Oregon's 2025 Integrated Water Resources Strategy

September 2025

Office of Governor
TINA KOTEK

A Message from Governor Kotek

Dear Oregonians:

There is no more essential public resource than water.

Access to safe, clean drinking water should be a given for all Oregonians in every part of the state. The reality of growing water scarcity requires increased urgency in addressing water management and policy.

Our most vulnerable communities, our working and natural lands, our fish and wildlife, and our rivers, lakes and streams all face an existential threat, as the relentless march of climate change and other challenges test our resolve to protect that which sustains us.

Our state's Integrated Water Resources Strategy is the roadmap to both increasing our understanding of our water resources and improving the State's capacity to manage water. With water allocation and management policies in particular, there are many challenges - both with resource limitations, and with long-held practices and expectations that are now colliding with very real constraints on our existing water supply.

In the face of these pressing challenges, we must act—decisively, urgently, and in true partnership to protect and sustainably manage our surface- and groundwater reserves for generations to come. This Strategy charts a proactive pathway forward to advance strategic actions that will improve management of Oregon's water resources for the benefit of our communities, environment and the economy.

As stewards of our air, water, and landscapes, we cannot stand idly by and watch our beautiful and productive landscapes deteriorate in front of us. It is incumbent on us to act boldly, embrace creative, new solutions, and take strong action to enhance the resiliency of our natural resources and communities. The actions laid out in this Strategy are critical to achieving our shared goals and advancing water security for all Oregonians.

Governor Tina Kotek

The Integrated Water Resources Strategy

Water is a public resource essential to Oregon's communities, ecosystems, and economy. In 2009, the Oregon Legislature recognized that the protection and management of water and responsible use of public funds requires an integrated strategy, and directed the state to develop an Integrated Water Resources Strategy (Strategy).

The first Strategy, released in 2012, inspired many improvements in water resources data collection, management, planning, and funding for water projects.

The impact of climate change on our water has grown exponentially since 2012. **The 2025 Strategy elevates the role of climate change and identifies actions needed for mitigation, adaptation and resilience.**

The fundamental purpose of the Strategy remains the same: to better understand and meet Oregon's instream and out-of-stream water needs — environmental and consumptive — including water quantity, water quality, and ecosystem needs. The 2025 Strategy updates the wording of some objectives, critical issues, and adds two new actions, identifying areas where incentives or new policies could serve as powerful tools for progress.

This document serves as the introduction of the state's 2025 Integrated Water Resources Strategy.

KEY MILESTONES

2009
State directed to develop Strategy

2012
State releases first Strategy

2017
State releases second Strategy

2025
State releases third Strategy

The Future of Oregon's Water

The state of Oregon faces water shortages, declining water quality, and increasing climate impacts. This threatens our ability to have enough clean water for our people, our economy, and our environment, now and for generations to come.

The choices we make today will determine the legacy we leave for future generations.

For the long-term health and sustainability of Oregon's communities, ecosystems, and economy, we must act in thoughtful coordination on the immediate steps we can take today in preparation for a future of water scarcity.

100,000
miles of rivers and streams

360
miles of coastline

95%
of fresh water is groundwater

An Outcomes-Driven Approach

To make progress in a resource-constrained environment, we must focus on a select number of actions.

Governor Kotek directed the 2025 Strategy to articulate clear outcomes that will best serve the water needs and interests of all Oregonians.

State agencies identified three priority areas, inspired by recent conversations with federally recognized sovereign tribal nations, communities impacted by groundwater contamination in the Umatilla Basin, dry domestic well issues in several basins, increasing water scarcity that impacts people, species, and ecosystems, and statewide effects of climate change.

Each priority area includes several tasks that require coordination across multiple agencies. There are 15 priority tasks summarized below, with more detail provided in Appendix E.

Priority Actions: *Act, Assist, and Adapt*

Priority 1: Act with Urgency to Protect Instream and Out-of-Stream Uses

Priority 2: Assist the State and Communities to Prepare for Water Scarcity

Priority 3: Adapt to Water Scarcity by Stretching our Water Supplies

A Future of Water Security

Key: IWRS Actions Appendix Reference

Act with Urgency

to Protect Instream and Out-of-Stream Uses

P1.1 Reduce unauthorized water use and gain compliance with other water laws — 8C, 10E, 10F, 13B

P1.2 Provide guidance for what constitutes reasonable use of water — 8C, 10F, 13B

P1.3 Increase the use of and develop protections for priority waters and/or watersheds — 10F, 11A-E, 13B-C

P1.4 Expand efforts to protect the quality of surface and groundwater sources that provide drinking water — 11A-4E, 12A-C, 13B, 13C

P1.5 Implement improvements to water permitting processes for transparency, efficiency, and effectiveness — 10F, 13B

Assist the State and Communities

to Prepare for Water Scarcity

P2.1 Increase quality and accessibility of water availability, water use, and water demand information — 1A, 3A, 13B

P2.2 Modernize water data systems and website user interfaces to facilitate wider data sharing — 1C, 13B

P2.3 Improve understanding of instream and out-of-stream needs through increased completed basin assessments, instream flow studies, and clean water plans — 1A-D, 2A-C, 13B

P2.4 Increase the number of communities and Tribes that have completed or are participating in water planning efforts — 9A, 9E, 13B

P2.5 Increase involvement of OWRD in advisory committees for Economic Opportunity Analyses to better align land use planning with water resource goals — 6A, 13B

Adapt to Water Scarcity

by Stretching our Water Supplies

P3.1 Increase the pace and scale of water reuse and aquifer storage, recovery and recharge projects that support resilience and protect the environment — 10B, 10C, 10F, 13B, 13C

P3.2 Increase the number of water users that are planning/implementing water conservation, efficiency, or modernization efforts — 7A, 9A, 10A, 13B, 13C

P3.3 Align existing and future agency funding to further instream flow restoration, groundwater recharge, source water protection, and water quality and habitat improvements — 11A-E, 12A, 13B, 13C

P3.4 Identify priority areas for new above and below ground storage — 10C

P3.5 Improve water right transfer processing times for lower risk transfers to facilitate the movement of water to high-priority use — 10F, 13B

Oregon's 2025 Integrated Water Resources Strategy

Butte Falls, Marion County, Oregon. Credit: Laura Tesler Photography

September 2025

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A Message from the Water Resources Department

Fellow Oregonians,

Everyone needs cold, clean, and abundant water. As communities grapple with an era of water challenges, we must think differently and act urgently.

The 2025 Integrated Water Resources Strategy (Strategy) aims to meet the moment. It brings together Oregon's natural resources, economic development, conservation, and health agencies to address these issues head-on through coordinated action. It is a roadmap for addressing water challenges that affect our entire state, from our abundant agricultural lands to our vital watersheds, from our Tribal partners to urban centers and rural communities.

With climate change driving warmer temperatures, declining snowpacks and precipitation shifts, the 2025 Strategy places this reality front and center, with concrete actions to help us mitigate and adapt.

This Strategy strongly supports enhanced data collection, helping us better understand how much water is available, assess water quality, and determine the needs of people and ecosystems most affected by water challenges.

I am very proud that the 2025 Strategy incorporates feedback from diverse voices across Oregon. We listened to opinions and concerns from residents of all 36 counties, including making a survey available in nine languages and hosting numerous community conversations. Oregon's Tribal sovereign nations were invited to provide their expertise and experience, and the Strategy reflects the priorities we heard throughout this process.

And importantly, this Strategy recognizes that our success depends on collaboration at every level. When communities come together with local, state, and federal agencies early and often, we can identify emerging issues and address them proactively. As we build relationships, we create the trust necessary for finding solutions.

The path forward won't be easy. There have been and will be difficult conversations about priorities and tradeoffs. We're facing real uncertainty around federal funding and policy changes that could affect water management and resource allocation moving forward.

But with the best available science, a collaborative approach, and our shared commitment to Oregon's future, we can work through these challenges together.

Ivan Gall

Ivan Gall
Director, Oregon Water Resources Department

Executive Summary

Water is a public resource, essential to our communities, ecosystems, and economic activities. Protection, conservation, and management of our shared public resource and responsible use of public funds requires an integrated strategy based on rigorous data and analysis. In 2009, the Legislature recognized the need to develop a statewide Integrated Water Resources Strategy (IWRS or from here forward referred to as the "Strategy") to coordinate water management efforts by many agencies and partners. The Strategy is needed to carry out two goals: to **improve our understanding of Oregon's water resources** and to **meet our state's instream and out-of-stream water resource needs**. The first two Strategies (2012 and 2017), inspired many improvements in water resources data collection, management, planning, and funding for water projects.

> ***"Instream"*** *as defined in ORS 537.332 "means within the natural stream channel or lakebed or place where water naturally flows or occurs"*
>
> ***"Out-of-Stream"*** *– water withdrawn or diverted from a groundwater or surface water source for a beneficial use*

The 2025 Strategy places an emphasis on the need for data, collaboration, voluntary, and regulatory efforts. It identifies areas where incentives or new policies could serve as powerful tools for progress. It also identifies where public and private partnerships could stretch our dollars and further instream and out-of-stream efforts. Just as importantly, **the Strategy does not remove or jeopardize existing water rights or other local, state, Tribal, and federal authorizations. The Strategy does not itself change any existing authorities. It is the platform for prioritized investments in the coming years.**

In 2019, former Governor Brown initiated the 100-Year Water Vision (Vision), a community engagement process to elevate water concerns of Oregonians and call for strategic investments to address these challenges. Completed in 2020, the Vision called for Oregonians to "invest strategically in infrastructure and ecosystems across all regions to support resilient communities, vibrant local economies, and a healthy environment for all who live here." The 2021 Oregon Legislature made historic investments in Oregon's water resources by passing a $538 million water package distributed among many natural resource agencies. This funding allowed state agencies to make progress toward addressing water issues identified in both the Vision and 2017 Strategy. Vision participants called for the Vision findings to be applied to the next Strategy. The 2025 Strategy highlights where Vision challenges and opportunities align with Strategy actions. **To streamline Oregon's water initiatives, the 2025 Strategy will be the single statewide water planning effort carried forward.**

Document Vocabulary

Since 2012, the Strategy has used specific language to explain and organize goals, objectives, critical issues, and actions. The Strategy's organizational terms are provided below.

- **Framework** – describes the overall structure of the Strategy. The Framework shows how the goals, objectives, critical issues, and actions relate to one another. The Framework is included in Appendix D.
- **Goal** – The Strategy was designed to meet two overarching goals: to improve our understanding of Oregon's water resources, and to meet Oregon's instream and out-of-stream needs. Strategy objectives and actions support meeting these goals.
- **Objective** – Statute (536.220) requires that the Strategy describe objectives of the Strategy and actions designed to achieve those objectives. The Strategy has four objectives, carried forward from the 2012 Strategy.
- **Critical Issue** – Critical issues describe specific water challenges under each objective. Critical issues are the headings for groupings of related actions.
- **Action** – Actions are identified to address a critical issue. Actions are directed to both agencies and others, recognizing many people have a role to play in managing our water. There are 48 actions in the 2025 Strategy.
- **Example Actions –** Each action includes a list of example actions to show how to implement the action. Example actions are distributed throughout the chapters and included on the action summary sheets in Appendix D.

Document Organization

The 2025 Strategy has four objectives. Each objective is separated into its own chapter, Chapters 1 through 4. Within each chapter, the narrative describes critical water issues, actions, and example actions. Several Appendices have been created to provide additional information and support Strategy implementation.

- **Appendix A** - summaries of Tribal, state and federal agency roles and responsibilities regarding water
- **Appendix B** - water laws, policies, and regulations guiding management of instream and out-of-stream uses
- **Appendix C** - comparison of wording and numbering updates between the 2017 Strategy and the 2025 Strategy
- **Appendix D** – includes the Framework and action summary sheets for each of the 48 actions. Each action summary sheet provides a quick reference regarding who might take this action, examples of how to implement the action, and current resources including existing workgroups or funding programs, if known.
- **Appendix E** – agency action priorities for the next 6 years, 2025-2031
- **Appendix F** – the key challenges and opportunities identified in the 100-Year Water Vision and the relevant 2025 Strategy actions
- **Appendix G** – the 2017-2022 Progress Report highlighting progress towards implementing the 2017 Strategy

Changes from the 2017 Edition

The 2025 Strategy updates the wording of some objectives, critical issues, and adds two new actions. Appendix C provides a crosswalk to review these updates. The 2025 Strategy provides an opportunity to address equity, climate change, and increase agency accountability throughout the document.

- **Equity** – A centerpiece of pursuing water equity requires bringing more voices to the table to meaningfully address the disparities regarding access to clean water across the state. The 2020 Oregon Water Futures Project Report, the 2020 100-Year Water Vision effort, the 2022 State of Water Justice Report, the 2022 Oregon Water Justice Framework, and the 2023 Secretary of State Water Advisory Report 2023-04 all document water insecurities and inequities in Oregon. A new action has been added to identify the need for meaningful community engagement. Equity and environmental justice considerations have been added throughout the Strategy example actions.
- **Climate Change** – Climate change is a pervasive part of life, more so than in 2012 when the first Strategy was published. The 2025 edition provides an opportunity to introduce climate change as the first critical issue in Chapter 3. The 2025 Strategy explains how many actions address climate mitigation, adaptation and resilience. References to climate change have been increased throughout the document.
- **Agency Accountability** –New for the 2025 Strategy, each action is presented in a summary sheet (Appendix D) that identifies the need for the action and detailed information to assist in implementation, including the likely lead and supporting state or federal agencies and partners contributing to the action. Resources, such as funding sources are also provided, if known. Also new for 2025, the Strategy includes agency priority actions for the next 6 years (Appendix E).

Biennial Workplan

In line with previous Strategies, implementation occurs after the Strategy has been adopted by the Water Resources Commission. The statute guiding the development and implementation of the Strategy was updated in 2023 to require a two-year workplan. Following the adoption of the 2025 Strategy, the Water Resources Department will work with state agencies to develop the first biennial workplan that reflects the multi-agency priorities (Appendix E) and the legislatively adopted budget for the 2025-27 biennium. Future workplans will include engagement with agencies, water partners, and the public in advance of biennial agency budget processes and legislative concept development to adequately support Strategy implementation. Workplan development provides an opportunity to coordinate work across many agencies and partners and must be done in a way that protects the public interest and balances instream and out-of-stream needs.

Guiding Principles

Development and implementation of the Strategy is guided by a set of principles, including accountability, a balanced approach, collaboration, employing an open and transparent public process, reasonable cost, science-based approaches, streamlining, and other principles memorialized as part of the Strategy's development. The guiding principles developed by the first Policy Advisory Group (2012) still apply today.

Accountable and Enforceable Actions
Ensure that actions comply with existing water laws and policies. Actions should include better measurement and enforcement tools to ensure desired results.

Balance
The Strategy must balance current and future instream and out-of-stream needs supplied by all water systems (above ground and below ground). Actions should consider and balance tradeoffs between ecosystem benefits and traditional management of water supplies.

Collaboration
Support formation of regional, coordinated, and collaborative partnerships that include representatives of all levels of government, private and non-profit sectors, Tribes, stakeholders, and the public. Collaborate in ways that help agencies cut across silos.

Conflict Resolution
Be cognizant of and work to address longstanding conflicts.

Facilitation by the State
The State should provide direction and maintain authority for local planning and implementation. Where appropriate, the State sets the framework, provides tools, and defines the direction.

Incentives
Where appropriate, utilize incentive-based approaches. These could be funding, technical assistance, partnerships/shared resources, regulatory flexibility, or other incentives.

Implementation
Actions should empower Oregonians to implement local solutions; recognize regional differences, while supporting the statewide strategy and resources. Take into account the success of existing plans, tools, data, and programs; do not lose commonsense approach; develop actions that are measurable, attainable, and effective.

Interconnection/Integration
Recognize that many actions (e.g., land-use actions) in some way affect water resources (quality and/or quantity); recognize the relationship between water quantity and water quality; integrate participation of agencies and parties.

Public Process
Employ an open, transparent process that fosters public participation and supports social equity, fairness, and environmental justice. Advocate for all Oregonians.

Reasonable Cost
Weigh the cost of an approach with its benefits to determine whether one approach is better than another, or whether an approach is worth pursuing at all. Actions should focus on reducing the costs of delivering services to the state's residents, without neglecting social and environmental costs.

Science-Based, Flexible Approaches
Base decisions on best available science and local input. Employ an iterative process that includes "lessons learned" from the previous round. Establish a policy framework that is flexible. Build in mechanisms that allow for learning, adaptation, and innovative ideas or approaches.

Streamlining
Streamline processes without circumventing the law or cutting corners. Avoid recommendations that are overly complicated, legalistic, or administrative.

Sustainability
Ensure that actions sustain water resources by balancing the needs of Oregon's environment, economy, and communities.

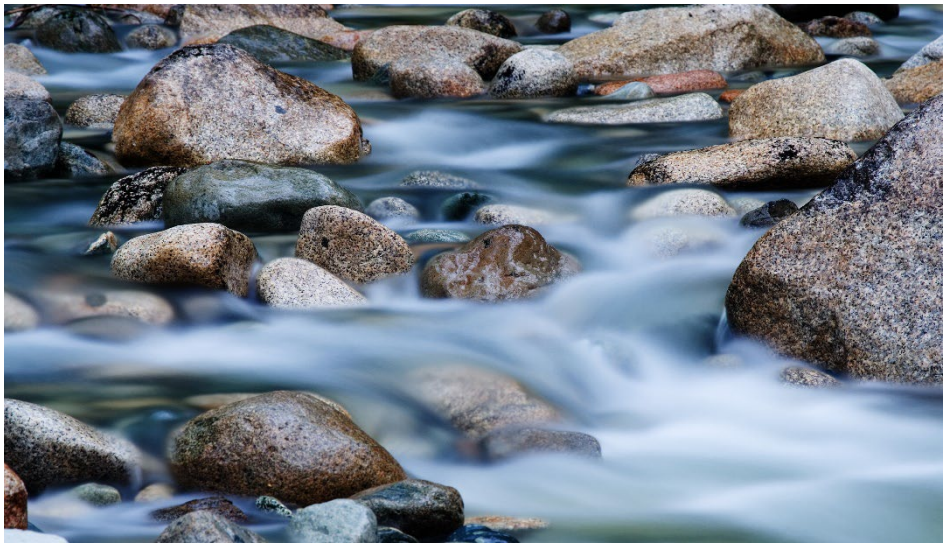
CHAPTER 1

Objective 1: Understand Oregon's Water Resources

Water is one of our most precious natural resources. With more than 100,000 miles of rivers and streams, 360 miles of coastline, and more than 1,400 named lakes, Oregon is renowned for its water.

While progress has been made in recent years, Oregon has a continuing need to understand its water resources. This includes how climate change impacts the form and timing of precipitation, the amount and timing of streamflow, the location and volume of groundwater, water quality, the condition of our ecosystems, and overall accessibility of water to communities and the environment.

The 2025 Strategy continues to be a forum for interagency collaboration. This includes a commitment to thoughtful, collaborative, and robust data collection, analysis, and sharing information with the public and those engaged in water management and decision-making.



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Chapter 1 Actions at a Glance

Objective 1: Understand Oregon's Water Resources

Critical Issue - Water Resource/Supply Information

1A Improve Water Resource Data Collection and Monitoring
1B Conduct Additional Groundwater Basin Investigations
1C Enhance Interagency Data Coordination
1D Support Basin-Scale Climate Change Research

Critical Issue | Water Resource/Supply Information

Oregon needs to understand the quantity and quality of available water to meet instream and out-of-stream water needs in a changing climate. Improving our knowledge of water resources requires investments in interagency work, analytical methods and approaches, scientific modeling tools, and platforms to share information with the public and other partners. This section includes Actions 1A-1D which address acquiring and sharing water resource quality, quantity, and ecosystem information. Chapter 2 covers data needs for defining instream water needs (Actions 2A-2C) and out-of-stream water needs (Actions 3A-3B).

Oregon's surface water and groundwater resources, by their very nature, are ever-changing. By day, month, and year, water and natural resource managers need up-to-date information to manage the resource and make sound decisions. This requires measurement of baseline conditions, trends over time, and evaluating the effectiveness of water monitoring programs.

State agencies need to maintain and add to their monitoring networks to augment the long-term record, fulfill day-to-day management responsibilities, and identify trends. Installing and maintaining additional monitoring stations for water supply and water use will need to be done in strategic locations to answer a growing list of questions. Monitoring stations include observation wells, streamflow gages, flowmeters, temperature probes, rain gages, snow survey equipment, soil moisture sensors, and AgriMet weather stations.

Action 1A Improve Water Resource Data Collection and Monitoring

The Water Resources Department (OWRD) uses the 2016 Oregon Water Resources Monitoring Strategy[1] to identify their monitoring priorities (e.g., climate change, groundwater protection), for both surface and groundwater resources. The Department of Environmental Quality (ODEQ) uses the 2020 Water Quality Monitoring Strategy to propose, evaluate, prioritize, and implement monitoring activities.[2] The 2017 Monitoring Strategy for Oregon's Waters, An Interagency Approach helps natural resource agency scientists identify and collect the right information to inform policy-makers about emerging water issues, the status and trends of Oregon's waters, and the effectiveness of current agency actions.[3] The Department of Fish and Wildlife (ODFW) has several monitoring programs. Their State Wildlife Action Plan (previously known as the 2016 Oregon Conservation Strategy) outlines monitoring strategies for priority species and habitats.

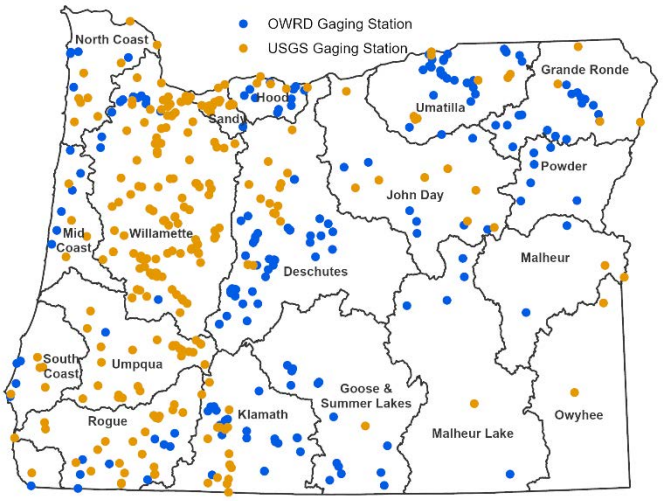
Monitor and Evaluate Surface Water Flows

A gage is a structure installed in a stream that includes equipment to measure water levels. Gages can also measure other parameters such as stream temperature. Scientists use water level information to calculate streamflow and water quality information to determine the health of waterways. The OWRD operates about 260 gages on streams, canals, and reservoirs throughout the state, maintaining an extensive long-term record for about 70 of them. About 240 of these gages are operated as near real-time, transmitting data once every hour. As shown in Figure 1-1, the OWRD also provides access to data from an additional 365 gages, primarily operated by the U.S. Geological Survey (USGS).

Approximately 10,000 river miles in Oregon are covered by an instream water right, but the state has limited capacity to monitor whether instream water rights are being met. While the state has taken steps to enhance measurement activities, only about 200 instream water rights have an associated stream gage in place to monitor whether the instream flows are being met. Approximately 497 of 2,000 instream water rights were monitored in 2024.

Operating a gage network requires trained hydrologic technicians to keep the equipment operating properly, to conduct regular measurements and/or observations at gages, and to input the collected information into a central database. Hydrographers review and analyze the data, make corrections based on field conditions, and finalize the records to meet computation standards established by the USGS.

Figure 1-1: Active Surface Water Gaging Stations
July 2025



An expansive network of gages is essential for planning, permitting, and the management of Oregon's surface water and groundwater resources, and the existing network is not sufficient. The data is used by a variety of agencies, water users, and other entities for making daily decisions, distributing water, protecting and monitoring instream flows, forecasting floods, and designing infrastructure such as bridges and culverts. The data is also useful for planning recreational activities, better understanding how much water is available for new uses, and tracking long-term trends such as climate change and drought. The ODEQ uses streamflow data to calculate the loading capacity of certain pollutants during development of Total Maximum Daily Load (TMDL) plans to improve water quality.

Since the early 1990's, the state has lacked sufficient capacity to maintain and process data from its existing network of stream gages in a timely fashion. This has resulted in a backlog of unprocessed records and has hindered the OWRD's ability to share valuable water resources information. The public can access these records in their provisional state, but they are subject to change until they undergo final review and are published. Expanding the network will require additional resources to process data in a timely fashion.

Surface Water Availability

The OWRD maintains the Water Availability Reporting System (WARS), a decision tool for determining the amount of water available for new water right applications for most surface waters in the state. The WARS database includes stream flow data, water right information, landscape and climate characteristics, and water use data. The goal of WARS is to quantify water availability and limit appropriations such that Oregon's water supplies can sufficiently meet supply demands of water users, including both instream and out-of-stream uses. In the current iteration of WARS, water availability was calculated based on streamflow conditions representative of 1958 to 1987. Estimates of water demands were calculated based on information and research developed in the early 1990s.

