to stream heating. Some of these factors reflect human activity, while others are natural and not quantified in the models. Modeling shows that background sources contribute to exceedances of temperature criteria, and reductions are necessary to meet standards.

Implementation addresses background sources through long-term restoration that improves watershed processes. Actions such as riparian planting, channel restoration, and flow protection can reduce background thermal loading and support attainment of temperature standards over time.

5. Timelines for implementing strategies

OAR 340-042-0040(4)(I)(D) requires WQMPs to describe timelines for implementing management strategies. This WQMP establishes benchmarks and reporting expectations. Responsible persons, including DMAs, must include detailed timelines and milestones in their

implementation plans. Timelines support accountability through annual reports and five-year reviews.

5.1 Schedule for revising permits

DEQ incorporates wasteload allocations from the TMDL into NPDES permits during issuance, renewal, or modification. DEQ updates individual and general permits to ensure consistency with the TMDL. NPDES permits are issued on five-year cycles.

5.2 Schedule for achieving appropriate incremental and measurable water quality targets

DEQ uses a benchmark of 10% cumulative improvement in effective shade every 10 years to evaluate progress. Annual reports must show how actions contribute toward this target, and DEQ reviews basin-wide progress every five years. Implementation plan revisions are required if monitoring results, changed conditions, or insufficient progress warrant adjustments.

The 10% cumulative improvement in effective shade every 10 years benchmark assumes consistent implementation of the three primary streamside vegetation strategies in Section 4.2.1 and normal vegetation growth rates without major disturbance. Timelines may be affected by restoration site availability, land ownership patterns, project opportunities, impacts from climate change, invasive species, or natural disturbances.

5.3 Schedule for implementing control actions

Implementation plans must include timelines and measurable milestones for priority actions. Responsible persons, including DMAs, must track progress and submit annual reports to DEQ. Annual reports provide the basis for five-year reviews including an evaluation of progress and any required plan revisions.

5.4 Schedule for completing other measurable milestones

Other measurable milestones, such as monitoring deliverables or site-specific performance targets, must follow schedules identified in Table 7 or those established in coordination with DEQ. These timelines support evaluation across sectors and allow transparent tracking of implementation.

6. Timeline for attaining water quality standards

This chapter fulfills the elements in OAR 340-042-0040(4)(I)(E) and (F), which require a description of how implementing management strategies will result in attainment of water quality standards and the timelines for achieving those standards.

6.1 How management strategies support attainment of water quality standards

Management strategies proposed in Section 4 reduce excess thermal loading from both point and nonpoint sources and support attainment of Oregon's temperature criteria. For nonpoint sources, the TMDL establishes effective shade as the primary surrogate target to evaluate whether load allocations are being met. The Rogue River Basin TMDL Section 9.1.5.2 provides site-specific effective shade targets. Where site-specific targets are unavailable, the TMDL provides effective shade curves that describe the expected shade for a given stream width, orientation, and vegetation type.

Implementation plans must include strategies sufficient to meet load allocations and surrogate measure targets. While individual actions may not immediately change stream temperatures, cumulative increases in shade reduce solar loading over time. In addition to riparian shading, channel restoration, flow enhancement, and dam and reservoir management can provide measurable temperature benefits.

Consistent with the TMDL, implementation success depends on the achievement of load allocations measured through meeting surrogate measure targets, not solely on measured in-stream temperatures. DEQ tracks progress through annual reports and monitoring data. For large dams and reservoirs, meeting load allocations is evaluated primarily through surrogate measure targets based on in-stream temperatures.

Modeled shade gap data (TMDL Section 9.1.5.2) reflect conditions from past data sets XX. They may not reflect more recent vegetation changes from wildfire, restoration, land use change, or policy shifts. Monitoring of streamside conditions and shade assessments is necessary to identify protection and restoration priorities, evaluate progress towards meeting surrogate measure targets, and to refine management strategies. These evaluations provide the technical foundation for implementation planning, including streamside evaluations and shade gap analysis (Section 10.2.1). They also support adaptive updates to implementation plans, basin-wide tracking, and compliance evaluations through annual reports and year-five reviews.

This monitoring framework allows for locally tailored strategies. It also maintains accountability through measurable milestones, adaptive updates, and performance tracking. When actions align with the WQMP and approved implementation plans, responsible persons remain in compliance even if full attainment of numeric criteria by all sources takes decades.

6.2 Timelines for attaining temperature water quality standards

Restoring stream temperatures to meet Oregon's water quality standards is a long-term effort. Some localized improvements may occur within a few years but full attainment across the basin requires decades and sustained implementation actions across land uses and jurisdictions.

Effective shade surrogate measure targets are the primary measure of progress towards meeting load allocations. DEQ uses a benchmark of 10% cumulative improvement in effective shade every 10 years. At this pace, basin-wide targets may be achieved by the mid-2100s. The benchmark is an estimate based on vegetation growth rates and assumes consistent implementation across the basin. Actual progress varies with site conditions, land use, restoration actions, and natural disturbances such as wildfire. Recovery rates vary by stream size, vegetation potential, disturbance history, and restoration opportunity. DEQ expects

responsible persons, including DMAs, to consider these projections and interim targets when establishing implementation plan timelines.

This WQMP does not assign a fixed deadline to meet load allocations. Instead, it emphasizes consistent implementation of temperature control measures, incremental progress toward surrogate measure targets, adaptive updates, and accountability through annual reports and five-year reviews. DEQ assesses progress using annual reports, condition assessments, and monitoring data. For nonpoint sources, meeting load allocations expressed through surrogate measure targets demonstrates compliance.

7. Identification of responsible persons, including DMAs

OAR 340-042-0040(4)(I)(G) requires WQMPs to identify the persons, including DMAs, responsible for implementing management strategies and preparing implementation plans. Responsible sources must meet TMDL allocations through compliance with discharge permits or other strategies in implementation plans (OAR 340-042-0025(2)). WQMPs must also specify the implementation plans, the persons, including DMAs, responsible for developing, implementing, and revising those implementation plans (OAR 340-042-0080).

Designated Management Agencies are public entities formally designated by DEQ to implement TMDLs. Under OAR 340-042-0030(2), DMAs are federal, state, or local agencies with authority over pollutant sources and designated by DEQ in a TMDL. Because the WQMP is part of the TMDL, all the DMAs named are responsible for implementation.

This WQMP also identifies other responsible persons, including utilities, dam and reservoir operators, special districts, and private entities. These entities impact water quality but are not formally designated as DMAs. For purposes of this WQMP, a ‘responsible person’ is any entity accountable for sources of pollution addressed by the TMDL.

Appendix A provides the list of responsible persons, including DMAs, named in this WQMP. It covers entities with current implementation responsibilities in existing TMDLs and those not currently required to submit TMDL implementation plans. Appendix A is not an exhaustive list of every individual or entity that bears responsibility for TMDL implementation. Broad participation across the basin is necessary to meet standards and protect beneficial uses.

DEQ considered several sources of information to determine explicit TMDL planning and implementation responsibilities. These included GIS-based streamside jurisdictional area, consistency with other temperature replacement WQMPs, and discussions with entities to better understand their operations and authorities. DEQ estimated streamside jurisdictional area was calculated using 100 meters from stream center. GIS data are available upon request.

Four agencies manage over 88 percent of the streamside area within the area of the Rogue River Basin TMDL: U.S. Forest Service (24.88 percent), Bureau of Land Management (28.54 percent), Oregon Department of Forestry (26.54 percent), and Oregon Department of Agriculture (8.74 percent). Because of the scale of land under their management, these agencies are central to achieving load allocations. They also have additional monitoring and assessment responsibilities described in Sections 10.2.1 Shade Monitoring and Assessment and 11.1**.** (Monitoring Responsibilities).

Based on these factors, Table 3 summarizes the responsible persons, including DMAs, with TMDL planning and implementation responsibilities. It includes DMAs carried forward from previous TMDLs in the Rogue River Basin and newly named entities. Note that The National Park Service is not included as a responsible person in Table 3 because the management of Crater Lake National Park falls under exclusive federal jurisdiction and as such is outside of the scope of this WQMP.

Table 3. Responsible persons with TMDL planning and implementation responsibilities

Entity Names	Area of Jurisdiction
Oregon Department of Agriculture	Agricultural or farm-related activities, both commercial and noncommercial including livestock and pastures, both inside and outside of municipal boundaries
Oregon Department of Forestry	commercial activities involving the establishment, management, or harvesting of trees in Oregon's nonfederal forestlands
Oregon Department of State Lands	DSL managed lands and facilities
Oregon Department of Transportation	State highways, rights-of-way, and facilities
Oregon Parks and Recreation Department	OPRD managed lands and facilities
Oregon Department of Fish & Wildlife	ODFW managed lands and facilities, including fish hatcheries
U.S. Bureau of Land Management	BLM and O&C managed lands, roads, and facilities
U.S. Forest Service	USFS managed lands, roads, and facilities
Jackson, Josephine, Curry, Klamath Counties	Urban, rural, and non-resource land use, including zoning, permitting and riparian protection; operation and maintenance of governmental facilities including transportation corridors
Municipalities: Ashland, Butte Falls, Cave Junction, Central Point, Eagle Point, Gold Beach, Gold Hill, Grants Pass, Jacksonville, Medford, Phoenix, Rogue River, Shady Cove, Talent	City land use, including zoning, permitting and riparian protection; operation and maintenance of governmental facilities including transportation corridors and dam/reservoir operations.
Irrigation Districts: Grants Pass, Gold Hill, Rogue River Valley, Medford, Talent, Eagle Point	Structures and discharges under district control including diversion dams, canals and other water conveyance systems, operational spills, and return flows
U.S. Army Corp of Engineers, U.S. Bureau of Reclamation	Dams and structures associated with the projects in the Rogue River Basin as well as streamside lands managed under authority

DEQ expects all named responsible persons to manage heat sources originating within their jurisdiction, regardless of their implementation plan responsibilities. Implementation plan expectations may vary depending on a responsible person's relative contribution to heat sources and capacity to implement effective strategies. This WQMP identifies five responsible persons and DMAs (see Appendix A) who are not currently required to submit implementation plans. These include:

1. Bonneville Power Administration
2. Central Oregon & Pacific Railroad
3. Klamath County
4. Pacific Power and Light
5. Rogue Valley Terminal Railroad

The criteria used by DEQ to determine which DMAs or responsible persons are not required to submit implementation plans are specific to each TMDL and may vary across the state. The criteria for the Rogue River Basin include:

- Responsibilities are addressed under another TMDL (e.g. the Upper Klamath and Lost Subbasins TMDL
- No ownership or jurisdiction over land management activities within streamside areas, preventing implementation of actions identified in this WQMP.
- Other implementation pathways exist:
    - The area is managed by entities already required to develop implementation plans
    - Water protection actions are implemented through permits (e.g., DEQ, DOGAMI).
- Limited ability or opportunity to conduct stream restoration (e.g., railroads)
- Limited streamside area under its jurisdiction (generally less than 25 acres area measured 100 meters from stream centerline).

DEQ may require implementation plans from these responsible persons in the future if ownership or jurisdiction of streamside areas increases, or other information indicates a TMDL implementation plan is needed to achieve the thermal load allocations and surrogate shade targets identified in this TMDL.

8. Existing implementation plans

OAR 340-042-0040(4)(I)(H) requires this WQMP to describe existing implementation plans for responsible persons, including DMAs. Some responsible persons, including DMAs, prepared plans following the approval of previous TMDLs in the Rogue River Basin, while others relied on statewide or federal programs serving the same role. Not all of these plans received DEQ approval, and updates are required to align existing plans with this WQMP.

Reporting requirements for some of responsible persons, including DMAs, require annual reports and five-year reviews. This updated WQMP places all responsible persons under a common framework with clear expectations for plan content, submittal, and reporting.

For ODA and ODF, statewide rules and programs are currently in place to reduce or control nonpoint sources of pollution. OAR 340-042-0080(2) and (3) recognize these programs as existing implementation plans for non-federal forest and agricultural lands. The adequacy of these statewide programs, along with existing plans and federal land management programs administered by ODA, ODF, BLM, and USFS, is evaluated in the subsections below.

8.1 Oregon Department of Forestry

In 1994, Oregon established waterway protection measures for state and private forest practices, codified in Oregon Revised Statutes 527.610 through 527.992, the Forest Practices Act (OAR 629-600 through 629-665), and Oregon's Plan for Salmon and Watersheds (Executive Order 99-01). Under ORS 527.770, forest operations conducted in compliance with the Forest Practices Act and voluntary measures are generally considered to meet water quality standards. However, as stated in OAR 340-042-0080(2), revisions to Forest Practices Act rules may be required if DEQ determines they are adequate to implement the load allocations in an approved TMDL.

