

Monitoring Oregon's Waters

Summary of State Agency Actions

Oregon STREAM Team

February, 2025

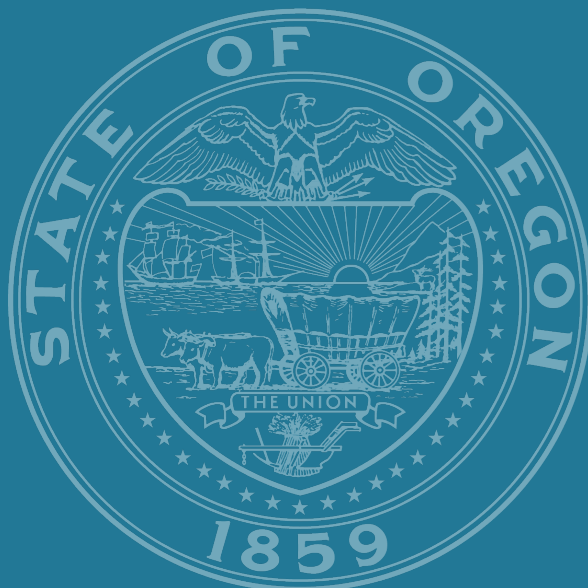


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Executive Summary

This summary of water monitoring for Oregon's waters was developed by an Oregon inter-agency STRategic Enterprise Approach to Monitoring (STREAM) Team. This summary compiles state agency information into a single reference document to promote coordination and collaboration. The purpose of this document is to help natural resources agency scientists identify and collect the right information needed to inform policymakers about emerging water issues, the status and trends of Oregon's waters, what types of monitoring are occurring throughout the state, and the effectiveness of current agency actions.

This summary identifies the current authorities, monitoring strategies, and programs of Oregon's primary natural resource agencies working to monitor the state's fresh waters, including lakes, reservoirs, rivers, streams, wetlands, estuaries and groundwater, along with the aquatic life they support. The agencies included here are the Department of Agriculture (ODA), the Department of Environmental Quality (DEQ), the Department of Fish and Wildlife (ODFW), the Department of Forestry (ODF), the Water Resources Department (WRD), the Department of State Lands (DSL), and the Watershed Enhancement Board (OWEB). Also included are two integrated university-based institutes: the Institute for Water and Watersheds (IWW) at Oregon State University, and the Institute for Natural Resources (INR) at Oregon State University and Portland State University.

While the authorities, monitoring strategies and programs of the seven agencies vary, they overlap in their focus on effectiveness monitoring. Collectively, the agencies have extensive programs to regulate the use of, impacts to, and protection and restoration of water and aquatic systems in the state. The majority of their monitoring has been designed to develop plans or programs and to assess the effectiveness of the activities implemented through these programs. In the "Overlapping Needs" section, this summary begins to identify opportunities for agencies to work together to plan, collaborate and share environmental data. Ongoing coordination could enhance efficiencies and provide more complete water data to answer important questions about the states' waters.

As current environmental data systems are replaced and new monitoring programs are established, coordination can increase the efficiency of monitoring efforts. For example, statewide stream temperature and flow monitoring is a key information need. A major need is to understand water quality and quantity trends, including a coordinated statewide stream temperature and flow monitoring program that would (1) inventory existing information, (2) identify gaps, (3) establish new monitoring sites, and (4) develop a common storage solution for continuous data to facilitate mapping of current and future resource states through stream network monitoring tools. Temperature and flow are cross-cutting indicators important to many of the natural resource agencies, presenting an immediate opportunity for coordination and efficiency gains. Web-based data tools offer opportunities for agencies to coordinate their ongoing monitoring efforts for temperature and flow. The STREAM Team offers an important venue for facilitated inter-agency discussion about common questions, and to facilitate monitoring and environmental data coordination to ensure that data tools and other supporting products remain relevant to these questions.

Introduction

High quality environmental monitoring data provides a foundation for making sound decisions that impact Oregon's water resources. In 2012, Oregon developed the state's first Integrated Water Resources Strategy (IWRS 2012) which identified the need to improve access to water quality and water quantity monitoring information as a "critical issue". The IWRS provides specific recommendations and outlines an over-arching inter-agency framework to address these issues. The IWRS was updated in 2024. Oregon's natural resources agencies collect a wide variety of environmental data on shared water resources. These data are used to assess compliance with regulations, identify areas for protection, evaluate the effectiveness of restoration and conservation projects designed to protect and restore stream flows, water quality, and aquatic life, and to identify issues of emerging concern.

This document was developed by Oregon's inter-agency STRategic Enterprise Approach to Monitoring (STREAM) Team. It examines the roles, responsibilities and questions state natural resource agencies have related to water monitoring activities. This information was compiled to help agency scientists identify and collect the information needed to better inform policymakers about emerging issues of concern, the status and trends of Oregon's waters, and the effectiveness of current agency actions and programs.

The different authorities, jurisdictions and missions of Oregon's natural resources agencies often require unique data to interpret compliance with agency rules, programmatic effectiveness and success in accomplishing specific mission objectives. At the same time, there are opportunities to share environmental data between our agencies while creating efficiencies in the way data is collected and shared. The success of any individual agencies' environmental mission is linked to the success of all partners. As agencies and organizations strive to understand the status and trends of our waters and aquatic life, and the effectiveness of programmatic activities, we need evidence that our collective efforts are working, complementary and efficient to ensure plentiful, clean water is available to meet the needs of current and future generations.

This summary provides an overview of the current strategies, authorities and programs of Oregon's natural resource agencies use to monitor Oregon's fresh waters, including lakes, reservoirs, rivers, streams, estuaries and groundwater, along with the biota they support. Each agency provides information on the following:

- The federal and/or state rules that provide authority to monitor;
- The primary information needs or questions addressed by the agency's strategy;
- Where on the geographic and/or political landscape their monitoring strategy applies;
- How the agency goes about implementing their monitoring strategy; and
- Gaps in strategy or in agency monitoring that need to be addressed.

Oregon Department of Agriculture

Geographic and Jurisdictional Responsibilities

In 1993, the Oregon Legislature passed the AgWQ Management Act directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion, to achieve water quality standards, and to adopt rules as necessary to implement the Program (Oregon Revised Statute (ORS) 568.900 through 568.933). In 1995, the Oregon Legislature further clarified that ODA is the lead agency for regulating agriculture with respect to water quality (ORS 561.191).

State and federal programs that drive the establishment of Area Plans and Rules include:

- State water quality standards.
- Load allocations for agricultural nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to Section 303(d) of the federal Clean Water Act.
- Approved management measures for Coastal Zone Act Reauthorization Amendments.
- Agricultural activities detailed in a Groundwater Management Area Action Plan (if the Oregon Department of Environmental Quality (DEQ) has established a Groundwater Management Area and an action plan has been developed).

The Program applies to all agricultural activities on non-federal and non-Tribal Trust land.

Between 1997 and 2004, ODA worked with Local Advisory Committees (LACs) and other local partners to develop Area Plans and associated Area Rules in 38 watershed-based Management Areas across Oregon (Figure 1).

ODA meets with the LAC, Soil and Water Conservation District (SWCD) staff, and other conservation partners every four years to review and update each Area Plan.

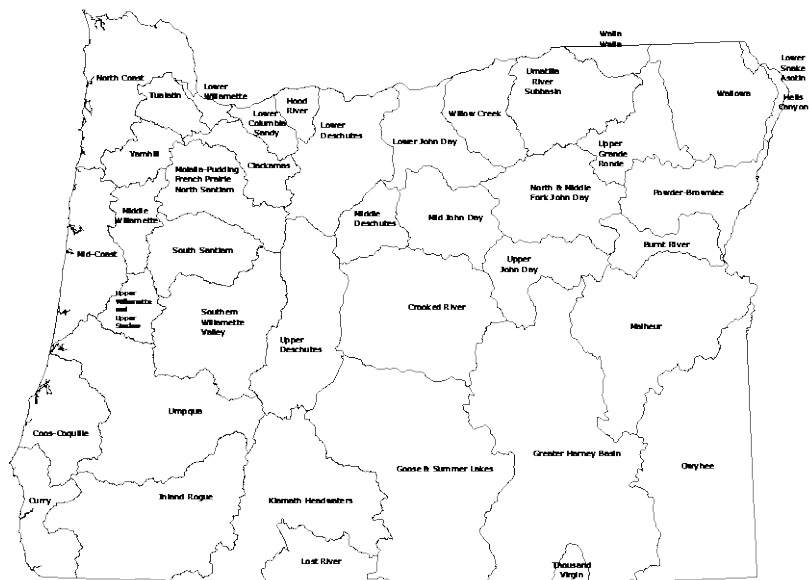


Figure 1. ODA's Watershed-Based Management Areas.

The Program emphasizes protection and enhancement of vegetation along streams to prevent and control water pollution from agriculture activities and to prevent and control soil erosion. Streamside vegetation can provide three primary water quality functions: shade for reducing solar heating of streams, streambank stability, and filtration of pollutants. The Program uses the concept of "site-capable vegetation" (SCV) to describe the vegetation that agricultural streams can provide to protect water quality. SCV is the vegetation that can be expected to grow at a particular site,

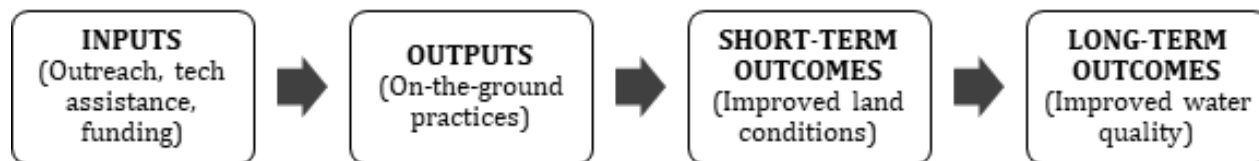
given natural site factors (e.g., elevation, soils, climate, hydrology, wildlife, fire, floods) and historical and current human influences that are beyond the Program’s statutory authority (e.g., stream channelization, roads, modified flows, previous land management). The goal is for Oregon’s agricultural landowners to provide the water quality functions (shade, streambank stability, and filtration of pollutants) produced by SCV along streams flowing through agricultural lands.

Area Plans

Area Plans provide guidance for addressing water quality related to agricultural activities in each Management Area. Area Plans are non-regulatory and unenforceable. Each Area Plan identifies strategies to prevent and control water pollution from agricultural lands through a combination of outreach programs, suggested land treatments, voluntary management activities, funding, compliance with regulatory Area Rules, and monitoring.

The goal of each Area Plan is to prevent and control water pollution from agricultural activities and soil erosion and achieve applicable water quality standards. This goal is the same as the Program’s goal. This goal is accomplished through helping landowners make on-the-ground changes, resulting in improved upland and streamside conditions that will protect water quality (Figure 2). ODA and LACs will use the monitoring data provided at each biennial review as part of the adaptive management process to review and evaluate progress, and determine what additional efforts, if any, are needed. These may include work in prioritized watersheds and adoption of appropriate management practices.

Figure 2. Process for meeting the Area Plan/Program GOAL



Area Rules

Area Rules (Oregon Administrative Rules 603-095-0000 through 3900) require that landowners perform actions as necessary to prevent and control pollution from agricultural activities and soil erosion.