> "Good data is the foundation of wise and coordinated decisions. We can work across agencies at all levels, with tribes, and with the private sector to improve access to accurate, relevant, trusted, and current water data and infrastructure condition. We can also use science and information to anticipate future trends. Access to quality information will help communities strategically plan for and invest in their water future."
>
> -100-Year Water Vision (2020)

With funding provided in 2023, the OWRD is developing the Surface Water Information Modeling System (SWIMS) to update and replace WARS. The update is focused on calculating water availability to better align with today's climate and practices in water resources management. This work includes designing a system that permits more frequent updates to SWIMS, incorporating more recently collected stream flow data, and utilizing technological advances in recent decades (e.g., satellite-based remote sensing data) to better understand water use and demands. The OWRD is also evaluating existing policies and determining policy needs to support decision making related to water allocation. Information from this new system is expected to be available in January 2030.

Action 1A

Improve Water Resource Data Collection and Monitoring

Examples of how to implement this action:

- Use agencies' monitoring strategies, or similar methods, to design, expand, and maintain real-time monitoring networks for surface water and groundwater quality and quantity
- Prioritize basins for data collection and monitoring by centering the needs of people and ecosystems most affected by water quantity or quality challenges
- Expand gage network associated with monitoring instream water rights
- Improve agency capacity to collect, share, analyze, and report data, bringing records to final form and make them available to the public
- Implement statewide groundwater quality monitoring programs and assure responsiveness to community health
- Update water quality standards and develop additional TMDL's (also see Action 12C)
- Increase the number of stream gages with reportable water temperature data to support water quality programs
- Increase resources to help disadvantaged homeowners and renters access water quality testing in private drinking water wells; update real estate transaction database
- Monitor habitat and watershed conditions and evaluate the effectiveness of restoration efforts (e.g., OWEB restoration inventory)
- Establish methods for measuring ecosystem services and incorporate results into planning efforts, when useful
- Increase monitoring and evaluate the effectiveness of pollution control plan implementation
- Identify and address gaps in staffing or process that prevent agencies from sharing in the collection of, or already collected, data (e.g., temperature data)
- Work with BOR and irrigation districts to help fund state agency staffing to improve measurement of water use and water storage
- Work with state, federal, and local monitoring partners (e.g., USGS) to analyze gage network to identify and address gaps

Future updates to SWIMS would benefit from improved understanding of surface water-groundwater interactions to better account for the impacts of groundwater pumping on surface water availability. Additionally, the current coverage of SWIMS is limited by lack of data in some areas of the state. This effort could be supported by additional staff to conduct research, perform data analysis, maintain and monitor the OWRD's monitoring network (including stream gages and groundwater wells), and develop decision-support tools. While SWIMS supports the OWRD's programs and operations, other agencies (i.e., ODFW, ODEQ, and OPRD) and planning groups depend upon database information to make recommendations and planning decisions.

Administrative rules prescribe how the OWRD determines whether water is available for monthly natural flow based on water being available 80 percent of the time (80% exceedance), and for storage, 50 percent of the time (50% exceedance). Protections for water quality and habitat for sensitive, threatened, and endangered fish species are also considered when evaluating new water right applications through the OWRD's Division 33 Rules and review process in partnership with the ODEQ and ODFW. Figure 1-2 shows (in shades of purple) where water is potentially available for natural flow allocation during the month of August, the month most representative of low summer flows and high out-of-stream demands. With some exceptions, the mostly tan map indicates that throughout the state, very little surface water is available to allocate for new uses during August. Figure 1-3 illustrates (in shades of purple) modeled water availability for new uses during the month of January. Many water rights authorize storage of surface water during the winter and early spring to supplement summer water supplies.

In addition to water availability, other administrative rules are used to determine whether a new water right can be approved for a beneficial use. For example, although surface water is available in portions of the Willamette River Basin, many uses of water are not classified or allowable during the summer months for several reasons.

Increasingly, water users are relying on tools such as water conservation, reuse, water right transfers, and water storage to meet their needs during the summer months. Some of these tools are designed to benefit instream flow. See Chapter 4 and Strategy Actions 10A-10C, 11B, and 11E.

Figure 1-2: Available Streamflow in August
(calculated at 80 percent exceedance)
July 2025

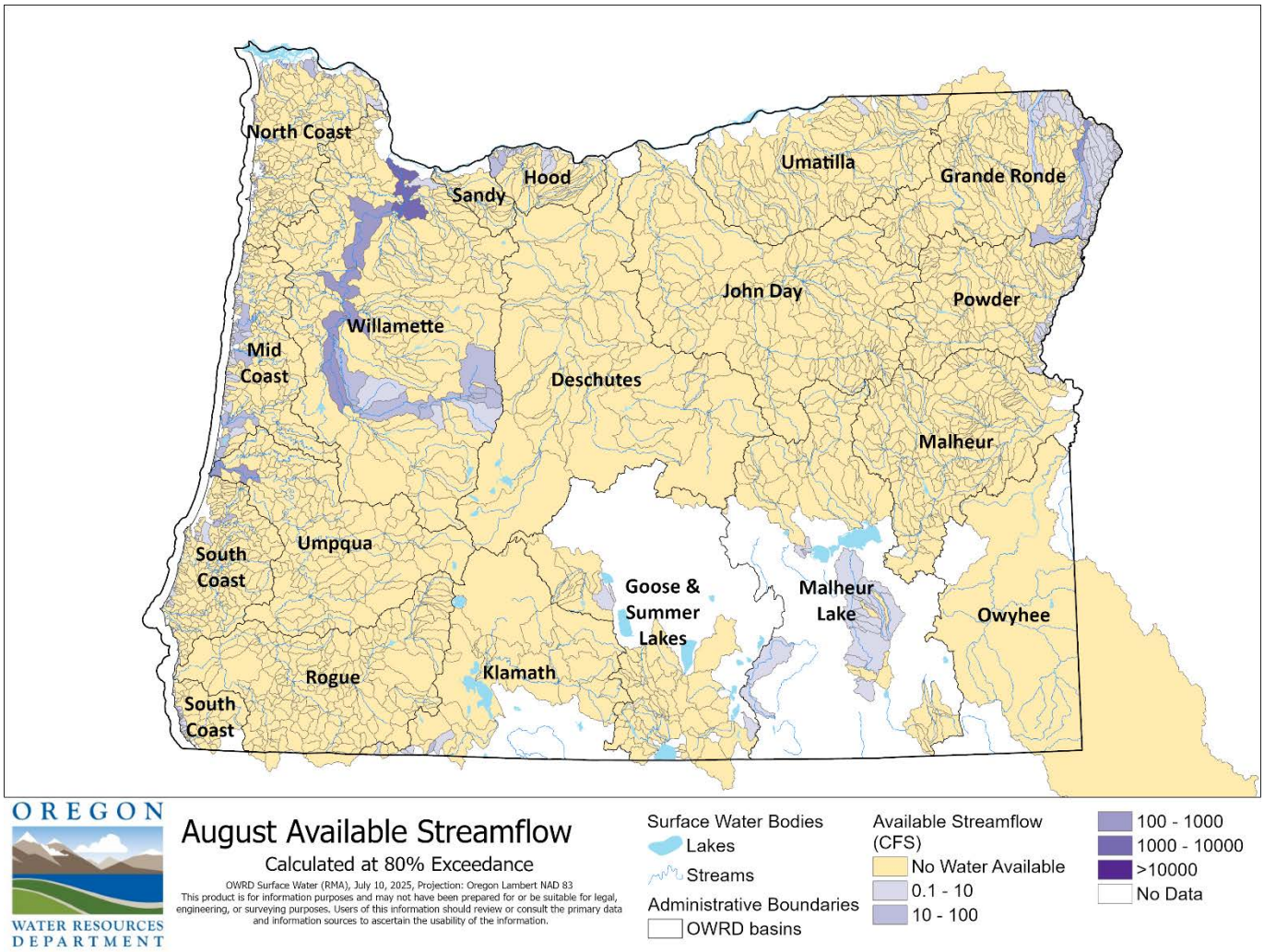
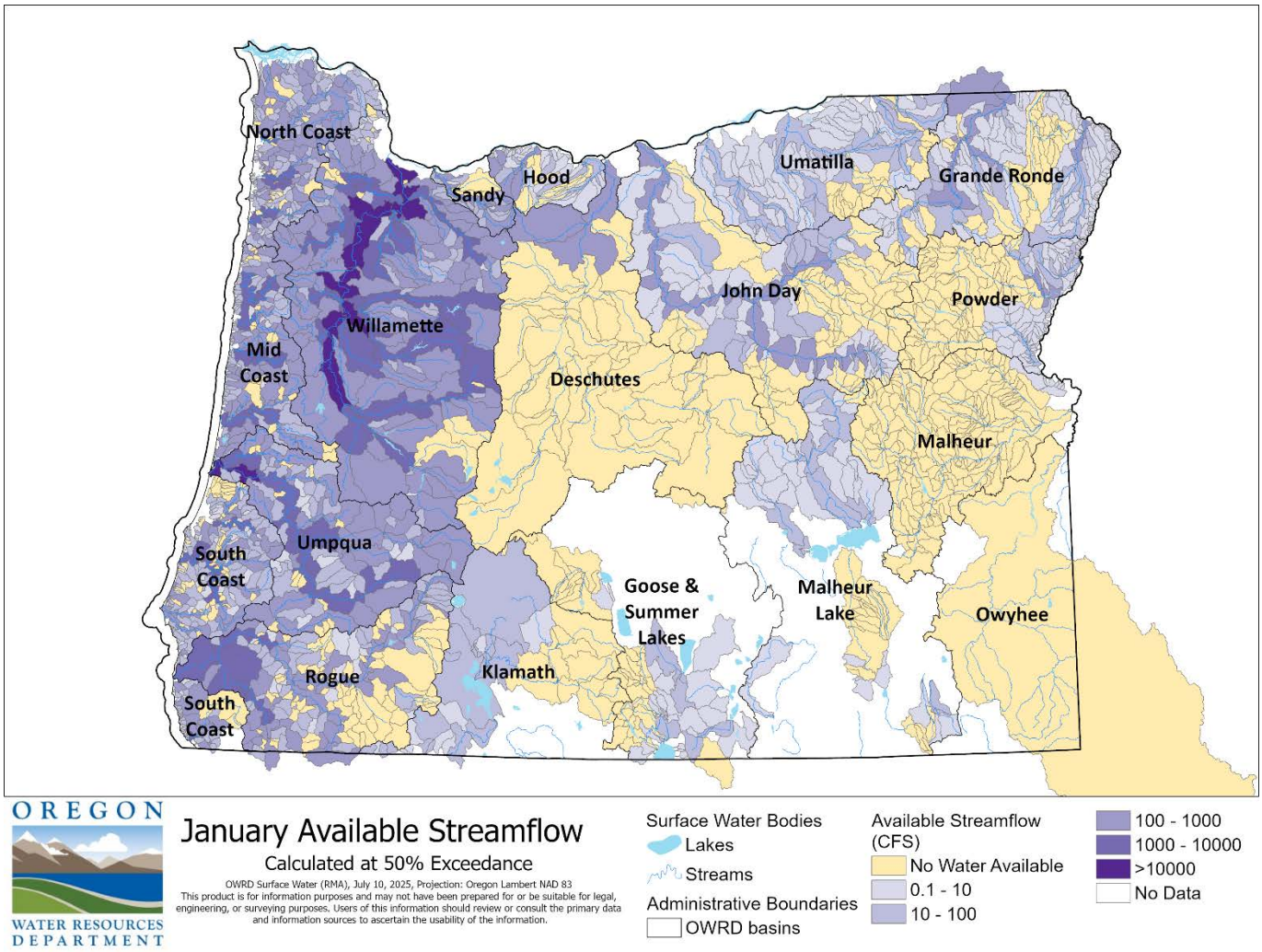


Figure 1-3: Available Streamflow in January
(calculated at 50 percent exceedance)
July 2025



Groundwater – Surface Water Interaction

Groundwater is connected to surface water in various ways. Oregon water law recognizes this important connection, managing these resources as one. This is called conjunctive management.

The hydraulic connection of groundwater to surface water can inform the Potential for Substantial Interference which indicates that the use of groundwater can deplete streamflow and reduce important cold-water discharge. This depletion is often difficult to measure due to delayed effect and natural variability, making conjunctive management a challenge. Climate change, including multi-year droughts, intensifies this challenge. However, there are some locations where the OWRD and the USGS have conducted detailed studies and are able to quantify these connections.

Generally, the OWRD denies or limits new groundwater applications in instances where use from an aquifer could substantially interfere with a surface water source that is already fully appropriated. One example of conjunctive management stems from a 2001 study[4] conducted by the OWRD and USGS that quantified the hydraulic connection between groundwater and surface water within portions of the Deschutes River Basin. Because of this connection, the OWRD established the Deschutes Basin Groundwater Mitigation Program and rules around

protecting Scenic Waterway flows and instream rights within the basin. This program allows for the development of new groundwater uses within the Deschutes Basin Groundwater Study Area, that would not otherwise be allowed, by requiring the purchase of mitigation credits or the implementation of a mitigation project to mitigate for their impacts on surface water flows.

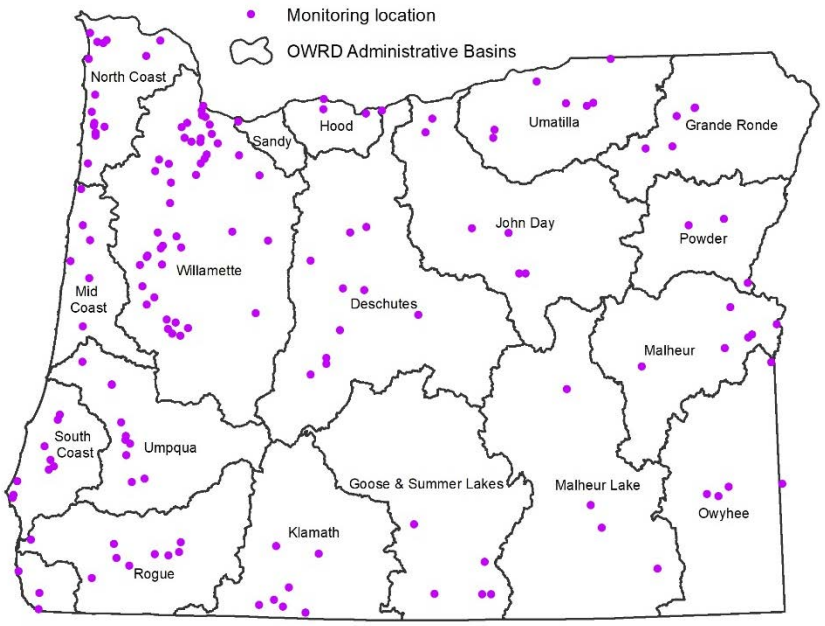
Monitor and Evaluate Surface Water Quality

Water quality standards are established by the state pursuant to Section 401 of the Clean Water Act to ensure that our lakes and streams support multiple beneficial uses, including domestic water supplies, recreational activity, and fish and wildlife needs. Water quality monitoring data and information on status and trends define the priorities and set the direction for programs and activities aimed at protecting and restoring water quality. State agencies and partners utilize water quality monitoring data to update water quality standards, determine causes of impairment, develop water quality improvement plans (Total Maximum Daily Loads and Water Quality Management Plans), establish permit limits and restrictions to limit further impairment, notify the public of health advisories, measure project and program effectiveness, and modify program strategies as needed to improve water quality outcomes.

The ODEQ monitors and evaluates water quality through a variety of programs. Some of these activities are statewide assessments of water quality, whereas others focus on geographically specific assessments of water quality or narrow categories of pollutants and/or beneficial uses. Established monitoring programs and projects at the ODEQ include:

- Ambient Monitoring Network and Oregon Water Quality Index (OWQI) (See Fig 1-4)
- Oregon beach monitoring (with Oregon Health Authority)
- Cyanotoxin monitoring (with Oregon Health Authority)
- Biomonitoring
- Groundwater monitoring
- Pesticide Stewardship Partnership
- Watershed monitoring (TMDLs)
- Toxics monitoring
- Volunteer water quality monitoring
- National aquatic resource surveys
- Other special projects

Figure 1-4: Ambient Water Quality Monitoring Stations
July 2025



Harmful Algal Blooms (HABs) - An overgrowth of cyanobacteria in lakes, rivers, and ponds can result in the development of a harmful algal bloom (HAB), which can produce extremely dangerous toxins (cyanotoxins) that can sicken or kill people and animals. Historically, the ODEQ only sampled active HABs in support of Oregon Health Authority's (OHA) recreational advisory program. During the 2021-23 biennium, the ODEQ received legislative direction to start actively monitoring Oregon waterbodies to promote early detection. Starting in 2024 active field monitoring for HABs was expanded to 40 high recreation use water bodies across the state. This active monitoring approach is in addition to ongoing recreational response monitoring which uses satellite imagery to identify HABs and prompt visual inspections. The results of satellite monitoring are published and updated regularly.

Fish and Shellfish Monitoring – Water quality impacts the organisms living and feeding in the water, including fish and shellfish that humans consume, for subsistence, recreation, or commercial purposes. The Oregon Department of Agriculture monitors and reports the status of shellfish for toxin levels, as part of their Food Safety Program.

The ODEQ conducts fish and shellfish monitoring as part of their water quality toxics monitoring efforts.

Water Quality Impairments and Oregon's Integrated Report - The Federal Clean Water Act requires the ODEQ to report on the quality of Oregon's surface waters every two years. Oregon's surface waters are assessed to determine if they contain pollutants at levels that exceed protective water quality standards. The results are published in the Integrated Report which combines the Clean Water Act requirements for a list of impaired water bodies and a status report, sections 303(d) and 305(b).

The 2024 Integrated Report identified more than 87-percent of assessed water bodies as impaired and not meeting water quality standards for one or more parameters, including more than 130 lakes and reservoirs, and about 1,700 stream/river segments and watershed units. Additional information regarding the 2024 Integrated Report can be found on the ODEQ's website, including a story map, web map, and downloadable database.[5]

Monitor and Evaluate Groundwater Levels

Accurate well location information and water-level data are critical for assessing groundwater resources and the connections to surface water. Prior to conducting detailed groundwater studies in a basin (See Action 1B), it is necessary to establish long-term, water-level data sets suitable to evaluate climatic, seasonal, and groundwater development impacts on the aquifers. Today, there are more than 400 active state observation wells, and in the past five years, the OWRD has measured more than 1,300 other wells at least annually. Since 2013, the Oregon Legislature has provided funds to help expand the OWRD's network of dedicated observation wells, providing staff with suitable wells for deployment of automated data recording instruments that provide high-frequency, year-round water level records. The process of siting these wells is spelled out in more detail in the OWRD's 2016 Monitoring Strategy.

Claire Sturdy measuring Lost Creek in the Klamath Basin. Credit: Garrett Steensland

Groundwater Availability

Groundwater development has occurred primarily in areas where the geologic conditions are favorable or where additional surface water is no longer available for new allocations. In most locations, groundwater aquifers are no longer capable of sustaining additional development without leading to declining supplies for existing water users and reducing streamflows where surface water and groundwater are hydraulically connected. Groundwater quality can also limit use. Detailed geologic maps are needed to accurately map the depth and capacity of aquifers across Oregon. Geologic maps are essential for siting wells and bringing a scientific basis to groundwater management.

A recent increase in complaints to OWRD from people experiencing dry domestic wells has elevated awareness regarding declining groundwater levels associated with climate change, consecutive years of drought, wildfire damage, and groundwater pumping. The state needs adequate data to better anticipate and respond to groundwater issues and possibly designate additional Groundwater Administrative Areas.

Evaluate Groundwater Administrative Areas - The OWRD oversees 22 Groundwater Administrative Areas (Figure 1-5, below) designated to limit further water level declines or groundwater interference with surface water. As hydrological conditions change with climate change and the cumulative impacts of appropriation to consumptive uses, groundwater data may reveal the need to designate additional Groundwater Administrative Areas and Management Areas.

Specific rules apply to each Groundwater Administrative Area, but they all fit in the following categories:

- **Withdrawn** – prevents new allocation in specified areas or aquifers.
- **Classified and Limited** – limits new allocations for specified uses and areas or aquifers through Basin Program Rules (OAR 690-5XX) to address groundwater supply and quality.
- **Critical** –curtails existing uses, to address groundwater supply, quality, or thermal issues.
- **Mitigation** – requires mitigation for new uses to offset impacts to hydraulically connected surface water.
- **Serious Water Management Problem Areas** – requires measurement and reporting of water use authorized under existing rights.
- **ODEQ Groundwater Management Area** – related to groundwater quality and described in further detail below.

Monitor and Evaluate Groundwater Quality

Groundwater contamination is also a serious issue in some areas of Oregon. Private domestic wells may face contamination issues from agricultural or industrial sources, failing septic systems, or from surface water and groundwater interactions. Naturally occurring elements such as arsenic, uranium, and boron can also make water supplies unsuitable for some uses. Testing the water quality of private domestic wells falls outside of state agency authority in most cases. The OHA requires that private domestic wells are tested for nitrate, bacteria, and arsenic before a home is sold, and the data be provided to the real estate transaction database.

The ODEQ implements a Statewide Groundwater Monitoring Program to monitor groundwater for contaminants of concern, including nitrates and pesticides. From 2015 to 2017, the ODEQ was able to monitor two geographic regions per year. Funding and staffing reductions now only allow for monitoring in one region every other year, in addition to regular sampling in the three Groundwater Management Areas. The monitoring data are used to determine areas of the state that are especially vulnerable to groundwater contamination, long term trends in groundwater quality, status of ambient groundwater quality, emerging groundwater quality problems, and potential risks from contamination. Increased resources for groundwater monitoring can help protect public health.

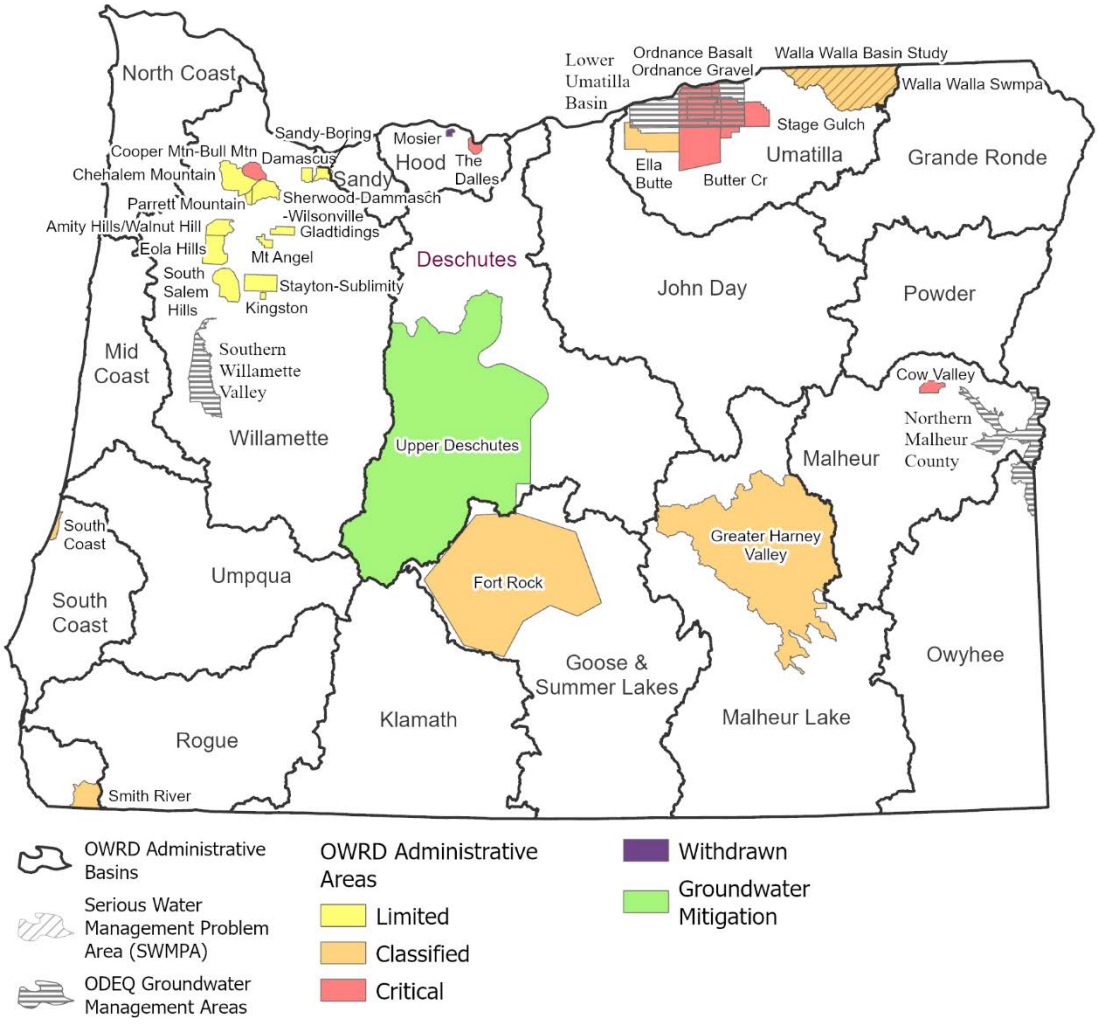
Groundwater Management Areas - The ODEQ designates an area as a "Groundwater Management Area" when groundwater has elevated contaminant concentrations (Figure 1-5). Commonly analyzed contaminants include nitrates, bacteria, and arsenic. Once a Groundwater Management Area has been declared, a local groundwater management committee is formed and then works with state agencies to develop an action plan to address the

contamination. Three Groundwater Management Areas have been designated in Oregon due to elevated nitrate concentrations in groundwater:

- Lower Umatilla Basin
- Northern Malheur County
- Southern Willamette Valley

The ODEQ typically collects groundwater quality samples from well-owners who have granted permission, both within Groundwater Management Areas and other areas of the state. Budget restrictions have not allowed for the installation of monitoring wells.