Periodic revisions to Forest Practices Act rules occurred between the 1990s and 2022. Studies by ODF and DEQ indicated that rules adopted before 2022 did not fully meet Oregon's temperature criterion for protecting cold water. Following the publication of the Private Forest Accord Report and the passage of Senate Bills 1501 and 1502, and House Bill 4055, the Board of Forestry adopted revised Forest Practices Act rules in October 2022, with additional amendments anticipated. These revisions include increased riparian widths and additional tree retention, which are expected to support progress towards meeting load allocations as measured through effective shade targets.

Table 4 summarizes current Forest Practices Act requirements for streamside vegetation retention and riparian management area distances. Additional requirements and exceptions outlined in the forest practice rules are not included in the table.

Table 4. Summary streamside vegetation retention riparian management area distances in Forest Practices Act rules OAR 629-643.

ODF Stream Type *	Standard Practice Vegetation Retention (Feet)	Small Forestland Option Vegetation Retention (Feet)
Large Type F	110	100
Medium Type F	110	70
Small Type F	100	50
Large Type N	75	70
Medium Type N	75	50
Small Type N	See Type Np	See Type Np
Small Type Np flows into to Type SSBT	75 feet vegetation retention for 500 feet upstream from the confluence with the Type SSBT, then 50 feet buffer retention for 650 feet upstream. Retention distance is the shorter of 1,150 feet (RH Max+) or the uppermost flow feature.	35 feet vegetation retention from the confluence with the Type SSBT to the upper most flow feature or 1,150 feet upstream (RH Max), whichever is shorter.
Small Type Np flows into to Type F	75 feet vegetation retention from the confluence with the Type F to the upper most flow feature or 600 feet upstream (RH Max), whichever is shorter.	35 feet vegetation retention from the confluence with the Type F to the upper most flow feature or 600 feet upstream (RH Max), whichever is shorter.
Small Type Ns	35' Equipment Limitation Zone (ELZ)	
Large Type F	110	100

***ODF Stream Type Definitions:**

SSBT -- salmon, steelhead, or bull trout
F -- fish-bearing (non-SSBT)
N -- non-fish-bearing, non-domestic
Np -- perennial, Type-N
Ns -- seasonal, Type-N

+ "RH Max" means the maximum distance described for any particular small Type Np stream.

DEQ finds the no-harvest vegetation retention buffers of 100-110 feet (e.g., large SSBT, large F, small and medium SSBT/F under standard practice) may meet effective shade targets in some locations, depending on factors such as residual tree density, stream orientation, and topography. However, findings in TMDL Appendix xxC indicate that these buffers do not provide shade equivalent to a 120-foot no-harvest buffer. As required no-harvest buffers decrease with stream type, they are less likely to meet shade targets for fish-bearing and perennial non-fish-bearing streams. This issue is most pronounced under the Small Forestland Option. Additional measures to align protections for small forestlands with standard practices could strengthen program effectiveness.

The Forest Practices Act rules revisions do not require retroactive restoration of riparian areas harvested under previous rules. As a result, effective shade may not be adequate in riparian areas adjacent to small and medium SSBT/F streams harvested before the new rules took effect. The recovery trajectory for future riparian shade on these streams varies depending on the rules in place at the time of harvest and the replanting timeline. Achieving water quality improvements will take decades, during which DEQ and ODF will evaluate whether the revised rules adequately meet load allocations as measured through effective shade targets.

DEQ's main concerns are:

- **Buffer adequacy.** Riparian reserves of 100–110 feet may not provide shade equivalent to a 120-foot no-harvest buffer, and narrower buffers for smaller streams are even less likely to meet shade targets (TMDL Appendix C).
- **Small Forestland Option.** Reduced buffer requirements under this option create a risk of insufficient shade protection compared to standard practice.
- **Legacy harvest areas.** Riparian areas harvested under pre-2022 rules are not subject to retroactive restoration, leaving long recovery timelines before effective shade is regained.

For these reasons, ODF must prepare an implementation plan for DEQ approval.

As documented in the 2021 Memorandum of Understanding between DEQ and ODF, DEQ will work with ODF to identify additional regulatory or non-regulatory measures such as rule revisions, stewardship agreements, or incentive programs that may provide reasonable assurance of achieving load allocations. Collaboration on these measures may occur during development of ODF's implementation plan.

8.2 Oregon Department of Agriculture

The Agricultural Water Quality Management Program, established in 1993 under ORS 568.900 to 568.933 and ORS 561.191, and OAR section 603, divisions 90 and 95, addresses water quality issues from agricultural sources. The Oregon Department of Agriculture developed 38 watershed-based Agricultural Water Quality Area Rules and Area Plans, including the Rogue Basin Agricultural Water Quality Area Rules and Area Plan, established in 2001.

As part of ODA's Inland Rogue Agricultural Water Quality Management Area Plan review process, DEQ provides water quality summaries, identifies land uses and agricultural practices

that may contribute to impairments. DEQ also assesses implementation progress, and recommends actions where needed that will better align with identified water quality goals. Most recently DEQ participated in the 2022 full review and the 2024 light review biennial updates of the Inland Rogue Agricultural Water Quality Management Area Plan. ODA anticipates conducting a light review of the plan in 2026 a full review in 2028. DEQ consistently identifies protecting, maintaining, and restoring streamside vegetation as a top priority for achieving temperature load allocations. DEQ also recommends setting measurable objectives at the management area scale, establishing timelines for BMP implementation, and promoting actions that support streamflow, wetland function, and temperature monitoring.

ODA's current Inland Rogue Agricultural Water Quality Management Area Plan outlines general strategies for riparian vegetation, such as protecting existing vegetation, encouraging voluntary restoration, and supporting landowners by providing technical assistance. While the Area Plan proposes implementation activities across the management area, measurable objectives are defined primarily for Focus Areas and Strategic Implementation Areas. The Area Plan does not define the streamside conditions necessary to meet effective shade targets or describe how progress toward those targets will be evaluated at a basin scale. It also lacks timelines for when implementation actions should occur or when outcomes are expected. ODA has not provided evidence demonstrating that voluntary actions consistently result in riparian conditions consistent with load allocations. Without measurable objectives, timelines, or supporting data, it is difficult to determine whether voluntary efforts under the Area Plan can achieve the streamside conditions required to meet effective shade targets.

The Area Rules in OAR 603-095-0740(6) define an "unacceptable condition" as agricultural management or soil-disturbing activities that preclude the establishment and development of adequate riparian vegetation for streambank stability and shading, consistent with site capability, along a perennial stream with site potential for such vegetation. However, what qualifies as "adequate" under the Area Rules may not correspond to the streamside conditions needed to meet effective shade targets established in the TMDL.

DEQ's main concerns are:

- **Objectives and timelines:** Lack of measurable objectives and timelines for basin-wide implementation.
- **Voluntary actions:** Reliance on voluntary actions without evidence of meeting shade targets.
- **Vegetation standards:** "Adequate" vegetation under Area Rules may not ensure conditions needed to meet TMDL load allocations.

For these reasons, ODA must prepare an implementation plan for DEQ approval.

8.3 U.S. Bureau of Land Management

The Bureau of Land Management currently manages streamside vegetation on federal lands in the Rogue River Basin area under the Northwestern & Coastal Oregon and Southwestern Oregon Resource Management Plans.(BLM 2016)

BLM defines "riparian reserves" as management areas along streams, measured as slope distance from the ordinary high-water line on each side of the stream. The riparian reserve width is specific to stream type (Table 5) and is based on site-potential tree height, the average maximum height of the tallest dominant trees (≥200 years old) for a given site class. SPTH generally range from 140 feet to 240 feet across the basin.

Table 5. BLM riparian reserve buffer distance by water feature.

Feature	Riparian reserve distance and management directions
Fish-bearing streams and perennial streams	One SPTH distance from the ordinary high waterline 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 SPTH distance from the ordinary high waterline on each side of the stream Class III subwatersheds: 50 feet from the ordinary high waterline 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 unstable areas 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 waterline

Timber salvage is prohibited within riparian reserves, except when necessary to protect public safety, or to keep roads and other infrastructure clear of debris. Yarding corridors, skid trails, road construction, stream crossings, and road maintenance and improvement are allowed where there is no operationally feasible and economically viable alternative to accomplish other resource management objectives.

The BLM riparian reserve management direction is no thinning within 120 feet of fish-bearing streams and perennial streams or within 50 feet of intermittent, non-fish-bearing streams, except for sudden oak death treatments or individual tree cutting or tipping that achieve restoration or habitat enhancement objectives. Beyond 50 feet, thinning is allowed in Class I and II subwatersheds as long as stands maintain at least 30 percent canopy cover and 60 trees per acre on average, while in Class III subwatersheds the reserve ends at 50 feet.

The effectiveness of riparian reserve management to achieve load allocations is influenced by the accuracy of stream classification and mapping. The Willamette Subbasins temperature TMDL Technical Support Document Section 2.4 found that current methods often fail to capture intermittent streams that retain surface flow during the critical period when allocations apply (DEQ, 2025a).

DEQ finds that BLM's management directions for riparian reserves on fish-bearing and perennial streams are adequate and will likely meet TMDL load allocations as measured through effective shade targets. However, riparian reserve management on intermittent, non-fish-bearing streams may not always provide adequate protection to meet load allocations. DEQ's main concerns are:

- **Stream classification and mapping.** Intermittent streams may contain residual pools that support aquatic life or retain surface flow during the critical period when TMDL allocations apply (April 1 - Nov 15. See TMDL Section 5), but current mapping methods may not consistently capture these conditions (DEQ, 2025a).

- **Riparian reserves in intermittent, non-fish-bearing Class III subwatersheds.** During the TMDL critical period, a 50-foot riparian reserve on intermittent, non-fish-bearing streams may offer only limited shade and can contribute to localized warming. Literature reviewed for the TMDL indicates that riparian reserves of 120 feet are generally needed to maintain effective shade conditions (TMDL Appendix C).
- **Thinning allowances for intermittent, non-fish-bearing streams.** Thinning is authorized beyond 50 feet in Class I and II subwatersheds, subject to canopy and tree-retention requirements. Thinning at these levels within 120-foot slope-distance from the stream may reduce effective shade and contribute to stream warming. The extent of impact depends on thinning intensity and spacing (Roon et al., 2021; Willamette Subbasins TMDL TSD Appendix I).

For these reasons, BLM must prepare an implementation plan for DEQ approval.

8.4 U.S. Forest Service

The U.S. Forest Service manages streamside lands in the Rogue River Basin under the Northwest Forest Plan (USFS and BLM, 1994). This plan includes the Aquatic Conservation Strategy, which aims to restore and maintain the ecological health of watersheds and aquatic ecosystems on federal lands, with a particular focus on habitat for salmon and steelhead. A core objective of the strategy is to protect and improve water quality through careful management of riparian areas, referred to as riparian reserves.

Like BLM, USFS uses site-potential tree height to define many riparian reserve distances. The Northwest Forest Plan defines SPTH as the average maximum height of dominant trees 200 years or older for a given site class. In the Rogue National Forest, SPTH generally ranges from 150-200 feet (Personal communication, Joe Blanchard, USFS Watershed Manager).

The Northwest Forest Plan sets the following riparian reserve widths for different types of waterbodies (USFS and BLM, 1994, Attachment A, Standards and Guidelines, Section C):

- **Fish-bearing streams:** Riparian reserves include the stream and the area extending from the edge of the active channel to the top of the inner gorge, the outer edge of the 100-year floodplain, the outer edge of riparian vegetation, or 300 feet slope distance (two SPTH) on each side of the stream, whichever is greatest.
- **Perennial non-fish-bearing streams:** Reserves extend from the stream edge to the same physical features or 150 feet slope distance (one SPTH), whichever is greatest.
- **Constructed ponds, reservoirs, and wetlands over 1 acre:** Reserves extend to the edge of riparian vegetation, the limit of seasonally saturated soils, the extent of unstable or potentially unstable areas, or 150 feet slope distance, whichever is greatest.
- **Lakes and natural ponds:** Reserves extend to the same physical features or 300 feet slope distance (two SPTH), whichever is greatest.
- **Intermittent streams, wetlands under 1 acre, and unstable areas**: Riparian reserves must include the channel or wetland, unstable or potentially unstable areas (e.g., earthflows), the top of the inner gorge, the edge of riparian vegetation, and a slope distance 100 feet or one SPTH, whichever is greater.