All Management Areas have at least two rules: a waste rule and a streamside vegetation rule. Some Area Rules have additional rules that are specific to that Management Area.

Waste Rule

All agricultural landowners must comply with a Waste Rule by not polluting ground or surface water, discharging waste into waters of the state, or placing any waste in a location where they are likely to enter waters of the state (ORS 468B.025). *Wastes* include excess soil, manure, fertilizer, or other substances that can pollute water. *Waters of the state* can include ponds, groundwater, canals, ditches, and rivers.

Streamside Vegetation Rule

At a minimum, all agricultural landowners must comply with a streamside vegetation rule by allowing vegetation to establish and grow along:

- Streams that flow all year (perennial streams), provide shade, stabilize banks, and filter out pollutants from overland flows.
- Streams that flow part of the year (intermittent streams), to stabilize banks and filter out pollutants from overland flows.

Agency Specific Monitoring and Information Needs

The Program is focused on showing status and progress of water quality in Agricultural areas via monitoring. The Program primarily focuses on evaluating land conditions that are under the control of landowners, collects in-stream water quality data under specific circumstances, and guides monitoring efforts to telling agriculture's story.

The Program's key monitoring questions, to determine status and trends, are:

A. Inputs and Outputs

1. What activities are being done to help achieve desired land conditions and water quality?

B. Short-term Outcomes: Compliance and Land Conditions

2. What percent of agricultural uplands are in compliance with the Waste Rule?
3. What percent of stream miles on agricultural lands are in compliance with the Streamside Vegetation Rule?
4. What percent of agricultural uplands have land conditions that protect water quality?
5. What percent of stream miles on agricultural lands have vegetation that provides water quality functions equivalent to site-capable vegetation?
6. What percent of stream miles on agricultural lands have conditions that will likely prevent site-capable vegetation from providing desirable water quality functions?

C. Long-term Outcomes

7. What are water quality status and trends in agricultural areas?
8. How are water quality status and trends related to changes in agricultural upland and streamside vegetation conditions?

Status and Implementation of Agency Monitoring Strategy

The ODA Water Quality Program is currently updating its Monitoring Strategy along with an operating Strategic Plan. The strategy focuses on methods and metrics to answer questions identifying and tracking water quality influenced by agriculture.

The Strategic Implementation Area (SIA) is a water quality program focused on identifying priority landscape and operational compliance concerns. Each SIA contains a monitoring program, developed in conjunction with the local sponsoring body (SWCD), local partners, ODA, OWEB, DEQ, and ODFW. The monitoring can be for baseline, effectiveness or source identification. With increasing monitoring needs due to increasing TMDLs, the monitoring is commonly directly TMDL related. Area Plans and Focus Areas are two other avenues for ODA and SWCD partners to perform land and/or water quality monitoring for agricultural influences. ODA water quality program offers a Water Quality Support Grant biennially, dependent on legislative funding, that commonly includes agricultural water quality monitoring. ODA water quality program funds approximately 40 locations of long-term water temperature monitoring since 2017.

Data and Information Gaps

ODA relies on available information to implement the Program and measure progress. However, data gaps lead to many assumptions and limitations. ODA has identified gaps (Table 1) that limit our ability to effectively answer our key monitoring questions.

Table 1. Data gaps identified by ODA

Gaps
An accurate, detailed statewide GIS layer of agricultural lands
An accurate, detailed statewide GIS layer of perennial and seasonal streams
GIS layer of Shade Gap for all temperature TMDL layers
Comprehensive documentation of conservation activities implemented at the Management Area or HUC10 scale, particularly NRCS and USDA FSA
Sufficient data to characterize agricultural water quality in most Management Areas
Adequate water quality data for seasonal streams
An affordable, repeatable, automated method for assessing the characteristics of streamside vegetation at the landscape scale
Adequate flow data for perennial and seasonal streams to calculate loads



Oregon Department of Environmental Quality

Geographic and Jurisdictional Responsibilities

The Department of Environmental Quality (DEQ) is authorized and in certain cases mandated to conduct water quality monitoring under Oregon Revised Statutes (ORS).

- **ORS 468.05:** (1) (b) and ORS 468.05 (1) authorize the department to conduct monitoring.
- **ORS 468B.110 (4):** Requires the department to establish guidelines describing how the department and commission will determine whether water quality standards in waters affected by non-point sources are being met.
- **ORS 468B.035:** Authorizes the department to implement the Clean Water Act.
- **ORS 468B.160 (3):** Requires the department to conduct statewide programs to identify and characterize groundwater quality.
- **ORS 468B.162 (4):** Requires the department submit a report to the legislature on January 1 of each odd-numbered year on the status of groundwater in Oregon.
- **ORS 468B.190:** Requires the department to conduct a groundwater monitoring and assessment program based on vulnerability to contamination that determines status, long-term trends and emerging problems.

The Department also implements the requirements of the Clean Water Act. Clean Water Act requirements related to monitoring include:

- **Section 106 (d):** “ Administrator shall not make any grants under this section to any state which has not provided or is not carrying out as a part of the program-(1) The establishment and operation of appropriate devices, methods, systems, and procedures necessary to monitor, and to compile and analyze data on (including classification according to eutrophic condition) the quality of navigable water and to the extent practicable, groundwaters including biological monitoring; and provisions for annually updating such data and including it in the report required under Section 305 of this Act.”
- **Section 303(d) (1) (A) & (B):** Requires each state to identify waters within its boundaries for which effluent limits and controls of thermal discharges required by section 301 are not stringent enough to meet water quality standards and to assure protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife.
- **Section 305 (b)(1):** Requires each state submit a biennial report by April 1 on even-numbered years that includes a description of the water quality of all navigable waters in the state, an analysis of the extent to which they provide for shellfish, fish, wildlife and recreation, the extent to which the elimination of pollutants has provided for the above and recommendations for additional actions necessary to do so, the economic and social costs to do so, and a description of the extent of non-point source pollutants and recommended actions to address non-point sources including costs.
- **Section 314:** Requires the establishment of a clean lakes program including an assessment of the status and trends in water quality in publicly owned lakes and list of impaired lakes and the pollutant sources in those lakes.

- **Section 406:** Requires the establishment of a coastal recreation water monitoring and notification program.

Agency Specific Monitoring and Information Needs

Virtually all DEQ's water programs need water quality data. Every two years, DEQ's Standards and Assessment section compiles statewide water quality data and evaluates compliance with Oregon's water quality standards. Of particular importance for interpreting narrative water quality standards are biological and physical stream habitat data. Permitting and nonpoint source programs need water quality data to identify emerging water quality problems and to identify where DEQ needs to develop new water quality standards. When waterbodies do not meet water quality standards, DEQ collects extensive water quality and associated physical habitat data throughout a watershed. DEQ's Total Maximum Daily Load program uses this data to quantify pollution sources for allocating pollution reduction responsibilities and developing projects and plans to achieve compliance with water quality standards over time.

DEQ also uses water quality data to understand the condition of Oregon groundwater. Groundwater supports multiple beneficial uses including drinking water, agriculture and stream baseflow. DEQ uses groundwater monitoring data to identify emerging contamination problems, to develop plans in areas with known contamination issues and to track progress in areas with established groundwater management plans.

DEQ communicates with decision makers and the general public on the status and changes in water quality across Oregon using water quality indices and metrics. DEQ uses surrogate measures, such as the Oregon Water Quality Index, that simplify data without compromising the accuracy of the information.

DEQ needs water-related monitoring data and information to:

- Develop and renew water quality permits.
- Develop the 303 (d) listing of impaired waters of the state. (April 1, even years)
- Report on water quality issues statewide 305(b) report. (April 1, even years)
- Develop Total Maximum Daily Load models. (ongoing)
- Track compliance with water quality regulations.
- Develop new water quality standards.
- Calculate the Oregon Water Quality Index (annual Key Performance Measure).
- Assess groundwater conditions in groundwater management areas.
- Assess groundwater conditions statewide.
- Understand and reduce pesticides in targeted watersheds by using monitoring data and adaptive management.
- Develop watershed toxics reduction strategies for contaminants such as current use and legacy pesticides, industrial chemicals, pharmaceuticals and personal care products. e.
- Inform recreation contact risks associated with bacteria on the coast.
- Inform recreational contact risks associated with cyanotoxins.
- Identify drinking water risks for Oregon Health Authority action.

Status and Implementation of Agency Monitoring Strategy

DEQ implements monitoring programs and activities outlined in the “DEQ Water Quality Monitoring Strategy 2020”. Below is a summary of monitoring activities currently being implemented by DEQ.

Large River Network

DEQ currently monitors 160 large river fixed station sites statewide. The Oregon Department of Agriculture funds monitoring at 19 of these sites on agricultural lands.

Reference Site Biomonitoring

DEQ monitors temperature, aquatic insect population and habitat characteristics at 12 statewide reference trending sites annually as resources allow.

TMDL Monitoring Total Maximum Daily Load

DEQ collects data that supports the development of maximum daily loads for specific pollutant parameters in waterbodies identified in Oregon’s list of impaired waters (The Clean Water Act Section 303d list). DEQ’s analysts and regional watershed planners prioritize TMDL development, which can require multiple years of data collection and analysis. Analysts and planners then work with DEQ’s laboratory project managers to implement necessary monitoring and analytical testing. Between 2020 and 2024, DEQ’s monitoring resources supported TMDL development and implementation projects in the Klamath, Deschutes and Tualatin Basins.

Toxics Monitoring

The objectives of toxics monitoring in Oregon are to provide data to understand the risks to human health and aquatic life posed by toxic substances in water, sediment and fish tissue. Broadly the strategy is to:

- Gather information to characterize the presence and concentration of toxic substances such as current-use and legacy pesticides, combustion byproducts, metals and industrial chemicals in Oregon’s rivers, streams, lakes and estuaries.
- Use this information to identify sources of these chemicals.
- Present and make information publicly accessible.
- Work with DEQ programs, external partners and Oregon communities to identify opportunities for reducing these pollutants.

Since 2019, DEQ has monitored 60 sites statewide although in 2020, DEQ focused on 28 sites in the Willamette Basin. DEQ has analyzed water samples for toxics at all sites and has analyzed sediment and fish tissue from some sites. DEQ also completed a special project in 2021, analyzing toxics in water samples downstream from areas burned in the 2020 wildfires. DEQ will be reevaluating its toxics monitoring strategy in 2025.

Groundwater Monitoring

DEQ regularly monitors dozens of wells in each of three Groundwater Management Areas: Lower Umatilla Basin (quarterly), Southern Willamette Valley (twice each year) and Northern Malheur (annually). The primary analyte of concern is nitrate although DEQ has periodically done more extensive sampling and analysis in GWMA's for other drinking water contaminants. DEQ's Statewide groundwater monitoring has focused resources in one basin of concern every one to two years since 2017. DEQ has completed sampling events in the following basins and geographic areas: Rogue, Harney County, Walla Walla, North Coast, mid-Willamette, Klamath, and Southern Deschutes. DEQ will be reevaluating its statewide groundwater monitoring strategy in 2025.