Figure 1-5: OWRD Groundwater Administrative Areas and ODEQ Groundwater Management Areas



Testing Private Drinking Water Wells –Private drinking water supply wells are not routinely tested for water quality issues, although state law requires testing at the time of a real estate transaction. The Domestic Well Testing Act requires a homeowner selling a property with a drinking water well to test the water for nitrate, total coliform bacteria, and arsenic. Within 90 days after the seller receives the test results, the seller must submit the results to the buyer and to the OHA. The data has potential to provide a broad overview of groundwater quality in the state, however compliance for reporting has been low. This points to a need to amend the Domestic Well Testing Act to require laboratories to electronically report domestic well testing results associated with real estate transactions to the state (see Action 12A Ensure the Safety of Oregon's Drinking Water).

Domestic wells located in an area impacted by wildfire should be tested to ensure water is still safe to drink. OHA recommends testing for arsenic, nitrate, bacteria, lead, and, depending on damage assessment results, benzene, toluene, ethylbenzene, and xylenes, commonly referred to as "BTEX."

The 2025 Oregon Legislature enacted House Bill 3525 requiring landlords who rent homes that rely on domestic wells to test the water for arsenic, coliform, nitrate, and lead and report the results to their tenant and the OHA. However, this requirement applies only to homes in areas designated by the ODEQ as Groundwater Quality Management Areas. The testing requirements will go into effect starting January 1, 2027.

Monitor and Evaluate Habitat Conditions and Watershed Functions

The ODFW, Oregon Watershed Enhancement Board (OWEB), and other agencies have significant responsibilities around habitat and watershed monitoring. Habitat and watershed function monitoring includes evaluating the change in river channels over time, substrate, and fish passage issues, as well as wetland and floodplain conditions. Monitoring is a broad term that encompasses baseline monitoring, compliance monitoring, status and trend monitoring, and effectiveness monitoring. Diversity of monitoring approaches is essential to building an understanding of watershed health, tracking the success of watershed improvement projects, and setting restoration priorities.

The OWEB maintains the Oregon Watershed Restoration Inventory of more than 20,000 completed projects since 1995.[6] This database is used to report on the progress of the Oregon Plan for Salmon and Watersheds, to support effectiveness monitoring of restoration activities, and to inform watershed assessments and future restoration project planning and implementation.

Oregon continues to develop guidance for prioritizing watersheds/basins for data collection and monitoring, including recommendations for further investment. The ODFW is identifying and prioritizing areas for aquatic habitat protection and restoration using new species distribution and climate change information. Some watershed-based tools used to prioritize sensitive water bodies and habitat for future restoration efforts include Endangered Species Act Recovery Plans, the ODFW's State Wildlife Action Plan,[7] watershed assessments and action plans, and the Department of State Land's Oregon rapid wetland assessment protocol, the stream functional assessment method, and streamflow duration assessment method.

Indicator Species - One way of tracking the status of both water quality and ecosystem health is with a designated indicator species. The health of an indicator species can offer early warning signs regarding ecosystem impairment.

Such indicator species include native salmonids (salmon, steelhead, and trout) that depend on cold, clean water. Since 1991, the National Oceanic and Atmospheric Administration's Fisheries Office of Protected Resources, which monitors anadromous species that migrate between freshwater and the Ocean, has listed 15 out of 23 Evolutionarily Significant Units/Distinct Population Segments of salmon and steelhead found in Oregon under the Endangered Species Act. To date, none of them have been delisted.

In addition to these indicator species, the U.S. Fish and Wildlife Service (USFWS), which has authority for monitoring non-anadromous fish species that reside year-round in Oregon's rivers and streams, has listed five species as either threatened or endangered (Bull trout, Lahontan cutthroat trout, Hutton tui chub, and Shortnose and Lost River suckers). Several other aquatic species are proposed for listing or being assessed for potential listing, including the Northwestern pond turtle and the Western ridged mussel. The high number of aquatic species listed as threatened or endangered are a result of declining water quality and quantity in many areas of the state during critical life history periods and can be an indicator of inadequate ecosystem health. Recovery efforts by local, state, tribal, and federal entities, which include improving habitat connectivity, increasing habitat quantity, and improving habitat quality, are underway for these listed species, as well as other species of significance such as Pacific lamprey.

As a result of such efforts, the USFWS announced the removal of the Oregon chub and Modoc sucker and their associated critical habitat from the list of Endangered and Threatened Species in 2015, making them the first to be delisted due to recovery. In addition, the Foskett Spring Speckled Dace and Borax Lake Chub were delisted in 2019 and 2020, respectively.

Oregon chub, Credit: Rick Swart

Modoc sucker, Credit: Doug Markle

Impacts to indicator species can also serve as an early warning sign of broader impacts to the benefits that Oregonians enjoy. Healthy ecosystems provide clean air, clean and abundant water, fish and wildlife habitat, and other values that benefit the public. All Oregonians benefit from a healthy aquatic ecosystem as freshwater is vital to human life and economic well-being.

See Strategy Actions 2A-2C for additional data needs related to ecosystems. For Strategy actions that support ecosystem protection and enhancement, see Chapter 4 Strategy Actions 11A-11E.

Measuring Ecosystem Services – Ecosystem services are the benefits that nature provides to the economy, including producing clean water, storing water, and cooling. The State Wildlife Action Plan highlights ecosystem services markets as a way to create economic incentives to protect or restore the environment. The U.S. Department of Agriculture's Conservation Effects Assessment Project is a multi-agency effort led by the Natural Resources Conservation Service to quantify the effects of conservation practices across the nation's working lands. More work is needed in Oregon to quantify ecosystem benefits to support conservation, restoration, or mitigation solutions associated with environmental impacts from development.

Action 1B Conduct Additional Groundwater Basin Investigations

Action 1A outlined the primary data collection and monitoring needs for surface water, groundwater, and ecosystems. This action identifies additional detail needed to understand our groundwater at a finer geographic scale. Place-based water planning and future iterations of the Strategy require groundwater data at the basin or sub-basin scale.

Prioritize Groundwater Basin Studies

Oregon needs additional basin studies to further understand the relationship between groundwater and surface water, and the availability of both. Conducting groundwater studies is a priority for the state, which has historically evaluated groundwater resources at the basin scale through cooperative, cost-share programs with the U.S. Geologic Survey (USGS). These studies result in a better understanding, or conceptual model, of the basin, including a description of the basin geology, groundwater flow paths, and a water budget quantifying annual volumes of groundwater recharge, discharge, and changes in dynamic storage. A numerical groundwater flow model is also developed and used to better understand the outcome of potential management scenarios with computer simulations.

The Water Resources Department (OWRD) has completed cooperative basin studies in four areas (Harney, Deschutes, Willamette, and Klamath basins) and is currently working with the USGS and Washington Department of Ecology to study the Umatilla Basin's Walla Walla Sub-basin. The state has prioritized additional basins for subsequent groundwater studies. Priority areas include:

- The Hood Basin's Fifteenmile Creek Sub-Basin, to understand declining groundwater levels and whether groundwater extraction is affecting surface water flows. The OWRD initiated this basin study and associated public outreach in 2025.
- The Powder Basin, to assess groundwater availability and potential overallocation.
- The Grande Ronde Basin, to assess groundwater availability and potential overallocation.

Groundwater Budgets for Major Hydrologic Basins

The 2021 Legislature passed House Bill 2018 that directed the OWRD to:

- Enter into a cost-sharing agreement with the USGS to develop and publish groundwater budgets for all major hydrologic basins in the state. This work is anticipated to be complete by the end of 2028.
- Contract with a qualified person to produce a peer-reviewed report on statewide consumptive water use. The initial set of statewide evapotranspiration data was published in January 2025.
- Expand the groundwater level monitoring network. Groundwater observation wells have been added in the Deschutes, Harney, Rogue, Umatilla, Walla Walla, and Willamette basins. OWRD is in the process of analyzing where there are data gaps to prioritize additional locations.
- Help communities use the data collected under this bill to inform local water planning efforts.

The water use measurement component of this work is addressed in more detail under Action 3A.

Improve Groundwater-Related Records

The state collects and maintains a variety of groundwater-related records that well owners, consultants, and state agencies need to better understand Oregon's water wells, some examples are described below. Data specific to water users reporting their water use is called for in Action 3A.

Well Location Data Gaps – Wells were not required to be registered with the state until 1955. Since then, most well location information has been reported at a very coarse scale (within a 40-acre area). In 2009, requirements were put in place to obtain more precise location information for newly drilled exempt-use wells, which are most often used for domestic purposes. An estimated 280,000 such wells exist today, with several thousand more drilled each year. In 2014, the state updated its online mapping program to help well drillers and landowners record the location of new, existing, and unused water wells—including both exempt-use wells and permitted wells. On July 1, 2023, statutory changes require all well reports submitted to include the GPS coordinates of the well's location. Despite those efforts, Oregon has inadequate documentation of the number, location, and average water use of water wells.

Water-Level Access – Installation of measuring tubes helps to ensure that accurate water level measurements can be taken in water wells, without measurement equipment getting tangled in pumps or wires. This can

Action 1B

Conduct Additional Groundwater Basin Investigations

Examples of how to implement this action:

- Install and maintain dedicated state observation wells in priority basins
- Partner with UGSG to conduct and cost-share additional groundwater recharge studies and basin investigations
- Evaluate existing and potential establishment of new groundwater administrative areas; review time-limited permits more efficiently
- Locate and document water wells, including exempt use wells, permitted wells, and unused wells
- Ensure groundwater level measurements are high-quality; install measuring tubes and make scheduled measurements
- Investigate connections between groundwater and surface water, particularly where groundwater sustains summer low flows and/or discharges cold water
- Support and coordinate with ODEQ's Groundwater Monitoring Program (water quality)
- Incorporate groundwater quality and quantity information into Oregon's Environmental Justice Mapping Tool

be particularly helpful in deep wells. Several locations in Oregon, such as Eola Hills in Polk County, Pete's Mountain in Clackamas County, and Mosier in Wasco County have requirements to install measuring tubes during new well construction.

Scheduled Measurements – Agency scientists collect baseline information at the start of each irrigation season before any significant groundwater pumping begins. This activity is a high priority because it provides an annual snapshot of groundwater conditions that can be compared over time and contributes to Oregon's long-term understanding of the resource.

Action 1C Enhance Interagency Data Coordination

Data-sharing among agencies supports informed decisions and more efficient management of water resources. As one example, the Department of Environmental Quality (ODEQ) and Department of Fish and Wildlife (ODFW) use data to provide information and advice on water allocation decisions made by the Water Resources Department (OWRD) per agency rules and statutes. Their understanding of species and water quality needs helps determine whether a proposed use of water is in the public interest.

As another example, the Department of Forestry (ODF) uses water right information from the OWRD to determine whether forest streams are sources of drinking water. Streams that serve as a drinking water source trigger more stringent forestry protections. There are many examples among local, state, federal, and tribal agencies where current and accurate water resources information from one agency partner affects whether the other agency can effectively carry out its mission.

Monitoring Oregon's water resources is not limited to just state agencies. There are several federal agencies whose data collection and analysis are critical to the understanding and management of Oregon's surface water and groundwater resources, including the Army Corps of Engineers, Bonneville Power Administration, Natural Resources Conservation Service, the National Weather Service, and the U.S. Geological Survey. Local partners, including soil and water conservation districts and watershed councils, collect valuable monitoring data too.

The lack of stable resources to maintain or expand the state's monitoring networks, collect and share data, conduct studies, and develop modeling tools presents a significant, ongoing challenge. Several years' worth of water quantity and quality data still needs to be processed, analyzed, and shared with the public and other partners. Methods to enhance data collection, processing, and sharing include:

- **Coordination** – Better integration of federal, state, and local data collection efforts, including staffing to coordinate data across agencies, while adhering to quality control standards (e.g., interagency temperature data coordination)
- **Data Management –** Resources need to be allocated for data infrastructure and data stewardship
- **Training** – Improving data collection standards, manuals, training, and technical support
- **Access** – Providing on-line platforms for data submittal, retrieval, and quality control
- **Real-Time** – Adding remote and real-time monitoring to existing stations
- **Backlogs** – Processing the backlog of water quantity and water quality data

A Strategic Enterprise Approach to Monitoring

Oregon's interagency Strategic Enterprise Approach to Monitoring (STREAM) Team was created in June 2013 and is made up of many of the state's natural resources agencies, all of which monitor Oregon's waters for various public purposes. The STREAM Team facilitates collaborative decision-making to support a healthy environment through coordinated planning, monitoring, and communication of water-related data and information. The work of the STREAM Team directly supports the intent of the Strategy, improving water resources data collection and monitoring by coordinating interagency efforts.

The STREAM Team has developed a collaborative workspace for agency partners and a monitoring calendar and associated map that are updated annually. Members meet regularly, where agencies provide input on statewide water-related monitoring issues, such as new stream gages, harmful algae bloom coordination, environmental data management strategies, and more. They published a statewide monitoring strategy in 2017.

Make Water-Related Information Available Electronically

Water-related program information, contact information, and data are often not available from state agencies, or sometimes difficult to find and use, though agencies do try to keep fact sheets and "how-to" guides accurate and up to date. Agencies have made progress scanning older documents and making newer documents available online in a searchable format, however, investments in information technology have been insufficient. In a culture that relies on instant access to information, agencies are still in the process of making historic documents available while working to make data more interactive.

A significant milestone in the process to share information among agencies and with the public has been achieved through the initiation of the Oregon Water Data Portal Project in 2022.[8] The project, led by the ODEQ, is still in the early phases including developing a beta version of the portal in early 2025. The Legislature did not authorize additional funding in for the 2025-27 biennium. Eventually, if funded, the portal will be a single location for agencies and the public to access a variety of data that has been collected by many agencies and partners.

Statewide Lidar – Oregon's Lidar Program (Airborne Light Detection and Ranging) uses a remote sensing tool to provide three-dimensional surface terrain data (i.e., topographic information) for the state. In 2007, the Oregon Legislature designated the Department of Geology and Mineral Industries (DOGAMI) as the lead agency for lidar acquisition in Oregon. The DOGAMI established the Oregon Lidar Consortium to build funding for the acquisition of large swaths of lidar across the state. These data help create geologic maps, flood hazard maps, evaluate tidal channel topography, locate infrastructure, model water quality, delineate wetlands, evaluate habitat restoration, assess hazards, and inventory forests. As of 2025, the Oregon Lidar Consortium has acquired high-resolution lidar data for approximately 92 percent of the state. A web-based mapping application shows which parts of Oregon are completed or in-process for lidar coverage.[9]

Action 1C
Enhance Interagency Data Coordination

Examples of how to implement this action:

- Improve integration of federal, state, and local government data collection efforts while adhering to quality control standards
- Improve data sharing and availability using on-line platforms and emerging technologies, mobile apps, and open standards
- Invest in information technology and modernization of databases and applications
- Develop or update modeling and other decision-support tools
- Encourage inter-agency work among a variety of partners
- Provide resources for interagency data management, including data infrastructure and stewardship, as well as participation in the Oregon Water Data Portal
- Support the development, implementation, and ongoing maintenance of the Oregon Water Data Portal Project
- Provide interagency training to improve data collection standards, including manuals and technical support
- Improve public access to water data and provide a centralized location to access various types of water data

Action 1D

Support Basin-Scale Climate Change Research

Many local, state, federal, and tribal governments are conducting, and must continue, climate change research, identifying and assessing risks and actions specific to the Pacific Northwest. These research efforts will help water managers and natural resources agencies develop placed-based strategies for addressing climate-related impacts on water quality, water quantity, and ecosystems. There are many opportunities to further collaborate between local partners, governments, and research institutions.

Oregon Climate Change Research Institute

The Oregon Climate Change Research Institute (OCCRI) has been tasked by the Oregon Legislature to lead climate change research among faculty of the Oregon University System. In 2025, OCCRI released the Seventh Oregon Climate Assessment, a compendium of research on climate change and its impacts on Oregon.[10]

Researchers at OCCRI are examining climate change impacts on a regional scale, looking specifically at risks to the Pacific Northwest. The National Oceanic and Atmospheric Administration awarded a five-year grant to establish and coordinate a regional consortium of climate variability assessment, research, and outreach in the Pacific Northwest. Funds were used to establish the Climate Impacts Research Consortium, which includes OCCRI and other researchers from universities and extension services within Oregon, Washington, and Idaho. The Consortium provides information and tools for making decisions about landscape and watershed management and has been home of the Regional Integrated Sciences and Assessments (RISA) for the Pacific Northwest since September 2010, one of ten RISAs in the country. In 2022, Congress changed the name of the RISA program to "Climate Adaptation Partnerships."

Oregon's Climate Change Adaptation Framework

Oregon's Climate Change Adaptation Framework provides a broad-scale qualitative assessment of risks to people, infrastructure, communities, and natural resources that are expected to result from the effects of variable and changing climate conditions.[11] The Framework calls for additional research in several areas, including social, economic, and climate change impacts related to forest management and other types of management.

Oregon Climate Action Commission (formerly Oregon Global Warming Commission)

In 2007, the Oregon Legislature, through passage of House Bill 3543, established the goal of reducing greenhouse gas emissions by 10 percent below 1990 levels by the year 2020.[12] By 2050, those emissions have to be at least 75 percent below 1990 levels. That legislation also created the Oregon Global Warming Commission, which is tracking progress towards the goal. The Oregon Department of Energy provides support for the Commission.

In 2023, the Oregon Legislature (Senate Bill 522) changed the name of the Oregon Global Warming Commission to the Oregon Climate Action Commission. The Commission developed an Oregon Climate Action Roadmap that provides foundational information on state climate impacts, emission trends, and progress towards achieving Oregon's greenhouse gas emissions goals. The Commission has also authored several other documents including the 2021 Natural and Working Lands Proposal, in collaboration with the Department of Agriculture (ODA), Department of Forestry (ODF), and the Oregon Watershed Enhancement Board (OWEB). Through the adoption of HB 3409 in 2023, the Oregon Legislature established the state's Natural and Working Lands Fund to support investments in natural climate solutions on Oregon's natural and working lands. As approved by the Oregon Climate Action Commission in early 2024, the Fund's initial $10 million appropriation was allocated between the ODA, ODF, OWEB, and the Oregon Department of Fish and Wildlife to support a variety of programs and projects to advance nature-based climate solutions.

Next Steps

Oregon should continue collaborating with existing climate change research organizations and institutions to improve climate change projections at a basin scale. Basin-scale data are needed to help Oregonians prepare responses and strategies to address climate change.

These include: identifying basins susceptible to changing flow regimes, establishing gages to quantify the rate of change in the magnitude, frequency, duration, and timing of streamflow; identifying groundwater systems with areas of recharge within the rain-snow transition zone; monitoring groundwater level responses to climatic impacts; and working with the U.S. Geological Survey 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., U.S. Geological Survey Hydro-Climatic Data Network stations, and Geospatial Attributes of Gages for Evaluating Streamflow stations).

Action 1D

Support Basin-Scale Climate Change Research

Examples of how to implement this action:

- Make improvements in surface water and groundwater monitoring, flood and drought frequency projections, and long-range forecasts
- Improve climate change projections at the basin-scale
- Develop reliable projections of basin-scale hydrology and associated impacts on built and natural systems, including aquatic species and habitat
- Analyze how instream and out-of-stream water rights will be met with hydrologic changes
- Investigate potential shifts in the hydrograph, agriculture and irrigation seasons and impacts to fish distribution/life history timing
- Develop climate change forecasting for use in water availability analyses and permitting decisions (also see Action 10F)
- Investigate new crop types suitable to a changing climate
- Investigate increased risks to ecosystems and water supply and wastewater management infrastructure associated with wildfires, particularly in environmental justice communities
- Finalize and implement ODFW's Aquatic Habitat Prioritization assessment which incorporates climate projections for water quantity and temperature when evaluating future habitat suitability for sensitive aquatic species
- Coordinate data collection into the Oregon Water Data Portal Project
- Include an assessment of vulnerable water supply systems and identify those in environmental justice communities
- Consider the increased risk to water infrastructure by wildfire in environmental justice communities
- Look for equity impacts of climate change (i.e., climate justice) and water management (i.e., water justice)
- Advocate for financial resources to help local basins better understand climate impacts, including partnerships with OCCRI

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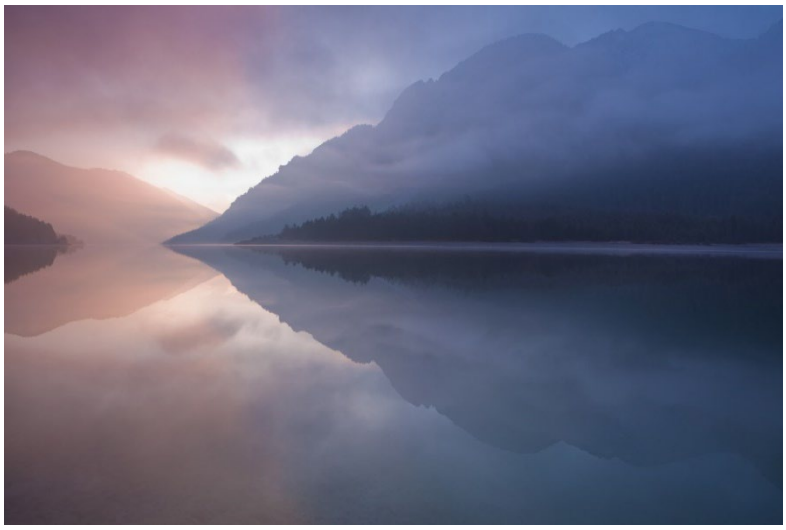
CHAPTER 2

Objective 2: Understand Instream and Out-of-Stream Needs

Oregon's rivers, streams, lakes, estuaries, wetlands, springs, and aquifers support a wide range of benefits for both humans and the environment. They provide sources of water for drinking, agriculture, energy, industry, recreation, plants, and essential habitat for fish and wildlife.

A clean and reliable source of water is critical for meeting our basic human needs and for supporting Oregon's economy. Thousands of businesses and industries rely on water in some form, to irrigate a crop, to manufacture a product, to provide energy, or to provide a service or experience. Oregon's economy is therefore dependent upon a healthy environment where water resources play an essential part. Fish and wildlife need a sufficient quantity and quality of water in rivers, lakes, wetlands, and estuaries to live, reproduce, and thrive. A healthy environment includes fully functioning ecosystems that can support our commercial, recreational, and cultural needs and a quality of life unique to Oregon and the Pacific Northwest.

Oregon continues to seek better information about water needs and demands, both instream and out-of-stream. Without a better characterization of ecosystem needs and water use today, the state cannot adequately plan to meet these needs sufficiently and sustainably in the future.



Objective 2: Understand Instream and Out-of-Stream Needs

Critical Issue - Instream and Ecosystem Water Needs

2A Determine Instream Flow Needs (Quality and Quantity)
2B Determine Needs of Groundwater-Dependent Ecosystems
2C Develop Instream and Ecosystem Water Need Forecasts

Critical Issue - Out-of-Stream Water Needs

3A Improve Water-Use Measurement and Reporting
3B Regularly Update Out-of-Stream Water Demand Forecasts
3C Determine Unadjudicated Water Right Claims
3D Authorize the Update of Water Right Records with Contact Information

Critical Issue | Instream and Ecosystem Water Needs

Enough cold, clean water is needed within the environment to ensure overall ecosystem health. "Instream flows," or those within a stream channel, lakebed, groundwater aquifer or place where water naturally flows or occurs, support pollution abatement and sustain fish, wildlife, and the habitats they depend on. Instream flows also support society's economic and cultural needs, including energy production, navigation, transportation of goods, recreation, tourism, scenic values, and fishing.