Riparian Reserve management on USFS lands is tailored to local conditions, resource objectives, and ecological function. Clearcutting is prohibited. DEQ finds that USFS's streamside vegetation management strategies on fish-bearing streams, perennial streams, 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 achieve of the TMDL load allocation and effective shade targets. Vegetation management strategies on intermittent streams, and wetlands less than 1-acre may not consistently achieve the load allocation or effective shade targets (DEQ, 2025a). Streamside management on intermittent streams is a concern because they may contain residual pools that support aquatic life; or be flowing during periods when the TMDL allocations apply. The classification and mapping of intermittent streams often do not account for these situations.

Current stream classification and mapping methods may not consistently capture intermittent streams that retain surface flow during the critical period when TMDL allocations apply (Willamette Subbasins Temperature TMDL Technical Support Document, Section 2.4; DEQ, 2025a). The Rogue National Forest supplements stream mapping with field verification of streams and wetlands. Guideline #5 of the Rogue Forest Plan requires protection for channels with a defined bank and at least seasonal surface flow, with verification applied during timber sales (USDA-USFS, 1990, Chapter 4, p. 60). However, because field verification is limited to proposed activities, intermittent streams outside projects areas may not be identified.

DEQ finds that USFS's streamside vegetation management strategies on fish-bearing streams, perennial streams, constructed ponds and reservoirs, lakes and natural ponds, and wetlands greater than one acre are adequate and will likely meet TMDL load allocations as measured through effective shade targets. However, riparian reserve management on intermittent streams and wetlands less than one acre may not provide adequate protection to achieve load allocations or shade targets (TMDL Appendix C). DEQ's main concerns are:

- **Stream classification and mapping.** Intermittent streams may retain surface flow or residual pools during the critical period when TMDL allocations apply (May 1–October 31), but current mapping methods may not consistently capture those conditions. USFS supplements mapping with field verification for proposed activities, but this approach may miss some streams (see DEQ, 2025a).
- **Thinning allowances.** Thinning and other silvicultural treatments within riparian reserves are permitted when intended to promote late-successional forest conditions, improve riparian function, or enhance habitat. Even with safeguards, thinning may reduce canopy cover and effective shade in some areas, which may influence localized stream temperatures (see TMDL Appendix C; Roon et al., 2021).

For these reasons, USFS must prepare an implementation plan for DEQ approval.

9. Schedule for implementation plan submittal and revisions

OAR 340-042-0040(4)(l)(I) requires the WQMP to include a schedule for submittal of implementation plans by responsible persons, including DMAs, and the process for revising those plans. OAR 340-042-0080(4)(a) further requires entities identified in the WQMP with implementation responsibilities to prepare and submit implementation plans for DEQ approval according to the schedule in this WQMP.

The responsible persons, including DMAs, listed in Table 3 must submit an implementation plan to DEQ for review and approval within 18 months of Environmental Quality Commission adoption of this WQMP. Once approved, the responsible persons must implement the plan according to the timelines and measurable milestones established in the plan.

Responsible persons must review and revise their implementation plans every five years and submit them to DEQ for approval. Revisions must update timelines for continued implementation and should reflect information gained through monitoring and evaluation. If DEQ identifies deficiencies that prevent the acceptance of the implementation plan, it will set a deadline for submitting a revised plan for approval.

10. Implementation plan requirements

Responsible persons, including DMAs, identified in Table 3 must prepare and submit implementation plans. As required under OAR 340-042-0080(4)(a), each implementation plan must include the following components:

- Management strategies the responsible person will use to achieve load allocations and reduce pollutant loading
- Provide a timeline for implementing management strategies and a schedule for completing measurable milestones
- Provide for performance monitoring with a plan for periodic review and revision of the implementation plan
- Provide any other analyses or information specified in the WQMP

Implementation plans describe how each responsible person will carry out their responsibilities under the WQMP and support meeting load allocations and surrogate measure targets established in the TMDL.

For public transparency, TMDL implementation plans and annual reports must be posted to each entity's website or a centralize project website such as through the Rogue Valley Council of Governments. If the entity does not have a website, these documents must be made available to the public in another manner.

10.1 Management strategies

Each implementation plan must include the management strategies needed to achieve load allocations. Plans must also identify the nonpoint sources and activities within the responsible person's jurisdiction, with emphasis on streamside areas that affect shade. Each plan must incorporate applicable strategies from Table 2 and any additional strategies suited to local pollutant sources and landscape conditions.

Plans should also identify existing ordinances, policies, programs, and practices that function as current management strategies supporting TMDL implementation. If additional measures are needed, new strategies must be included, such as developing or revising ordinances, rules policies, programs, or practices.

10.2 Additional analysis and information to support implementation

Implementation plans must include additional analysis and information required by the WQMP to support effective and long-term implementation. This includes monitoring and assessments, public engagement, long-term strategy maintenance, and identification of funding mechanisms.

In addition to TMDL implementation plans, the responsible persons, including DMAs, listed in Table 3 must submit the information and analysis described below according to the schedule in Table 7. The results must be used to inform, update, and revise implementation plans including strategies, timelines, and measurable milestones. Implementation plans must also identify all streamside areas and streamside activities within each entity's jurisdiction.

10.2.1 Shade monitoring and assessment

Responsible persons, including DMAs, listed in Table 3 with jurisdiction over streamside lands must conduct shade-related monitoring and assessments. Figure 2 summarizes the requirements.

The monitoring and assessments provide the technical basis for implementation plans by evaluating riparian conditions and identifying priority areas for protection or restoration most likely to meet load allocations. They also support tracking progress toward effective shade targets, recovery from natural disturbances, and adjustment of management strategies. To guide these evaluations, the TMDL establishes effective surrogate shade measures to express nonpoint source load allocations. The TMDL includes two types of effective shade surrogate measure targets: site-specific modeled targets (TMDL Section 9.1.5.2) and generalized effective shade curves surrogate measures by stream orientation, channel width, and mapping unit (TMDL Section 9.1.5.3). Responsible persons may use either type of target to conduct a shade gap analysis and inform a streamside evaluation. Alternative targets must be reviewed and approved by DEQ.

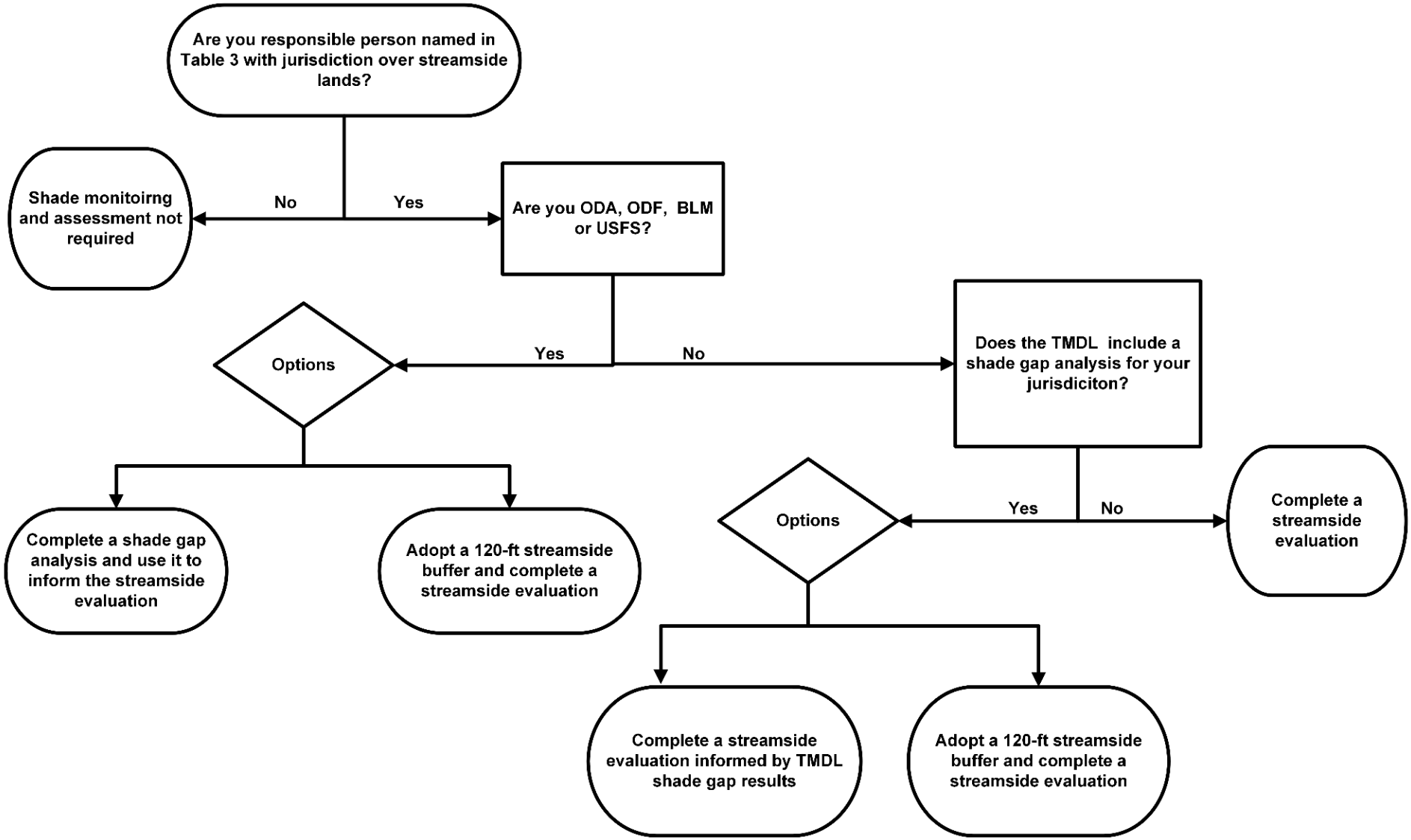

Figure 2. Decision tree for streamside shade monitoring and assessment requirements.

10.2.1.1 Streamside evaluation

Responsible persons in Table 3 with jurisdiction over streamside lands must complete a streamside evaluation as part of the implementation plan according to the schedule in Table 7. The evaluation must classify streamside areas into the following categories:

- **Protect/enhance/maintain** – Areas already meeting or trending toward effective shade targets. Actions focus on protecting existing canopy, enhancing stand health, and maintaining conditions that sustain long-term shade.
- **Planting/establishment** – Areas lacking adequate riparian canopy or dominated by non-native vegetation. Actions focus on planting and establishing native species to create new canopy and move conditions toward effective shade targets.
- **Vegetation management -** Areas where selective thinning or other active management is needed to improve long-term canopy development and structure, ensuring healthier stands that provide effective shade.
- **Constraint-limited** – Areas where achieving effective shade targets is not feasible due to physical barriers (e.g., infrastructure, buildings) or jurisdictional limitations (e.g., private ownership without cooperative agreements). Focus is on documenting these constraints and identifying opportunities for future action if conditions change.
- **Alternative strategy** – Areas where streamside shade is not the primary driver of thermal loading. In these cases, non-vegetative practices (e.g., flow augmentation, in-stream restoration, cold-water refuge protection) may provide more effective temperature management.

Responsible persons with a TMDL shade gap analysis, or those required to complete one under Section 10.2.1.2, must use the results to inform their streamside evaluation. Responsible persons not required to complete a shade gap analysis may use TMDL shade gap results or other DEQ-approved sources to inform their evaluation.

The evaluation must summarize the extent of each category in acres (or percentage where acreage is not feasible), identify priority areas for protection or restoration based on potential to reduce thermal loading, magnitude of the shade gaps, and feasibility. It must also describe the data sources, indicators, and assumptions used. Responsible persons may define reasonable evaluation units (e.g. stream reach, ownership block, or another relevant planning scale) subject to DEQ approval. Methods may include field observations, remote sensing, vegetation surveys, professional judgment, or other appropriate approaches suited to available resources.

The evaluation must also identify opportunities to implement alternative best management practices, such as in-stream restoration, flow augmentation projects, experimental temperature management techniques, or the protection and enhancement of cold-water refuges where present.

DEQ recognizes that factors such as climate change, wildfire, flood, geology, and legacy impacts may prevent meeting effective shade targets. DEQ will not consider shade reductions caused by natural disturbances as a violation or failure to implement a plan. In such cases, responsible persons should assess and prioritize these areas for restoration or protection following the disturbance.