The beach monitoring program is a cooperative effort between the Oregon Health Authority (OHA) and the DEQ that utilizes the specific authorities and capacities of each agency to accomplish the work. During summer months, DEQ provides bacteria data to OHA to assess health risks to beach users and post advisories if bacteria levels exceed action values.

Lakes Monitoring

DEQ participates in the National Lake Assessment every 5 years. In 2017, DEQ supplemented funding from the EPA to get a statistically valid sample for Oregon and incorporated toxics monitoring. DEQ monitored 40 lakes and reservoirs from May through October 2024 and analyzed samples for cyanobacteria toxins and chlorophyll. DEQ's Watershed Management section uses this data along with satellite imagery to characterize and track seasonal trends in chlorophyll and pigments associated with cyanobacteria (phycocyanins).

Estuary Monitoring

DEQ has participated in the National Coastal Condition Assessment every 5 years but will not participate in 2025. DEQ has collected estuarine sediment and tissue for toxics analysis as part of DEQ's toxics monitoring program before 2019.

Environmental Data and Information Gaps

As DEQ laboratory water monitoring sections (Water Quality Monitoring and Resource Assessment and Technical Services) plan our 2025 – 2030 work, we see four areas where we will likely be reassessing and considering resource needs:

- **Data management and accessibility**

For several years, DEQ has had vacant monitoring and assessment staff positions and this has resulted in a data processing backlog, particularly with continuous temperature and stream physical habitat data. DEQ has prioritized continuous temperature data that supports TMDL development or implementation (e.g. Lost River, Klamath Basin). During winter 2023-24, staff made significant progress loading historical temperature data from north coast streams into AWQMS and this work will continue in 2024-25, although behind current TMDL development continuous data processing priorities. DEQ has loaded summary metrics for historical physical habitat data through 2007 into AWQMS. DEQ has also uploaded 2018 – 2022 raw physical habitat data into AWQMS. Physical habitat data from other periods are not yet in AWQMS. DEQ monitoring staff have installed and operated

telemetry-enabled sampling stations at two sites in the Deschutes Basin. Monitoring staff authored a standard operating procedure as guidance for future installations, as they may be needed and as resources become available.

- **Data needed for narrative criteria application and multi-parameter impairments**

Some DEQ water quality criteria are narrative, rather than quantitative. Examples include biocriteria, toxic substances, sedimentation, and algal growth. Processes to collect and manage data needed to support application of narrative criteria are more complex, time consuming and logistically challenging. In recent years, DEQ laboratory and headquarters staff have made substantial progress on a method to designate waterbody impairment based on overall biological condition (e.g. aquatic insect population diversity). A lab-headquarters cross-program team has also been developing processes and tools to identify particular parameters (e.g. temperature, sediment) that are stressing a stream's biological community; this work will continue in 2025.

DEQ lab monitoring and headquarters assessment sections also see a need to increase continuous monitoring capabilities for parameters other than temperature (e.g. pH, dissolved oxygen). Such monitoring is essential for better understanding productivity (e.g. algae, cyanobacteria) in closed waterbodies. Expanded continuous monitoring would also help to identify surface water impairment that grab sampling does not capture.

- **Sampling responsiveness in climate change-affected areas**

Climate change effects we see in Oregon's watersheds include increasing surface water temperatures, larger storms and erosion from wildfire-burned landscapes. Some or all of these factors may also contribute to increased incidents of harmful algal blooms that threaten drinking water and water bodies in and on which people recreate. DEQ's water monitoring section needs to be responsive to monitoring requests from DEQ's regional staff, Oregon Health Authority (the agency that issues recreational advisories and regulates public drinking water systems) and the general public (often via OHA's or DEQ's online complaints portals). In summer 2024, DEQ split its HABs monitoring and analytical resources (which included a seasonal position May through October) between the recreational network and recreational response sampling events. DEQ's water monitoring section relied on local partners and DEQ regional staff to respond to HABs notices from non-network sites.

For DEQ to be responsive to monitoring requests downstream from wildfire-affected areas, DEQ's monitoring section would need to enhance its continuous monitoring capabilities and equipment. DEQ's monitoring section is exploring the use of fluorescent dissolved organic matter monitoring devices which, when telemetry-enabled, could warn downstream drinking water systems of materials in raw water that could affect drinking water treatment.

- **Toxics monitoring partnerships with Oregon Health Authority and other agencies**

In recent years, DEQ's laboratory has partnered with OHA to measure per- and polyfluoroalkyl substances in small drinking water systems. DEQ expects to expand that work, under OHA's direction, in 2025. In the coming years, DEQ's laboratory monitoring and analytical sections expect to explore methods to measure toxics in surface water, groundwater, sediment and fish tissue.



Oregon Department of Fish and Wildlife

Geographic and Jurisdictional Responsibilities

The mission of the Oregon Department of Fish and Wildlife (ODFW) is to protect and enhance Oregon's fish, wildlife, and their habitats for use and enjoyment by present and future generations. With respect to the beneficial uses of water, ODFW is responsible for the management of aquatic life, including fish. Oregon has 73 known native freshwater fish species, as well as a number of subspecies, distributed across Oregon's diverse aquatic ecosystems.

ODFW does not have direct regulatory authority over water quality or quantity, but the agency provides comments and guidance to other state and federal regulatory agencies regarding water use, instream flow rights, water quality standards, total maximum daily loads (TMDLs), hydroelectric application review, land use/development proposals, and instream and riparian habitat restoration and protection.

Legal Authorities Related to Water:

- The Oregon Fish and Wildlife Commission is charged with the protection and propagation of fish in the state. This includes responsibility for regulating harvest of fish, protection of fish, enhancement of fish populations through habitat improvement, and the rearing and release of fish into public waters (See ORS 506.036). ODFW's Fish Division is responsible for the management of all fish and other marine life over which the State Fish and Wildlife Commission has regulatory jurisdiction (ORS 506.142).
- As the state agency with fish and wildlife expertise, ODFW is directed to provide comments to Water Resources Department regarding water use applications, permit extensions, or transfers of use (See OAR 690-033; OAR 690-315; and OAR 690-380 for transfers). ODFW also has the authority to file for instream water rights (ORS 537.336).
- Oregon Department of Fish and Wildlife Instream Water Right Rules (OAR 635-400). These rules set the policy, procedures, criteria, standards, including flow methodologies, and definitions for instream water right applications by the Department of Fish and Wildlife to the Water Resources Department.
- Vector Control - Vector Control Districts and Counties must obtain ODFW approval before applying pesticides to control vectors (ORS 452.140 and ORS 452.245). ODFW's role in vector control is to review and approve the use of pesticides used by Vector Control Districts or Counties in order to protect fish, wildlife and their habitats.
- Fish Passage – Fish passage is required in all waters of the state in which native migratory fish are currently or were historically present.
 - ODFW is responsible for determining the current or historical presence of native migratory fish and for reviewing and approving passage plans, waivers, or exemptions from providing passage. Regulations covering fish passage can be found in ORS 509.580-910 and in OAR 635, Division 412.
 - The owner or operator of artificial obstructions located in these waters must address fish passage requirements prior to abandonment or specific trigger events (e.g., installation, major replacement, a fundamental change in permit status).

- Scientific Take Permits – OAR 635-007-0900 requires a Scientific Taking Permit issued by ODFW in order to take fish from the waters of the state for scientific or educational purposes. Statutory Authority is found in ORS 506.119 (See also OAR 635-007-0910 through 635-007-0950).
- Additional ODFW authorities include: in-water blasting permits, fish screening and bypass requirements, and fish and wildlife habitat mitigation guidance.

Agency Specific Monitoring and Information Needs

Stream Temperatures

ODFW is currently implementing a statewide temperature strategy which will inform fish, wildlife, and habitat management decisions. Given the importance of water temperature to all native species and its relationship with other important and influential stream conditions (e.g. flow, riparian condition, habitat quality), the research and monitoring around water temperature will contribute to decisions made across ODFW divisions and programs. This approach will help ODFW be better prepared to respond to and address numerous management issues related to stream temperature. There are four key objectives to the strategy that are discussed below.

Objective 1: Understand stream temperature dynamics and thermal regimes across Oregon at discrete spatial and temporal scales, particularly at critical locations and during temperature-limiting time periods. The data generated through Objective 1 will help ODFW develop a protection plan for sensitive cold-water areas across the state.

The first task to accomplish this objective is to utilize a statewide network of thermistors to collect temperature data. ODFW will work with partners to obtain estimates of water temperature for all streams, and statistical models will be developed to predict water temperature in unmeasured locations and make projections into the future.

The second task is to intensively monitor watersheds more finely to inform and validate models, especially in highly critical/sensitive locations. Through these models ODFW seeks to improve its understanding of spatial and temporal patterns, evaluate the strength of various temperature regimes, and explain patterns of distribution and survival of native species.

The third task is to identify cold water refuge areas using paired thermistors. ODFW will identify cold water tributaries that have inflows $\geq 2^{\circ}\text{C}$ colder (OAR 340-041-0002(10)) than their receiving streams as well as regionally cold streams that are both cold and large.

The fourth task ODFW will use to accomplish Objective 1 is to identify cold-water patches in rivers and regionally cold streams using airborne thermal infrared (TIR) imagery and the use of an unmanned airborne vehicle (UAV) with the goal of protecting cold-water patches in larger systems that provide necessary refuge and reprieve for native fish.

The fifth task includes working with local watershed staff to identify known locations of fish holding and/or presumed thermal refuge locations, and determining which cold-water patches are serving as thermal refuge for native fish.

Objective 2: Link water temperature and flow data to improve ODFW's ability to forecast water temperatures by increasing the network of coupled water temperature and discharge-

telemetered gages to provide real-time streamflow and water temperature data. These data will contribute to the statewide temperature model and be used to develop statistical temperature models to predict water temperatures and forecast water temperatures 3-7 days into the future.

Objective 3: Understand thermal tolerances and thresholds of fish species. ODFW will use physiological trait data (e.g., resting metabolic rate, maximum metabolic rate, aerobic scope) to identify temperature thresholds using field respirometry. To date, ODFW has data for coastal cutthroat trout, steelhead, Warner sucker, redband trout, and spring Chinook salmon.

Objective 4: Incorporate stream temperature and flow into decision frameworks or models that determine, assess, or forecast fish, wildlife, and habitat outcomes/needs. ODFW will use water temperature and flow data to calibrate and validate process-based models to provide an understanding of thermal and flow regimes, simulate data based on different scenarios, and as inputs into decision support tools to improve decision making.

Percent of Flow Studies

ODFW is also evaluating quantitative flow-ecology relationships over a range of flow reduction levels by examining fish response in streams that are impacted by water withdrawals for irrigation or other consumptive uses. ODFW's goal is to develop a more robust, scientific justification for setting flow targets using a percent of flow (POF) approach, particularly for reaches that fall within priority areas for conservation or restoration and where non-flow factors (e.g., extensive channel modification, poor water quality) are less likely to impede meeting ecological management objectives.