The practice of securing a water right and taking water out of streams and aquifers to use for beneficial uses has resulted in reduced amounts of water instream. Without adequate water in the system and its legal protection, instream uses and associated ecological, economic, cultural, and spiritual benefits are at risk. Oregon must develop a better understanding of instream water quantity and water quality needs. For example, efforts to protect and restore water instream for aquatic life require an understanding of the full range of flows and temperature requirements that are needed to not only prevent further species decline but also aid in the recovery of threatened and endangered species.

This section describes the data and studies needed to better understand instream water needs in the context of a changing climate. Chapter 3 describes actions (5A-5C and 6A-6B) to protect water resources during natural hazard mitigation and land use planning. Chapter 4 describes actions (11A-11E) to protect and enhance ecosystems and secure legal instream protections (e.g., Scenic Waterways designations, instream water rights).

Action 2A Determine Instream Flow Needs, Quality and Quantity

Healthy streams are dynamic, each exhibiting different patterns of variability to which native species are adapted. Ecosystems and aquatic species depend upon a range of flow conditions including frequency, magnitude, and timing, and suitable water quality to thrive. Scientists require site-specific data and studies to quantify these variable instream needs throughout the year. Agencies need information about the quantity and quality of flows needed to support public uses including recreation, scenic attraction, and pollution abatement. This section looks at the next steps for better understanding instream flow needs to inform adequate instream flow protection and prioritize flow restoration efforts.

Data Needs for Instream Water Rights

The state faces an ongoing challenge to sufficiently fulfill instream needs to protect ecosystem function because instream values were not initially recognized under Oregon's Water Code. Therefore, it is important to conduct studies to quantify specific instream flow needs by stream system and specific reaches and legally protect the identified necessary instream flows (Action 11B). Understanding the full suite of flows needed to support stream ecosystems and functions can better inform future management actions and support instream water right applications.

Instream water rights, a water right held in trust by the Water Resources Department (OWRD), are one tool that can be used to protect instream needs. Three state agencies can apply for instream water rights for aquatic life and wildlife, pollution abatement, and recreation and scenic attraction, described in more detail below. The historic and legal basis of instream water rights are described in more detail in Appendix B. Additional discussion about instream water rights, including instream leases and transfers, can be found in Chapter 4, Action 11B.

Aquatic Life and Wildlife - The Department of Fish and Wildlife (ODFW) applies for instream water rights for the conservation, maintenance and enhancement of aquatic and fish life, wildlife, and fish and wildlife habitat. There are

certain stream conditions that are necessary to support the life cycle of Oregon's fish species. Adequate amounts of cool, clean water are a requirement for all life stages of salmonids, and the water quality, water quantity, and habitat needs vary by species. The ODFW strives to understand and provide information regarding the ecological flows and water quality components needed to protect and enhance Oregon's fish and wildlife and their habitats. Ecological flows represent the full range of flows (i.e., from low water fall spawning flows to channel forming high flows) and water quality that must be maintained within a stream and its margins to support the natural functions of healthy ecosystems. Instream uses and their associated ecological benefits are threatened without adequate water in the system. The quantification of ecological flows is lacking across the state, so additional studies are needed. This lack of data makes water and species management challenging.

Data on ecological flows is needed to support public uses and ecosystem needs in future instream water right applications. Such applications require data collection and scientific analysis to determine the flows needed to meet the physical habitat requirements of target species and life stages. Understanding when and where species may be vulnerable can also inform streamflow and habitat restoration efforts and identify areas in need of additional study. There is very little information on the instream needs for wildlife, so more research is needed.

Pollution Abatement - The Department of Environmental Quality (ODEQ) is authorized to apply for instream water rights for pollution abatement. Elevated stream temperature is a common water quality impairment in streams across Oregon. Healthy, functioning streams require adequate riparian vegetation, floodplain connection, and adequate streamflow, among other factors, to prevent water quality degradation and maintain high-quality aquatic habitat. Some instream rights in Oregon streams are for "pollution abatement" purposes but the ODEQ currently lacks a program and technical capacity to apply for new instream water rights. The ODEQ recognizes that instream water rights for the purpose of fish and wildlife provide water quality benefits as well.

Recreation and Scenic Attraction - The Parks and Recreation Department (OPRD) is authorized to apply for instream water rights to support recreation and scenic attraction based on studies utilizing the Oregon Recreation Methodology. This methodology is used to determine the recreation flow or water level requirements for scenic attraction and recreational values of a stream, river, lake, or wetland. More studies are needed across the state to determine the amount of water needed to accommodate the main recreational use(s) or scenic attraction occurring during any given month.

Western brook lamprey (Lampetra richardsoni). Credit: Laura Tesler Photography

Action 2A
Determine Instream Flow Needs (Quality and Quantity)

Examples of how to implement this action:

- Prioritize and install gages in additional locations to monitor the status of instream flows and water rights
- Use existing and new data to develop statewide ecological flow criteria for streams
- Prioritize basins and install monitoring equipment to help characterize the full suite of flows through these basins
- Conduct instream needs studies to support future instream water right applications
- Conduct instream needs studies to assess spiritual and cultural needs
- Pursue a consistent, model-based framework for characterizing long-term instream need in the context of climate change to support the development of a long-term instream forecast (Action 2C)
- Review, synthesize, and update models/studies to quantify the ecological, economic, social, and cultural value of instream uses
- Support state agency instream flow efforts and programs (e.g., ODFW, ODEQ, OPRD)
- Support ODFW and ODEQ efforts and collaboration regarding stream temperature monitoring, modeling, and studies
- Support ODFW and OWRD efforts and collaboration regarding monitoring for instream flows and instream water rights
- Fill data gaps regarding fish passage barriers and screening needs
- Conduct studies to determine if wetland restoration or reconnection to streams could benefit instream flow

Data Needs to Support Spiritual and Cultural Values

Data needs regarding other instream values (e.g., spiritual and cultural values and access to First Foods) need to be studied, as they are not directly quantified in instream water rights. Studies could include environmental flows, which are metrics that consider human uses and other management objectives beyond ecological flow considerations. These are often called "balanced flows." They are set by evaluating trade-offs, but a solid understanding of ecological flow needs is an essential component to define realistic environmental flow targets.

Data Needs for Other Instream Needs

Salmon and steelhead need cold water refugia during their migrations upstream on the way to spawn and for rearing during the heat of summer when stream temperatures are at their highest. Such safe havens play an important role in the survival and migration of adult and juvenile salmon, steelhead, and trout as rivers warm to lethal thresholds during the summer. Identification, protection, and restoration of cold water refugia is critical, as climate change holds the potential for hotter, drier summers.

In 2015, the ODEQ, U.S. Environmental Protection Agency (USEPA), and the National Oceanic and Atmospheric Administration (NOAA) developed a partnership under the Clean Water Act to locate, protect, and restore zones of cold water habitat for fish in the Columbia and lower Willamette Rivers.[1] The Lower Willamette River Cold-Water Refuge Narrative Criterion Interpretation Study was submitted to the NOAA by the ODEQ in March of 2020, and the Columbia River Cold Water Refuges Plan was prepared by the USEPA in 2021.

Data Needs for Funding

Some water projects receiving funds from Water Projects Grants and Loans from the OWRD under Senate Bill 839 (2013)[2] will need flow prescriptions that describe the duration, timing, frequency, and volume of flows required to maintain the biological, ecological, and physical functions of the watershed.

Action 2B Determine Needs of Groundwater-Dependent Ecosystems

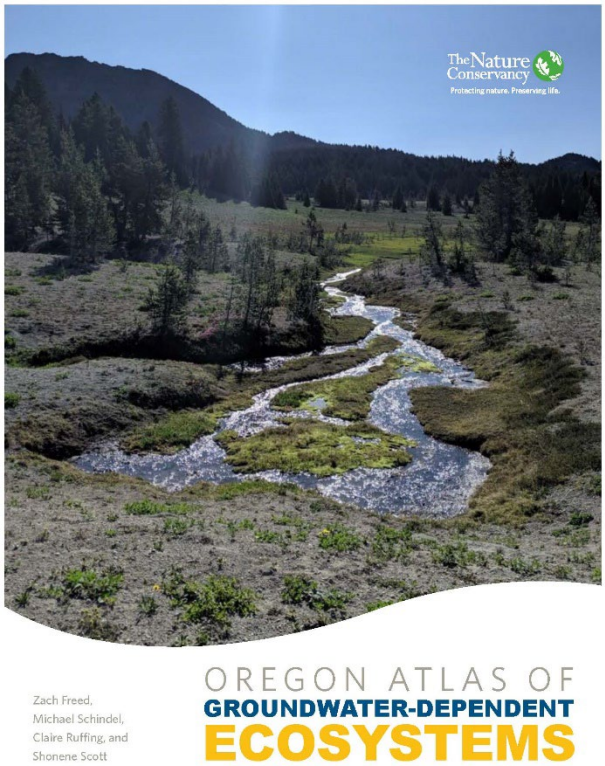
Groundwater is vital to both ecosystems and human communities, as groundwater discharges and delivers water to wetlands, rivers, and lakes. Groundwater provides late-summer flow for many rivers and creates cool-water upwellings critical for aquatic species during the warmer summer months. Groundwater-dependent ecosystems contain species and habitats that rely on groundwater for some or all of their life cycle. These ecosystems form the interface between groundwater and surface water, and due to their unique hydrology, often harbor many rare species native only to these locations. Groundwater-dependent ecosystems still need to be fully identified and characterized across the state, including their groundwater quantity and quality requirements.

Oregon has a wide distribution of groundwater-dependent ecosystems. In 2022, the Nature Conservancy published the Oregon Atlas of Groundwater Dependent Ecosystems, documenting the abundance and distribution of groundwater dependent ecosystems. This report identified nearly 30,000 springs and found that approximately 33-percent of all rivers, 45-percent of all wetland area, and 63-percent of total lake area are groundwater dependent. The report also noted over 3,100 observations of groundwater dependent species.

Action 2B
Determine Needs of Groundwater-Dependent Ecosystems

Examples of how to implement this action:

- Identify and characterize groundwater-dependent ecosystems and prioritize systems for long-term study
- Perform an in-depth analysis of accessible springs
- Monitor springs and seeps across the state to understand their contribution (quality and quantity) to streamflows
- Identify the water quantity and water quality needs of groundwater-dependent species and ecosystems
- Conduct seepage studies on priority streams to quantify groundwater exchange
- Evaluate impacts to groundwater ecosystems from human activities (e.g., groundwater pumping, lining canals, fish passage and transportation maintenance projects)



While some continued characterization of these systems is needed, the next important step is to quantify their groundwater quantity and quality requirements. This information can be used to help meet the needs of people, species, and ecosystems. For example, in the Oregon Dunes National Recreation Area, municipal wells pump water from an unconfined sand dune aquifer that also supports two sensitive species of amphibian that breed in the swale wetlands. Groundwater needs of amphibians and wetland plants were quantified to identify compatible pumping levels supportive of wetland species.[3]

Action 2C

Develop Instream and Ecosystem Instream Need Forecasts

The state has completed two long-term water demand studies (2008 and 2015) that focused on forecasting water demands for agricultural, municipal, domestic, and industrial uses (See Action 3B). A parallel statewide analysis is needed to better understand the quality and quantity of instream (surface water and groundwater) and ecosystem needs, now and into the future.

Climate change will continue to affect water quality, timing, availability and use, and balanced solutions are not achievable without understanding the full suite of instream and out -of-stream needs. An instream need forecast must be produced at the appropriate scale and periodically updated to inform water planning and management.

Action 2C is new for the 2025 Strategy. Work must be done to identify project details, agency roles, funding needs, and coordination with a statewide out-of-stream forecast (Action 3B). Current work at the Department of Fish and Wildlife (ODFW) may provide a starting point for the instream forecast. The ODFW is part way through a 5-year study that, once complete, may allow the state to more broadly and efficiently predict statewide instream demand.

Action 2C
Develop Instream and Ecosystem Water Need Forecasts

Examples of how to implement this action:

- Develop statewide instream water forecasts
- Periodically update instream forecasts with new climate projections
- Study potential impacts to ecosystems under a changing climate
- Study potential impacts to environmental justice and other frontline communities under a changing climate

Lostine River, Wallowa-Whitman National Forest. Credit: USFS

Critical Issue | Out-of-Stream Water Needs

Out-of-stream uses are those that divert water from the environment, from a stream, reservoir, or from below ground, to serve a beneficial purpose. The major uses of diverted water in Oregon are to supply the water needed for agriculture, municipal, industrial/manufacturing, and domestic purposes (e.g., drinking water, bathing, laundry), see Figure 2-1, below. Uses that divert water are often considered a "consumptive" use, or water that is not returned to its source. It is important to consider that freshwater is a finite resource and Oregon water law requires that it be used without waste. With few exceptions, water users must apply for and be granted a water right to use either surface water or groundwater for a beneficial use. Additional information about water rights can be found in Appendix B "Water Laws, Policies, and Regulations."

A changing climate has the potential to reduce water supplies, in the form and timing of snowpack and rain, leaving less water available to meet instream and out-of-stream needs. Oregon has been working to increase its accounting of out-of-stream water use to inform basin strategies for integrated water management. Out-of-stream water use supports many sectors of Oregon's economy – reinforcing the need to better understand these uses to avoid negative economic and environmental impacts.

Out-of-Stream Water Uses

Statewide Consumptive Use Estimates

House Bill 2018, passed in 2021, called to produce a report on statewide consumptive water use. The Water Resources Department (OWRD) is leading this work and expects to have consumptive water use estimates for all major hydrologic basins in Oregon in 2028. In absence of this more detailed data, generalizations about out-of-stream water use are summarized below using the 2023 Business Case for Investing in Water in Oregon report. The report utilized data from the U.S. Geological Survey.

Water Use in Agriculture

The majority of water diverted for out-of-stream use is for irrigation to grow crops. According to the 2023 Business Case for Investing in Water in Oregon, almost 80-percent of all water withdrawn from surface or groundwater sources is used for irrigation (Figure 2-1). [4]

Figure 2-1: Water Withdrawals by Source and Use Across Oregon

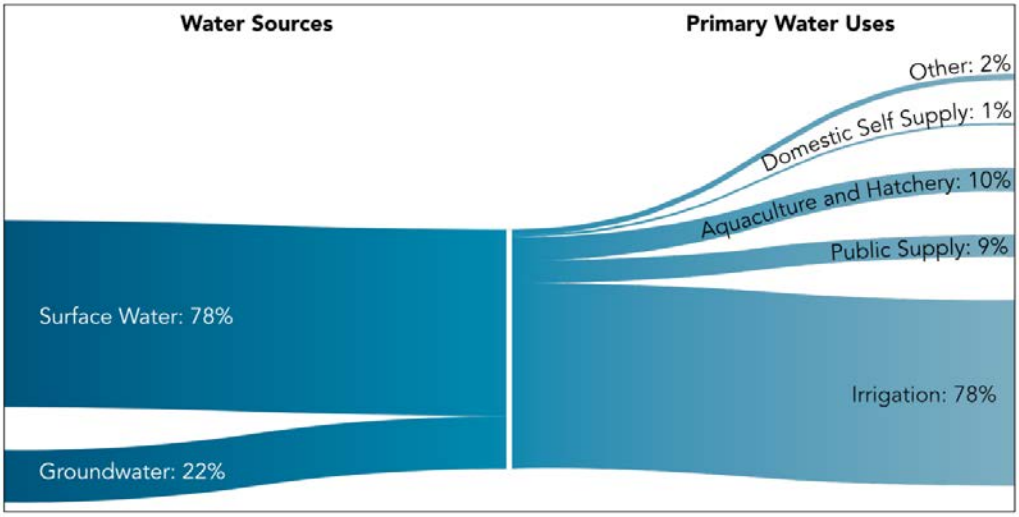


Image Source: AMP Insights, Data Source: USGS Water Use Data for Oregon[5]

Increases in agricultural water demand are expected from a range of possible changes in the climate, including increased temperatures and drier summers, resulting in prolonged agricultural growing seasons and increased evapotranspiration. Many basins are over appropriated, meaning there is not enough water to meet the full water rights held by people. This means that increasing irrigation or shifting irrigation seasons to respond to warmer, drier conditions may simply not be an option. Actions including increasing irrigation efficiency, water conservation, water reuse, storage, and market-based solutions are all potential management approaches outlined in Chapter 4, Actions 10A-10D.

Irrigated agriculture contributes to the economy, food supply, local communities, and Oregon's cultural heritage of agricultural production. The Department of Agriculture reports that Oregon's 35,500 farms produced more than 220 different products in 2023.[6] According to the 2023 Business Case, the total annual economic contribution of irrigated agriculture to Oregon's economy is $7.3 billion.

There are many other uses for water within agriculture besides irrigation. Water for livestock operations supports cattle and calves, one of Oregon's highest-ranking commodities valued at almost $985 million in 2023. [7]

Food Processing – Oregon hosts hundreds of food manufacturing companies that play an essential part in food production by cooking, freezing, and packaging products for consumers. The food processing industry handles crops from cherries to onions and includes bakery and dairy products, fruits and vegetables, meat, poultry, and seafood. Water is needed for washing, processing, and packaging food. Finding a high-quality water supply to meet the needs of this industry is sometimes a challenge.

Public Supply – Municipal, Commercial, and Industrial Water Use

Municipal water systems may be shared water systems operated by homeowner associations, larger systems managed by private water companies, or public systems operated by cities, towns, or water districts. Most commercial, industrial, and high-tech facilities receive water from municipal water systems. Public supply to meet municipal, commercial, and industrial demands, account for approximately 9 percent of out-of-stream diversions (Figure 2-1).

Municipal water systems are crucial to the state's economy, serving as a backbone of economic development, public health, and safety in many Oregon communities. These water providers supply clean and reliable water to residences, schools, parks, hospitals, industries, businesses, and other public and private facilities. In the past decade, manufacturing has largely been located in urbanized areas where access to a public water system has played an important role. The ability of municipal water systems to deliver reliable, high quality water supplies is one factor that has attracted industry to Oregon.

Industrial use involves using water within the processing or manufacturing of a product. Water can be used to construct, operate, and maintain industrial sites and facilities. Commercial use is very similar. It includes the use of water for the production or delivery of goods, services, or commodities, along with the use of water to construct, operate, or maintain a facility. Some industrial or commercial water needs can be met with reclaimed or recycled water.

Economic growth in Oregon depends, in part, on the availability of water and wastewater services, and the ability of municipalities to serve these needs. Through their planning efforts, municipalities will continually need to estimate

long-range water supply demands and to identify options, including water conservation programs, to meet future needs. Municipal Water Management and Conservation Plans, described in Appendix B, are one such tool to plan for the future.

Self-Supplied Industries – Self-supplied industrial and commercial facilities maintain their own water supplies and water rights independent of public water systems. It is important to recognize that much of the state's industries are supported by municipal systems and not "self-supplied."

Domestic Wells

Domestic self-supply makes up just one percent of the water withdrawals. While this is not a large amount of the total water diverted in the state, this water supply is critical to meeting many people's basic household needs. Nearly 23 percent of Oregonians rely on domestic or private wells as their primary source of potable water.[8]

Action 3A Improve Water-Use Measurement and Reporting

Objective water management decisions are made possible when they are based on reliable information about water use. Availability of water use data is fundamental to ensure efficient water management, effective water distribution, determine the effectiveness of water conservation actions, accurately characterize water budgets, account for water use in basin studies, and help plan for future water needs. The information is also used to ground-truth demand projections or models. The Water Resources Department (OWRD) has the authority to require users to measure water use; however, there was historically limited authority to require reporting of the resulting data. This changed with the passing of House Bill 2010 in 2023, now providing the OWRD with broader authority. Water users who do keep track of their use are better able to demonstrate the validity of their water rights, develop water management and conservation plans, and determine the design and funding needs of their water systems in the future.

2022 Legislative Report on Water Use Measurement and Reporting

The 2022 Legislative Report on Water Use Measurement and Reporting, published by the OWRD, outlines recommendations for improving collection and use of water use data.[9] Implementation of these recommendations is expected to provide information needed to facilitate planning, protect existing water right holders, maximize instream and out-of-stream beneficial uses, and minimize costly water conflicts. The report's six key recommendations include:

1. Improve water use reporting database functionality and public access
2. Integrate accurate, transparent statewide water use summaries
3. Invest in evapotranspiration monitoring and programs
4. Invest in water use measurement devices in priority watersheds
5. Install groundwater observation wells
6. Increase understanding of statewide water use through investments in field and technical staff

Integrate Accurate, Transparent Statewide Water Use Summaries – Basin studies, water budgets, and planning efforts would all benefit from accurate data of water use by water right. A robust data set is also needed to develop reports on water use by watershed, including cross-boundary watersheds, and support modeling efforts used in many planning initiatives. The OWRD received funding for this effort and is working to identify staffing and specific activities needed to develop these much-needed statewide summaries.

Invest in Evapotranspiration Monitoring and Programs - Evapotranspiration (ET) is water that transpires from the leaves of plants and evaporates from soil and reservoirs. ET data can be used to quantify how much water is consumed by irrigated agriculture and other lands (e.g., forest, lawn). Understanding how much water crops use can help farmers, water managers, and communities manage current supplies and plan for their future needs. The

OWRD uses estimates of ET for several important programs and projects ranging from studies to water right transfers.

Satellite-based ET data provides more accurate data over a larger area, over a broader period of time, and more affordably than any other approach. The OWRD uses satellite imagery, supported with ET models, and other well-established methods to calculate consumptive water use from irrigated fields and open water bodies. The OWRD published a well-vetted ET and water use dataset across Oregon to support water planning and management with legislative support from House Bill 2018 and Policy Option Package 110 in 2021. The study, Crop Evapotranspiration, Consumptive Use, and Open Water Evaporation for Oregon, provides ET and open water evaporation products and geospatial datasets to support the development of hydrologic budgets, reporting consumptive water use, and partitioning surface water and groundwater use.[10]

Future applications of satellite-based ET data sets for OWRD include:

- Compute water uses in the Walla Walla Basin and future groundwater basin studies
- Develop consumptive use values for statewide water budgets prescribed under House Bill 2018 (2021)
- Support enrollment and validation of historical use; monitoring compliance for the Harney Basin Groundwater Conservation Reserve Enhancement Program (CREP)

For more information, see the March 2025 OWRD memorandum.

Water Measurement Cost Share Revolving Fund – Federal support through the American Rescue Plan Act State Fiscal Recovery Funds provided $1 million in 2021 to the OWRD's Cost Share Measurement Program to assist water users with the installation of measuring devices.

Action 3A

Improve Water Use Data and Reporting

Examples of how to implement this action:

- Continue to work with Information Technology to improve the software and tools used for water-use measurement and reporting
- Update OWRD's water measurement authorities
- Implement new authority that allows OWRD to require reporting of water use, where measurement is required, including aligning the reporting with the Water-Use Reporting program
- Update and implement the Water Resources Commission's Strategic Measurement Plan, measuring significant diversions
- Coordinate the Water-Use Reporting Program and Water Resource Commission's Strategic Measurement Plan
- Improve Water Use Reporting Database functionality and public access, including establishing and maintaining quality assurance procedures to verify the accuracy of water use and other data
- Invest in water use measurement devices in priority watersheds
- Invest in evapotranspiration monitoring and programs
- Develop accurate statewide annual water use summaries for water rights using all available water use data sets
- Produce annual values of consumptive use by water right to allow for analysis of trends in water use over time
- Install and monitor groundwater observation wells
- Provide resources to assist with installation of measurement devices; update cost-share program
- Work with USGS to integrate water use data from OWRD into USGS water use products
- Seek authority to require water use reporting in areas of scientific interest in preparation for Serious Water Management Problem Areas (SWMPAs), basin studies, or planning exercises like updates to basin plan rules
- Increase documentation and data collection of decommissioned wells and well construction history
- Include equity considerations for assistance through measurement cost share programs

Action 3B Regularly Update Out-of-Stream Water Demand Forecasts

The most recent water demand forecast was developed by the Water Resources Department in 2015. Oregon's 2015 Long-Term Water Demand Forecast[11] describes potential long-term consumptive use demands in Oregon. The 2015 scenarios and assumptions included both a projected increase in population and a longer, warmer growing season, leading to more demand by agricultural, commercial, residential, and industrial water uses in 2050. The forecast was done at a coarse scale, offering projections for increased water demands at the county level.

Strategy Action 3A described improvements needed to statewide water use measurement and reporting. These improvements, outlined in the 2022 Legislative Report on Water Use Measurement and Reporting, are needed to develop the data and modeling tools needed to improve our statewide approach to water demand forecasting. Future out-of-stream water demand forecasts must be produced at the appropriate scale to inform collaborative approaches to water planning and management. Demand forecasts should identify trends in water use, economic development, urban-rural population growth/shift, per capita demands, and changing crop water requirements due to a changing climate.

Out-of-stream water demand forecasting is needed to support future place-based, integrated water resources planning and other planning efforts. For further discussion of place-based water planning, refer to Chapter 4, Action 9A.