The final evaluation must present the responsible person’s streamside lands in a format (e.g. map, table, or other product) that clearly shows the categories, constraints, and opportunities in a way that DEQ can readily review and interpret. Areas recovering from disturbance may be designated for passive restoration, where natural regrowth is expected to restore shade. Where

recovery is unlikely without intervention, responsible persons should identify opportunities for active restoration.

DEQ will review streamside evaluations as part of the five-year implementation plan review to assess whether the evaluation and associated strategies align with load allocations as measured through effective shade targets. DEQ will consider the evaluation complete if it includes the required elements in this section and incorporates any applicable shade gap analysis requirements in Section 10.2.1.2. DEQ may require responsible persons to revisit or update the streamside evaluation in the future to assess progress.

10.2.1.2 Shade gap analysis

A shade gap analysis estimates the difference between current effective shade and the applicable effective shade target, which is expressed as the load allocation. DEQ modeled shade gaps and effective shade targets in the TMDL (TMDL Section 9.1.5.2), but only on a limited number of streams. As a result, some responsible persons do not have shade gap results. Where results exist, they apply only to modeled stream segments, not full jurisdictions. DEQ averaged results across modeled waterbodies within a jurisdiction. Site-specific results are available upon request.

The purpose of a shade gap analysis is to determine whether effective shade targets are being met. This WQMP requires ODA, ODF, BLM, and USFS to complete a shade gap analysis in streamside areas where DEQ did not provide modeled results and where DEQ determined that existing management may not be adequate to meet load allocations (xx TMDL Section 9.1.5.2). These entities must include intermittent streams in their analysis.

Where DEQ provided results, responsible persons must use them for streamside evaluations, recognizing they apply only to modeled segments. Responsible persons not required to complete a shade gap analysis may do so voluntarily. Those with TMDL shade gap results are not required to update them but are encouraged to do so if land conditions have changed substantially since the period of time used in the TMDL modeling.

Responsible persons completing a shade gap analysis must use DEQ-approved methods and submit a project plan describing the method, data sources, and overall approach. Project plans must be submitted to DEQ for review and approval according to the schedule in Table 7. Responsible persons may propose alternative effective shade targets through a DEQ-approved project plan that provides site-specific data supporting revised targets and requesting DEQ approval.

Approved methods include:

- **Field-based measurements** – Measure current effective shade at the stream surface using a Solar Pathfinder™, hemispherical photography, or similar equipment and software. Document vegetation category, canopy density, stream width, and stream orientation. Compare results to either the site-specific modeled targets (TMDL Section 9.1.5.1.2), the shade curves (TMDL Section 9.1.5.1.2), or other DEQ-approved site-specific targets. Field methods should follow OWEB's Water Quality Monitoring Technical Guidebook, Chapter 14.
- **Modeling** – Apply Heat Source modeling, as used in the TMDL (TMDL Appendix GXX), to estimate current shade and calculate the difference from applicable effective shade targets.
- **Other DEQ-approved method** – Propose an alternative approach, such as remote sensing, through a project plan submitted to DEQ for approval.

Responsible persons with a TMDL shade gap analysis, or those required to complete one under this section, must use the results to inform their streamside evaluation. Areas with large shade gaps should generally be prioritized for protection or restoration unless limited by physical, jurisdictional, or post-disturbance recovery constraints.

10.2.1.3 120-foot slope buffer alternative

Responsible persons, including DMAs, that are required to complete a shade gap analysis, and responsible persons who choose not to use DEQ's shade gap results where available, may instead apply a 120-foot slope-distance buffer measured up-slope along the ground's contour from top of bank. The literature review in TMDL Appendix CXX shows that a 120-ft buffer is generally adequate to maintain stream shade and that potential shade loss at this distance is unlikely to cause stream temperature increases for most waterbodies. The buffer must protect overstory and woody vegetation and be enforceable by ordinance or regulation. Responsible persons must ensure that management activities within the buffer result in only limited shade reduction and meet applicable effective shade targets.

Streamside evaluations are still required to identify locations where restoration or protection actions are needed and to support adaptive implementation. The buffer option may be used alone or in combination with other strategies.

10.2.2 Dam and reservoir requirements

The TMDL establishes a surrogate measure to implement load allocations for dams and reservoirs (TMDL, Section 9.1.5.1). Dam and reservoir operations must meet the surrogate measure of no net warming of downstream outflow temperatures above upstream inflow temperatures, expressed as the seven-day average daily maximum (7DADM), plus the assigned Human Use Allowance above the applicable criteria in downstream waters (TMDL Tables 9-1 through 9-5).

DEQ identified dams and reservoirs shown in Table 6 that are required to develop monitoring and assessment plans to determine their thermal impact. These 6 facilities control over 97 percent of the on-channel water storage in the Rogue River Basin project area (see Figure 1) and exert the greatest influence on downstream temperatures. DEQ selected these facilities using screening criteria that excluded dams and reservoirs that are off-channel, do not discharge during the critical period, are privately owned and not operated for public benefit, store water solely for environmental benefit, or have an active capacity of less than 5,000 acre-feet. Using these criteria and data from the Oregon Water Resources Department and the National Inventory of Dams (Appendix D) DEQ identified 6 dam and reservoir operators that must develop monitoring and assessment plans as per the schedule listed in Table 7. Depending on the results of temperature monitoring and assessment, DEQ may also require facilities to develop implementation plans for temperature management. Note that some of these facilities are also identified in Appendix A as DMAs and are required to develop temperature implementation plans to address streamside areas under their jurisdiction as per the schedule in Table 7.

Table 6. Dams and reservoir operators with monitoring and assessment responsibilities

No.	DAM ID	Dam Name	Ownership	Maximum reservoir storage (Acre-Feet)	Required monitoring and assessment
1	OR00612	William L. Jess Dam	Federal	500000	Yes
2	OR00624	Applegate Dam	Federal	89300	Yes
3	OR00581	Emigrant Dam	Federal	46700	Yes
4	OR00212	Willow Creek	Local Government	12000	Yes
5	OR00021	Fish Lake Dam	Public Utility	9397	Yes
6	OR00422	Agate Dam	Federal	5700	Yes

In addition to the implementation pathways above, some dam and reservoir operators are also subject to additional regulatory requirements. Some dam and reservoir operators also hold NPDES permits for industrial wastewater discharges, such as cooling water from hydropower generation or other mechanical processes. NPDES permits may regulate thermal effects from point source temperature discharges, but do not address nonpoint source warming of surface waters from impoundment and reservoir operations. It is recognized that reservoir operators may also need to comply with operational requirements beyond the scope of the TMDL surrogate measures. These requirements should be outlined and discussed in monitoring and assessment plans that are submitted to DEQ. DEQ will determine if these alternative operational plans meet the requirements of the TMDL.

DEQ encourages partnerships between responsible persons including DMAs and individual dam operators within their jurisdictions to evaluate ways in which dams could be managed to reduce temperature impacts. All dams and reservoir operators, regardless of ownership or inclusion in this list, must ensure their operations meet the surrogate measure targets, and the applicable HUAs.

10.2.2.1 Dam and reservoir monitoring and assessment

Monitoring and assessment are essential to verify whether dam and reservoir operations meet the surrogate measure targets, attain the assigned HUA, and provide the basis for adaptive management. Reservoirs can alter solar heat flux, trap and release heat, and shift seasonal temperature cycles. Stratified reservoirs may cool rivers in the summer by releasing colder deep water, but they can also release warmer surface waters in the fall when reservoirs mix.

All dam and reservoir operators identified in Table 6 must submit a temperature monitoring and assessment plan as per the schedule outlined in Table 7. Note that this may be in addition to the temperature TMDL implementation plan required by dam managers to meet the riparian shade targets for streamside lands under their jurisdiction. DMAs and responsible persons are identified in Table 3 and Appendix A. A monitoring and assessment plan must define the methods needed to evaluate compliance with the surrogate measure and assigned HUA during the assigned critical period. Critical periods vary across the Rogue River Basin. See Table 5.1 in the TMDL for the critical period that applies. Continuous upstream and downstream

temperature monitoring data are required to evaluate whether operations meet the surrogate measure and HUA.

Operators may propose a mechanistic model or empirical model to estimate “free-flowing” conditions for comparison. With DEQ approval, modeled upstream conditions may be used to define the surrogate measure target and evaluate compliance with the applicable HUA.

Each monitoring and assessment plan must include:

- **Collect continuous upstream and downstream temperature data** for at least four consecutive years.
    - If multiple streams flow into a reservoir, operators may combine inflow temperatures as a flow-weighted mean.
    - Previously collected temperature data may be used if it reflects current operations and meets quality control and assurance protocols consistent with DEQ, EPA, or other recognized standards.

Dam and reservoir operators may also propose additional monitoring to inform assessment models or decisions about management changes, such as:

- **Collect vertical temperature profiles** to characterize stratification and mixing dynamics.
- **Track reservoir water level fluctuations and outflow rates** to assess operational influence on temperature.

Monitoring data collected to meet TMDL objectives must follow established quality control and assurance protocols consistent with DEQ, EPA, or other recognized standards. Temperature monitoring data, audit information, and other monitoring data shall be submitted to DEQ at a mutually agreed upon timeline, in electronic format using DEQ approved templates or made available in a publicly accessible database approved by DEQ.

Monitoring and assessment data will be used to establish baseline conditions, evaluate compliance with surrogate targets and applicable HUAs, guide adaptive management, and evaluate site-specific approaches to reduce temperature impacts.

10.2.2.2 Implementation pathways

Monitoring and analysis results will determine which implementation pathway applies (see Figure 3).

1. **No temperature increases and/or attains human use allowance**
   If DEQ determines sufficient data show no measurable temperature increase between the inflow and outflow above the assigned HUA, a dam management implementation plan may not be required.
2. **Temperature increases above the surrogate measure target**
   If monitoring shows operations increase outflow temperatures, the operator must either:
    - **Cumulative Effects Analysis:** Demonstrate that warmer discharges do not cause cumulative downstream exceedances of the assigned HUA when temperatures exceed the applicable temperature criteria. This analysis requires a DEQ-approved Quality Assurance Project Plan.
    - **Mitigation Strategies:** Develop or update their dam management implementation plan to include additional operational or structural changes to mitigate warming.

If a cumulative effects analysis demonstrates that dam operations cause downstream warming, then the operator must develop or update their dam management implementation plan to include additional operational or structural changes to mitigate warming. It is recognized that reservoir operators may also need to comply with operational requirements beyond the scope of the TMDL surrogate measure. These requirements should be outlined and discussed in monitoring and assessment plans that are submitted to DEQ to determine if alternative operational plans may meet the requirements of the TMDL.

Adjustments to the surrogate measure target may be allowed under specific conditions described in the TMDL (Section 9.1.5).

3. **Protecting cold water criterion**
   The "protecting cold water" criterion (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. In reaches where the protecting cold water criterion applies, the same no-net-warming surrogate measure is also used. Warming from all sources combined may not exceed 0.3°C (0.5°F) above the colder upstream ambient temperature at the point of maximum impact where salmon, steelhead or bull trout are present. PCW is evaluated against the colder upstream ambient temperature, not the biologically based criteria. Dam and reservoir operators listed in Table 6 where PCW may apply are responsible for evaluating surrogate measures and attainment of applicable HUAs relative to the colder ambient temperature (TMDL Section 4.6).
   XXBased on the assessment in the TMDL (TMDL Table 5.1), the PCW requirement may apply to water released from: XX. This list may change with updated assessments.

10.2.2.3 Irrigation districts

Irrigation districts identified as responsible persons within the geographic scope of this TMDL and required to submit implementation plans are shown in Table 3. The thermal Load allocation that applies to irrigation districts is shown in TMDL Tables 9-1 through 9-5 under the heading "anthropogenic warming from tributaries" as applied to specific tributaries or Assessment Units. Below are activities that could lead to thermal discharges and warmer stream temperatures from irrigation district operations within the Rogue River Basin.