Flow alteration is recognized as a major limiting factor contributing to continued biodiversity loss in freshwater systems. Accelerating implementation of environmental flows (EFs) is one key strategy that can assist in ecosystem recovery. The presumptive standard, proposed by Richter et al. (2011), is a percent of flow (POF) approach that attempts to classify the level of ecological impact that would be expected with increasing deviation from the natural hydrograph. In general, POF case studies have indicated that limiting daily extractions to 10-20% of natural median daily flows will maintain a moderate level of ecological function (Locke & Paul, 2011; Richter et al., 2011). In general, existing literature reviews (Davies et al., 2013; Poff & Zimmerman, 2010) and model-based studies (Carlisle et al., 2011, 2019) agree that detrimental ecological changes are more likely and more severe in systems where deviation from natural flows increase. ODFW has designed monitoring studies to evaluate thresholds of streamflow alteration that protect biological communities given the lack of regional studies from the Pacific Northwest.

Sites are selected through a preliminary GIS analysis within redband trout distribution, primarily in the Blue Mountains Ecoregion (the Deschutes, Malheur, and Powder WRD Administrative Basins). Electrofishing data will be collected at sites on wadable streams in areas with minimal land use impacts during the irrigation season. Ideally, data will be collected both up and downstream of discrete diversions that include a range of withdrawal rates (<10% to ~100% of flow). Additionally, water temperature, and discharge, substrate, and woody debris will be measured up and downstream of the point of diversion.



Oregon Department of Forestry

Geographic and Jurisdictional Responsibilities

The Oregon Forest Practices Act, ORS 527.610 to 527.770, 527.990 and 527.992, sets the standards for all commercial activities involving the establishment, management, or harvesting of trees in Oregon's nonfederal forestlands. Per ORS 527.765, the Board of Forestry establishes best management practices, through the forest practice rules, as necessary to insure that to the maximum extent practicable nonpoint source discharges of pollutants resulting from forest operations on forestlands do not impair the achievement and maintenance of water quality standards established by the Environmental Quality Commission (EQC) under their authority in ORS 468B.110.

ODF protects Oregon's natural resources through landowner and operator education, as well as monitoring and enforcement of the Forest Practices Act (FPA). This is accomplished primarily by the Forest Resources Division through statewide staff who serve as subject matter experts and field staff who work directly with landowners and operators. Additionally, several committees serve an advisory function to ODF and the Board and evaluate whether resources are adequately protected, and regulations are operationally feasible, and may recommend enhancements to ODF's work or changes to protections. ODF works closely with the Board in the administration of the Forest Practices Act and as appropriate provides staff reports and analyses for the Board's consideration which can include information regarding the potential need for forest practice rule changes, proposed rules and or information and reports from committees.

The forest practice rules are administered and enforced by ODF through operator education, site inspections, and when necessary, enforcement action. As the Board has exclusive authority to regulate forest practices, under ORS 527.770, if operations are conducted in compliance with the forest practice rules, they shall not be considered in violation of any EQC water quality standard; this is often referred to as the "BMP shield." The FPA rules are principally designed to meet water quality standards set by the Oregon Department of Environmental Quality (DEQ), or to enhance fish habitat (addressed in coordination with the Oregon Department of Fish and Wildlife and the Oregon Watershed Enhancement Board). ODF also coordinates inquiries related to pesticides with the Pesticide Analytical and Response Center (PARC).

The Oregon Legislature passed, and the governor signed, a total of four bills during the 2020 and 2022 legislative sessions reforming the Forest Practices Act (FPA) and requiring the State Board of Forestry (Board) to amend the forest practice rules on non-federal forestlands in Oregon: Senate Bill 1602 (2020 First Special Session) and Senate Bills 1501 and 1502 and House Bill 4055 (2022 Session). The resulting new and amended statutes and rules increase protection for riparian areas and landslide-prone steep slopes during timber harvest and other commercial forest activities; adds new road rules and inventory requirements (including those for abandoned roads); increases minimum buffers for herbicide application via helicopter; adds habitat mitigation funding and conservation incentives for small forestland owners; improves the compliance monitoring program; and creates a stakeholder input and science driven adaptive management program. One notable outcome from the Oregon Legislature is requiring

the Oregon Department of Forestry (ODF) to write and submit a Habitat Conservation Plan (HCP) to the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), to obtain an Incidental Take Permit covering aquatic species on non-federal lands. The HCP is a planning document prepared to meet the rules of the federal Endangered Species Act (ESA). ODF rules relevant to protection of water quality are found in the Oregon Administrative Rules (OARs) referenced in Table 2.

Table 2. Key ODF Rules Related to Water Quality and Erosion Control

Forest Practice Act Rule Divisions*	Rule Reference
Adaptive Management Program (Division 603)**	OAR 629-603-0000 through 629-603-0600
Planning Forest Operations (Division 605)	OAR 629-605-0150 through 629-605-0170
Small Forestland Owner (Division 607)	OAR 629-607-0000 through 629-607-0800
Forest Road Construction and Maintenance (Division 625)	OAR 629-625-0000 through 629-625-0920
Harvesting (Division 630)	OAR 629-630-0000 through 629-630-0925
Water Protection Rules (Division 635, 643, 655)	OAR 629-635-0000 through 629-655-0000
Enforcement & Civil Penalties (Division 670)	OAR 629-670-0000 through 629-670-0350
Compliance Monitoring (Division 678)	OAR 629-678-0000 through 629-678-0200

* New and revised rules went into effect January 1, 2024. Note: Water Protection Rules for landowners who own over 5k acres and do not qualify as a Small Forestland owners went into effect July 1, 2023.

**Adaptive Management Program went into effect November 15, 2022

FPA Rule Implementation

The 2020 and 2022 legislative sessions provided ODF with funding to hire additional field foresters (acting under the authority of the State Forester) and department staff to assist forestland owners with the implementation of the revised rules.

Under ORS 526.670 and OAR 629-605-0140, before beginning a forest operation, forestland owners or operators are required to submit a notification through ODF's notification and reporting system a minimum of 15-days before starting a forest operation. Once the completed notification is submitted, an ODF field forester will review the activities included in the proposed operation. The field forester will inform the notifier of any protected resources located in the area of their proposed operation, and which specific rules and protection

requirements shall be implemented. The field forester will then provide any necessary recommendations to the notifier before the operation begins. If needed, the field forester will arrange a site visit to better understand the site conditions and to provide additional feedback.

Under ORS 527.610 to 527.770, ORS 527.990, ORS 527.992, and OAR 629-670-0100, field foresters may conduct inspections to provide technical assistance, observe and evaluate forestland conditions, and/or inspect forest operations. Site visits and inspections occur to insure the proper implementation of the statutes, administrative laws, rules, policies, and programs associated with the prevention of soil erosion and stream sedimentation. Field foresters may conduct pre-operation, active operation, and post-operation inspections. The field forester documents correspondence, site visit outcomes, and inspection results in ODF's notification and reporting system. When applicable, the field forester has authority to issue written statements of unsatisfactory conditions or citations with an Order to Cease and Order to Repair depending on the degree of damage and other factors. Currently ODF has approximately 69 field foresters working across the state.

Civil Penalties

Under ORS 527.680 through 527.700, ORS 527.990, ORS 527.992, and OAR 629-670-0000 through 629-670-0350, Oregon's FPA rules are enforced through a Civil Penalty Program. This program is focused on preventing and correcting damage to Oregon's forest resources. Civil penalties are used to discourage operators, landowners, and timber owners from committing violations that could result in resource damage. While the civil penalty formula remains the same under the new rules, updates to the standard civil penalty calculations doubled base and maximum fines with the maximum civil penalty increasing from \$5,000 to \$10,000.

In addition, under OAR 629-670-0225 and OAR 629-670-0228, the new rules establish and define significant violations and repeat violators for operators, landowners, or timber owners. Repeat violators are individuals or companies with a history of significant violations that show a pattern of willful disregard of the FPA rules. The State Forester will maintain a repeat violators list of individuals and entities with three or more significant violations within three years. The list will be used in the civil penalty calculations process. This calculation considers the organizational structure of the party incurring the penalty and any economic benefits from the activity. The State Forester may impose a civil penalty for repeat violators in an amount not to exceed \$50,000 per significant violation. A repeat violator will be removed from the list three years after their last citation was issued.

The State Forester may also require a violator to acquire, post, and maintain a bond or another financial assurance instrument throughout the active periods of the operation, including stopping and restarting operations at a later date. The amounts are based on either the type and number of protected resources or the number of acres within the operation. The maximum value of a bond is \$250,000. Should an operator, landowner or timber owner fail to post a required financial assurance with the State Forester, or if they stop the operation and fail to renew their bond when resuming activities, the State Forester may issue an order to prohibit any new operations until they have filed an active financial assurance. The State Forester may also submit claims against the bond if the agency must repair damage and/or for the recovery of civil penalties.

Agency Specific Monitoring, Data, and Information Needs

The 2022 legislative changes and newly adopted forestry rules brought about changes to ODF Monitoring Program framework. This included the restructuring of the Compliance Monitoring Program that prioritizes the ODF riparian, roads, and steep slopes rule divisions plus any other rules as directed by the Board. The new statutes and rules also created an Adaptive Management Program Committee (AMPC) and an Independent Science Review Team (IRST) that will look specifically at effectiveness of ODF rules related to the Habitat Conservation Plan (HCP).

Another significant change occurred with the signing of the 2021 Memorandum of Understanding (MOU) between DEQ and ODF. If ODF is identified as Designated Management Agency (DMA) in a given DEQ TMDL Water Quality Management Plan (WQMP), ODF will be responsible for developing basin specific TMDL implementation plans describing the actions the agency will take to protect and reduce pollutant loading for a specified waterbody.

Compliance Monitoring Program

Under OAR 629-678-0000, the purpose of the ODF Compliance Monitoring Program (CMP) is to monitor forest practices rule implementation and analyze compliance rates. Areas of non-compliance that are identified through the CMP will be evaluated by ODF for actions such as new training, guidance, rule clarification, targeted enforcement, and to build the public's trust in the implementation of the FPA rules (OAR 629-678-0100 (10)). The new FPA activity completion reporting requirements and site access for monitoring will significantly reduce statistical uncertainty and improve the statistical reliability of ODF's compliance monitoring efforts. Under OAR 629-678-0100(3)(a), landowners are now required to report completed activities under their current notification of operation to the field forester. Landowners will use ODF's E-notification system to report their completed activities. This must be done by the end of the year in which they are notified, or if they have requested an extension, by the end of the following year (OAR 629-605-0150(10)(a), (b)). ODF will pull its sample population for the compliance monitoring studies from the submitted completed notifications.

In addition, forest landowners are now required to accommodate the State Forester by allowing access to the operation site for activities that they have informed the State Forester of completion, as described in OAR 629-605-0150(10). ODF must give notice to the forest landowners before on-site compliance monitoring to provide the landowner an opportunity to be present with the State Forester or their designee. If issues arise with access for purposes of conducting compliance monitoring, the State Forester may petition the circuit court with jurisdiction over the forestland for a warrant authorizing property access for the State Forester or their designee to conduct compliance monitoring (OAR 629-678-0100 (7) through (9)). Prior to the new forestry rules, landowner participation in the compliance studies was voluntary. The new rules requiring landowners to notify ODF of activity completion and to grant site access for compliance monitoring will significantly improve the statistical soundness of the compliance monitoring studies.