Forecasting is also needed for instream flow and ecosystem needs, see Action 2C.

Action 3B
Regularly Update Out-of-Stream Water Demand Forecasts

Examples of how to implement this action:

- Periodically update demand projections with new population, per capita water demand, industrial demand, crop water use, and climate projections
- Develop models/studies to quantify the economic, social, and cultural value of consumptive uses of water and publish outcomes
- Employ remote sensing and crop water demand modeling to improve crop water use estimates
- Provide data in a method consistent with needs of the public, and involve water users in the development of demand products
- Study potential impacts to environmental justice and other frontline communities in demand forecasts

Credit: Dan Meyers

Action 3C Determine Unadjudicated Water Right Claims

Action 3C
Determine Unadjudicated Water Right Claims

Examples of how to carry out this action:

- Conduct surface water and groundwater adjudications
- Settle federal reserved claims, including tribal claims

Appendix B describes the process for obtaining water rights in Oregon, and the need to resolve claims to the use of surface water that predate Oregon's 1909 Water Code. Adjudication is a formal administrative judicial process where water right claims are quantified, documented, and eventually incorporated into the prior appropriation system. In addition to pre-1909 claims, federal and tribal reserved water rights can be determined through an adjudication. There are similar procedures for conducting adjudications for groundwater uses that pre-date the Water Resources Department's (OWRD) authority to issue groundwater rights.

The ability to manage water resources has been greatly facilitated in Oregon where adjudications have been concluded. Adjudicating water right claims creates an enforceable system that is protective of senior users in times of shortage. Without the adjudication process, these claims cannot make calls for their water or take advantage of water management tools, such as transfers or leases.

The Federal Court ruled in US v Oregon (1994) that the US Government along with Indian Tribes must participate in Oregon's General Stream Adjudication in the Klamath Basin and have their rights to water quantified. Following this ruling, both the Federal Government and the Klamath Tribes filed claims in the Klamath Basin Adjudication. In 2013, the OWRD completed the administrative phase of the Klamath Basin Adjudication, submitting the Findings of Fact and Order of Determination (FFOD) to the Klamath County Circuit Court for review. A year later in 2014, the OWRD issued the Amended and Corrected Findings of Fact and Order of Determination (ACFFOD). The court remanded portions of the ACFFOD back to the OWRD for further findings. At the conclusion of the judicial phase, the Court will issue a water rights decree, either affirming or modifying the ACFFOD. The OWRD can then issue water right certificates in accordance with the decree.

Adjudications have proven to be very long and complex processes. Pursuing a water rights settlement instead of an adjudication could offer a timelier resolution to federal reserved and tribal claims. The need to resolve tribal and federal rights in Oregon, either through adjudication or settlement, is real and significant. The OWRD would require additional staff capacity to conduct this work.

Action 3D Authorize the Update of Water Right Records with Contact Information

Action 3D
Authorize the Update of Water Right Records with Contact Information

Examples of how to carry out this action:

- Authorize the OWRD to update the names on water rights certificates
- Update related water right records, including databases and geographic information system (GIS) layers

Almost 90,000 water rights certificates are held by water users. There are no statutory provisions allowing the Water Resources Department (OWRD) to change or update the name on a water right certificate, even if the holder of the certificate has passed away or sold off land with its appurtenant water rights. The state needs the ability to respond to holders of water rights who are asking to modify the names on these certificates. State authority will enable OWRD to update ownership information in its records.

This authority will also help facilitate OWRD processes, such as communicating with water right holders, researching water rights, mapping water rights with geographic information systems (GIS), updating the water rights database, and improving compliance with measurement and reporting permit conditions.

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CHAPTER 3

Objective 3: Understand the Pressures that Affect Our Needs and Supplies

Oregon must plan and prepare for pressures and unexpected challenges that affect our instream and out-of-stream water needs and supplies. Climate change, multi-year droughts, floods, and extreme temperatures will continue to affect water resources, ecosystems, and water needs now, and into the future. Ensuring the state can meet the need for access to clean water is necessary for both people and the environment.

Oregon Revised Statute 536.220 specifies that the Integrated Water Resources Strategy must consider climate change, land-use change, and population growth. This chapter describes how the Strategy offers both climate mitigation and resiliency actions. This chapter also addresses the connection between energy and water, resources to plan and prepare for natural hazards, information needed for land use planning and decision-making, the need to maintain, upgrade, and modernize our water infrastructure, and the importance of providing a foundation of education around water.

Chapter 3 Actions at a Glance

Objective 3: Understand the Pressures that Affect Our Needs and Supplies

Critical Issue – Climate Change
Actions to mitigate and adapt to climate change are distributed throughout the Strategy

Critical Issue - Water and Energy
4A Analyze the Effects on Water from Energy Development Projects and Policies
4B Develop Non-Traditional Hydroelectric Power
4C Promote Strategies that Increase/Integrate Energy and Water Savings

Critical Issue - Natural Hazards
5A Plan and Prepare for Drought and Wildfire Resiliency
5B Plan and Prepare for Flood Events
5C Plan and Prepare for a Cascadia Earthquake and Tsunami Event

Critical Issue - Land Use Planning
6A Improve Integration of Water Information and Land Use Planning
6B Encourage Low Impact Development Practices and Green Infrastructure

Critical Issue - Water Infrastructure
7A Maintain, Upgrade, and Decommission Water and Wastewater Infrastructure
7B Encourage Regional (Sub-Basin) Approaches to Water and Wastewater Systems
7C Support Dam and Levee Safety

Critical Issue – Education and Outreach
8A Support Implementation of K-12 Environmental Literacy Plan
8B Provide Career Training for the Next Generation of Water Professionals
8C Promote Community Education and Outreach
8D Identify Water Research Needs and Partnerships

Critical Issue | Climate Change

Oregon is experiencing increased temperatures, extreme weather events, decreased winter snowpack, and frequent and intense drought. These climate conditions place immense pressure on our ecological, social, and economic systems. Oregon's wetlands, estuaries, lakes, rivers, streams, and aquifers are receiving less natural recharge and experiencing more evaporation and increased pressure for human uses. Our water resources are less able to support the many species that rely on them for their survival, contributing to species extinctions and a biodiversity crisis. Oregon's forest ecosystems, essential for storing and filtering water, are suffering from increased disease, competition from invasive species, tree mortality, and wildfire risk. These climate pressures have implications for our ability to meet Oregon's instream and out-of-stream water needs.

Climate change does not affect all places and communities in Oregon equally. Underserved populations, rural communities, future generations, and sensitive ecosystems are disproportionately affected. Individuals who lack access to power, employment, adequate housing, and financial markets are less able to prepare for and respond to the changes brought about by climate change. Oregon's Social Vulnerability Assessment contains information from community members about the physical, economic, and social toll that a changing climate and extreme events take on Oregonians. Oregon's Climate Equity Blueprint provides tools that state agencies can use to advance equitable climate adaptation planning and action.[1]

This section will describe the latest climate projections, expected impacts to natural and human systems, and the Strategy's role in mitigation and adaptation. While this section does not include standalone actions, it points to the many actions distributed throughout the Strategy that seek to help Oregon mitigate and/or adapt to climate change.

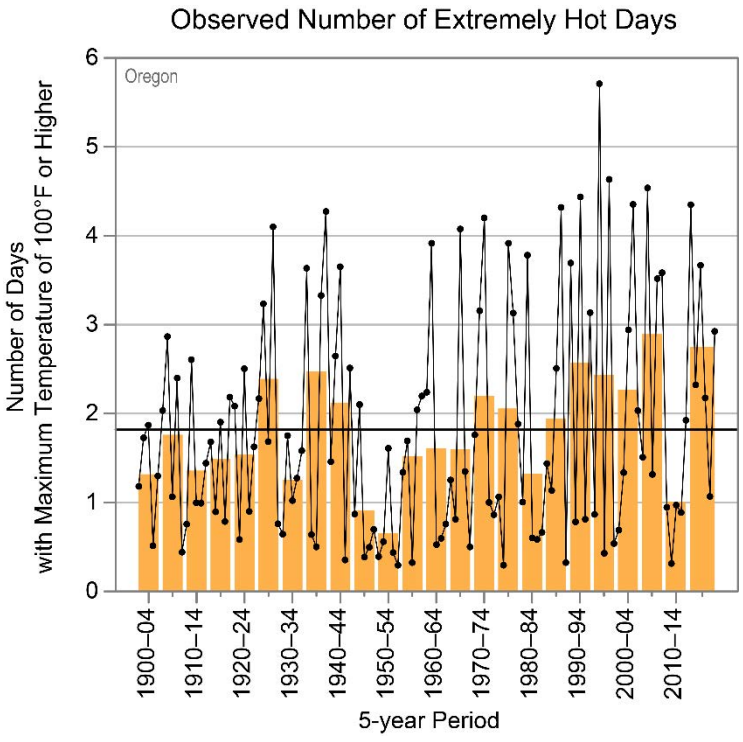
Climate Change Projections for Oregon

The Oregon Climate Change Research Institute (OCCRI) conducts regular biennial assessments of the state of climate change science and the likely effects of climate change on Oregon. The assessment supports the state's natural hazards mitigation planning and implementation of the 2021 Oregon Climate Change Adaptation Framework.[2] The following is a summary of some of the impacts and risks identified in OCCRI's Seventh Climate Assessment and other references.[3]

Increasing Air Temperature

Oregon's annual average temperature has warmed by 2.2 degrees Fahrenheit (°F) per century since 1895. Annual temperatures are projected to increase at least 5°F by 2074 if greenhouse gas emissions continue at current levels. The number of days each year where temperatures exceed 90°F during the day and 65°F at night has continued to increase.[4] Increased air temperatures cause a cascade of other impacts, including changes to snowpack, soil moisture, and water quality.

Figure 3-1: Days Oregon Exceeded 100 Degrees F
(Source: https://statesummaries.ncics.org)



Wetter Winters and Declining Winter Snowpack - As mean annual temperature increases, the percentage of precipitation that falls as rain instead of snow are expected to increase. Precipitation that arrives as rain instead of snow runs off the landscape sooner, reducing groundwater recharge and streamflow in the late spring and summer. Climate predictions also note that the amount of moisture contained in snowfall, called "snow water equivalent" is expected to continue to decline.

The retreat of Oregon glaciers has accelerated since the 1990s.[5][6][7] Shrinking glaciers change the hydrology and ecology of downstream systems. Changes in summer and winter air temperature and winter snowfall are the most important factors affecting changes in the extent of glaciers.[8]

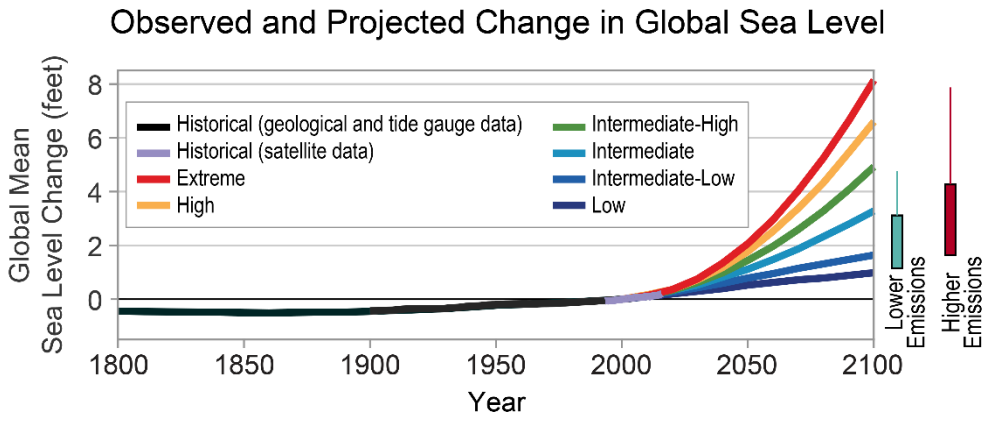
Drier Summers – In addition to summers becoming hotter, they are also expected to be drier. Oregon typically experiences dry summer months, but climate projections indicate the duration between rainy seasons will increase and overall summer precipitation will decrease.

Decreased Soil Moisture – Prolonged high temperatures increase plant uptake and evaporation of water from soil. Dry soils can worsen the human perception of extreme heat events through relative lack of evaporative cooling.

Surface Water Temperatures - High water temperatures are already a major water quality concern in many of Oregon's streams and rivers. Water temperature is projected to rise as air temperature increases in the 21st century, particularly in urban streams lacking natural riparian vegetation. A decline in summer streamflow will exacerbate the increase in water temperature, because low volumes of water can heat up more quickly than larger, faster streamflows. Warmer conditions may contribute to earlier or longer lasting harmful algal blooms.

Sea-Level Rise - Increasing temperatures raise concerns for sea level rise in coastal areas. Global average sea level has risen since 1900 by about 7–8 inches. It is projected to rise another 1–8 feet, with a likely range of 1–4 feet, by 2100 because of both past and future emissions from human activities. Movement of tectonic plates on the ocean floor is causing the Oregon coast to rise, a phenomenon known as "uplift." In some parts of the Oregon coast, the uplift is exceeding the rate of sea level rise; so, sea level has dropped in these locations. However, the rate of sea level rise is projected to exceed the rate of uplift along the entire Oregon coast by 2050, resulting in sea level rise for all locations.[9]

Figure 3-2: Global Sea Level Rise
(Source: https://statesummaries.ncics.org)



Wind Speeds

Projections indicate extreme winter wind speeds may increase while mean wind speeds across the state are projected to decrease slightly. Increased wind speeds have implications for water and energy infrastructure and public health and safety.

Climate Change Impacts

Impacts to Aquatic Species and Habitat

Changes in hydrologic variables, such as the timing and extent of streamflow, alter key habitat conditions for salmon and other anadromous fish that depend on specific conditions for spawning and migration. The impacts of climate change on the region's salmonids will vary across the region and among different species, populations, life-stages, and site characteristics.[10] Increased winter and early-spring streamflows have the potential to scour eggs or wash away newly emerged fry of fall-spawning salmon and trout species. Extreme low summer streamflows can limit the accessibility for some species to move upstream to spawn.

In snowmelt-dominated watersheds, an earlier occurrence of peak streamflow and snowmelt in the spring will result in decreased summer and fall flows, warmer summer water temperatures, and increased sedimentation, all of which have negative consequences for natural systems, salmonids and other estuarine and marine populations. Shrinking glaciers reduce benefits to cold-water adapted aquatic species, including insects and bull trout.[11,12]

For salmon populations to remain viable, adults must migrate to spawning habitat, where survival of eggs and larvae requires cool water, gravel substrates, and sufficient water flow and oxygen. There also must be enough water flow to support migration back to the sea. Climate change is affecting all these elements in ways that threaten the survival of salmon runs, and several of the region's populations may be approaching physical temperature tolerances.[13]

Impacts to Wetlands

Scientific data shows that climate change is causing significant impacts to coastal, estuarine, and freshwater wetlands. Sea level rise and ocean acidification is affecting tidal wetland habitats and the species they support. Wetlands can be sensitive to small changes in precipitation and temperature. These climate-sensitive habitats, including vernal pools, springs, and seeps, support a variety of unique species, including threatened and endangered species.

Impacts to Forests

Higher summer temperatures and earlier spring snowmelt increase the risk of forest fires. Wildfires will continue to increase in both frequency and severity. The average annual area burned in Oregon's forests is expected to increase by at least 50-percent. An increase of wildfires, insect outbreaks, erosion, and changing species composition in forests will pose challenges for ecosystems and significant challenges for water management.

Impacts to Groundwater Systems

Reduced snowpack contributes to declines in groundwater recharge, affecting aquifers that are recharged from mountain systems. The timing of groundwater discharge to streams may also shift, possibly reducing baseflows in the late summer months. Much of this change largely depends on the hydrogeological setting and a stream's sensitivity to climate change.

Figure 3-3 shows the distribution of more than 1200 domestic water wells that have been reported to the Water Resources Department since 2021 as "dry" or unable to produce adequate flow to meet demand.

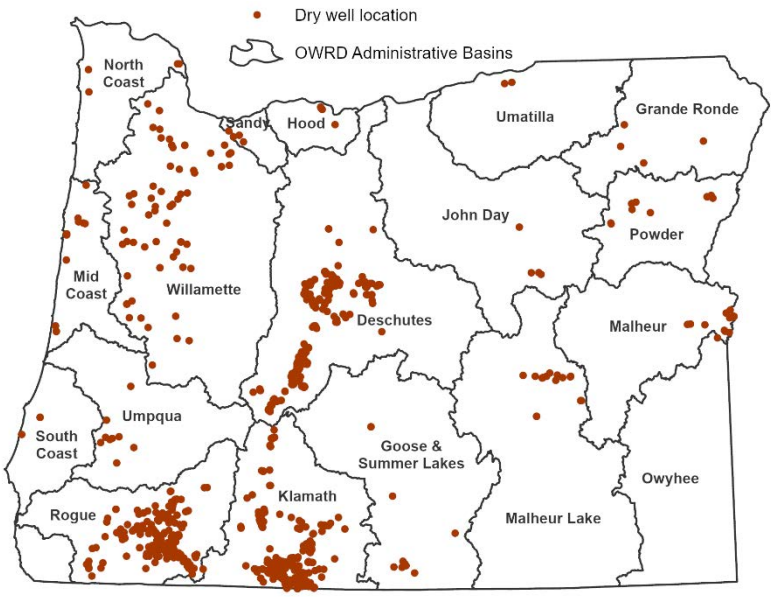
Impacts to Coastal Systems

The coast is already vulnerable to several hazards, and these will be further exacerbated by climate-related impacts. Winter storms have historically been the primary factor for coastal erosion and flooding. The combination of increasing wave heights and rising sea-levels presents a substantial threat to the Oregon coast, increasing erosion and the loss of some beaches and coastal lands.

Sea level rise will also have impacts beyond the coast, affecting tidally influenced rivers and surrounding inland communities, where rising river levels can pose flooding problems. Other threats include increasingly stressed infrastructure built under older engineering standards. Infrastructure at risk can include water treatment plants, diversion facilities, onsite wastewater treatment systems (septic systems) and wastewater treatment plants. The intrusion of salt water will pose a risk in some communities.

The Oregon Coastal Management Program at the Department of Land Conservation and Development (DLCD) published the Sea Level Rise Exposure Inventory for Oregon's Estuaries in 2017. The project identified vulnerable infrastructure and other assets and will help prioritize areas to focus future resources and further study. Additional sea level rise planning resources can be found on the Oregon Coastal Atlas.

Figure 3-3: Reported Dry Wells Throughout Oregon
July 2025



Impacts to Human Health

The Oregon Health Authority annually publishes Climate and Health in Oregon reports documenting how climate change hazards are impacting the health of people in Oregon, and actions communities and the state are taking to reduce those risks.

Impacts to Agriculture

Climate change may significantly affect the availability and use of water for irrigation. Longer and drier growing seasons generally result in an increased demand of water for irrigation. With projected rises in temperature, irrigation demands are projected to increase by at least 10 percent in arid and semi-arid regions, translating into higher pumping and energy costs.[14] Regenerative agriculture practices offer a way to restore degraded soils, increasing organic matter and moisture-holding capacity, and manage them sustainably.[15]

The retreat or disappearance of glaciers will also impact agriculture. For example, the Coe and Eliot glaciers on the north slopes of Mount Hood supply the Middle Fork of the Hood River and apple and pear orchards in the Hood River Valley. Modeling suggests that September flow along the Middle Fork will decrease by almost 70 percent by 2100 due to the loss of glacier area.[16,17]

Impacts to Water Rights

The shift in timing and availability of water due to climate change may affect whether water users are able to utilize their water rights as authorized. The implications of this could be particularly significant for water right holders who have historically relied on live flow surface water during the summer months. Prime growing conditions are shifting earlier in the year and lasting longer, because of increases in temperatures. This increased demand for water in the early spring or late summer could happen more frequently in the future under a changing climate.

Similarly, water rights that protect water instream for a certain amount, time of year, and location may no longer be adequate due to precipitation changes, decreased snowpack, and changes in species distribution. An increase in regulation may be needed to meet senior out-of-stream water rights, to protect instream needs, and to meet water quality needs. Policymakers may one day have to revisit the body of rules that define irrigation seasons that were based on historic conditions. Incremental adjustments will be important for maintaining a strong legal foundation, while keeping up with a changing climate.

Impacts to Population Growth and Shifts

Climate change is predicted to cause a decline in quality-of-life across much of the country.[18] Areas of Oregon west of the Cascades are anticipated to be an exception, with people in that region benefiting from climate change because of improvements to climate amenities in the future.

People are likely to move to Oregon in response to climate change, and the population and economic production of the Pacific Northwest may increase by 15 percent by 2065 due to climate migration from other areas of the country.[19] Oregon must consider how to prepare for climate migration to avoid economic disruption, housing shortages, and over-burdened infrastructure.

Planning for Climate Mitigation, Adaptation, and Resilience

The wide-ranging impacts of climate change may seem overwhelming and lead us to ask what can or should be done to keep things from getting worse and to adapt to the coming changes. Many state documents and programs are dedicated to addressing both the need to mitigate and adapt to climate change. Climate mitigation and climate adaptation mean very different things, but some actions described in the Strategy can simultaneously accomplish both. Actions to protect and restore our green infrastructure including wetlands, floodplains, and forests, or increasing vegetation in urban areas have potential to accomplish both mitigation and adaptation.

Climate Mitigation	Climate Adaptation	Climate Resilience
Measures to reduce the amount and rate of future climate change by reducing emissions of heat-trapping gases (primarily carbon dioxide) from the atmosphere	The process of adjustment to an actual or expected environmental change and its effects in a way that seeks to moderate harm or exploit beneficial opportunties	The ability to prepare for threats and hazards, adapt to changing conditions, and withstand and recover rapidly from adverse conditions and disruptions

Definitions from the U.S. Global Change Research Program[20]

Climate Mitigation

Greenhouse gases, such as carbon dioxide, nitrous oxide, methane, and ozone cause heat to be trapped near the Earth's surface causing a "greenhouse effect" and many of the conditions we refer to as "climate change." Greenhouse gases can be from human or natural sources. Carbon dioxide is the largest source of greenhouse gas, produced from a wide range of activities including burning fossil fuels and biomass, land-use changes (e.g., de-forestation), and industrial processes (e.g., concrete production). Climate mitigation refers to actions that reduce the production of greenhouse gases or capture carbon dioxide from the atmosphere, to prevent climate change from getting worse. The Climate Protection Program, led by the Department of Environmental Quality, sets an enforceable declining cap on greenhouse gas emissions from fossil fuels used throughout Oregon, including diesel, gasoline, and natural gas. The program is designed to reduce these emissions by 50% by 2035 and 90% by 2050. Some transportation sector emissions reductions have met or surpassed program emissions targets, but overall state emissions in 2023 were down about 7% from the 2017-2019 baseline. The Climate Protection Program covers just over half of current overall emissions, so that subset should see future reductions in line with the 50% target by 2035 and 90% target by 2050.

Oregon's Land Use Planning program (see Critical Issue later in this chapter) led by the DLCD works to address climate mitigation. Land use policies work together to seek to reduce vehicle miles traveled. Oregon's working farms and forests keep carbon sequestered in soil, plants, and trees. Protection of ecosystems is a best practice, and restoration of degraded ecosystems can yield climate mitigation benefits. Chapter 4 "Healthy Ecosystems" discusses several actions to improve watershed conditions.

2025 Strategy Actions Supporting Climate Mitigation

Strategy actions that decrease water and energy use may also reduce greenhouse gas emissions. Actions that protect and restore Oregon's green and natural infrastructure may provide the added benefit of carbon capture or storage. See Figure 3-4 for a list of actions that could be implemented in a way to mitigate climate change.

Figure 3-4: 2025 Strategy Actions with Potential to Support Climate Mitigation (not exhaustive)

Objective 3: Understand the Pressures that Affect Our Needs and Supplies

- 4C Promote Strategies that Increase/Integrate Energy and Water Savings
- 5A Plan and Prepare for Drought and Wildfire Resiliency
- 5B Plan and Prepare for Flood Events
- 6A Improve Integration of Water Information and Land Use Planning
- 6B Encourage Low Impact Development Practices and Green Infrastructure
- 7A Maintain, Upgrade, Decommission Water and Wastewater Infrastructure
- 8C Promote Community Education and Outreach

Objective 4: Meet Oregon's Instream and Out-of-Stream Needs

- 9A Support Place-Based Integrated Planning and Other Water Planning Efforts
- 9E Lead Meaningful Community Engagement
- 10A Improve Water-Use Efficiency and Water Conservation (also 4C)
- 11A Improve Watershed Health, Resiliency, and Capacity for Natural Storage
- 11B Develop Additional Instream Protections
- 11C Prevent and Eradicate Invasive Species
- 11D Protect, Restore, and Provide Access to Instream Habitat for Fish and Wildlife
- 11E Develop Additional Groundwater Protections
- 12A Ensure the Safety of Oregon's Drinking Water
- 12B Reduce the Use of and Exposure to Toxics and Other Pollutants
- 13B Fund Water Resource Management Activities by State Agencies
- 13C Invest in Planning, Feasibility Studies, and Water Resource Project Implementation

Climate Adaptation

In addition to climate mitigation, Oregon must moderate the harm to instream and out-of-stream needs from climate change by implementing adaptation measures. Adaptation includes changing how we manage water, protecting and restoring ecosystems to help them accommodate change, and improving infrastructure to protect public safety, water quantity, and water quality. The 2021 Oregon Climate Adaption Framework urges the state to plan for and respond to climate change impacts in a coordinated and efficient manner to increase impact and minimize redundant effort.