- Diversion dams are used to divert water from a stream to an irrigation ditch or canal. Diversion dams affect stream temperature by dewatering the downstream reach of the waterway. Reductions in stream flow in a natural channel slow the movement of water and generally increase the amount of time the water is exposed to solar radiation. Stream temperatures downstream of diversion dams can be substantially warmer than those above.
- Canals and other water conveyance systems are generally open ditches. These ditches are usually unshaded and increase the surface area of water exposed to solar radiation. Where canal waters are allowed to mix with natural stream flows, such as at diversion dams and at places where natural stream channels are used to convey irrigation water to downstream users, stream temperatures can increase.
- Irrigation return flows come off of fields or pastures after irrigation. These excess waters may end up in a stream or the irrigation ditch to be used by the next water right holder. These waters are generally warmer and may be rich in nutrients as well.
- Operational spills are places in the irrigation delivery system where excess unused irrigation water in the canals is discharged back into either a downslope canal, lateral or a natural stream channel without being delivered to or used on an individual field. These

waters may be picked up by the next water right holder or may continue downstream in natural waterways. Operational spills can increase stream temperatures in receiving waters.

DEQ expects irrigation districts identified as responsible persons in the Rogue River Basin (Table 3) to implement actions to meet the thermal load allocations assigned in the TMDL. Irrigation districts are required to continue to implement their current DEQ-approved TMDL implemented plans to address temperature and other TMDL related parameters within the Rogue River Basin and to update their plans as per the schedule shown in Table 7.

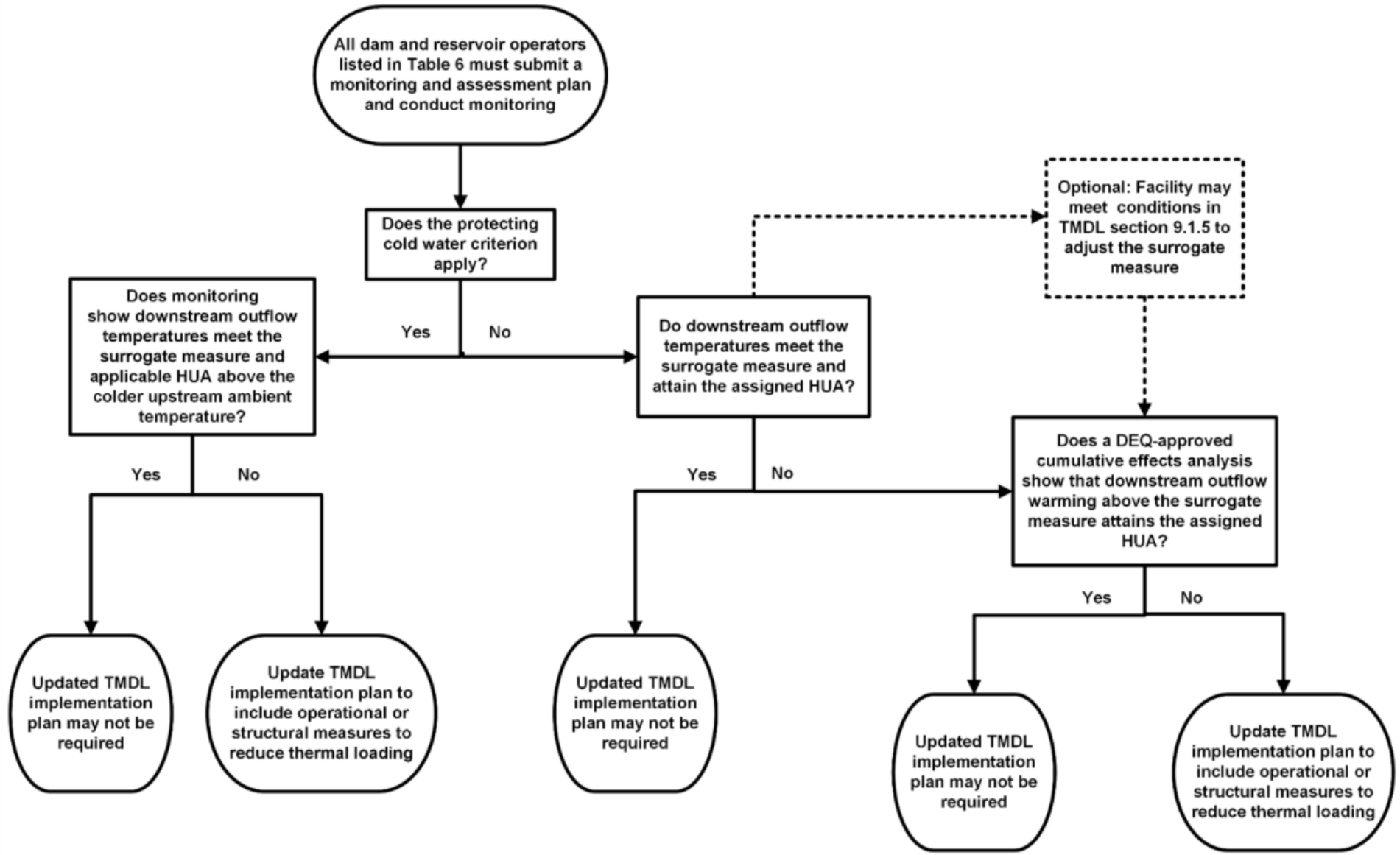

Figure 3. Monitoring and assessment decision tree for dam and reservoir operators during the applicable critical period.

10.2.3 Public involvement

Implementation plans must describe how responsible persons, including DMAs, use education and outreach to build understanding and support for management strategies. Plans should identify outreach methods (e.g., meetings, mailings, online tools), target audiences, identify opportunities for input, and describe how feedback will inform actions.

10.2.4 Maintenance of strategies over time

Implementation plans must describe how responsible persons, including DMAs, will maintain strategies to ensure continued progress toward load allocations and water quality standards. Plans should specify maintenance actions (e.g., inspections, repairs, updates), assign responsibilities, and set review schedules.

10.2.5 Implementation costs and funding

Implementation plans must include a five-year cost estimate for installing, maintaining, and monitoring TMDL implementation strategies. Plans should provide reasonable estimates of major costs, such as staffing, materials, operations, monitoring, outreach, and other relevant expenses, and identify likely funding sources or gaps. Entities are encouraged to report actual expenditures in annual progress reports to help evaluate cost-effectiveness. Appendix B lists some of the funding and assistance programs available to assist with implementing TMDL related actions.

10.3 Timeline for implementing management strategies and schedule for completing measurable milestones

Each implementation plan must provide a timeline for implementing management strategies and a schedule for completing measurable milestones. Timelines and milestones must align with basin-wide expectations in Section 5 and Section 6.2 and be informed by the monitoring and assessments defined in Section 10.2. This schedule is in addition to the requirement in Section 9 9 that responsible persons identified in Table 3 submit an implementation plan to DEQ within 18 months of EQC adoption of this WQMP.

Strategies and milestones should use the SMART framework—Specific, Measurable, Achievable, Relevant, and Time-bound (Doran, 1981)—to show progress during DEQ's five-year review.

Plans must commit to implementing management strategies on a reasonable timeline and provide a schedule that shows steady, incremental progress. Alternative schedules differing from Table 7 must be approved by DEQ.

Table 7. Schedule for implementation plans, monitoring and assessment

Requirement	Responsible persons, including DMAs	Submission date or timeframe
Submit an implementation plan to DEQ for review and approval	All responsible persons identified in Table 3 with jurisdiction over streamside lands	18 months after EQC adoption of the WQMP
Shade gap analysis project plan	ODA, ODF, BLM, USFS	18 months after EQC adoption of the WQMP
Dam and reservoir monitoring and assessment plan	Dam and reservoir operators identified in Table 6	18 months after EQC adoption of the WQMP
Streamside evaluation	All responsible persons identified in Table 3 with jurisdiction over streamside lands	Year-four annual report
Shade gap analysis or adoption of a 120-foot streamside buffer	ODA, ODF, BLM, USFS and any responsible persons not using the TMDL shade gap analysis for their streamside evaluation	Year-four annual report
Dam and reservoir cumulative effects analysis and/or implementation plan updates	Dam and reservoir operators in Table 6	Following completion of the temperature monitoring and assessment, operator consults with DEQ to set submittal dates

10.4 Implementation plan performance monitoring and review

Each implementation plan must provide for performance monitoring with a plan for periodic review and revision of the implementation plan.

10.4.1 Performance monitoring and reporting

Implementation plans must describe how progress will be monitored and reported, including the metrics and methods used to track implementation and evaluate effectiveness. Responsible persons, including DMAs, must submit annual reports to DEQ on a specified date. Reports must describe management strategies carried out, progress toward timelines and milestones, monitoring results, coordination with partners, and any significant changes that influence implementation. Reports may also include metrics such as the number and type of projects completed, practices applied, education activities, or technical assistance delivered. Responsible persons generally report on their own actions but may also include activities supported through partnerships or by individual landowners.

Projects that use practices listed in OWEB's *Oregon Watershed Restoration Inventory Online List of Treatments* must be reported to the OWRI database when completed, except for routine maintenance activities. This reporting is in addition to annual reports submitted to DEQ. DEQ uses OWRI to track implementation statewide and may approve other publicly accessible databases for this purpose.

10.4.2 Adaptive management and periodic review

Implementation plans must commit to adaptive management to evaluate the effectiveness of activities in improving streamside conditions, including shade. Annual reports must summarize the results of these evaluations. Reports submitted in year five must provide a cumulative assessment of implementation and effectiveness over the previous four years. DEQ may require responsible persons to revisit or update the streamside evaluation in the future to assess progress.

Responsible persons, including DMAs, must review and revise implementation plans every five years and submit them to DEQ for approval. Revisions must update timelines for continued implementation and should reflect lessons learned through monitoring and evaluation. If DEQ identifies deficiencies during review, it will set a deadline for submission of a revised plan.

11. Monitoring and evaluation of progress

OAR 340-042-0040(4)(I)(K) requires the WQMP to include a plan to monitor and evaluate progress toward achieving TMDL allocations and water quality standards, including (i) identification of persons responsible for monitoring, and (ii) a plan and schedule for reviewing monitoring information and revising the TMDL as needed.

Monitoring and adaptive management track implementation, assess effectiveness, and evaluate environmental conditions. These efforts demonstrate progress toward meeting load allocations, surrogate measures targets, and water quality standards, while also improving the understanding of pollutant loads and natural or human variability. Surrogate measure targets provide regulatory benchmarks for evaluating progress.

Monitoring under this WQMP includes two components:

- **Implementation and effectiveness monitoring** carried out by responsible persons, including DMAs, through their implementation plans, annual reports, and five-year reviews.
- **Environmental monitoring** that will be coordinated through the Rogue River Basin Temperature Monitoring Strategy that DEQ will develop with key partners.

11.1 Monitoring responsibilities

All responsible persons, including DMAs, must track the implementation and effectiveness of their strategies according to their implementation plans. Responsible persons identified in Table 3 and reservoir operators identified in Table 6 must conduct monitoring and assessments consistent with their implementation plans. The type and scope of monitoring depend on the strategies and commitments in each plan, and may include evaluations of streamside conditions, tracking of restoration projects, or other methods appropriate to local circumstances. Each responsible person must track their own actions, and some may also report on actions coordinated and implemented by partners or landowners.

DEQ, in coordination with key partners will develop a Rogue River Basin Temperature Monitoring Strategy. This strategy will provide a coordinated framework for periodically

monitoring the physical, chemical, and biological parameters needed to assess water quality status and trends for the impairments addressed in this TMDL. It will include development of sampling and analysis plans, refined in collaboration with basin partners, to track temperature and related parameters. The strategy will be initiated after the EQC adopts this WQMP and refined over time in collaboration with basin partners.

The objectives of the temperature monitoring strategy are to:

- Provide information needed to identify where management strategies should be applied and to assess their effectiveness.
- Refine information on pollutant loading by source or sector.
- Demonstrate progress toward meeting load allocations and surrogate measure targets.
- Support collaboration among responsible persons, including DMAs, to assess water quality status and trends.
- Provide information that supports adaptive management and adjustments over time.

Because ODA, ODF, BLM, and USFS combined manage over 88 percent of the streamside areas in the basin, they must continue to participate by monitoring within their jurisdictions, contributing to the design of a long-term temperature trend network, and evaluating opportunities to improve monitoring coverage. These agencies must also acknowledge their monitoring responsibilities in their implementation plans. The Rogue River Basin already benefits from established temperature monitoring partnerships involving agencies, watershed councils, and local organizations. The strategy is not intended to replace or duplicate these efforts, but to build on current efforts to ensure compatibility with existing programs. DEQ will help coordinate the development of a coordinated plan beginning with a review of existing data and sites and will work to refine the approach over time.

Other responsible persons, watershed councils, researchers, and local partners are encouraged to participate and support basin-wide coordination, data sharing, and evaluation.