Adaptive Management Program

OAR 629-603-0000 through 629-603-0600 lays out an Adaptive Management Program which will be used to coordinate future changes to Oregon's FPA rules. Using stakeholder input, the program will use a science driven process to analyze the need for any changes to rules, policies, or training. This program is an important part in creating an approved Habitat Conservation Plan (HCP), which is an end goal of the Private Forest Accord. The program's purpose is to apply the best available science to Oregon Board of Forestry's (Board) decision-making, which includes measuring the effectiveness of the rules to meet the Biological Goals and Objectives (BGOs) that benefit covered fish and amphibian species. The AMP can also evaluate topics such as the efficacy of rules for such things as water quality parameters relevant to both CWA implementation and the covered species in the private forests HCP. The program ensures effective change to meet the BGOs, seeks to limit operational costs when possible, and creates a process to increase the awareness of regulatory changes, so landowners, regulators, and interested members of the public can understand and are aware of the change. More information can be found at the AMP website: <https://www.oregon.gov/odf/pages/adaptive-management-program.aspx>

This program is made up of two committees: the Adaptive Management Program Committee (AMPC) and the Independent Research and Science Team (IRST). Both the AMPC and IRST must maintain self-developed guides; may receive participation grants; and will use super-majority votes for important decisions. The IRST will apply science to answer the policy questions put forth by the AMPC, and there is a process to report that information back to the board. ODF Adaptive Management Program staff will provide status reports to the Board of Forestry annually, and contract for performance audits every six years.

Water Quality Program

The Monitoring Unit will also track basin specific information where ODF TMDL implementation plans are required. For each TMDL implementation plan, ODF will track information related to forest activities that have the potential of impacting a given water quality limited parameter (Temperature, Dissolved Oxygen, Sedimentation, Mercury etc.). The information ODF will track and report annually on may include the following: total counts, types and locations of forest activities, inspections, best management practices employed, civil penalties issued, training, education and voluntary restoration activities and any other actions taken to protect the waters of the state. Water quality monitoring has recently been added as an additional measure for several of DEQs TMDL WQMP's. In the coming years, ODF will work with DEQ staff on the development of basin specific water quality monitoring strategies.

As of fall 2024, ODF is currently listed as a Designated management Agency (DMA) in the following DEQ TMDL WQMP's.

DEQ TMDL & Water Quality Management Plans (WQMP)	ODF Implementation Plan Status
Willamette Subbasin Mercury TMDL	Approved 10-2024
Upper Yaquina Dissolved Oxygen and Bacteria TMDL	Under Development

Lower Columbia-Sandy Temperature and Bacteria TMDL	Under Development
Willamette Subbasin Temperature Replacement TMDL (Includes mainstem, major tributaries, subbasins)	Under Development

Once an implementation plan is approved, ODF will provide DEQ with annual metrics reporting. Plans are to be updated every five years and submitted to DEQ. Similar to the Compliance Monitoring Program, the implementation plan reporting metrics will be used to inform ODF of where it needs to focus its landowner/operator trainings. Results may also help identify rules that may need to be updated to better protect.

Status and Implementation of Agency Monitoring Strategy

The ODF Forest Resources Division's Monitoring Unit has the following monitoring and analysis projects in progress:

Compliance Monitoring

- Recently completed the 2023 -2024 Reforestation Compliance Monitoring Study.
- Develop a pilot study for selected ODF Riparian Management Area Rules. The pilot study will begin in 2025.
- Develop a pilot study for selected ODF Road and Steep Slope Rules. The pilot studies for these two rule sets are scheduled for 2025.

Information gained from the three pilot studies will be used to inform the Long-Term Compliance Monitoring Study for the three prioritized rules sets (Riparian, Road and Steep Slopes Rules).

TMDL Plan Implementation

- Evaluate shade gaps identified in DEQ's Upper Yaquina Watershed Dissolved Oxygen and Bacteria TMDL WQMP.
- Evaluate shade gaps identified in DEQ's Willamette Subbasin Temperatures TMDL WQMP. Developing process for conducting shade gap analysis in unmodeled areas.
- Evaluate streamside shade gaps identified in DEQ's Lower Columbia-Sandy Temperatures TMDL WQMP.
- Develop process for conducting shade gap analysis in unmodeled areas for both the Lower Columbia-Sandy and Willamette Subbasin Temperature TMDLs.
- Work with DEQ on the development of the Willamette Water Quality Temperature Monitoring strategy.

Information gained from the shade gap analysis and streamside evaluations will help ODF identify where to focus its landowner education and training efforts. ODF will also work with local and regional partners to help with streamside restoration outreach efforts.

Data and Information Gaps

With the substantial changes in the FPA rules, some internal tracking systems are currently in the process of being updated and new systems developed. The databases used to track the metrics identified in each program are listed in Table 3.

Table 3. ODF Tracking Database Systems

Database	Format	Status
ODF E-notification system (FERNS)	Online Notification System	Developed, continuously updating
Certified Small Forestland Owner (SFO)	GIS	Developed, continuously updating
Forest Road Inventory & Assessment (FRIA)	GIS	Under development
SFO Road Condition Assessment (RCA)	Online Notification System	Under development
Abandoned Roads Inventory	GIS	Under development
Small Forestland Investment in Stream Habitat (SFISH)	GIS, MS Access	Under development
Civil Penalties	MS Access, Excel	Case management tracking system in planning phase
TMDL Basin Specific Implementation Data Tracking	GIS, Excel	Under development
Compliance Monitoring Studies-Field Data Tracking.	Excel	Under development

ODF is in the early phases of implementing both the new FPA rules and in developing and tracking the basin-specific TMDL implementation plans. As ODF develops the various tracking processes and assesses outcomes it anticipates data needs and gaps will be identified.

Oregon Water Resources Department

Geographic and Programmatic Responsibilities

By law, all surface and groundwater in Oregon belongs to the public. The Water Resources Department is the state agency charged with administration of the laws governing surface and groundwater resources. The Department's core functions are to protect existing water rights, facilitate voluntary streamflow restoration, increase the understanding of the demands on the state's water resources, provide accurate and accessible water resource data, and facilitate water supply solutions.

In 1909, the State Engineer's Office, the Department's predecessor, officially began registering water use. The Office worked in close partnership with the U.S. Geological Survey (USGS) to monitor water resources. The Department continues to work closely with the USGS on both surface water and groundwater monitoring and related studies. Together, the Department and USGS operate a gage network around the state of more than 500 stream gages. Of the over 250 gages operated by the Department, nearly 90% are close to real-time.

The Groundwater Act of 1955 (ORS 537.505 to 537.795 and ORS 537.992) establishes the authority for groundwater management and monitoring statewide to ensure the preservation of the public welfare, safety, and health. The Groundwater Act also directs the state to determine the extent, capacity, quality, and other characteristics of its groundwater bodies (ORS 537.525 (6)), which are used to inform resource management decisions. Other important aspects of the state's groundwater management policy provide that rights to use groundwater be protected, reasonably stable groundwater levels be determined and maintained, and groundwater overdraft be prevented.

ORS 537.099 requires all governmental entities to monitor monthly water use and report water data annually to the Water Resources Department. This requirement has been in place since 1987. The rules governing the state's Water Use Reporting Program are found in OAR 690-085. Since the Water Resources Department holds instream water rights in trust, the agency is responsible for monitoring instream water rights per OAR 690-085-0010(2)(d).

Agency Specific Monitoring and Information Needs

Oregon's first Integrated Water Resources Strategy (IWRS) was adopted by the Water Resources Commission in 2012, with an update in 2017, and a progress report in 2022. This strategy describes numerous coming pressures that may affect our water needs and supplies. The IWRS places an emphasis on data and monitoring to support decision-making, with a primary objective to better understand surface and groundwater resources today, and to better understand the interaction or connection between these resources. The IWRS emphasizes expanding the state's monitoring networks and fostering inter-agency data collection and processing. The 2012 IWRS led to the development of the Department's first Monitoring Strategy, which was finalized in February 2016. The 2016 monitoring strategy and subsequent IWRS updates outline key surface water and groundwater monitoring priorities for the following:

Understanding Water Resources/Supplies

- Conduct additional Groundwater investigations
- Improve water resource data collection and monitoring
- Coordinate inter-agency data collection, processing, and use in decision-making
- Understanding and meeting Instream and Out-of-Stream Needs
- Improve water-use measurement and reporting
- Water Right “analysis”

Climate Change

- Identify basins susceptible to changing flow regimes (e.g., basins that receive a significant percentage of precipitation as snow) and establish gages to quantify the rate of change in the magnitude, frequency, duration, and timing of streamflow.
- Identify groundwater systems with areas of recharge within the rain-snow transition zone and monitor groundwater level responses to climatic impacts.
- Work with the USGS and other partners to support long-term, natural streamflow monitoring stations that have previously been used to assess climate impacts on water supplies (e.g., USGS Hydro-Climatic Data Network stations, Geospatial Attributes of Gages for Evaluating Streamflow stations).

Extreme Events

Floods

- Identify gages that measure natural peak flows contained within channel and can be measured. Increase the number of high-flow measurements or relocate these gages.
- Upgrade gages in flood-prone areas to transmit data in real-time for flood forecasting and early warning systems. Work with other state agencies and municipalities to identify at-risk areas.
- Identify watersheds that would benefit from additional gages and/or additional measurements.
- Deploy temporary gages for real-time monitoring of high-flow events.

Drought

- Establish streamflow gages in locations that are vulnerable to low-flow conditions, to help with water supply forecasting.
- Establish water-level gages or inflow and outflow gages on reservoirs that provide water supplies or instream releases and that are also susceptible to short-term drought.
- Identify gages currently used for low-flow distribution and drought statistics; upgrade to near real-time, as needed.

Wildfire Conditions

- Place traditional streamflow gages or rapid deployment gages in recently burned watersheds to track and send alerts regarding potential flash flooding and debris flows.

Earthquakes from Cascadia subduction zone

- Evaluate dams and other water infrastructure to meet new seismic standards

Groundwater Protection

Identify Groundwater Level Trends

- Construct dedicated observation wells in key aquifers around Oregon to expand and improve long-term groundwater level data collection; locate wells in areas of high groundwater demand, hydraulic connection between aquifers and streams, and groundwater recharge locations.
- Install data logging equipment in key observation wells to expand the continuous groundwater level data collection network.
- Estimate annual aquifer recharge rates for basins in Oregon, and compare aquifer recharge to aquifer discharge (via pumping wells, or discharge to streams and springs).

Understand Surface Water / Groundwater Interactions

- Pair stream gages with observation wells in areas of stream-aquifer interactions.
- Target key basins for dedicated observation well installations to be monitored in conjunction with stream gages.
- Rank streams in Oregon based on the percent of annual yield contributed by groundwater. This ranking would provide a way to structure and prioritize long-term monitoring activities.

Aquifer Storage, Recovery and Recharge

- Construct dedicated observation wells in key basalt aquifers around Oregon to expand and improve long-term groundwater level data collection. Target wells in areas of potential aquifer storage and recovery (ASR) and artificial recharge (AR) projects with nearby surface water supplies.
- Expand continuous groundwater level data collection in key observation wells.
- Work with local water users to conduct ASR and AR feasibility studies for specific projects and water needs.