Oregon's Climate Change Adaptation Framework - DLCD partnered with 24 state agencies to update the state's Climate Adaptation Framework, published in 2021. The Framework addresses why we must adapt, provides guidance for implementing comprehensive climate change adaption, and describes vulnerabilities and adaptation strategies. It also includes a Climate Equity Blueprint that presents strategies for addressing climate and environmental justice. The Framework is being implemented by the DLCD hosting a weekly virtual meeting aimed at building a cooperative state agency community-of- practice around climate change adaptation.

A Climate Change Vulnerability Assessment, supporting the Framework, began in 2022 and is being completed in 2025. The Assessment will help us understand how climate change may affect existing and future social vulnerabilities across Oregon. The information gathered during the assessment will be used by agencies and policymakers to propose adaptation measures that support community needs, acknowledging that future community engagement will be needed before adaptation measures are implemented.

2025 Strategy Actions Supporting Climate Adaptation and Resiliency

The 2017 Strategy included Action 5B "Assist with Climate Change Adaptation and Resiliency Strategies." The 2025 Strategy acknowledges that adaptation and resiliency strategies are distributed throughout many other Strategy actions and therefore eliminates this standalone action. The 2025 Strategy also increases the discussion of climate change within the narrative for many other actions. Figure 3-5, below, summarizes how the 2025 Strategy actions contribute to climate adaptation and resilience.

Figure 3-5: 2025 Strategy Actions with Potential to Support Climate Adaptation and Resiliency

Objective 1: Understand Oregon's Water Resources	
Water Resource / Supply Information Actions 1A-1D	• Water resource data is necessary to understand current and future water supply to inform adaptation actions.
Objective 2: Understand Instream and Out-of-Stream Needs	
Instream and Ecosystem Water Needs Actions 2A-2C	• Information about instream and ecosystem water needs is critical to informing protection and restoration efforts that will help ecosystems be more resilient to climate change.
Out-of-Stream Water Needs Actions 3A-3D	• Information about out-of-stream water needs is critical to informing management and conservation efforts.
Objective 3: Understand the Pressures that Affect Our Needs and Supplies	
Water and Energy Actions 4B-4C	• Energy and water conservation measures help Oregon adapt to a future with increased drought frequency and intensity.
Natural Hazards Actions 5A – 5B	• Oregon must plan and prepare for an increased frequency and intensity of hazards like drought, wildfire, and flooding.
Land Use Planning Actions 6A – 6B	• Land use planning requires up-to-date water information (6A) to inform resilient zoning and development. Low impact development and green infrastructure (6B) make Oregon more resilient to increased temperatures, drought, and flooding.
Water Infrastructure Actions 7A – 7C	• Water infrastructure must be resilient to extreme weather events to protect public safety and ecosystems. Upgrades can make infrastructure more water and energy efficient, contributing to drought resilience.
Education and Outreach Actions 8A-8D	• Oregon's communities, including youth, can contribute to adaptation and resilience actions if they are informed about climate risks and needed actions.
Objective 4: Meet Oregon's Instream and Out-of-Stream Needs	
Water Planning Actions 9A – 9E	• A variety of water planning efforts get interested parties around a table to chart a new future for communities to prepare and adapt to new climate conditions.
Water Use and Management Actions 10A – 10E	• Water conservation, reuse, storage, and voluntary actions are all needed to adapt to a future with less water (10A-10C). Agency field presence and modernized permitting programs will help water users adapt to climate change (10E-10F).
Healthy Ecosystems Actions 11A – 11E	• Protection and restoration of ecosystems helps species adapt to increased temperatures, drought, and extreme weather.
Clean Water Actions 12A - 12C	• Surface and groundwater protection through source protection and reduced pollution helps ensure that the water that is available is clean and safe.
Funding Actions 13A – 13C	• Funding Strategy implementation and water management by state agencies helps the state be more responsive to changing conditions. The State can choose to fund planning, feasibility studies, and projects that target adaptation and resilience.

Water and energy uses are interdependent. Water is critical for energy production, and energy is used to pump, treat, and convey water through pipes for residential, commercial, industrial, and irrigation purposes. Approximately 23 percent of Oregonians get their drinking water from a private well and are therefore dependent on power for this necessity.[21] Water conservation saves energy, while energy conservation reduces the amount of water used in energy production. Across various locations and times of the year, climate change presents the challenge of having reduced availability of both water and energy. Actions and policies to reduce greenhouse gas emissions and diversify Oregon's energy portfolio will change how we use water in energy production. Severe weather events threaten energy and water infrastructure and climbing temperatures increases demand for water for many types of cooling processes.

Since 2018, the Oregon Department of Energy (ODOE) has delivered Biennial Energy Reports to inform local, state, regional, and federal energy policy, planning, and investments. The most recent report from 2024 provides information on key energy resources, policies, trends, and forecasts, and what they mean for Oregon. The document serves as a helpful education tool, including a section called 'Energy 101' that provides the reader with foundational knowledge about energy planning and management in Oregon.

In 2023, the Oregon Legislature directed the ODOE (House Bill 3630) to develop a state energy strategy by November 1, 2025. The strategy will help identify pathways to achieving the state's policy objectives while increasing the reliability and resilience of the energy system.

Energy-Water Interdependence

Water is critical for electricity production. The U.S. Department of Energy estimates that nearly half of all fresh surface water withdrawals in the United States are used at thermoelectric power plants.[22] Oregon has small water withdrawals for thermoelectric power plant cooling and the largest water withdrawals for irrigation. In Oregon, the electricity we use comes from energy production plants throughout the West, including hydroelectric, coal, natural gas, wind, solar, and other sources (see Figure 3-6). About 40 percent of Oregon's electricity is generated by hydroelectric facilities. The ODOE website offers interactive features to see how Oregon's electricity mix has changed over time.

Oregon's Renewable Portfolio Standard (RPS)

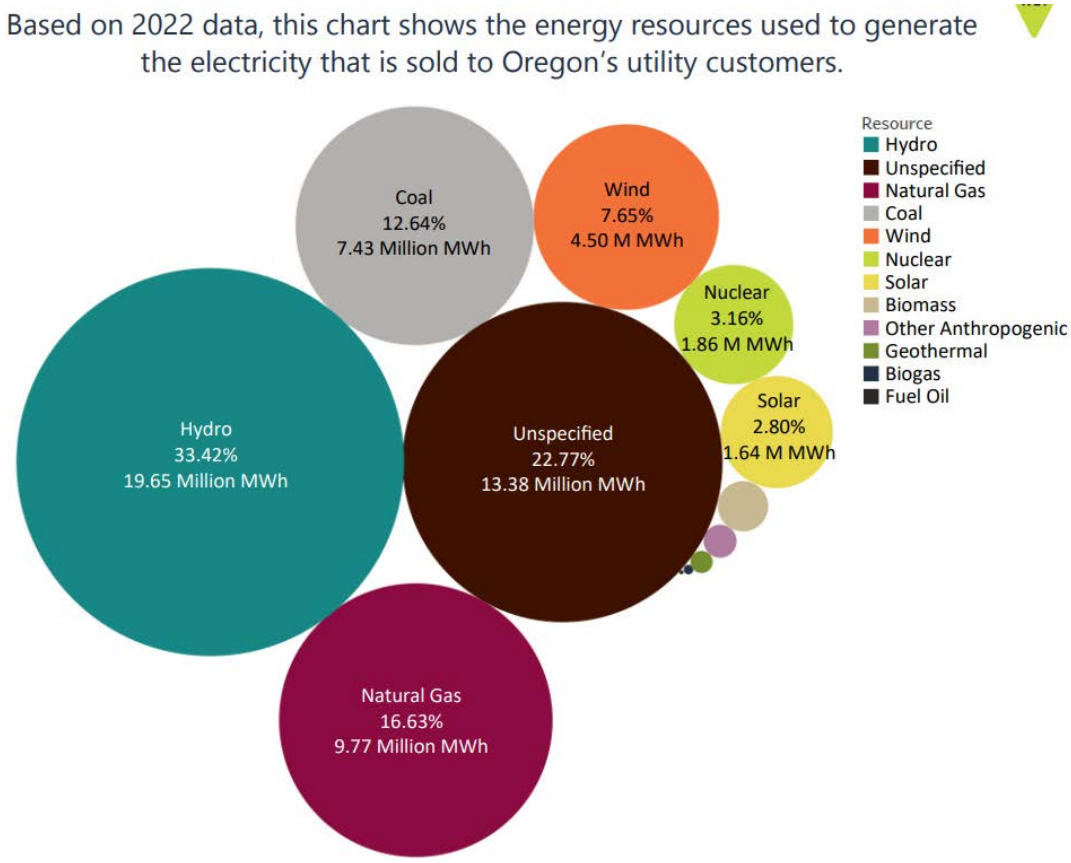
Oregon's 2016 Renewable Portfolio Standard (RPS) update requires that 50 percent of the electricity sold by Oregon's large utilities comes from eligible renewable resources by 2040. Oregon's 100 percent clean energy target established by House Bill 2021 in 2021 also requires the state's large investor-owned electric utilities to achieve a 100 percent reduction in the greenhouse gas emissions associated with their electricity mixes by 2040. House Bill 2021 established an emission-based clean energy requirement and therefore wouldn't necessarily require new renewable energy resources. Existing dams are eligible for the Oregon RPS if they are modified to be more efficient and produce more power, without increasing water flow through the dams. Existing hydropower facilities are also eligible for the Oregon RPS if they are certified as "low-impact hydro" by the Low-Impact Hydropower Institute. Certified low-impact hydropower facilities are facilities that meet science-based criteria for flow, water quality, fish passage, aquatic and riparian habitat, and cultural resource protection.

Conventional and renewable energy projects and infrastructure have the potential to impact both instream water quantity and quality. The state will need to understand how new renewable energy projects affect water resources and respond accordingly. Wind and solar generation facilities have minimal water needs, but new thermoelectric generation may be needed to supply electricity when wind and solar energy are not meeting demands. Energy storage advancements could reduce the need for new thermoelectric generation. Potential low carbon alternative

fuels such as hydrogen and biofuels may grow in demand and production to meet decarbonization targets. Production of these fuels requires the use of water and may lead to greater water demand from the energy sector.

Figure 3-6 Resources Used to Generate Oregon's Electricity

Source: Oregon Department of Energy 2024 Biennial Energy Report



Action 4A Analyze the Effects on Water from Energy Development Projects and Policies

Hydropower facilities at dams produce affordable energy, however, dam operations, including procedures for maximizing power production, alter streamflow amounts and timing to the detriment of fish and other aquatic wildlife and other instream needs. Reservoirs behind dams emit methane, a potent greenhouse gas. Statewide goals to reduce greenhouse gas emissions while meeting future energy demand elevates the need for improving efficiency of existing facilities and developing alternative energy projects. Proposed energy projects should undergo a thorough scientific analysis to understand potential impacts to instream and ecosystem needs. This information can then provide the basis for decision-making for often conflicting objectives to produce affordable, low emission power and protect aquatic ecosystems and other instream needs.

Municipal and privately-owned hydropower facilities, as well as those authorized by the Federal Energy Regulatory Commission, are reviewed and evaluated by a multi-state agency Hydroelectric Application Review Team (HART) established under ORS Chapter 543A. HART members develop a coordinated state position and provide required conditions and recommendations during reauthorization of existing projects to maintain, enhance, and protect the natural resources of Oregon from adverse impacts caused by the continued existence of a project. The state position includes, but is not limited to, decisions relating to the allocation of water, certification of water quality, and other state regulatory actions.

In June 2024, the federal government published a report titled Historic and Ongoing Impacts of Federal Dams on the Columbia River Basin Tribes. This report is significant because this is the first time the federal government has described the past and ongoing harm to Tribes in the region from the eleven federal dams on the Columbia River. This report highlights the conflict between building dams for energy production, water supply, or flood control and ecological and cultural harm that can have multi-generational impacts. The federal report omitted an acknowledgement that the Willamette Valley Project dams are also Columbia River dams, thereby ignoring the potential adverse impacts to the Willamette River and the Confederated Tribes of the Grand Ronde. The Confederated Tribes of the Grand Ronde are a Columbia River Basin Tribe per the Willamette Valley Treaty of 1855.

Action 4A
Analyze the Effects on Water from Energy Development Projects and Policies

Examples of how to implement this action:

- Analyze and project the water demand and water quality impacts of current and proposed energy development projects (e.g., hydroelectric, solar, wind, geothermal, bioenergy, nuclear, hydrogen, natural gas) in the context of climate change and greenhouse-gas reduction strategies
- Analyze the siting impacts of proposed energy projects on water quantity, quality, and ecosystems
- Evaluate where impacts to water quantity and quality associated with energy projects have been experienced, including environmental justice communities, and look for opportunities to recognize and avoid or mitigate in future energy projects

The Northwest Power and Conservation Council's Columbia River Basin Fish and Wildlife Program has designated certain river reaches as "protected areas," finding that new hydropower development in those areas would have unacceptable risks of loss to fish and wildlife.[23] Exemptions to this policy include adding hydroelectric facilities to already-existing non-hydroelectric dams or diversion structures. These projects must be designed to avoid and minimize potential impacts to fish, wildlife, and water quantity and quality.

Oregon has a need to analyze the impact of existing and potential energy development projects and policies on water quality, quantity, and ecosystems to inform an equitable climate future. Oregon's dam safety program, described in Action 7C, provides for periodic reviews of dams only related to safety for humans and property. Periodic reviews for hydrologic or ecological harms would require additional authority and resources for several agencies.

Non-dam energy projects, such as solar, wind, and geothermal, may also have water demands and siting-related hydrologic or ecological impacts. Actions to develop non-traditional hydroelectric power and projects that integrate water and energy savings are discussed in the following actions.

Action 4B Develop Non-Traditional Hydroelectric Power

There are several ways that existing infrastructure can support additional power generation. Existing hydroelectric dams can be modified to produce more energy, non-hydroelectric dams can be modified to produce power, and piped water distribution systems can be modified to include in-conduit energy production. Pumped storage systems are less frequently considered for existing infrastructure (e.g., occupying a brownfield site rather than developing a greenfield).

In-Conduit Hydroelectric Development

Irrigation and Municipal Distribution Systems - Oregon has an expedited review process for proposed hydroelectric projects at existing artificial delivery systems, such as within an irrigation district distribution system. The amount and timing of water diverted for an existing water use must remain unchanged (Oregon Revised Statutes 543.765). Holders of water right certificates, or decreed rights under these provisions may apply to install hydroelectric generation inside or at the end of existing transmission pipelines or conduits. The resulting

hydroelectric water rights certificate will include requirements for fish screens, by-pass devices, and fish passage, with some exceptions.

In 2013, the Oregon Legislature passed Senate Bill 837, requiring in-conduit hydro developers to install fish passage as required by the Oregon Department of Fish and Wildlife (ODFW), pay into a statewide fish passage restoration account that will fund fish passage at priority locations identified by ODFW, or seek an agreement, waiver, or an exemption.[24]

Action 4B
Develop Non-Traditional Hydroelectric Power

Examples of how to carry out this action:

- Utilize the state's expedited application process to develop hydroelectric projects at existing infrastructure
- Offer incentives for low-impact hydropower projects that provide local co-benefits, such as in-conduit micro-turbines installed in irrigation or municipal pipes
- Invest in alternative energy projects that protect water resources and the environment

Aquifer Storage and Recovery Wells - There are other in-conduit projects generating electricity as water is injected into aquifer storage and recovery wells. Aquifer storage and recovery projects at Madison Farms of Echo and the City of Pendleton also represent a non-traditional use of hydroelectric power.

Pumped Storage Systems

A pumped storage system consists of two reservoirs, one at a higher elevation than the other, where water moves from the upper reservoir to the lower reservoir to generate power when demand is high. Water is then pumped back up to the higher reservoir, using electricity, when pricing and demand is low, usually at night. Pumped storage systems can be coupled with solar or wind generation to optimize the timing of energy production and delivery. For example, excess electricity generated from a solar project during the day can provide power to pump water from a lower reservoir to an upper reservoir. At night, when the solar panels are not producing power, water from an upper reservoir can release water and generate power. Pumped storage systems can be considered both a power management tool and an energy storage device but notably consume more energy than they produce.

These systems require large amounts of land and very specific topographies to provide the needed elevation change between the two reservoirs. Such projects must be designed to avoid and minimize potential impacts to fish, wildlife, cultural resources, and water quantity and quality. Utilizing a brownfield, or previously developed land, may reduce the ecological footprint associated with this power generation technique. Pumped storage projects have the potential for environmental justice impacts and therefore need to include environmental justice communities early in the planning process.[25] The Federal Energy Regulatory Commission has licensed one pumped storage project in Oregon, and a number of pumped storage projects are currently being proposed.

Action 4C

Promote Water and Energy Savings

There are many options when selecting energy-efficiency and water efficiency techniques. Significant efficiencies could be realized from coordinating energy conservation and water conservation efforts.

Also see Action 10A for water efficiency and conservation resources.

Saving Water and Energy in Agriculture

Pumping and moving water, especially groundwater, can require significant energy for agriculture and businesses. Many of Oregon's farmers and ranchers have implemented energy efficiency projects, and a few have implemented renewable energy projects. Some of the most attractive projects are those that provide significant co-benefits, such as labor savings, water savings, and improved soil productivity. Irrigation efficiency and reduced or no-till cropping systems are some of the most popular types of multi-benefit projects. Farms often employ the use of efficient water application equipment, energy-saving pumps and motors, soil moisture monitoring programs, and precision fertilizer applications. Reducing the amount of groundwater used for irrigation can save significant energy. The deeper the well, the more power and energy is required to use the water.

Achieving greater efficiencies in water application, such as moving from gravity-powered systems to pumped systems, increases the demand for energy, driving up energy costs. This can be mitigated by using efficient water and energy efficient delivery, e.g., LEPA, LESA and using VFDs to control pumps. This increased energy cost may outweigh the water-use efficiency benefits and should be considered during the design of a project. Grants and incentives are offered by the U.S. Department of Agriculture and Energy Trust of Oregon to encourage installation of more energy efficient irrigation and renewables. A variety of measures are supported by public utilities, including the installation of freeze-resistant stock watering tanks and low-energy precision irrigation equipment.

Agrivoltaics – Agrivoltaic projects combine growing crops and energy production using solar voltaic panels. The Oregon State Extension Service has constructed a research study area at the North Willamette Research and Extension Center in Aurora, Oregon. According to Oregon State University's Sustainable Farm Agrivoltaic website, this approach may reduce the water demand by plants, providing solar panels shading them enough to limit evapotranspiration. The plants also provide a benefit to the solar panel efficiency by keeping them cooler, and thus more productive.

Oregon State University agrivoltaics test site. Credit: OSU

Saving Water and Energy at Municipal Utilities

Energy is needed to pump, treat, and deliver water to homes and businesses. For a municipality, the energy costs for managing water and wastewater can represent one-third of electricity costs. Water supply treatment plants, pump stations located throughout municipalities, and wastewater treatment plants all provide an opportunity for water and energy efficiency upgrades. Oregon Department of Environmental Quality's Clean Water State Revolving Fund program can finance wastewater, irrigation modernization, and other water quality projects that improve energy and/or water efficiency as "green" projects under U.S. Environmental Protection Agency (USEPA) guidelines.

The Oregon Association of Clean Water Agencies has actively partnered with its member agencies, providing training and best practices to drive down the use and cost of electricity in Oregon's wastewater treatment plants.[26] The association named the City of Gresham its outstanding member agency in 2015 for becoming a "net-zero energy" wastewater treatment plant. Gresham's activated sludge treatment plant generates all the power it needs to drive the wastewater plant through best-in-class energy conservation, a ground-mounted solar photovoltaic array, and co-generation engines driven in part by fats, oil, and grease collection. The city saves $500,000 annually on power bills, while generating $250,000 annually from fats, oil, and grease hauler tipping fees. Gresham is the first wastewater utility in the Pacific Northwest to reach net-zero energy status and one of only a handful in the United States.

Saving Water and Energy through Building Codes and Standards

Building codes and standards provide a basic starting point for water and energy savings in both residential and commercial buildings. Oregon has mandatory building codes in 11 different specialty areas, including plumbing (e.g., faucets, showerheads, urinals, and toilets) and residential energy efficiency.[27] To provide guidance to local jurisdictions on water conservation, the State of Oregon Building Codes Division approved Statewide Alternative Methods in 2008 for rainwater harvesting (applicable to both commercial and residential construction as well as potable and non-potable uses) and for the use of graywater for toilet flushing.[28] The Building Codes Division updated these Statewide Alternate Methods in 2017 and is also directed by Executive Order 17-20[29] to amend the code by October 1, 2025 to require water efficiency improvements in all newly constructed commercial buildings through standards for capture and safe reuse of water for irrigation purposes.

The Building Codes Division has also published a series of Oregon Smart Guides for consumers; two of those guides focus on rainwater harvesting and water conservation systems.[30]

The Oregon Department of Energy (ODOE) sets efficiency standards for certain products that must be met for those products to be sold or installed in Oregon. In 2021 the ODOE, in coordination with the Building Codes Division, completed rulemaking and subsequent legislation to establish efficiency standards for showerheads and faucets to require high-efficiency fixtures that align with the most efficient standards in the country and exceed WaterSense® fixture efficiencies.[31] The Building Codes Division's 2023 Oregon Specialty Plumbing Code adoption included updates to align with these standards.[32] In 2022, ODOE updated rules for demand-response capable water heaters and completed rulemaking to establish minimum standards for spray sprinkler bodies for residential irrigation sprinklers.

Saving Water and Energy in the Home

ENERGY STAR, a joint program of the USEPA and the U.S. Department of Energy, rates energy efficient products and practices to help consumers and businesses save money and energy on new purchases. Many qualifying appliances also reduce water use. Some utilities in Oregon offer incentives for installing ENERGY STAR appliances, some even offer incentives for premium water-heating technologies, such as tankless and heat pump water heaters, that help reduce the energy needed to heat water in the home.

Cross-Sector Coordination

Addressing the water-energy nexus cannot occur in isolation; the state must focus on cross-sector and cross-agency collaboration to develop solutions. Oregon's state agencies, working with their civic and industrial partners, should focus efforts on maximizing the efficient use of our water resources, particularly with respect to the generation of low-carbon electricity. Developing new partnerships between the water and energy sectors to better understand how energy is used in water services and how water is used in energy production is critically important.

Action 4C

Promote Strategies that Increase/Integrate Energy and Water Savings

Examples of how to carry out this action:

- Move toward energy independence and resiliency for publicly operated treatment works (wastewater treatment)
- Continue to implement and evaluate building codes that encourage water and energy efficiencies
- Encourage individuals, communities, industries, and businesses, including agriculture, to look for and integrate ways to conserve both energy and water
- Encourage cross-sector and cross-agency collaboration to achieve energy and water savings
- Strive to capture and publicly report energy and water savings data
- Promote resources that increase water and energy efficiency and conservation for irrigation
- Promote regenerative agriculture and permaculture practices
- Improve availability of cost savings associated with ENERGY STAR and similar programs to low-income or disadvantaged households and businesses
- Explore new or innovative technologies to accomplish energy and water savings
- Consider developing an energy/water nexus efficiency program that could support industrial water and energy intensive uses (e.g., data centers, paper mills)
- Increase interagency and energy/water sector collaboration, to identify co-benefits and opportunities for water efficiency (See Action 10A)

Critical Issue | Natural Hazards

Since the adoption of the first Strategy in 2012, Oregon has recorded its warmest year (2015), experienced the lowest snowpack on record (2015), had one of the most severe wildfire seasons (2020), and declared drought emergencies in 26 counties (2021). Recognizing that natural hazards or extreme events, such as drought, wildfires, floods, and earthquakes occur at great cost to society and the environment, Oregon communities must prepare themselves for these natural hazards. The negative impacts of such events can be far-reaching and may worsen already existing water challenges, such as water scarcity, water quality, and instream habitat conditions.