All monitoring conducted to meet WQMP obligations must follow DEQ, EPA, or equivalent quality control and assurance protocols. ODA, ODF, BLM, and USFS must prepare or adapt Quality Assurance Project Plans or project-specific Sampling and Analysis Plans for DEQ approval, either individually or under a DEQ-coordinated umbrella plan according to a schedule approved by DEQ. Data must be submitted in formats accessible to DEQ. Resources for developing QAPPs and SAPs are available on DEQ's water quality monitoring website (DEQ, 2023a).

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

This section establishes DEQ's plan and schedule for reviewing monitoring information and revising the TMDL as needed. Monitoring and reporting give DEQ and responsible persons the feedback needed to adjust strategies and guide adaptive management (Figure 4). Surrogate measure targets serve as regulatory benchmarks for evaluating implementation progress over time.

The annual review evaluates whether implementation actions are implemented as committed to in DEQ-approved implementation plans. Annual reports from responsible persons, including DMAs, summarize actions taken, monitoring results, and observations. DEQ and responsible persons use this information to confirm practices, identify needed adjustments, and evaluate

other restoration efforts that contribute to improved stream temperature, such as channel morphology, and streamflow restoration.

The five-year review evaluates whether implemented actions effectively advance basin progress toward surrogate measure targets, load allocations, and water quality standards. DEQ compiles cumulative monitoring results, annual reports, and other relevant information to assess progress, determine whether strategies remain effective, and identify where updates to implementation plans, monitoring approaches, or other elements of the WQMP are needed. If DEQ finds plans ineffective, it may require revisions. The review incorporates new science, improved practices, and changes in basin conditions over time.

Based on these reviews, DEQ may revise the WQMP or prepare a revised TMDL for EPA approval if evaluation of monitoring data shows allocations are insufficient to meet water quality criteria or protect designated beneficial uses. Any DEQ revisions will follow the public participation requirements in OAR 340-042-0040(7).

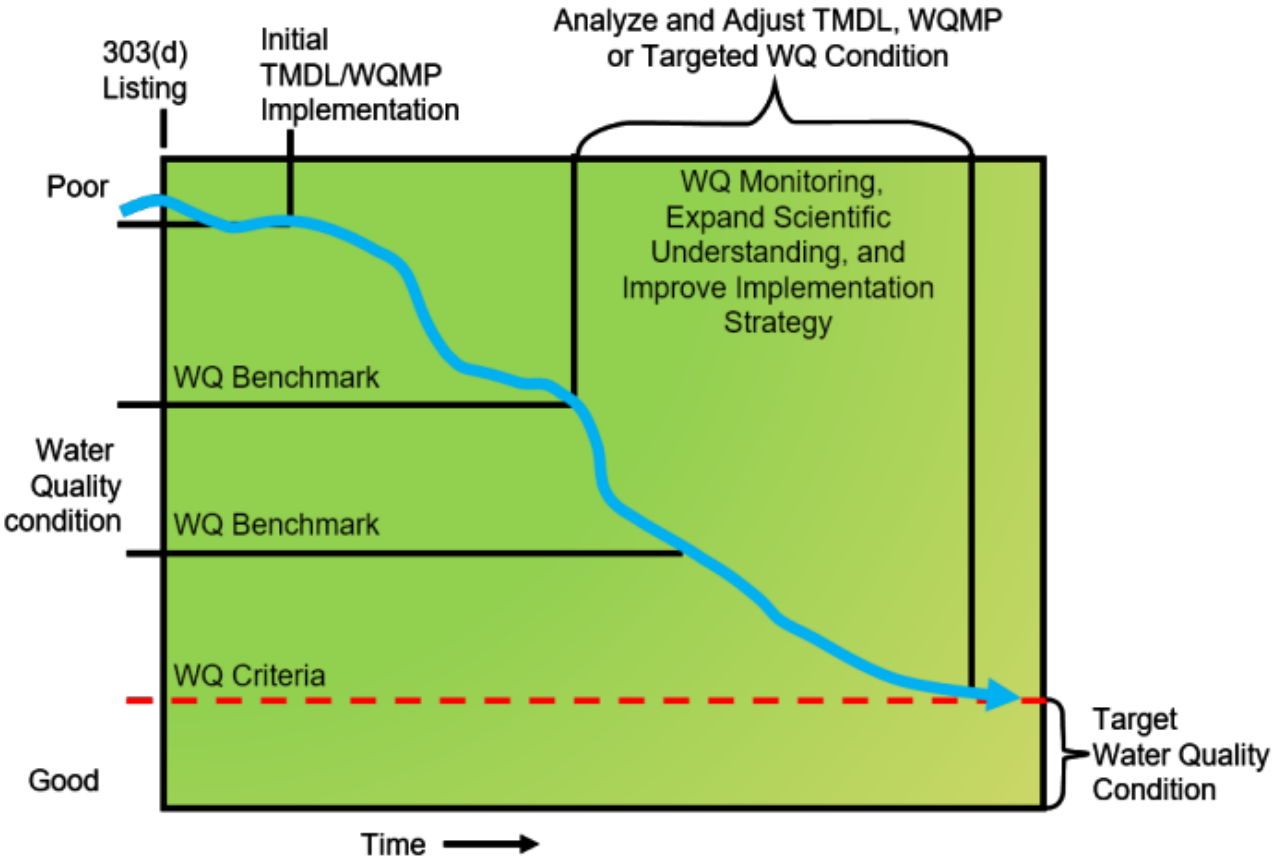

Figure 4. Conceptual representation of adaptive management.

12. Supporting program elements: public involvement, maintenance, and funding

As required by OAR 340-042-0040(4)(l)(L)–(N), this WQMP describes DEQ's approach to public involvement in implementing management strategies, maintaining strategies over time, and identifying costs and funding to support implementation.

12.1 Public involvement

DEQ provided opportunities for public involvement during the rulemaking process, including a rulemaking advisory committee, a public hearing, and a public comment period. DEQ will continue to provide opportunities throughout TMDL implementation. Updates will be provided during major WQMP revisions and five-year reviews. Summaries of implementation progress will be available to the public.

DEQ currently convenes regular basin-focused implementation meetings with responsible persons and interested watershed partners to support coordination and information sharing. Local public involvement remains the responsibility of responsible persons, including DMAs, who must describe in their plans how public input will inform strategies, implementation and future updates.

12.2 Maintenance of management strategies

DEQ ensures strategies remain effective and enforceable over time by reviewing implementation plans, annual reports, and five-year evaluations; assessing progress toward TMDL load allocations; and recommending updates when needed. If plans are incomplete or ineffective, DEQ issues written feedback and sets deadlines for revisions.

Day-to-day maintenance of individual strategies remains with responsible persons, including DMAs, who must describe in their plans how long-term maintenance will be supported through regular updates, resource commitments, and coordination mechanisms.

12.3 Costs and funding

Implementing strategies may result in capital and operational costs for responsible persons and DEQ. Costs vary with land use, pollutant sources, and existing controls. Most direct costs will be borne by those contributing heat to streams.

Expenses may include developing implementation plans, implementing projects and management strategies, conducting monitoring and assessments, and preparing annual reports and five-year reviews. Some strategies may reduce long-term costs through preventive maintenance or operational efficiencies, and water quality improvements can provide community-wide benefits such as healthier ecosystems and restored fisheries.

Estimated costs to DEQ, local businesses, and responsible persons are summarized in the Fiscal Impact Statement for this rulemaking. Responsible persons, including DMAs, must describe costs and funding strategies in their implementation plans. Appendix B lists funding

opportunities and grant programs that can support implementation of the Rogue River Basin TMDL.

13. Reasonable assurance of implementation

This section demonstrates that the TMDL implementation framework in this WQMP and the implementation plans required under OAR 340-042-0080 will be carried out through regulatory or voluntary actions. These actions reduce human-caused heat inputs, meet TMDL wasteload and load allocations, and support attainment of temperature-related water quality standards consistent with federal antidegradation rules (40 CFR 131.12(a)(2)) and Oregon's antidegradation policy (OAR 340-041-0004). OAR 340-042-0040(4)(l)(J) requires a description of reasonable assurance that those strategies and plans will be carried out.

OAR 340-042-0030(9) defines reasonable assurance as a demonstration that a TMDL will be implemented through regulatory or voluntary actions. OAR 340-042-0040(6)(g) requires that practices exist, be technically feasible, and have a high likelihood of implementation. This three-point test, consistent with EPA practice including the Chesapeake Bay TMDL (EPA, 2010), guides DEQ's determination that this WQMP will be implemented.

EPA guidance (1991 and 2012) emphasizes that reasonable assurance must connect enforceable mechanisms, monitoring, and adaptive management to demonstrate that practices exist, are feasible, and will be implemented. The Clean Water Act Section 303(d) further requires that a TMDL be established at a level necessary to implement the applicable water quality standard. This framework reinforces the three-point test and supports DEQ's approach in this WQMP. For point sources, the NPDES program provides reasonable assurance; for nonpoint sources, DEQ applies the three-point test to determine whether reductions are achievable. Without such a demonstration, additional point source reductions may be required.

13.1 Implementation mechanisms

Figure 5 illustrates DEQ's accountability framework. It links pollutant reduction strategies to responsible persons, assigns timelines and milestones, tracks progress through monitoring and reporting, and provides adaptive management and enforcement actions if implementation falls short. This stepwise approach demonstrates how reasonable assurance is maintained over time.

The core of reasonable assurance comes from enforceable requirements in this WQMP:

- **NPDES permitting**
  DEQ implements wasteload allocations for point sources through NPDES permits consistent with 40 CFR 122.44(d)(1)(vii)(B). Federal regulations require that water quality-based effluent limits in permits align with the assumptions and requirements of the approved TMDL, providing enforceable mechanisms to meet these allocations.

- **WQMP and DEQ-approved implementation plans**
  For nonpoint sources, DEQ implements load allocations through this WQMP, and implementation plans required under OAR 340-042-0080. These plans must identify management strategies to meet allocations, include timelines and milestones, provide

performance reporting, ensure public involvement, describe how strategies will be maintained, and include cost estimates for installing, maintaining, and monitoring practices. DEQ reviews each plan for adequacy before approval and oversees implementation through required reporting and adaptive management. Because approval is conditioned on these required elements, only plans capable of meeting allocations move forward. ODF and ODA must also prepare and implement TMDL implementation plans in addition to their existing Forest Practices Act and Agricultural Water Quality Management Area Plans and Rules.

- **Section 401 water quality certifications**
  Certain dams operate under Clean Water Act Section 401 water quality certifications issued by DEQ that include enforceable measures to maintain compliance with water quality standards and implement applicable TMDL load allocations. Section 401 water quality certifications are specific to each dam or hydropower project and include conditions for management of water quality and protection of beneficial uses potentially impacted by dam operations. Section 401 water quality certifications are an enforceable mechanism for managing temperature-related impacts from dam operations.