Water Management

Improve Distribution and Regulation Effectiveness

- Place gages in locations that will help distribute water and validate regulation calls quickly. In particular, select reaches where regulation takes place frequently. Optimal sites may include areas near large water withdrawals or at specific locations named in water rights.

Predicting the Response of the Hydrologic System to Diversion or Appropriation

- Establish observation wells and stream gages in areas where groundwater basin studies will take place.
- Establish observation wells where the volume of requests for groundwater permits is high, and the number of recent groundwater-level measurements is low.

Water Availability

- Establish natural flow stream gages in areas likely to see an increase in water development in the near future to adequately capture before and after conditions.
- Establish gages above diversions and impoundments in major streams (i.e., measure natural streamflow) throughout the state.
- Establish evapotranspiration measurements to improve water availability consumptive use estimates.
- Improve the resolution of the water availability model by establishing gages in regions of the state where stream gage density needs to be increased.

Water Use Data

- Coordinate the Water Use Reporting and Significant Points of Diversion programs.
- Establish quality assurance procedures to verify the accuracy of water use data.
- Monitor and report surface water diversions in high-priority watersheds.
- Establish a water use reporting requirement for irrigation wells in declining or critical groundwater areas.
- Integrate the Water Use Reporting program with quasi-real-time water management.
- Utilize satellite-based remote sensing imagery to estimate consumptive use on irrigated lands.
- Collect groundwater use data from observation wells that are actively pumped.

Dam Safety

- Place gages to appropriately serve as early warning systems for high-flow events that could indicate dam failures. Prioritize high-hazard dams that have been evaluated as unsafe.

Instream Needs

Characterizing Instream Needs

- Identify basins with sensitive, threatened, and endangered species (e.g., coastal tributaries) and install monitoring equipment to help characterize the suite of flows through these basins.
- Collaborate with other state agencies and watershed councils to monitor streamflow in order to support restoration and conservation activities.

Protecting a Suite of Instream Needs

- Increase the number of stream gages with telemetry (real-time monitoring) in reaches with instream water rights.
- Increase the number of gages in streams where water has been transferred to instream water rights.
- Ensure there is a stream gage located at the mouth of each state scenic waterway.

Water Supply

Meeting Future Water Demands

- Establish stream gages and monitoring wells in watersheds with projected increased demand in locations that allow for tracking of the entire water distribution network.
- Employ the Department's Water Use Reporting Program to track demand over time.
- Use telemetry in wells to monitor actual groundwater use in each basin.

Forecasting Seasonal Water Supply

- Ensure communities in every basin have access to natural streamflow data from long-term, high-elevation gages, mid-level snow survey sites, and baseline groundwater levels.
- Participate with federal partners in the Jet Propulsion Laboratory's "Airborne Snow Observatory" (ASO) Program. ASO is a LiDAR-based system used to quantify snowpack conditions which will provide complete, accurate real-time water supply data for water management.

Partnering with Other Agencies

- Develop instream flow prescriptions
- Monitor water quality (e.g. temperature)
- Restore and conserve instream habitat

Status and Implementation of Agency Monitoring Strategy

During 2018-2020, the Department evaluated and scored the 250+ stream gages it operates to determine if and how these gages support the monitoring priorities defined above. This work also identified safety concerns and logistical issues. This previous evaluation will be combined with a current gage evaluation being done to support the WARS (Water Availability Reporting System) natural flow gage network expansion. Most of the monitoring goals are being met through the expansion of our natural flow gage network, using funds received 23-25 biennium, as well as continuing to operate the current stream gage network. Through this process, the department has identified gaps in natural flow monitoring network and is actively working to install between ten and fifteen new gages. This funding also helped secure the installation of thirty new Agrimet stations across the state to better understand and quantify the role of evapotranspiration in our watersheds.

Basin studies were another huge component to OWRD's monitoring work over the last several years for both surface water and groundwater monitoring. The Walla Walla basin study is coming to a close with the analysis and technical writing of results. The Fifteenmile Creek basin study will be starting to ramp up in 2025.

The groundwater monitoring network has expanded utilizing funds from the 23-25 biennium, focused on drilling new wells for the monitoring network. These wells, along with the existing well network, have aided the Department in improved understanding of regional groundwater supplies. Additionally, the groundwater section has implemented procedures to read groundwater meters from many wells across the state.

The Department has received funding to develop the historic data set of remotely sensed ET for the Landsat satellite archive, and is working with Oregon State University, Desert Research Institute, and OpenET to develop standards and a platform for the delivery of in-season remotely sensed ET data for Oregon.

Finally, Field Services and Dam Safety staff have greatly increased the number of dams being regularly inspected. Although no new gages have been installed to support this work, replacement equipment has been distributed at key sites.

Data and Information Gaps

The Department has not identified data and information gaps for each monitoring priority described above. Once the network evaluations and scientific studies for each monitoring priority are completed, the Department can determine where any data gaps and redundancies exist. These results will show where high value monitoring sites exist and where certain sites may need to be decommissioned.



Oregon Department of State Lands

Geographic and Programmatic Responsibilities

The Oregon Department of State Lands (DSL) protects wetlands and waters, manages publicly owned lands to support K-12 public schools, and is the state partner to NOAA in managing South Slough National Estuarine Research Reserve near Coos Bay. DSL enforces laws on wetland conservation and removal-fill in waters of the state, maintains the State Wetlands Inventory, and supports local wetland planning. It manages publicly owned lands, including certain rivers, lakes, and 1.5 million acres of lands and minerals. DSL authorizes certain public, private, and commercial uses of these lands, the revenue from which goes to the Common School Fund to be distributed to public schools. The South Slough Reserve, a 7,000-acre protected area, is part of a national network that promotes research, environmental education, and contributes to coastal management knowledge throughout the world.

Agency Specific Monitoring and Information Needs

DSL's water monitoring and information needs focus on:

1. Integrating the best available science and information into our decision-making, including:
 - a. information to identify locations and boundaries of rivers, streams, and tidal areas for ownership and jurisdiction (e.g., head of tide, highest measured tide, and extreme low tide) including tide and river gauge data,
 - b. LiDAR,
 - c. aerial imagery, including global satellite imagery for some areas,
 - d. wetland mapping to improve the Statewide Wetlands Inventory,
 - e. water data including quantity, quality and availability,
 - f. plant and animal species, including habitat needs and connectivity priorities,
 - g. habitat restoration strategies and performance standards to determine success,
 - h. environmental priorities by watershed (8-digit or smaller) to help guide compensatory mitigation, and
 - i. social and environmental justice information.
2. Providing information that can be accessed and downloaded by others, particularly GIS-based data.
3. Providing the public with the best possible information on the extent, type, and health of our state's wetlands and waters and the ecosystem services they provide. This includes information needed for the program that may not require site level data collection or assessment, such as level of function and value based on modeling.
4. Tracking and evaluating the broad goals that DSL's programs contribute to such as maintaining a stable wetland resource base, preserving ecosystem services, and maintaining public use of Oregon-owned waterways for navigation, commerce and fishing.

5. Information about wetland or stream habitats that are irreplaceable, difficult to replace, or rare on the landscape, either naturally or due to historic loss (Aquatic Resources of Special Concern).

Status and Implementation of Agency Monitoring Strategy

DSL maintains records for wetlands, waterways and land management in a database, including wetland delineations, permits, waterway authorizations, and land authorizations. This information is used to report annually for program areas, including mandatory reporting to the legislature, and to develop strategic plan documents. Examples include the Aquatic Resource Management Program Annual Report that summarizes information on removal-fill activities and management of publicly owned waterways each fiscal year, and the Asset Management Plan and Strategic Plan that guides stewardship of school lands. These reports are available on our website.

Maps for the Statewide Wetlands Inventory, Essential Salmonid Habitat (ESH), Mitigation Banks and State Lands Online are available to the public through our website and typically, through Oregon GeoHUB. The State Wetlands Inventory includes data maintained by DSL in local wetlands inventories, wetland delineations, and compensatory mitigation sites, plus federal data on wetlands, hydrography, and soils. The ESH map shows streams where sensitive, threatened, or endangered salmonid species spawn and rear, and where a permit is needed to remove or fill any material. The Mitigation Bank map shows areas where a wetland or stream improvement project has been approved to sell those benefits as credits to others as compensatory mitigation. Finally, the State Lands Inventory is a map and inventory of the ownership of land owned by the Department as well as other state agencies.

DSL develops and maintains tools necessary to assess the functions and values provided by wetlands and streams in Oregon for purposes of removal-fill permitting and wetland planning. This includes the Oregon Rapid Wetland Assessment Protocol (ORWAP), the Stream Function Assessment Method (SFAM), the Vernal Pool Functional Assessment Method (for Jackson County area), and the Wetlands Assessment for Planning in Oregon expected in 2025 for local governments to use for Goal 5 compliance in identifying Locally Significant Wetlands. Data needed for use with ORWAP and SFAM are maintained on the Aquatic Mitigation topic page on Oregon Explorer.

The Department also maintains a Wetlands Planning Map Viewer on Oregon Explorer to help the public understand where a wetland or stream project might be most valuable in addressing ecosystem services important to the public. DSL's compensatory mitigation rules allow permitted impacts to be replaced with a different type of wetland or stream, or different functions and values, than what is impacted (i.e. out-of-kind) if doing so will address a watershed priority. DSL has collected data layers that would be helpful to demonstrate that a watershed priority exists, including the DEQ Integrated Report, Agricultural Water Quality Management Areas, surface and groundwater water drinking water source areas, Conservation Opportunity Areas, Important Bird Areas, and others.

DSL periodically evaluates status and trend data. For example, in 2019 DSL published a study on wetland and land use trends for the Willamette Valley from 2005 to 2020, which was a third in

a series of trend studies. The South Slough Reserve completes environmental monitoring, species and habitat monitoring, climate change research, and habitat restoration research on Reserve lands and published research is available on the DSL website.

The Department is developing a guide for Aquatic Resources of Special Concern to better describe habitat characteristics and includes photos so that consultants and the public can better identify these habitats in wetland delineation and permits.

Data and Information Gaps

Head of tide is a jurisdictional feature under removal-fill law for estuaries, tidal bays and tidal rivers. It is the farthest point upstream where a river is affected by tidal fluctuations. Head of tide information was last collected between 1979 and 1984 for larger streams and published by the Department in 1989. This information needs to be updated in a way that is repeatable and includes more coastal streams.

Estuaries, tidal bays and tidal rivers are also jurisdictional to the highest tide elevation. DSL is conducting rulemaking in 2025 to allow use of an elevation-based estuary model, but current models like the Elevation-Based Estuary Extent Model (EBEEM) need refinement to allow these models to extend into smaller coastal streams.

Mapping submersible lands in estuaries would be helpful for both removal-fill permitting and waterways management.

Rapid assessment methods like ORWAP and SFAM either (1) associate the functions (i.e., water quantity and quality, habitat, species diversity) provided by a wetland or stream with its observable features, or (2) summarize data from similar wetlands and streams and provide these results to the user. Functionality is determined as higher, moderate or low for 14 specific functions of wetlands and 11 specific functions in streams. Additional studies are needed to associate features and data to the functionality of similar types of wetlands and streams.