Oregon uses a natural hazard mitigation planning process to prepare for such events. Natural hazard mitigation focuses on identifying risk and taking actions to reduce potential impacts that a natural hazard might have on people, property, and the environment. Oregon has developed a Natural Hazards Mitigation Plan (NHMP) that addresses twelve hazards (coastal hazards, dam failure, drought, earthquakes, extreme heat, floods, landslides, tsunamis, volcanic hazards, wildfires, windstorms, and winter storms). The Oregon NHMP was last updated in 2020, is required to be updated and reapproved by the Federal Emergency Management Agency every five years to maintain eligibility for certain pre- and post-disaster funds, and has two primary parts: (1) risk assessment-characterizing each hazard, assessing probabilities, vulnerabilities, and describing risks; and (2) mitigation strategy - mitigation goals, a capability assessment, mitigation actions, and an implementation plan. Tribes may work directly with the Federal Emergency Management Agency to develop and update their own NHMP's. Cities, counties, and special districts create and update local NHMPs. Jurisdictions the Oregon Interagency Hazard Mitigation Team oversees provides expertise and information for Oregon NHMP updates. The Federal Emergency Management Agency began curtailing funding for these programs in 2025, leaving state and local partners to prepare for such events without assistance from their federal partners.

Public, private, Tribal, and non-profit organizations working together, as well as individuals who take personal responsibility for thorough preparation, will be critical for Oregon to withstand these extreme events. Key organizations play roles in mitigation, communication, response, and recovery. Their work will be to design resiliency into community and environmental planning, determine which communities, infrastructure, systems, and habitats are vulnerable, and document the economic, social, environmental, and other impacts of such events.

Action 5A Plan and Prepare for Drought and Wildfire Resiliency

Drought is a normal occurrence in Oregon, with notable droughts in the 1930s, 1976-77, 1992, 2001-02, 2012-2015, 2018, and 2020-2023 and 2025. The severity and frequency of drought has increased in recent years and climate change projections indicate this will continue. Precipitation and temperature are the main drivers of drought, and largely determine snowpack, soil moisture, and streamflow levels, which are commonly used as indicators of drought. In Oregon, many watersheds depend heavily on snowpack for annual water supply, and the timing of peak runoff from snowmelt is critical to providing water when and where it is needed most. Climate change predictions indicate that warm winters may be more common, with more precipitation falling as rain rather than as snow, leading to earlier runoff.

In the case of severe or multi-year droughts, soil moisture does not recover in time for the next growing season. Parched soils can absorb precipitation before it can become available to streams. Increased temperatures can lead to increased evaporation and fish die-off. Groundwater levels do not rebound, and refilling reservoirs can prove difficult. Fish populations may suffer loss of a year-class. These conditions can lead to limited water quality and quantity for fish, wildlife, livestock, drinking water, and crops. Warm summer temperatures can also cause changes in the timing of water supply and water quality issues (e.g., algae blooms and waterborne diseases), as well as shift fish distribution. Droughts are a slow-moving disaster where impacts develop over time, persisting even after the

rain and snow returns. Building drought resiliency in Oregon requires a portfolio of water management methods that are put into place long before the next drought arrives.

Defining Drought

As noted in Oregon's 2016 Drought Annex, a drought response plan within the state's emergency operations plan, droughts can generally be characterized by an increased demand or decreased supply of water.[33] In the early 1980s, researchers with the National Drought Mitigation Center (NDMC) and the National Center for Atmospheric Research located more than 150 published definitions of drought. To simplify analysis, the NDMC now provides five different ways in which drought can be defined.

- **Meteorological Drought** – Defined based on dryness, compared to some type of normal or average amount. Due to climatic differences, what might be considered drought in one location of the state may not be the same in a different location. The concept of a "snow drought" has emerged in recent years. Experiencing below average snowpack with above average precipitation has spurred the study of snow droughts.
- **Hydrological Drought** – Occurs when surface and subsurface water supplies are below normal, caused by shortfalls in precipitation, including snow. A hydrological drought usually lags behind a meteorological or agricultural drought. Low precipitation takes longer to show up in streamflow and groundwater, for example.
- **Agricultural Drought** – Occurs when the amount of moisture in the soil no longer meets the needs of a particular crop. This type of drought links together the various characteristics of meteorological (or hydrological) drought to agricultural impacts.
- **Socioeconomic Drought** – Occurs when physical water shortages begin to affect people and the supply of economic goods and services.
- **Ecological Drought** – Occurs when a prolonged and widespread deficit in available water supplies — including changes in natural and managed hydrology — creates multiple stresses across ecosystems.

Impacts of Drought

Drought impacts instream and out-of-stream uses in a variety of ways, requiring additional management actions. It is important to note that these impacts may affect communities and ecosystems disproportionately. Water insecurity is an environmental justice issue and can have health, environmental and economic impacts for communities.

Fisheries

- Restricted access to habitats, dry streams, lethal temperatures, fish die-offs
- Proliferation of parasites or bacterial disease
- Reduced access to fishing (curtailment by Oregon Department of Fish and Wildlife)

Drinking/Potable Water

- Dry domestic wells
- Increased outreach efforts by water suppliers to their customers
- Municipal water conservation and curtailment requests
- Reduced water quality (e.g., concentration of contaminants, harmful algal blooms)
- Reduced water available for firefighting

Recreation

- Reduced access to boating (waterskiing, paddling, kiteboarding, rowing etc.), fishing, hunting, skiing, swimming, diving, clamming, crabbing
- Economic impacts to tourism destinations
- Reduced access due to water quality (e.g., harmful algal blooms)

Agricultural

- Crop damage
- Reduced yields

- Stressed livestock and reduced ranching profit
- Fallow fields
- Soil erosion

Wildfires

- Loss of safety and human life
- Lost/damaged property
- Crop damage (e.g., viticulture)
- Economic losses associated with property damage/lossDamage to water supply systems (health and economic impacts)
- Damages from smoke (health and economic impacts)
- Destruction of terrestrial and aquatic ecosystems
- Displacement of fish and wildlife
- Loss of culturally important lands/water

Action 5A

Plan and Prepare for Drought and Wildfire Resiliency

Examples of how to implement this action:

- Implement Oregon's Natural Hazard Mitigation Plan and recommendations from the Drought Vulnerability Assessment
- Identify, assess, and assist those communities and ecosystems most vulnerable to drought and wildfire (e.g., assess water supply systems for vulnerability)
- Develop the appropriate set of indicators that signal and forecast differing stages of drought
- Document the economic, social, and environmental impacts of drought and wildfire, including the frequency, distribution, intensity and duration
- Prepare for, respond to, and mitigate for the impacts of drought and wildfire
- Improve the drought toolbox through education and outreach, drought contingency plans, more efficient water distribution systems, and additional voluntary measures to improve streamflow
- Increase education and outreach efforts to help landowners minimize risk to their property from wildfires
- Invest in built and green/natural infrastructure, (i.e.., nature-based solutions), refer to Actions 6B, 7A, 11A-11E
- Provide technical assistance and funding to local governments to evaluate the need and opportunities for inter-tie projects in Local Natural Hazards Mitigation Plans
- Prioritize resources for planning and preparation to those most vulnerable to drought and wildfire impacts
- Explore ways to protect minimum stream flows during drought declarations
- Educate the public about the importance of having an emergency supply of drinking water

A Closer Look at Drought Declarations

County-wide drought declarations go through a two-part process before securing a drought declaration from the Governor. First, County Commissions, Boards, or Courts meet to determine whether they need to request a Governor's declaration. Then these requests go to the Water Supply Availability Committee and Drought Readiness Council (co-chaired by the Office of Emergency Management and Water Resources Department (OWRD)) for review and recommendation to the Governor. The Drought Readiness Council is a standing body comprised of federal and state natural resource, public health, and emergency response agencies. The Governor can issue an Executive Order to declare drought—either independently or in response to a request by counties. In recent years, these Executive Orders have been set to expire at the end of a calendar year.

A Governor's drought declaration can trigger a number of requirements and water management tools not otherwise accessible. Declarations allow the Water Resources Commission to grant a temporary preference of use of water for human consumption and/or stock watering. Drought declarations also authorize the Water Resources Commission and Governor to require state agencies and local governments to develop and file water conservation and/or curtailment plans; the Governor may require the implementation of such plans. Finally, declarations allow the OWRD to use an expedited process in a number of water right areas, including the issuance of emergency drought permits for groundwater. Expedited processes do not weaken or allow loopholes to protective laws.

Drought declarations focus on managing human water needs but do not provide additional protections for instream flows or ecosystem needs. Additional work is needed to protect minimum stream flows during drought declarations.

Communities and businesses looking to offset drought-related losses often turn to the federal government, which can provide payments or emergency loans after a federally issued drought disaster designation by the Secretary of Agriculture. Federal drought funds generally cannot cover all losses suffered by producers, but they can help.

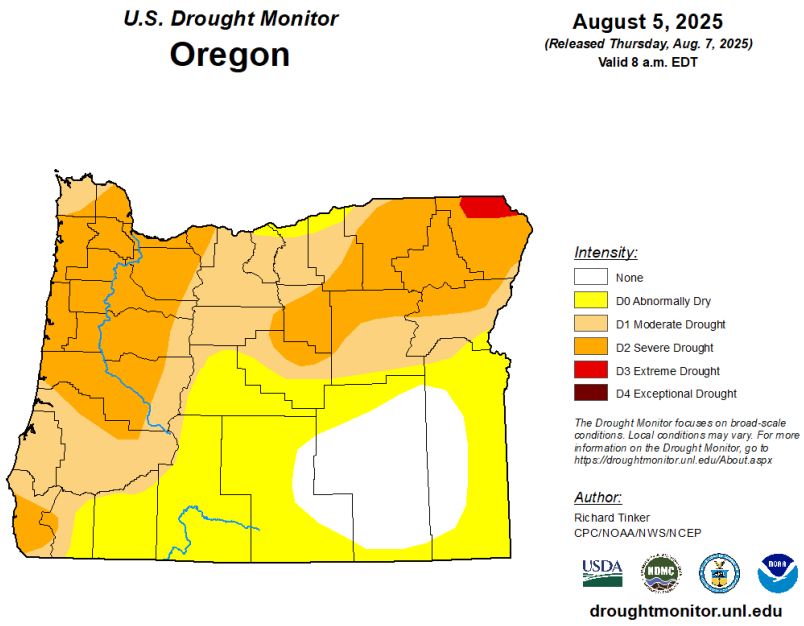
Drought Vulnerability Assessment

In 2023, the OWRD contracted with the National Drought Mitigation Center, the Oregon Climate Change Research Institute, and the University of Oregon to complete a statewide drought vulnerability assessment, addressing Recommendation B from the 2016 Task Force on Drought Emergency Response (HB 4113): "Provide resources for assessments of drought impacts, risks, and vulnerabilities on instream and out-of-stream sectors in order to better prepare for, respond to, and recover from drought," and part of the 2017 Strategy Recommended Action 5.5A: "Plan and Prepare for Drought Resiliency." The drought vulnerability assessment examines drought exposure, drought sensitivity, and adaptive capacity with a focus on drinking water supplies, agriculture, and water-dependent recreation. The final assessment is anticipated in 2025.

Drought Early Warning System

The National Integrated Drought Information System is a program authorized by Congress in 2006 to coordinate and integrate drought research and create a national drought early warning information system. These systems explore and demonstrate a variety of early warning and drought risk reduction strategies that incorporate drought monitoring and prediction information. The Pacific Northwest Drought Early Warning System (DEWS) includes Idaho, Oregon, Washington, the western portion of Montana that feeds into the Columbia River Basin, and British Columbia. The Pacific Northwest DEWS is a collaborative federal, Tribal, state, and local interagency effort to improve early warning capacity and resilience to drought in the region.

Figure 3-7: Drought Conditions Across Oregon on August 5 2025



Action 5B Plan and Prepare for Flood Events

This section focuses on the public safety and emergency nature of flooding. Other parts of the Strategy call for actions that can help protect and restore floodplains and reduce risk of flooding. Oregon's land use planning system, described below under "Land Use Planning", can be used to reduce risk to people and property. Floodplain protection and restoration is called for in Chapter 4 under "Healthy Ecosystems" Action 11A. Upgrading infrastructure and dam safety is discussed later in this chapter under "Water Infrastructure" Actions 7A and 7C. Statewide efforts to prepare and respond to floods are addressed in the Oregon Emergency Operations Flood Annex.

Oregon's mountain ranges are part of the reason there is tremendous variation in the types of flooding we experience. Although floods are a common natural hazard in Oregon, floods west of the Cascades tend to be large-scale events, while eastern Oregon typically experiences more localized, intensive events. Four main types of flooding described in Oregon's Natural Hazard Mitigation Plan include:

- **Riverine flooding –** This is the most common flood hazard in Oregon and usually occurs during winter. The most severe flooding conditions occur in "rain on snow" events, when heavy rainfall is augmented by rapid snowmelt. Longer duration storms and floods are more common in western Oregon. Very large and widespread floods occurred in parts of western Oregon in 1861, 1891, 1948, 1964, 1996 (three separate storms), and 2007.
- **Flash flooding –** Flash floods are caused by extremely intense rainfall over a short period of time, commonly within a single drainage. Such events usually occur in the summer during the thunderstorm season. In eastern Oregon, local convective thunderstorms often produce the most severe flooding. One of the worst flash floods in history occurred in eastern Oregon in June 1903, killing 247 people (one-fifth of the population at the time) in the town of Heppner.[34]
- **Coastal flooding –** Coastal floods result from different conditions. Winds generated by tropical storms or intense offshore low-pressure systems can drive ocean water inland, causing significant flooding.
- **Urban flooding –** Urban floods occur because land is converted from fields or woodlands to roads, roofs, and parking lots, losing its ability to absorb rainfall. This transition from pervious surfaces to impervious surfaces results in more and faster runoff of water. During periods of urban flooding, streets can become swift moving rivers, and basements can fill with water. Storm drains may back up with yard waste, causing additional nuisance flooding.

Dam and Levee Failure

In addition to the types of flooding described above, large precipitation events can also place stress on dams and levees. Dam or levee failures can cause catastrophic downstream flooding, risking both life and property. The Dam Safety Program, administered by the Water Resources Department (OWRD), works to evaluate the safety of dams. More information about the program can be found under Action 7C. Oregon does not currently have a statewide and state-led levee safety program. The establishment of such a program is called for in Action 7C and would provide increased public safety, increased resilience to climate change and natural disasters such as earthquakes.

Rain and rapid snowmelt caused severe flooding and eventual levee failure along the Silvies River in Harney County in the spring of 2025. The flooding caused damage to over 950 homes near Burns and on the Burns Paiute Indian Reservation and released untreated sewage into the river causing a public health crisis. Local officials knew for several years that the levee needed repairs, but much of the levee is located on private property which complicates maintenance and repairs.

Atmospheric Rivers

Atmospheric rivers are relatively long, narrow regions in the atmosphere – like rivers in the sky – that transport water vapor from the tropics. When atmospheric rivers make landfall, they often release this water vapor in the form of rain or snow. Although atmospheric rivers come in many shapes and sizes, those that contain the largest

amounts of water vapor and the strongest winds can bring extreme rain and floods, often by stalling over watersheds vulnerable to flooding. These events can disrupt travel, induce landslides or mudslides, and cause catastrophic damage to life and property.[35]

The OWRD is currently leading a project to analyze the extreme atmospheric river precipitation potential for Oregon. The first phase was completed in 2023, analyzing how extreme precipitation is influenced by ocean and air temperature, and other factors. The second phase, targeted for completion at the end of 2026, will provide an updated method and procedure for determining extreme precipitation in Oregon and guidance on how that precipitation could result in flooding. This project, once complete, will provide the Dam Safety Program with better information to evaluate the Probable Maximum Flood potential when assessing new and existing dams and ensuring proper design to prevent dam failures.

Understanding Oregon's Flood Risk

Like drought, Oregon should develop indicators of flood emergency stages that can be used as a planning, communication, and response tool. We know with reasonably high confidence that the frequency of extreme precipitation and flooding events are likely to increase around the state under a warming climate. Oregon does not have a consolidated assessment of past floods and their economic, social, and environmental impact and is one of only five states that lack up-to-date precipitation-frequency analysis prepared by the National Weather Service. Oregon also does not have a reliable extreme maximum flood document, which most other states have. Oregon should research how changes in land use, land cover, forest cover, and watersheds—including upstream impervious surfaces, geomorphology, logging, and forest fires—may change the location, strength or duration of floods, flood ways, and flood discharge. This information could be beneficial to local planning efforts.

Uncertainty in precipitation information coupled with climate change and possibly more extreme precipitation events has significant implications for the design and safety of water resources infrastructure. Oregon now relies mostly on information from 1973, with a very partial update completed in 2008. Better information, is needed to inform infrastructure upgrades or retrofits to avoid failure during a major flood and as a result, imperil public safety and property.

Flood Risk Mapping - Publicly available mapping educates Oregonians about their flood risk and helps inform future development to reduce flood risk. The Department of Land Conservation and Development (DLCD) supports the Oregon Explorer Hazards, an online web application that allows users to explore GIS data depicting natural hazards in the state. The Department of Geology and Mineral Industries (DOGAMI) has produced a Statewide Geohazards Viewer that shows 100-year flooding potential along with several other hazards.

DOGAMI has also produced a channel migration map that shows historic river or stream channels which can indicate locations prone to flooding. Channel migration is the process by which streams move laterally over time through a natural process of sediment erosion and deposition. While this change often occurs gradually (across decades or hundreds of years), significant channel migration can happen very rapidly during flood events. Although this is rare, streams can also "avulse" and shift to occupy a completely new channel during a flood. Damage due to channel migration and erosion often impacts roads, bridges, and levees and can cause landowners to lose land. It also can undermine houses, buried utility lines, septic tanks, and other types of infrastructure. Critically, the FEMA Flood Insurance Rate Maps do not consider the potential risk from channel migration and properties that are mapped outside the regulatory floodplain can be impacted with the river shifts. DOGAMI has been mapping channel migration zones in Oregon using available federal funding. However, they have only mapped a small fraction of the rivers in Oregon and many people remain unaware of this hazard. During the 2020 floods in Umatilla County, erosion heavily damaged some key roads and bridges which hindered evacuation efforts and has resulted in costly repairs.

There are also federal sources of flood mapping. The Federal Emergency Management Agency maintains and updates flood hazard data through regulatory flood maps.

Increased Risk Following Wildfires

Where forest fires have burned and changed land cover, updated precipitation frequency information can be used in hydrologic models to predict new flows in the watershed. After a wildfire, the charred ground repels rainwater, increasing the risk of flooding and debris flows for several years. Intense storms can lead to severe flooding and landslides, which threatens drinking water supply, degrades aquatic habitat, and even suffocates fish. Considering frequent drought and recent wildfires, state emergency managers recognize the need to be able to respond to these environmental stressors rapidly and responsibly.

The DLCD and DOGAMI are partnering on four Post-Fire Debris Flow risk reduction projects, with funding provided by the Federal Emergency Management Agency. The four projects are in areas impacted by the Eagle Creek Fire (2017), Beachie Creek and Lionshead Fires (2020), Holiday Farm Fire (2020), and Archie Creek Fire (2020).

Interagency Coordination

Dealing with floods and the potential for landslides requires interagency partnerships across multiple jurisdictions. Silver Jackets is a group of local, state, federal and Tribal agencies chaired by the U.S. Army Corps of Engineers and is focused on reducing the risk of flooding and other natural disasters. Most states have a Silver Jackets program, and Oregon's program focuses on flood preparedness, communication, and recovery. The Oregon Silver Jackets Team is a subcommittee under the State Interagency Hazard Mitigation Team. Oregon also has a Flood Core Team that is focused on updating the flood-related portion of Oregon's Emergency Operations Annex.

Local soil and water conservation districts work with the federal Natural Resources Conservation Service to provide technical and financial assistance to communities through the Emergency Watershed Protection Program. The program does not require a federal or state disaster declaration to provide assistance.

Action 5B

Plan and Prepare for Flood Events

Examples of how to implement this action:

- Implement Oregon's Natural Hazards Mitigation Plan
- Develop indicators of flood emergency stages, using information about meteorologic, hydrologic, hydraulic, and watershed conditions
- Document the economic, social, and environmental impacts of floods
- Evaluate potential for extreme flooding, under atmospheric rivers and climate change scenarios
- Establish early flood and debris-flow warning systems in areas where recent drought and wildfire have affected forests and vegetation
- Complete update of precipitation frequency estimates for Oregon
- Update methods and procedure for determining extreme precipitation and flooding
- Support DLCD to continue to provide assistance and training to local floodplain managers, property owners, surveyors, real estate agents, and other to support compliance with the National Flood Insurance Program
- Increase education and outreach efforts to help landowners minimize risk to their property from floods
- Invest in built and green/natural infrastructure (i.e., nature-based solutions), refer to Actions 6B, 7A, 11A-11E
- Prioritize resources for planning and preparation to those most vulnerable to flood impact
- Develop an inventory of levees in Oregon and assess their condition and risk (also see Action 7C)
- Support dam safety (also see Action 7C)
- Educate the public about the importance of having an emergency supply of drinking water

Action 5C

Plan and Prepare for a Cascadia Earthquake and Tsunami Event

Seismic activity in the state has been relatively low since the time of European settlement. Up until the mid-1980s, Oregon was not considered to be at high earthquake risk. Infrastructure built before 1980 was designed with criteria based on that seismic understanding. However, during the past 25 years geological analyses have led to a very different understanding of seismic risk in Oregon.

Statewide efforts to prepare and respond to earthquakes and tsunamis are each covered in separate Oregon Emergency Operations Annexes.

Earthquakes and Tsunamis in Oregon

The Oregon Department of Geology and Mineral Industries (DOGAMI) is the lead agency for earthquake hazards. DOGAMI has created maps that identify areas in selected Oregon communities that will suffer more damage, relative to other areas, during a damaging earthquake. A clearinghouse of tsunami information is also maintained by DOGAMI and includes information for coastal residents, visitors, planners, and scientists.

There are two major types of earthquakes that occur in Oregon: megathrust earthquakes that occur along the Cascadia Subduction Zone near the coast, and smaller crustal earthquakes. For the most part, crustal earthquakes occur on shore on much smaller fault systems. The two largest earthquakes in recent years occurred in Scotts Mills (magnitude 5.6) in March 1993 (known as "The Spring Break Quake") and six months later in Klamath Falls (magnitude 5.9 and magnitude 6.0), both of which were crustal earthquakes. The last major subduction zone (megathrust) earthquake and tsunami occurred more than 300 years ago in 1700.

Figure 3-8: Cascadia Subduction Zone

Source: Adapted from FEMA

A Cascadia Earthquake

The Cascadia Subduction Zone fault, shown in Figure 3-8, spans from Northern California to southern British Columbia and can produce earthquakes as large as magnitude 9.0 with corresponding tsunamis. Scientific evidence indicates that an earthquake of this size occurs along the fault on average once every 200 to 500 years.

The Cascadia Subduction Zone closely mirrors the subduction zone in northern Japan that produced the 2011 Tohoku earthquake. The incredibly destructive tsunami that resulted from the Tohoku earthquake should serve as a warning to Oregon.

When a Cascadia earthquake occurs, it will affect mostly western Oregon, and in particular, coastal communities. Following such an event, it is estimated that it will take one to three years to restore drinking water and sewer services in the coastal zone. A 2025 study by the National Academy of Sciences showed that an earthquake along the Cascadia fault could cause subsidence (sinking) of coastal land up to six feet which would increase the exposure of these areas to sea-level rise and flooding.[36]

Available studies estimate that a Cascadia earthquake and resulting tsunami could result in 1,250 to more than 10,000 fatalities, tens of thousands of buildings destroyed or damaged so extensively that they will require months to years of repair work, tens of thousands of displaced households, more than $30 billion in direct and indirect economic losses (close to one-fifth of Oregon's gross state product), and more than one million truckloads of debris.[37]

The Oregon Coastal Management Program is coordinating with coastal communities to help them prepare for a Cascadia Subduction Zone tsunami through land use planning. The Program, administered through the Department of Land Conservation and Development, has helped many coastal cities and counties create tsunami mapping, adopt Tsunami Hazard Overlay Zones, and develop Tsunami Evacuation Facility Improvement Plans.

2013 Oregon Resilience Plan

In 2013, the Oregon Seismic Safety Policy Advisory Commission published the Oregon Resilience Plan describing likely outcomes from a Cascadia Subduction Zone earthquake event. The plan notes that while we cannot predict when the next Cascadia earthquake will occur, we can calculate odds. Experts estimate the odds that a Cascadia earthquake will occur in the next 50 years range from 7 to 15 percent for a great (magnitude of 8.7 to 9.3) earthquake affecting the entire Pacific Northwest to about 37 percent for a very large (magnitude of 8.3 to 8.6) earthquake affecting southern Oregon and northern California. The likelihood and predicted consequences of a Cascadia event during our lifetimes are both so great that it is prudent to consider this type of earthquake when designing new structures or retrofit of existing structures, evaluating the seismic safety of existing structures, or planning emergency response and preparedness.