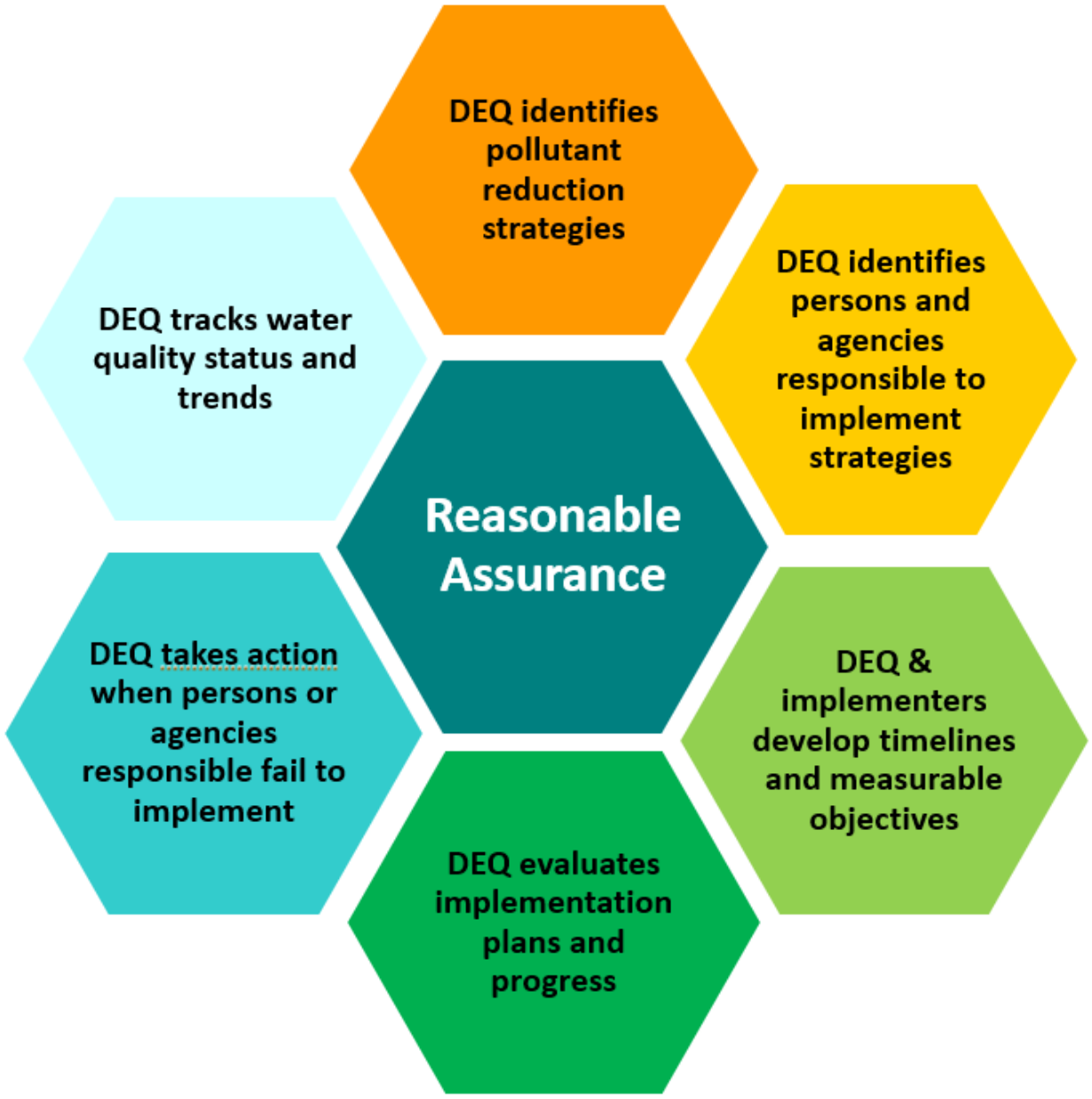

Figure 5. DEQ reasonable assurance accountability framework

Voluntary and collaborative efforts also strengthen basin-wide implementation capacity, including:

- Riparian restoration and habitat improvement projects that increase shade, stabilize streambanks, and reconnect floodplains.
- Basin-wide monitoring and data-sharing networks that track conditions and adaptive management.

- Education, outreach, and technical and financial assistance programs that help responsible persons adopt effective management strategies.

Variable lag times for riparian recovery and site-specific conditions create uncertainty. Ongoing monitoring and adaptive management help to address this uncertainty. Because some management strategies may prove less effective than anticipated, DEQ may require substitution or addition of practices where monitoring shows inadequate load reductions. DEQ relies on its accountability framework - approval of implementation plans, annual and five-year reports, performance monitoring, and adaptive management reviews - to maintain progress and require corrections if strategies fall short.

Climate change is altering precipitation, streamflow, and temperature patterns in Oregon. These shifts increase thermal loading risks and can slow stream recovery. The Office of Greenhouse Gas Programs within DEQ leads state efforts to reduce greenhouse gas emissions through policies such as the Greenhouse Gas Reporting Program, the Clean Fuels Program, and the Climate Protection Program. The CPP, re-adopted in November 2024, establishes enforceable declining caps on fossil-fuel emissions, with goals of reducing statewide emissions about 50 percent by 2035 and 90 percent by 2050. The State Agency Climate Change Adaptation Framework further guides agencies and local partners in building resilience. While not enforceable under this WQMP, these initiatives complement local riparian and watershed actions by reducing long-term stressors, supporting adaptation, and reinforcing the likelihood of attaining temperature standards.

The enforceable requirements in this WQMP demonstrate a high likelihood of implementation because DEQ reviews and approves implementation plans for adequacy, requires periodic reporting, and uses monitoring to track compliance and address deficiencies. Voluntary and collaborative efforts, while outside DEQ's regulatory authority, further strengthen basin-wide capacity and increase the overall likelihood of achieving TMDL targets. The WQMP names responsible persons, including DMAs, in Appendix A, each with obligations tied to timelines, milestones, and performance monitoring.

13.2 Oversight, enforcement, and adaptive management

DEQ ensures implementation by reviewing implementation plans to confirm they identify strategies capable of meeting load allocations and surrogate measure targets, include measurable milestones, and commit to monitoring and adaptive management. DEQ then tracks progress through required reporting and coordinates with responsible persons. ODA, ODF, BLM, and USFS manage most of the land in the basin (over 88 percent of streamside area in the Rogue River Basin) and are required to prepare and implement implementation plans. These plans are central to basin-wide accountability.

DEQ tracks water quality status and trends through performance reporting, demonstration of management strategy effectiveness, progress toward Oregon's Nonpoint Source Program Five-Year Plan goals, discharge monitoring reports, and instream monitoring. The Rogue River Basin Temperature Monitoring Strategy provides a coordinated framework for collecting instream temperature data to guide adaptive management decisions. DEQ Status and Trends reports and biennial Integrated Reports, required under the Clean Water Act, provide basin-wide and statewide water quality assessments that guide resources and plan revisions.

Implementation plans approved by DEQ are enforceable. Failure to submit, timely implement, or revise a plan as required is a Class II violation under OAR 340-012-0055(2)(e), and failure to submit required annual reports on time is a Class I violation under OAR 340-012-0053(1).

DEQ evaluates annual reports and five-year reviews against established timelines and milestones to confirm that strategies remain on track. These evaluations trigger enforcement or adaptive management actions when strategies fall short of expected progress. If progress lags, DEQ may require revised strategies, stronger measures, or updates to the streamside evaluation to assess progress, as well as additional permit conditions. If responsible persons fail to develop, implement, or revise their implementation plan, or to meet established milestones, DEQ may take appropriate action. Options include voluntary engagement, formal enforcement, or referral to the EQC under OAR 340-042-0080.

When establishing permits for point sources, if any credit is based on future nonpoint source reductions, the record must demonstrate (1) reasonable assurance that nonpoint source controls will be implemented and maintained, or (2) that such reductions are documented through an effective monitoring program.

DEQ may also determine that plans are not necessary for some responsible persons. New information may also warrant adding additional responsible persons or requiring previously identified responsible persons to submit an implementation plan. In such cases, DEQ may revise the WQMP or reissue individual orders to require plan submittal.

If evaluation shows that current strategies are unlikely to meet allocations and temperature standards, DEQ may require revisions to implementation plans, revise the WQMP or prepare a revised TMDL for EPA approval. DEQ will follow all public participation requirements, including convening a local technical or rulemaking advisory committee to provide input on TMDL revisions per OAR 340-042-0040(7). These adaptive management actions ensure that management strategies remain effective, protect beneficial uses, and respond to new information or changing conditions.

The enforceable requirements in this WQMP and DEQ-approved implementation plans demonstrate reasonable assurance because they include the key elements needed for successful implementation and are subject to DEQ review, approval, and adaptive management. DEQ's accountability framework, linking enforceable requirements, monitoring, and adaptive management, mirrors the Chesapeake Bay TMDL approach that EPA has recognized as a model for demonstrating reasonable assurance. Together, these mechanisms provide high confidence that allocations will be met, and temperature standards attained.

14. Legal authorities

As required by OAR 340-042-0040(4)(l)(O), the following legal authorities provide the basis for implementing the management strategies outlined in this WQMP. They support both regulatory and voluntary actions by DEQ and its partners to reduce pollutant loads and protect water quality.

Clean Water Act, Section 303(d)

DEQ is responsible for implementing the Clean Water Act in Oregon. Under Section 303(d) of the 1972 Federal Clean Water Act, as amended, states must develop a list of rivers, streams, and lakes that cannot meet water quality standards without additional pollution controls beyond those already required for industrial sources and sewage treatment plants. These waters are

considered "water quality limited." States or the EPA must identify these waterbodies, and in Oregon, DEQ maintains and updates the list every two years. This list is known as the 303(d) list.

Section 303 of the Clean Water Act also requires the development of TMDLs for all waters on the 303(d) list. DEQ implements TMDLs through OAR 340-042, with special provisions for agricultural lands and nonfederal forestland governed by the Agriculture Water Quality Management Act and the Forest Practices Act, respectively. OAR 340-042(4)(I) requires TMDLs to include a WQMP.

A TMDL defines the maximum amount of pollution a waterbody can handle without violating water quality standards. To meet these limits, DEQ develops WQMPs that outline strategies to reduce pollution to the levels specified in the load allocations and wasteload allocations in the TMDL. This strategy aims to restore water quality and ensure compliance with water quality standards, protecting the designated beneficial uses of the water for all users.

Endangered Species Act, Section 6

Section 6 of the 1973 federal Endangered Species Act, as amended, encourages states to create and maintain conservation programs for federally listed threatened and endangered species. Under Section 4(d) of the ESA, the National Marine Fisheries Service must identify activities that may result in a “take,” meaning harm or harassment, of the species they protect. This WQMP focuses on protecting salmonid fish.

NMFS also defines specific precautions that, if followed, protect local governments and other entities from prosecution for take even if a listed species is unintentionally harmed. This provision, known as a limit on the take prohibition, provides greater certainty about liability.

In July 2000, NMFS published a rule responding to Section 4(d) (65 FR 42421) which lists 12 criteria to determine whether a local program includes sufficient precautionary measures to conserve fish. Local jurisdictions can submit development ordinances to NMFS for review under some or all of these criteria. The criteria for municipal, residential, commercial, and industrial development and redevelopment include:

- Avoid development in inappropriate areas such as unstable slopes, wetlands, and high habitat value areas.
- Prevent stormwater discharge impacts on water quality.
- Protect riparian areas.
- Avoid stream crossings by roads, utilities, or other linear developments.
- Protect historic stream meander patterns.
- Protect wetlands, wetland buffers, and wetland functions.
- Preserve the hydrologic capacity of permanent and intermittent streams to pass peak flows.
- Promote landscaping with native vegetation.
- Prevent erosion and sediment runoff during and after construction.
- Ensure water supply demand does not negatively impact salmon needs.
- Provide mechanisms for monitoring, enforcement, funding, and implementation.
- Comply with all relevant state and federal environmental laws and permits.

Oregon Revised Statute Section 468B

DEQ has legal authority to prevent and reduce water pollution across the state. Under ORS 468B.020, the law declares pollution of state waters as neither a reasonable nor natural use of

those waters and states that pollution contradicts Oregon's public policy outlined in ORS 468B.015. To enforce this policy, DEQ must take necessary actions to prevent new pollution and reduce existing pollution by encouraging cooperation among individuals, industries, cities, and counties. DEQ also requires the use of all available and effective methods to meet the water quality and purity standards set in ORS 468B.048. Additionally, ORS 468B.110 gives DEQ and the Environmental Quality Commission authority to take actions necessary to meet and maintain water quality standards. This includes issuing TMDLs and establishing WQMPs.

NPDES and WPCF Permits

DEQ issues two types of wastewater permits under ORS 468B.050. The National Pollutant Discharge Elimination System permit regulates the discharge of waste into waters of the United States and is required under the federal Clean Water Act. The Water Pollution Control Facilities permit regulates waste disposal on land and operates as a state program.

401 Water Quality Certification

Section 401 of the Clean Water Act requires applicants for federal licenses or permits to obtain certification from DEQ before starting any activity that may discharge pollutants into state waters. This certification confirms that the activity complies with state water quality standards. The requirement applies to projects such as hydroelectric developments and dredge-and-fill operations. Relevant legal authorities include 33 U.S.C. 1341, ORS 468B.035 – 468B.047, and OAR 340-048-0005 – 340-048-0040.