As more research and information is available, our assessment methods need to be updated. SFAM was updated and released as version 2.0 in 2024, but the scientific underpinnings of ORWAP has not been updated since the first version was released in 2009. The Department is seeking funding and capacity for this work. Updates are also needed for wetland values to potentially incorporate new data and information to inform the societal benefits that wetlands provide. DSL uses this information to help determine locally significant functions and mitigation decisions.

Rapid assessments are not available for near-shore habitats, tidal channels, non-wadable streams, or large rivers. Methods need to be developed, or existing methods adapted, for these areas.

Finally, waterway management plans can help guide decision-making. Currently, the Lower Willamette River Management Plan is adopted (OAR 141-080) and informs removal-fill permitting and waterway management. Unfortunately, this plan is 30 years old which makes it difficult to implement. DSL has requested funding in our 2025-2027 legislative budget to update the Plan and we anticipate it would be a multiyear effort involving multiple stakeholders.



Oregon Watershed Enhancement Board

Geographic and Jurisdictional Responsibilities

In 2001, the Oregon Legislature institutionalized the Oregon Plan for Salmon and Watersheds (https://www.oregonlegislature.gov/bills_laws/ors/ors541.html) or the “Oregon Plan.” This legislation placed state authorities in statute, including those directing OWEB to develop and implement a statewide monitoring program in coordination with Oregon Plan agencies and partners.

Throughout its development, the Oregon Plan historically emphasized the importance of monitoring the status of environmental factors that affect watersheds and habitat quality as well as monitoring salmon population status and trends. Support for monitoring and reporting represents the State’s commitment to evaluate the benefit of measures implemented to improve watershed conditions and salmon populations and to make changes in policies or programs when necessary. With Executive Order 99-01, the Governor expanded the original monitoring program developed for the 1997 Coastal Salmon Restoration Initiative (CSRI) to include all watersheds and salmon species and to the habitats of native fishes throughout the state.

In 2010, Oregonians passed Ballot Measure 76, providing long-term support for OWEB to administer grants to local partners to implement the Oregon Plan for Salmon and Watersheds, the Oregon Conservation Strategy, and Oregon’s native fish and wildlife conservation and recovery plans. The subsequent statutory changes specifically called out native species and their habitats, along with water quality as components of the priorities for OWEB investments.

OWEB programs support Oregon’s efforts to restore native species and their habitats, improve water quality, and strengthen ecosystems that are critical to healthy watersheds and sustainable communities. OWEB carries out three interrelated monitoring functions:

- strategic guidance for cooperative monitoring,
- tracking of accountability and effectiveness of restoration investments, and
- reporting on the progress of the Oregon Plan.

OWEB does not have any legal authorities related to water. Chapter 541 of the Oregon Revised Statutes describes OWEB’s role in Watershed Management and Enhancement as part of the Oregon Plan: https://www.oregonlegislature.gov/bills_laws/ors/ors541.html.

Agency Specific Monitoring and Information Needs

[The Oregon Plan Monitoring Strategy](#) (OPMS) was written in 2003 and provides a framework to evaluate existing monitoring efforts and to expand efforts to assess the effectiveness of Oregon Plan and OWEB activities. This Monitoring Strategy is comprehensive and identifies information needs that several State agencies have a role in collecting.

Monitoring needs outlined in the strategy focus primarily on topics such as:

1. The need to evaluate the effectiveness of restoration efforts by monitoring representative samples of specific project, activity, and program types.

2. The need to provide sufficient guidance so that OWEB investments in monitoring contribute to Oregon's overall monitoring priorities.
3. The need for a monitoring network to help evaluate progress toward environmental benchmarks, watershed restoration, and native species recovery goals.

Status and Implementation of Agency Monitoring Strategy

OWEB has worked with the appropriate state agencies to implement the OPMS. In addition, the OWEB's Monitoring and Reporting Program has taken specific steps to fill information needs in Section 2 of this report. OWEB has commissioned studies to evaluate the effectiveness of restoration efforts of specific restoration actions at a programmatic level that spans broad spatial and temporal scales. Some of the restoration actions that have been evaluated since this strategy was last written (2017) include livestock exclusion, riparian planting, juniper removal, valley wide floodplain restoration, tide gate replacement and removal. A project evaluating effectiveness of the Conservation Reserve Enhancement Program (CREP) was completed during the 2015-17 biennium.

In addition, OWEB funds local, state, federal and tribal water monitoring activities through its grant programs, contributing to the implementation of the OPMS. Grantees also can request funding for effectiveness monitoring (EM) of restoration projects that are funded by OWEB to determine if an individual restoration project is effective at meeting its biological and ecological objectives. EM is not a requirement of any OWEB grant, and is above and beyond compliance monitoring/implementation reporting. Information from project-level EM can be helpful in assisting the restoration practitioner and OWEB in determining the biotic and abiotic changes on the treatment area from the restoration action(s) and informing future restoration design.

Currently, OWEB has administrative procedures in place to track short-term outputs associated with restoration projects, including via reporting tools such as the Oregon Watershed Restoration Inventory. OWEB works with partners to evaluate the ecological outcomes associated with funding for specific actions in a particular geographic area. In particular, the approach employed by OWEB's Focused Investment Partnership (FIP) investments provides an opportunity to learn about the progress and outcomes possible under longer term (i.e., 6 year), larger scale investments. Information emerging from these investments will be used by the OWEB board, staff, and stakeholders to adaptively manage partnership investments in the future.

In addition, OWEB has been working to offer targeted funding to help the board and grantees better communicate the ecological outcomes of restoration funded by the agency. In 2017, OWEB started a new Telling the Restoration Story grant offering to support compilation, analysis, and/or interpretation of existing data from a watershed restoration project or projects, and the production of outreach materials that describe outcomes from that work.

OWEB staff support efforts to describe how restoration actions result in measurable outcomes by convening cross-agency teams to engage with natural resources agencies to achieve common objectives. For example, OWEB convenes the Monitoring and Assessment Group (MAG) to provide guidance for Strategic Implementation Area (SIA) monitoring, including the Oregon Departments of Agriculture, Environmental Quality, and Fish and Wildlife.

OWEB's ten-year strategic plan was adopted in 2018. In 2024, the agency updated and refreshed the plan to meet new requirements from the Governor's office, to hear from partners, and to recognize significant accomplishments and changes in the past five years. The foundational elements of the plan were retained, including a priority to "Advance learning about watershed effectiveness through coordinated monitoring", which remains aligned with supporting the STREAM Team's work. Additionally, new components of this priority adopted by the Board include efforts to integrate indigenous knowledge and continue to support adaptive management and OWEB's approach to integrate monitoring throughout the agency's grant programs. An updated priority is to "Take bold and innovative action toward climate resilience", and some related data needs are described below.

Data and Implementation Gaps

The OPMS outlines examples of data and information needed to address the gaps in the State's monitoring approach, as of 2003. There may be value to revisiting these gaps to determine which have been addressed, which still exist, and what new data and/or information gaps have emerged in the intervening years. However, such an effort would need to involve all relevant agencies that are engaged in the Oregon Plan.

OWEB has adopted a Climate Resolution and added climate criteria to the agency's grant making, providing some technical resources to assist applicants and grantees with incorporating climate considerations in their work. OWEB continues to advise and support inter-agency efforts to provide technical resources to grantees and partners about climate impacts and other topics.

The following list provides a summary of data and information needs from OWEB's perspective:

Tracking water and species monitoring efforts:

- Understand what parameters are being monitored regularly, and where these efforts are happening throughout Oregon. Mapping locations provides information about the scope and context of water and species monitoring efforts.
- Tracking results at specific locations over time helps evaluate cumulative progress.

Linking investments to conservation outcomes:

- Access to high-quality datasets to inform and develop ecological indicators to evaluate trends related to aquatic habitats and watershed condition.
- Define conservation outcomes resulting from restoration, management practices, and conservation policies over the short and long term.
- Methods to use monitoring results to identify the highest priority areas for restoration that will offer the best return on investment.

Incorporate climate considerations into grant-making:

- Continue to compile resources to help grantees identify specific monitoring needs related to climate change and develop monitoring plans that consider climate change.
- Continue to support efforts to quantify carbon sequestration benefits, such as the Blue Carbon Calculator for estuarine restoration and an evaluation of carbon sequestration from riparian reforestation projects

Oregon State University - the Institute for Natural Resources and the Institute for Water and Watersheds

Geographic and Jurisdictional Responsibilities

The Institute for Natural Resources (INR) and the Institute for Water and Watersheds (IWW) are legislatively established institutes created to provide information and assistance to decision-makers in Oregon, particularly to address natural resources and water issues. INR and IWW are partner programs that share staff and work together, based on differing mandates and authorities, although both are mandated to work statewide, and have also chosen to work elsewhere across the west and throughout the world to address critical natural resource and water issues.

Agency Specific Monitoring and Information Needs

Neither INR, IWW nor OSU have any specific monitoring and information needs aside from those identified in the Oregon Natural Areas Act (ORS 273.561-.591), related to evaluating the status of Oregon species and ecosystems, and their distribution within designated natural areas. The primary mission is to support agencies and decision-makers and to help solve agency problems and information gaps. The Oregon Explorer program, a natural resources digital library, is one way that INR supports agencies with access to water data and information.

INR and IWW share and distribute information through a long-term partnership with the Oregon State University Libraries and Press, as well as with many of the state agencies represented on the Oregon Stream Team. Specifically, the following Oregon Explorer mapping tools support informed water decision-making in Oregon at different geographic scales and were developed in collaboration with Stream Team agencies.

1. [Oregon Rapid Wetland Assessment Protocol \(ORWAP\) and Stream Function Assessment Method \(SFAM\) Map Viewer](#) – Developed in collaboration with DSL, ORWAP is a standardized method for rapidly assessing the functions and values of wetlands. The ORWAP tool provides site-specific mapping and reporting information needed to answer a small but important subset of ORWAPs 140 indicator questions. The SFAM tool provides site-specific mapping and reporting information needed to answer a subset of SFAM indicator questions. The data is updated annually.
2. [Oregon Watershed Restoration Tool](#) – Developed in collaboration with OWEB, the OWRT provides access restoration project information and supports data downloads for Oregon Plan basins, subbasins or watershed councils (1995-2022). The data is updated annually.
3. [Oregon Mid-Coast Water Planning Map Viewer](#) – Developed in collaboration with OWRD and the MCWPP, this tool aggregates water data for a selected area of interest within and including the Mid-coast. The report includes queried data for the following sections: Area Overview, Water Quantity, Water Quality, Water Use, Infrastructure, Hazards. The tool was developed for the Mid-Coast Water Planning Partnership to support their integrated Water Action Plan. One of the eight imperatives listed in their action plan specifically addresses monitoring and data sharing.

4. [Oregon Water Map Viewer](#) (BETA) – Developed in collaboration with OWRD, this tool provides access to data to create a water report for an area of interest within Oregon. The report includes information about water quality, water quantity, water rights and much more.

The Oregon Explorer program is also leading the technical work for the Oregon Water Data Portal under the direction of DEQ and an interagency water team. Although this platform is still under development, it will likely provide the best way to provide broad-based access to statewide water monitoring data in the near future.