Oregon Forest Practices Act

The Oregon Department of Forestry regulates land management activities on non-federal forest lands that impact water quality under ORS 527.610 to 527.992 and OAR 629, Divisions 600 through 665. The Board of Forestry has adopted water protection rules detailed in OAR 629, Divisions 625, 630, and 635-660. The Oregon EQC, Board of Forestry, DEQ, and ODF rely primarily on these pollution control measures to meet state water quality standards. Statutes and rules also include adaptive management provisions, which allow revisions to Forest Practices Act practices when necessary to meet water quality standards. These provisions appear 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 preventing and controlling water pollution from agricultural activities under the Agricultural Water Quality Management Act (ORS 568.900 to ORS 568.933), adopted by the legislature in 1993. As the lead state agency for regulating agriculture's effects on water quality under ORS 561.191, ODA collaborates with local communities to develop Agricultural Water Quality Management Area Plans in watersheds where agricultural practices contribute to water quality impairments. The Rogue River Basin is subject to the Inland Rogue Agricultural Water Quality Management Area Plan Rules under OAR 603-095-1400 through OAR 603-095-1460.

Local ordinances

Local governments must comply with applicable statewide land use requirements. DMA Implementation plans will identify the existing local legal authorities available to carry out management strategies and any new authorities needed to meet TMDL allocations. If new or

revised codes or ordinances are required, the DMA must include code development as a management strategy.

15. References

BLM (U.S. Department of the Interior, Bureau of Land Management). 2016a. *Northwestern & Coastal Oregon record of decision and resource management plan.*

BLM (U.S. Department of the Interior, Bureau of Land Management). 2016b. *Southern Oregon record of decision and resource management plan.*

DEQ & ODF (2021). Memorandum of Understanding between DEQ and ODF.

Galli, J., & Dubose, P. (1990). *Effects of channel modifications on stream temperature.* Metropolitan Washington Council of Governments, Department of Environmental Programs. Washington, DC.

DEQ. 2006. Rogue Basin Water Quality Management Plan.

DEQ. 2022. Water Quality Status and Trends.

DEQ. 2022. EPA approved Integrated Report.

DEQ. 2023. Rogue Basin Interactive Map.

DEQ. 2023a. Volunteer Monitoring Resources webpage. Accessed September 18, 2025.

DEQ. 2023b. Water Temperature Impacts from In-Channel Ponds in Portland Metro and Northwest Region.

DEQ. 2025. Willamette Subbasins Technical Support Document. Oregon Department of Environmental Quality.

Doran, George T. 1981. There's a S.M.A.R.T. way to write management's goals and objectives. Management Review. 70. Pages 35-36. Accessed January 20, 2023.

EPA. 1991. Guidance for Water Quality-based Decisions: The TMDL Process. EPA/440/4-91-001. Washington, D.C.

EPA. 2007. National Management Measures to Control Nonpoint Source Pollution from Hydromodification. EPA 841-B-07-002. National Management Measures to Control Nonpoint Source Pollution from Hydromodification (epa.gov)

EPA. 2010. Chesapeake Bay TMDL. December 29, 2010.

EPA. 2012. Supplemental Information for Reviewing Reasonable Assurance in TMDLs. Office of Wetlands, Oceans and Watersheds. February 15, 2012.

EPA. 2017. Causal Analysis/Diagnosis Decision Information System (CADDIS): Vol. 2: Sources, Stressors, and Responses - Temperature.

EPA. 2023. Funding Resources for Watershed Protection and Restoration webpage. Accessed September 18, 2025

DEQ. 2026. Rogue River Basin Total Maximum Daily Load for Temperature.

Larson, L.L., and S.L. Larson. 1996. Riparian Shade and Stream Temperature: A Perspective. Rangelands, 18(4):149-152.

Oregon Department of Agriculture. Inland Rogue Agricultural Water Quality Area Plan (2001, updates, 2024, 2026).

Oregon Plan for Salmon and Watersheds. 1999. Oregon Aquatic Habitat Restoration and Enhancement Guide. Restoration_Enhancement_Guide.pdf (oregon.gov)

OWEB. 1999. Addendum to Water Quality Monitoring Technical Guidebook: Chapter 14 Stream Shade and Canopy Cover Monitoring Methods.

OWEB. 2023. Oregon Watershed Restoration Inventory.

Roon, D. A., Dunham, J. B., & Groom, J. D. (2021). Shade, light, and stream temperature responses to riparian thinning in second-growth redwood forests of northern California. *PLoS ONE, 16*(2), e0246822.

USFS (U.S. Department of Agriculture). 1990. Rogue Land and Resource Management Plan. Chapter 4, Page 60.

USFS and BLM (U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management). 1994. *Record of decision for amendments to Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl*.

16. Appendices

The WQMP includes the following list of appendices.

Appendix A: List of responsible persons including DMAs

Name	Type	Total Acres in the Rogue River Basin	Streamside Acres**	TMDL plan Required
Bonneville Power Administration	Special District	22.83	10.60	No
Central Oregon & Pacific Railroad	Private	996.49	350.97	No
City of Ashland	Municipality	4519.00	963.29	Yes
City of Butte Falls	Municipality	282.38	67.56	Yes
City of Cave Junction	Municipality	1204.88	233.88	Yes
City of Central Point	Municipality	2487.05	312.35	Yes
City of Eagle Point	Municipality	1885.27	604.07	Yes
City of Gold Beach	Municipality	253.59	66.52	Yes
City of Gold Hill	Municipality	392.43	104.00	Yes
City of Grants Pass	Municipality	8235.50	1655.35	Yes
City of Jacksonville	Municipality	1195.67	420.92	Yes
City of Medford	Municipality	16697.14	2618.77	Yes
City of Phoenix	Municipality	875.32	219.08	Yes
City of Rogue River	Municipality	582.58	151.03	Yes
City of Shady Cove	Municipality	1219.94	354.64	Yes
City of Talent	Municipality	855.36	138.54	Yes
Curry County	County	5088.71	1358.52	Yes
Jackson County	County	148063.16	48958.05	Yes
Josephine County	County	76417.52	23291.42	Yes
Klamath County	County	18.16	5.64	No
Oregon Department of Agriculture	State Agency	236570.89	77910.97	Yes
Oregon Department of Fish and Wildlife	State Agency	2355.43	596.36	Yes

Name	Type	Total Acres in the Rogue River Basin	Streamside Acres**	TMDL plan Required
Oregon Department of Forestry - Private	State Agency	674562.44	235881.05	Yes
Oregon Department of Forestry - Public	State Agency	8848.81	2516.74	Yes
Oregon Department of Geology and Mineral Industries	State Agency	797.18	331.80	Yes
Oregon Department of State Lands	State Agency	323.51	133.52	Yes
Oregon Department of Transportation	State Agency	9385.28	2978.80	Yes
Oregon Parks and Recreation Department	State Agency	2198.53	563.76	Yes
Pacific Power and Light	Private	63.55	22.23	No
Rogue Valley Terminal Railroad Corporation	Private	11.59	2.36	No
State of Oregon	State Agency	1515.45	534.58	Yes
U.S. Army Corps of Engineers	Federal Agency	5622.08	847.53	Yes
U.S. Bureau of Land Management	Federal Agency	723600.37	254463.00	Yes
U.S. Bureau of Reclamation	Federal Agency	254.79	31.60	Yes
U.S. Forest Service	Federal Agency	1199042.28	221811.76	Yes
U.S. Government - Crater Lake National Park	Federal Agency	6191.55	1776.86	No

*NOTE: Streamside Acres are measured 100 meters from stream centerline.

Appendix B: List of funding and technical assistance resources for TMDL implementation

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	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
Conservation Reserve Program	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	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.	OHA
Watershed Protection Program	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	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	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

Program	General Description	Contact
Agricultural Conservation Easement Program	Provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits.	NRCS
Farm and Ranchland Protection Program	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	Provides incentives to landowners to protect and restore pastureland, rangeland, and certain other grasslands.	NRCS
Landowner Incentive Program	Provides funds to enhance existing incentive programs for fish and wildlife habitat improvements.	U.S. Fish and Wildlife Service
Oregon Watershed Enhancement Board	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
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
Resource Conservation & Development	Provides assistance to organizations within RC & D areas in accessing and managing grants.	Resource Conservation and Development
ODF Small Forestland Investment in Stream Habitat \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

Program	General Description	Contact
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	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

Appendix C: List of dams and reservoirs in the Rogue River Basin

DEQ compiled a list of 60 dams in the Rogue River Basin TMDL temperature project area using data from the U.S. Army Corps of Engineers National Inventory of Dams and the Oregon Water Resources Department dam safety program. Of these, DEQ identified 6 facilities required to submit plans to monitor and assess temperature effects. Depending on the results of temperature monitoring, DEQ may also require these 6 facilities to develop implementation plans for temperature management. Note that some of these facilities are also identified in Appendix A as DMAs and are required to develop temperature implementation plans to address streamside areas under their jurisdiction.

No.	DAM ID	Dam or reservoir name	Ownership	Maximum reservoir storage (Acre-Feet)	Required monitoring and assessment
1	OR00612	William L. Jess Dam	Federal	500000	Yes
2	OR00624	Applegate Dam	Federal	89300	Yes
3	OR00581	Emigrant Dam	Federal	46700	Yes
4	OR00212	Willow Creek	Local Government	12000	Yes
5	OR00021	Fish Lake Dam	Public Utility	9397	Yes
6	OR00422	Agate Dam	Federal	5700	Yes
7	OR00513	McMullen Creek	Local Government	2000	No
8	OR00357	Woodrat Knob	Private	1789	No
9	OR00395	Lake Creek	Private	1360	No
10	OR00246	Walch Dam	Private	1300	No
11	OR00400	Sams Valley	Local Government	1200	No
12	OR00379	Wade	Private	1100	No
13	OR00222	Yankee	Private	1100	No
14	OR00110	Hosler (Reeder Gulch)	Local Government	888	No
15	OR00442	Bradshaw	Private	785	No
16	OR00401	Osborne Creek	Private	775	No
17	OR00295	Woolfolk Reservoir	Private	700	No
18	OR00148	Dailey Reservoir Log Pond	Private	575	No
19	OR00460	Harrison	Private	500	No

No.	DAM ID	Dam or reservoir name	Ownership	Maximum reservoir storage (Acre-Feet)	Required monitoring and assessment
20	OR00560	North Fork Diversion Dam	Private	450	No
21	OR00031	Keene Creek Dam	Federal	391	No
22	OR00247	Stanley, Charles W. Reservoir	Private	380	No
23	OR00414	Lippert Reservoir 2 (Upper)	Private	365	No
24	OR00218	Grizzley Creek Reservoir No. 2	Private	360	No
25	OR00715	North Fork Diversion Dam	Public Utility	309	No
26	OR00387	Star Lake	Private	290	No
27	OR00139	Pierce Reservoir	Private	250	No
28	OR00695	Shipler Reservoir	Private	250	No
29	OR00437	Ferry Creek	Local Government	167	No
30	OR00025	Bolan Lake Dam	Federal	165	No
31	OR00204	Gardener Reservoir	Private	142	No
32	OR00530	Hoover Pond 1	Local Government	139	No
33	OR03772	Camp Creek #2 (Curry)	Private	136	No
34	OR00457	Big Miller Lake	Local Government	134	No
35	OR00635	Medford Forest Nursery	Federal	127	No
36	OR00286	Skou Reservoir	Private	114	No
37	OR00528	Hoover Pond 3	Local Government	109	No
38	OR00523	Lester James #1	Public Utility	106	No
39	OR00702	Bounds Reservoir	Private	93	No
40	OR00278	Nelson Reservoir No. 1	Private	92	No
41	OR00439	Simpson Reservoir (Jackson)	Private	90	No
42	OR03864	Ditch Creek Reservoir	Private	90	No
43	OR00346	Lester James Reservoir 3	Private	75	No
44	OR00142	Strong	Private	70	No
45	OR00529	Hoover Pond 2	Local Government	68	No

No.	DAM ID	Dam or reservoir name	Ownership	Maximum reservoir storage (Acre-Feet)	Required monitoring and assessment
46	OR00459	Frog Pond #1	Private	60	No
47	OR00468	Werner (Upper)	Private	60	No
48	OR00429	Bradshaw 2	Private	60	No
49	OR00636	Owen	Private	55	No
50	OR00304	Hammel No. 2	Private	50	No
51	OR00475	Duggan	Private	50	No
52	OR01363	Charley Horse Reservoir	Private	48	No
53	OR00720	Sowell Dam	Private	47	No
54	OR04001	Ra Murphy Dam	Private	45	No
55	OR02356	Mccormick Reservoir	Private	38	No
56	OR00427	Tall Timber Lake	Private	29	No
57	OR02172	Lester James Reservoir 2	Public Utility	29	No
58	OR03712	Spalding Dam	Federal	25	No
59	OR00716	South Fork Diversion Dam	Private	19	No
60	OR00538	Squaw Lake Dam	Federal	unknown	No