Status and Implementation of Agency Monitoring Strategy

Neither INR nor IWW have an agency monitoring strategy.

Data and Information Gaps

INR and IWW have identified some data gaps related to addressing key issues and programs identified in the most recent strategic plan. These include:

1. The lack of a number of statewide framework datasets needed to model and address key water issues, including:
 - a. elevation – at least a 5 meter Digital Elevation Model (DEM) statewide,
 - b. hydrography (statewide hydrography created from the 1 or 5 meter DEM),
 - c. updated and agreed-upon 12-digit HUC boundaries created from the new elevation dataset, and
 - d. a mid-scale (1:24,000) surficial geology and at least a few key soil attributes for the state (although statewide Soil Survey Geographic Database (SSURGO) remains the goal).
 - e. Updated wetland map, designating aquatic resources of special concern
2. Software to share observations and records of fish and aquatic invertebrates and statewide 12-digit HUC distributions of all fish and key freshwater invertebrates.

Overlapping Themes, Needs and Summary

Overlapping Themes

Effectiveness

A common need among Oregon’s natural resource agencies is more information to understand the “**effectiveness**” of activities in protecting water related resources. This information need is characterized differently by each agency reflecting the unique responsibilities, priorities, and resources available for understanding how water is influenced by activities that fall within the scope of their mission.

Based on these unique responsibilities, “effectiveness” may be interpreted as:

1. Characterizing progress on implementing activities designed to protect streamside areas;
2. Evaluating whether streamside buffer regulations result in healthy aquatic communities and attainment of water quality standards;
3. Measuring progress towards attaining instream water quality standards;
4. Measuring progress towards restoring salmon habitat and populations;
5. Understanding the benefit of activities designed to restore stream flows; or
6. Collecting information on the effectiveness of protection, restoration and mitigation of wetlands.

Providing information on effectiveness requires a detailed monitoring plan that can be implemented and updated as needed. Management activities may have some measurable near-term effects, but the longer-term impacts will take many years to measure. The use of the appropriate indicators, measured at the right scale and frequency over time, will provide the information needed to answer important questions about the trajectory of our water resources.

Status and Trends

Agencies also identified a number of important needs for statewide status and trends data. In particular, meaningful status and trends information for groundwater, seasonal water use, temperature, shade, sedimentation, nutrients, toxics, and harmful algal blooms were identified. There are many opportunities for our natural resource agencies to work together to provide the type of effectiveness and status and trends information needed through careful planning, collaboration and sharing of environmental data, and providing assistance to other state agencies when possible.

One example is Strategic Implementation Area (SIA) monitoring, where ODA, DEQ, ODFW and OWEB work together to provide guidance to SIA grantees as they establish Local Monitoring Teams. SIA boundaries are determined by ODA and therefore include some agricultural influences. Many SIA projects have found value in collecting baseline water quality information in the project area, and the resulting information is stored with DEQ to help inform status and trends over time.

Needs Assessment

Natural resources agencies need better tools to share and understand water-related data. Resources for collecting data are often limited, emphasizing the need to maximize the utility of available information. Aging, outdated data systems make accessing and sharing difficult, time consuming and inefficient. As these data systems are replaced by the individual agencies to meet their key data management needs, there is an opportunity to create efficiencies by having a list of the previously identified information needs of each of the water state agencies to see if any of these could be easily addressed within alternative systems.

The STREAM Team provides a forum for discussing the needs of individual agencies related to water associated data management and to recommend improvements for sharing this information.

More efficient, effective, and adaptive natural resource planning, investment, and monitoring across state agencies and resource conservation initiatives will require that Oregon's natural resource agencies:

- Understand what we have and what we will have (e.g., mapping of current and predicted states of natural resources at 1:24K);
- Understand and predict demands on natural resources (e.g., document/map current and future resource use at 1:24K scale); and
- Use this information to develop tools to prioritize/categorize areas for utilization, regulation, restoration and/or protection.

In this context, statewide stream temperature and flow monitoring is a key information need and a gap in monitoring coordination. Currently, OWRD has a statewide program for stream flow monitoring which includes 254 gages operated by OWRD staff and another 250 operated by USGS. Currently, 50% of OWRD gages are collecting temperature data and this percentage is continuing to increase with the installation of new probes and sites. All new stream gages installed, 10 or more planned over the next 2-4 years, will include stream temperature monitoring. Almost all of the USGS gages also have water temperature probes. The federally recognized tribes, US Forest Service and the BLM have a number of temperature monitoring stations in selected areas on lands they manage, while ODFW, NOAA, OSU and many OWEB monitoring grantees including watershed councils, soil and water conservation districts and non-governmental organizations each support temperature monitoring.

There is a need to perform an assessment of current statewide stream temperature and flow monitoring efforts that would (1) inventory existing information from all entities, (2) identify gaps, (3) identify new monitoring sites, and (4) develop a common storage solution for continuous data would facilitate mapping of current and future resource states through stream network monitoring tools. Temperature and flow are of cross-cutting importance to many of the natural resource agencies, presenting a tangible opportunity for coordination and efficiency gains.

Members of the STREAM Team and those working on implementing the IWRS have identified an initial eight recommendations to improve the ability of water monitoring agencies to work together:

- 1) **Build upon existing inter-agency monitoring approaches, including those from the Oregon Plan for Salmon and Watersheds.** Monitoring teams developed under the Oregon Plan, the

Agricultural Water Quality Pesticide Management Plan, and other efforts are valuable for fostering communication and data sharing among agency partners. Agencies and decision-makers should continue building upon existing efforts such as these.

Collaborative efforts, such as the STREAM team, offer an ongoing forum to identify questions of mutual interest among agency natural resources specialists, and to develop solutions to common problems.

Support agency efforts to share data and results so that resources can be allocated efficiently, reducing costs and potential duplication of efforts. STREAM Team provides a forum for actionable coordination among water agencies and can help to promote efficiency as well as respond to emerging needs identified by agency decision-makers.

In 2025, one example of inter-agency coordination is an effort between ODF and ODFW to update a stream layer showing stream permanence as well as fish presence. Another example related to assisting other agencies with data collection is related to the MOU regarding response to harmful algae blooms to protect public health.

An inter-agency partnership focused on data sharing is the Conservation Effectiveness Partnership (CEP), which was active from 2010 through 2025. The CEP mission was to describe the effectiveness of cumulative conservation and restoration actions in achieving ecological outcomes through collaborative monitoring, evaluation, and reporting. CEP partners agreed on goals for the partnership, with an emphasis on water quality and watershed health. CEP identified watersheds with significant agency investment and with specific water quality issues and then engages with on-the-ground partners to identify specific questions about the effects of restoration investments on ecological outcomes. CEP completed work in 6 watersheds around the state, including Tillamook County's Wilson River and Wasco County's Fifteenmile Creek. For more information please see a [storymap overview](#).

Provide information about metrics, variables, and data management practices so that agency results can be easily shared and understood by tribal, state and federal agencies, along with key partners. Support monitoring leaders and scientists within agencies to identify variables of interest to multiple agency partners (e.g. temperature, stream flow, presence of important fish species), along with identifying a permanent interagency funding source for ongoing efforts such as the monitoring calendar, map, and data sharing portals which can strengthen collaborative monitoring efforts. Share information about accepted survey and data collection protocols, and support efforts to collect data in a standard format as agencies work towards greater compatibility.

- 2) **Assure monitoring is undertaken at the appropriate scale.** The scale of inference for the sampling design needs to correspond to the scale of the question to be addressed (e.g. site, stream, watershed, or ecoregion). Identifying a set of standard scales for monitoring has the potential to lead to efficiencies in data collection and integration of different agency monitoring efforts.
- 3) **Support web-based data tools, such as the Oregon Water Data Portal.** As of 2025, DEQ and other state agencies, universities and contractors are currently planning a water data portal in response to direction from the 2021 Oregon Legislature (HB 5006), and widespread public

interest in having improved data and information resources to support water-related decision making. This highly collaborative effort builds on past and recent water planning efforts, and will be responsive to recommendations from Oregon's 2017 Integrated Water Resources Strategy, the 2020 Oregon 100-Year Water Vision, and the Oregon Secretary of State's 2023 Water Security Advisory Report. The resulting portal will help provide water data and information in support of future water security. The data workflows supporting the portal will help individual agencies make their data accessible and help answer important water questions.

- 4) **Assist with coordination and sharing technical assistance and information among monitoring partners at a regional level.** Although STREAM Team works statewide, STREAM Team members recognize there is a need to share information, coordination, and technical assistance including monitoring at a regional level, and works to support these efforts as appropriate. Examples include WRD Basin Assessments; Place-based planning; partner-led Pesticide Stewardship Partnerships. Agencies are currently engaging in some coordination at a regional level to determine the best approaches to meet regulatory requirements such as TMDLs.

In 2013 and 2018, the STREAM Team supported regional summits to bring together those collecting information on aquatic life and water within particular regions. In 2013, the STREAM Team convened a regional Summit in the John Day, Umatilla, and Grande Ronde basins and a summit was recently completed for the North and Mid Coast regions in February 2018. The summits included state, federal, and tribal agency staff, along with those from watershed councils, universities, municipalities and NGOs working with rivers, streams, lakes, estuaries and groundwater in these regions. Regional summits allowed groups to connect with others collecting data and create efficiencies by making connections and identifying methods that have been successful locally. They also provided the basis for agreement on overall regional monitoring goals and priorities, and helped to identify the funded and ongoing projects that a regional strategy could build upon.

- 5) **Use results of monitoring to prioritize areas for further study, regulation, protection, conservation, and restoration.** In addition to what is required for current regulatory decision-making, agencies see value in collecting and sharing water data for possible future uses. Adaptive management is a goal of all of the agencies working to protect Oregon's water resources, aquatic species and ecosystems. While it is included in all agencies' monitoring strategies, it can be difficult to implement, and many efficiencies can be gained through a coordinated approach.

Summary

State laws require agencies with responsibility for managing aquatic resources to be able to assure their efforts to restore, protect and manage sustainable uses are effective. To succeed at this effort, agencies must be able to understand the status and trends of these resources, which requires efficient monitoring. Successful aquatic monitoring to inform public policy decisions requires the ability to efficiently collect and store data, and to assure it is available for agency analysis and reporting. Data sharing is especially important when agencies are collecting similar

data and when agencies are making decisions that could be enhanced by information collected by or available from another agency.

There is work underway at DEQ, DAS, WRD, and PSU, along with the BLM, USFS, and USGS to address these issues, although not with a schedule that holds promise to meet the short-term needs identified by this summary. The inter-agency STREAM Team provides a forum to discuss common issues and develop solutions together.

STREAM Team is endeavoring to make progress by communicating among the agencies when and where aquatic monitoring is happening in Oregon through a shared calendar, and a monitoring map. Both the calendar and map will help agency natural resources specialists identify economies of scale and opportunities for collaboration. In addition, efforts to better address water issues in Oregon led by the Governor's Office also hold promise in promoting information sharing and cross-agency collaboration. Improving the state's capacity to understand the status and trends of our water, aquatic species and the habitats that support them will significantly improve our efforts to assure they remain sustainable.