The Oregon Resilience Plan encompasses a set of short- and long-term recommendations regarding critical and essential structures, transportation, energy, information and communication, and water and wastewater systems:

- Begin aggressive public information efforts to re-set public expectations for a realistic response time. The old guideline of having a 72-hour emergency survival kit falls far short.
- Public agencies should be advised that the Oregon Water/Wastewater Agency Response Network is a vital resource and membership is recommended.
- Service providers from all sectors should be required to have a business continuity and seismic response plan that includes resources normally provided by functioning infrastructure (e.g., food, water, and communications).
- Service providers should plan for and support employee preparedness.
- Water-related industry associations and manufacturers should evaluate the need for seismic design standards for pipelines.
- Seismic vulnerability criteria should be incorporated into overall capital improvement project planning and asset management priorities, particularly updates to water system master plans.
- The Oregon Health Authority should be encouraged to include a seismic design requirement as part of routine design review of water system improvements.
- Encourage the Oregon Department of Environmental Quality and the Oregon Health Authority to establish goals and expectations for post-earthquake regulatory compliance and applicable standards. For example, will it be acceptable to discharge into waters of the state the chlorinated water from main breaks and main repairs?
- Encourage public health, water, and wastewater agencies to plan for significant water quality impacts to rivers downstream from urban areas.

The plan further describes the vulnerabilities facing our water delivery systems. These include numerous potential points of system failure at reservoirs, intakes, treatment plants, pump stations, and outfalls. Many materials are inflexible, joints are push-on, and pipelines may be prone to failure at connections to above-ground structures. Vulnerabilities also include interdependence with other potentially damaged systems, such as power, transportation, chemical, and financial industries. Water from leaks and breaks in water pipelines and private plumbing systems will

cause collateral damage, drain available water storage, and contribute to loss of water supply and pressure, which will in turn result in a loss of fire protection capability.

The performance of gravity sanitation and storm sewers depends on appropriate grades and slopes, which are disrupted by ground displacement associated with liquefaction. Liquefaction is when water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking. Because nearly all water and wastewater treatment plants are built near rivers, they are vulnerable to liquefaction and effective mitigation may require rebuilding these plants on more stable soils.

Earthquake Impacts to Water Wells

Earthquakes can cause structural damage to the integrity of a water well, cause a noticeable change in the appearance of water supplies, or may cause a change in the supply rate. The shaking associated with an earthquake can stir up sediments and cause drinking water to be cloudy and discolored. If visible structural damage is observed, the well produces cloudy water for an extended period of time, or if the well suddenly does not produce an adequate amount of water., then there may be serious damage to the well that will require the services of a groundwater professional.

Seismic Retrofits

Throughout Oregon, businesses and service providers are taking another look at critical infrastructure and undergoing seismic retrofits where feasible. Retrofits to roads, schools, and hospitals receive sizable sums of money from the Oregon Legislature. Water infrastructure in the agricultural, municipal, industrial, and domestic sectors also requires seismic upgrades, but have been less well funded. The Oregon Health Authority provides funding for seismic evaluations of water infrastructure and mitigation plans. Some dams, transmission lines, and treatment plants have received state or federal funding for seismic study and upgrade, although more work in this area is needed.

Understanding Risk from Hazardous Materials

Although some studies have been started, there is more work needed to understand how a major seismic event and subsequent tsunami will impact a wide range of hazardous materials being released into the air, land, and water. This includes but is not limited to liquid fuels, toxic materials and hazardous chemicals used in agricultural and industrial processes, and wastewater and sewage. The cumulative impact of these releases could pose a major risk to environmental and human health in the short and long run. Further study is needed to understand the extent and magnitude of risk, who it may impact, and how to mitigate the risk.

Action 5C

Plan and Prepare for a Cascadia Earthquake and Tsunamic Event

Examples of how to implement this action:

- Implement Oregon's Natural Hazard Mitigation Plan
- Follow the recommendations provided by the Oregon Seismic Safety Policy Advisory Commission, including in its 2013 Oregon Resilience Plan and 2021 Tsunami Resilience on the Oregon Coast Report
- Incorporate earthquake and tsunami resilience regulations in local land use plans (see model policies developed by DLCD)
- Evaluate and retrofit dams and other water infrastructure to meet new seismic standards (see Action 7C)
- See water infrastructure Actions 7A – 7C
- Consult or develop a local Tsunami Evacuation Facilities Improvement Plan
- Prioritize resources for planning and preparation to those most vulnerable to earthquake and tsunami impacts
- Evaluate and mitigate the seismic vulnerability of bulk oils or liquid fuel terminals (SB 1567, 2022) that pose significant pollution risks to critical waterways
- Educate the public about the importance of having an emergency supply of drinking water

Land and water are connected in many ways. Land use planning is a process to regulate the location of different types of land uses, restricting or promoting various land uses through zoning and permitting, to protect the environment, conserve resources, and support economic growth. This is an important step in determining how best to develop the land to protect the quantity and quality of our water resources. The statewide land use program and its implementation by cities and counties is an important framework for integrating water resource issues with land use and development decisions.

This section covers considerations and regulations for land use planning which is distinctly different from regulating land management. Land management practices including pollution management are addressed in Chapter 4, under "Clean Water" identifying ways in which urban, farm, and forest practices are regulated to protect water quality for humans and the environment.

Considering Oregon's projected changes in population, industrial, and commercial growth, communities need to adequately plan and prepare for meeting a larger demand on a shared resource. Water quality, water quantity, and ecosystems all need to be considered within the context of land use planning and development. Efforts aimed at directing development to appropriate areas and minimizing the impact of development can help meet statewide goals related to protection and use of water resources.

Plan for Changes in Land Use

Oregon's statewide land use planning program was designed to: foster livable and sustainable development; protect agricultural land, forest lands, and other natural resources; to conserve coastal and ocean resources; and to improve the well-being and prosperity of Oregon's citizens, businesses, and communities. Originating in 1973 under Senate Bill 100, the program positioned Oregon as a nationally recognized leader in the arena of land conservation and development.[38] Changes in land use in urban and rural areas can affect the function of forested lands, wetlands, riparian habitat, and other landscapes. When natural functions are impacted, there are consequences for our water resources.

Local Comprehensive Plans

Land use planning is a function that resides with local planners, local planning commissions, boards, and councils, all of which include a public process and oversight from the Oregon Department of Land Conservation and Development (DLCD). Local governments in Oregon are responsible for developing and implementing their own comprehensive land use plan that complies with the statewide planning goals, shown in Figure 3-9. The Land Conservation and Development Commission and the DLCD are responsible for reviewing city and county comprehensive plans for consistency with the Statewide Land Use Planning Goals.

When the Commission officially approves a local government's plan, the plan is said to be "acknowledged." Local governments adopt the plan, and it becomes the controlling document for land use in the area covered by that plan. Local governments develop code to implement the plan.

Figure 3-9: Oregon's Statewide Land Use Planning Goals

Oregon's Land Use Planning Goals	
Goal 1 – Citizen Involvement	Goal 11 – Public Facilities and Services
Goal 2 – Land Use Planning	Goal 12 – Transportation
Goal 3 – Agricultural Lands	Goal 13 – Energy Conservation
Goal 4 – Forest Lands	Goal 14 – Urbanization
Goal 5 – Natural Resources, Scenic & Historic Areas, and Open Spaces	Goal 15 – Willamette River Greenway
Goal 6 – Air, Water & Land Resources Quality	Goal 16 – Estuarine Resources
Goal 7 – Areas Subject to Natural Hazards	Goal 17 – Coastal Shorelands
Goal 8 – Recreational Needs	Goal 18 – Beaches & Dunes
Goal 9 – Economic Development	Goal 19 – Ocean Resources
Goal 10 – Housing	

Statewide Land Use Planning Goals - There are several statewide land use planning goals that are relevant to water resources, specifically Goals 3, 4, 5, 6, 7, 11, 16, 17, 18 and 19. Descriptions of all goals are available on the DLCD's website. Local governments coordinate with state agencies to ensure that land use decisions comply with statewide planning goals and local comprehensive plans as well as other applicable state regulations. This includes permit applications submitted by state agencies. State actions are needed to add detail to some of these goals. Specific needs are described below and included as example actions under Action 6A.

Goal 5 covers 13 resource categories, including wetlands, riparian areas, and groundwater resources. Goal 5 groundwater resources include critical groundwater areas and restrictively classified areas designated by the Oregon Water Resources Commission, and certain wellhead protection areas. Oregon Administrative Rules for Goal 5 set procedures for local governments to identify and protect "significant natural resources." Few local governments have completed planning for groundwater resources, particularly since completing the process for wellhead protection areas is not mandatory. Many communities have not updated their Goal 5 inventories since the 1980's or 1990's and therefore many important riparian, wetland, and wildlife habitat resources are not considered during the land use review process because they are not identified in the local plans. Resources are needed to support communities in updating their Goal 5 resource inventories.

Goal 7 directs local governments to adopt measures to reduce the risk to people and property from natural hazards, such as floods, landslides, earthquakes, tsunamis, coastal erosion, and wildfires. Protecting people and property from natural hazards requires knowledge, planning, coordination, and education. This goal directs jurisdictions to apply appropriate safeguards, such as hazard overlay area zones and review standards when planning for and authorizing new development. Good planning does not put buildings or people in harm's way. Planning, especially for the location of essential services like schools, hospitals, public utilities, fire and police stations, is done with sensitivity to the potential impact of nearby hazards. A local government addresses natural hazards in its comprehensive land use plan by adopting a natural hazard inventory and supporting plans and policies. A limited amount of planning grant money is available through the DLCD to help communities address these planning needs. The DLCD works with the Oregon Department of Geology and Mineral Industries, the Federal Emergency Management Agency, and others to help communities plan for natural hazards. With the reduction of federal funding for hazards planning, the burden falls to state and local agencies, in partnership with the private sector and community partners.

There is no implementing rule for Goal 7, so comprehensive plans have been acknowledged for consistency with the goal based solely on participation in the National Flood Insurance Program. Additional information about planning for natural hazards was provided in the previous section, Actions 5A-5C. Funding for local governments to conduct natural hazard inventories and Goal 7 rulemaking by the DLCD may help further protect people and the environment from natural hazards.

Goal 11 and its administrative rules require cities with populations greater than 2,500 to prepare public facilities plans addressing drinking water, wastewater disposal and treatment, and stormwater management needs. These plans focus on the costs and timing of infrastructure needs consistent with planned uses and coordination among providers within the jurisdiction. Funding the development and implementation of these plans can avoid water quality impacts associated with deteriorating infrastructure or systems operating beyond their design capacity.

Goal 16 directs the planning and management of Oregon's 39 estuaries. There is a critical need for dedicated investments to update estuary management plans. Updated plans will incorporate new information, improve coordination among jurisdictions and Tribes, and implement new or updated policies. Robust estuary management leads to community co-benefits such as flood reduction, improved water quality, increased recreation opportunities, and storm buffering.

Goal 17 sets planning and management requirements for lands bordering estuaries, coastal lakes, and the ocean shore. Activities and uses occurring adjacent to coastal waters directly and indirectly impact the water quality and quantity of those waters. Goal 17 is focused on the protection and management of resources unique to shoreland areas, among which are significant habitats and potential restoration or mitigation sites.

Goal 18 focuses on conserving and protecting Oregon's beach and dune resources, and on recognizing and reducing exposure to hazards in this dynamic environment. The goal includes a requirement for local governments to inventory beaches and dunes and their associated groundwater resources. Local governments and state agencies are required to conduct permit reviews to protect groundwater from drawdown which would lead to loss of stabilizing vegetation, loss of water quality, or intrusion of salt water into water supplies.

The coastal goals (Goals 16-19) and their implementation contribute significantly to the state's Coastal Nonpoint Pollution Control Program, see Chapter 4 Action 12C.

Periodic Review - Periodic review is a is a process for certain local governments in Oregon to examine and, as necessary, update their comprehensive land use plan and implementing codes. The process was once mandatory, but now is voluntary. The process is voluntary for two reasons. First, the process can be complicated and arduous as DLCD implemented it, leading the Legislature to remove the periodic review requirement for most counties and smaller cities. Second, in 2009 the Legislature eliminated technical assistance funding due to recession-related budget shortfalls. The DLCD decided not to require periodic review if the State of Oregon could not provide technical assistance funding to help them through the program.

The intent of periodic review is to make sure that local comprehensive plans respond to changes in local, regional, and state conditions, are coordinated with other comprehensive plans and investments, and are in compliance with statewide planning goals, statutes, and rules. Requirements for who must complete periodic review and which statewide goals are addressed have been scaled back to focus on economic development and housing needs and no longer includes Goal 5 Natural Resources, Scenic & Historic Areas, and Open Spaces.

Excluding Goal 5 resources from periodic review can have cumulative impacts on water resources and associated sensitive habitats. In addition to updating Goal 5 inventories (described above,) there is a need to encourage and support periodic review and updates to comprehensive land use plans to reflect current Goal 5 resources.

Plan for Population Changes in Oregon

Recent population projections indicate a slowing of statewide growth, compared with what Oregon has experienced in recent years. Oregon's Demographic and Population Outlook, published in March 2023 by the Oregon Office of Economic Analysis shows that Oregon's growth rate from 2020-2030 will be the lowest in recent history. This is due to an increase in deaths and rapid decline in births, with migration into the state providing for the only population increase. [39] Population changes will likely be experienced differently across the state, with some areas growing while

others decline. Some areas that experienced growth in population over the last decade were also areas with known water resources issues. Planning for future development must consider pressures on Oregon's water resources, in terms of both water quantity and water quality and impacts to the environment and ecosystems.

Each city and metropolitan area in Oregon has an urban growth boundary that separates urban land from rural land. The boundary contains a 20-year planning area for a city to plan to grow into considering the extension of public services, like water, sewer, and road networks, that will be required to serve future urban growth. By law, every city must maintain a long-term supply of buildable land in its urban growth boundary to accommodate anticipated economic and population growth. The development of public facilities plans (Goal 11), municipal water management and conservation plan (when required by the Water Resources Department), or a Water Master Plan (when required by Oregon Health Authority) can help a municipality plan for growth.

Oregon's statewide planning program discourages "sprawling" development, outside an urban growth boundary. However, rural development is permitted in existing rural residential, recreational, commercial, and industrial zones. Counties can rezone rural lands to allow more intensive development, provided the rezoning is consistent with standards set in state statutes and rules. Statewide Planning Goal 11 (public facilities) prohibits the extension of community sewerage systems and limits the extension of community drinking water systems outside an urban growth boundary. Availability of water and capacity for onsite sewage treatment to serve new development on rural lands is an important consideration.

Oregon Statute lists the land uses allowed on rural lands that are zoned primarily for commercial farm production. Allowable uses include several non-resource uses. Statewide Planning Goal 3 and DLCD rules implement statute. A similar structure exists for limiting new development on rural lands zoned primarily for commercial timber production. Statewide Planning Goal 4 and associated administrative rules provide standards for siting non-forest uses in forest zones. It is possible to rezone these Goal 3 and 4 lands to allow the subdivision of large lots for rural residential use. This process requires a "Goal exception." The standards that must be met for an exception to Goals 3 or 4 are high.

Rural lands with a "non-resource" designation (not in a farm or forest zone) exist in some counties. These lands can be made available for new rural development, provided natural resource functions, such as water quality and wildlife habitat, are preserved. Proposals to amend county zoning codes to allow rural residential development on non-resource lands have been more frequent over the past few years.

Another option available for developing new housing on rural lands is the destination resort siting process, described in statute and Statewide Planning Goal 8. Destination resorts are self-contained developments that provide visitor-oriented lodging and recreational facilities in a setting with high natural amenities. Destination resorts have significant infrastructure needs and potential water impacts.

Housing

The Oregon Legislature passed House Bill 2001 in 2023 to help communities meet the housing needs of Oregonians. The law establishes a new methodology to estimate and allocate housing needs for all communities in Oregon. The bill also requires many cities and Metro counties to take local actions that promote housing production, affordability, and choice. Jurisdictions will periodically assess whether there is enough land to accommodate needed housing. They will also maintain a Housing Production Strategy, which identifies actions to meet their housing needs. The DLCD is responsible for integrating House Bill 2001 policies into Oregon Administrative Rules.

The bill established the Housing Acceleration Program. The program will support cities that fall behind their assigned housing production target. For cities that need to accelerate housing production, the DLCD will identify state and local barriers to production and work with local governments to remove these barriers. Water availability is expected to be a barrier in regions where water supplies are limited. Meeting housing needs may require some cities

to implement strategies that reduce per capita water demand. A Water Management and Conservation Plan can help a community manage water efficiently and allow for stewardship of our limited water resources.

Action 6A Integrate Water Information and Land Use Planning

Local government land use planners do not always have the tools or information needed to assess the positive or negative effects of their long-term planning decisions on water resources. The need to better integrate water management and land use planning is not a challenge unique to Oregon. Other states have addressed the lack of decision-making tools or information with:

- Laws and policies that require coordination through certain approval processes
- Financial incentives that link land use development proposals to beneficial water management strategies or projects (e.g., incentives for green infrastructure, see Action 6B)
- Training sessions and workshops where land use planners and water management staff interact
- Requirements for consultation with water agencies during updates to land use plans

How Local Governments Utilize State or Federal Agency Information

Local governments need access to information collected by state and federal agencies. Below are several examples of information or agency programs that support local land using planning.

Natural Resource Information - To protect and plan for Goal 5 resources, local governments may utilize data from the Oregon Department of Forestry's stream classification maps, Oregon Department of Fish and Wildlife's fish and wildlife distribution maps, local, state, and federal wetland inventories, and the Federal Emergency Management Agency's floodplain maps.

Source Water Assessments -The Oregon Department of Environmental Quality (ODEQ) and Oregon Health Authority (OHA) have developed source water assessments for most federally regulated public water systems in Oregon. These assessments provide community officials with detailed information on the watershed or recharge area that supplies their well, spring, or surface water intake and identifies potential risks within the source area. Water systems and local communities can use the information in the assessment reports to voluntarily develop drinking water protection strategies and plans to address short- to long-term drinking water source protection challenges. The Drinking Water Source Protection Program provides technical assistance to water systems and communities to identify and cultivate partnerships, develop projects, locate potential funding sources, and access technical assistance resources. Both DEQ and OHA maintain robust web pages with extensive resources for Source Water Protection. Go to DEQ's Drinking Water Source Protection website and OHA's Drinking Water Source Protection Program website to access these resources and find direct contact information.

Existing and Future Land Uses - Municipalities consider water rights and their capacity to produce and distribute drinking water for uses within incorporated cities and districts. Access to existing land use data and future land use projections helps municipalities make critical water infrastructure investments to preserve and accommodate future demands.

Demographic Information - Population and employment forecasts are of interest to municipalities when estimating water demands for residential, industrial, and other uses. Individual studies conducted to evaluate land use requests, particularly to show that there is an adequate supply of groundwater for a proposed urban use, are frequently completed. The Portland State University Population Research Center produces county and urban growth boundary population projections, which are funded by the Department of Land Conservation and Development (DLCD).

Rural Water Supply - Oregon's land use laws provide opportunities for counties to consider the appropriate level of rural development in areas that are not zoned for "resource" (i.e., farm or forest) use and to study whether new areas for development should be designated. Since rural development typically relies on wells, counties need data on the availability of groundwater early in the planning process to make informed decisions on what density of development to permit in rural development zones.

Stormwater Management – Local urban governments have many potential permitting relationships with the ODEQ associated with stormwater. The ODEQ can identify certain federal, state, and local governments and agencies, including cities, counties, and special districts as a Designated Management Agency, with authority to manage and regulate water pollution listed in a Total Maximum Daily Load (TMDL) plan. Municipalities may also hold a Municipal Separate Storm Sewer System (MS4) permit. A MS4 is a conveyance or system of conveyances, such as roads with drainage systems, municipal streets, catch basins, curbs, gutters, constructed channels or storm drains, owned or operated by a governmental entity that discharges to waters of the state.

Underground Injection Control systems (UICs) are a way to legally, through permit, emplace water (e.g., stormwater, remediation fluids, low-temperature geothermal return water) below ground. UICs often consist of a concrete structure (e.g., drywell), placed below ground that receives stormwater and then slowly releases it over time. The UIC program is managed by the ODEQ and intended to prevent the contamination of groundwater. UIC locations are available to local governments and the public on a web-based map application. A user can enter an address or a latitude and longitude and check if there are permitted UICs at or near that location.

Data Gaps

There are areas where data is lacking and improvements can be made to connect land use planning and water resources planning. Of primary concern, local land use decision makers need more information about groundwater quality and availability at specific locations, as well as the groundwater quality vulnerability and long-term ability of local aquifers to yield water, when making decisions about appropriate locations for development, particularly in those rural areas already designated as Groundwater Administrative Areas or Groundwater Quality Management Area. Available groundwater information tends to be either too broad (based on regional studies) or too narrow (based on specific project sites) to help with land use planning decisions. Refer to Strategy Action 1B, calling for additional groundwater basin studies, for a list of priority basins that will be studied in the coming years.

The land use planning program at the DLCD needs accurate geographic information regarding water rights and district boundaries to better support local governments.

Land use decision makers also need better information about the cumulative impacts of development on water quantity and quality, to comprehensively plan land uses. Municipalities need information related to natural resources to support preservation and better information about the carrying capacity of land to absorb and/or mitigate stormwater and onsite wastewater disposal.

Action 6A

Improve Integration of Water Information and Land Use Planning

Examples of how to implement this action:

- Protect natural water bodies in the course of land use decisions, such as wetlands, estuaries, groundwater aquifers, rivers, and lakes
- Update land use protections for water bodies incorporating best available data
- Integrate regulation of water master plans with local comprehensive land use plans to sustainably support municipalities' development
- Make accurate geographic information on water rights and district boundaries available to local governments and DLCD
- Support local governments to perform periodic review of their comprehensive plans
- Update Goal 5 resource inventories in local comprehensive plans (e.g., riparian areas, wetlands)
- Develop and share information with local governments regarding the location, quantity, and quality of water resources for use in land use decisions; consider mechanisms for increasing access to water data such as through the Oregon Water Data Portal
- Improve coordination, technical guidance, and assistance to local governments for land use decisions that rely on water availability or could have negative impacts to water quality
- Take next steps to implement land use goals related to water resources: establish implementing rules, support local governments to update acknowledged plans, and the application of appropriate safeguards during permitting
- Build partnerships with state agencies and local governments to share land use information
- Increase resources for local governments to update their natural hazard inventories (Goal 7)
- Increase resources for local governments to update their facilities plans (Goal 11)
- Work towards achieving a statewide dataset of tax lots (identified as a priority by DAS)
- Update State Agency Coordination Programs and associated rules (see Action 9D)
- Include environmental and social justice information in land use planning

Action 6B Encourage Low Impact Development Practices and Green Infrastructure

Runoff from urbanized lands and impervious surfaces such as paved streets, parking lots, and building rooftops during rainfall and snow events often contain pollutants that negatively affect water quality. This polluted runoff commonly includes heavy metals, pesticides and fertilizers, oil and grease, bacteria, sediment, and other urban pollutants (e.g., 6PPD-quinone, PFAS) that impair human health and aquatic habitat. Urban runoff is a major source of degraded surface water quality and can also contaminate groundwater. In addition to pollution, the increased amount and timing of runoff from urban areas can have negative impacts on receiving streams. Action 6B focuses on incorporating stormwater management into planning and development. See Actions 7A, 11A, 12A-12C for additional ways to manage point and non-point sources of pollution.

Green infrastructure provides a way to manage stormwater and protect water quality and ecosystem health. MS4 permits, described under Action 6A, also encourage the use of low impact development and green infrastructure. "Green infrastructure" is defined by Oregon statute (ORS 550.160) to include both engineered stormwater practices (e.g., green roofs) as well as natural areas. Green infrastructure includes infrastructure adapted to wet weather management that:

- Infiltrates, evapotranspirates, captures and reuses stormwater to maintain or restore natural hydrology
- Protects or restores natural landscapes
- Rain gardens, porous pavements, green roofs, infiltration planters, trees, tree boxes, bioswales, or other green infrastructure strategies, or
- Harvests rainwater from an artificial impervious surface for non-potable uses, including landscape irrigation or toilet flushing

Low Impact Development (LID) uses techniques such as green infrastructure to manage stormwater quantity and quality close to its source. Green infrastructure, such as bioswales, rain gardens, large trees, or vegetated roofs mimic natural processes to intercept, infiltrate, evapotranspirate, or retain stormwater or runoff on the site where it is generated. The goal is to treat stormwater runoff at its source before it reaches the storm sewer system, reducing stormwater infrastructure maintenance, and reducing downstream impacts to receiving streams.

Effective LID must be incorporated at the beginning of the project, during site analysis and planning. Site topography, soils, and previous development status (e.g., brownfield) can guide the design for specific LID strategies. LID and green infrastructure support climate mitigation, adaptation, and resiliency strategies.

The Department of Land Conservation and Development (DLCD) is positioned to play an important role in promoting the use of green infrastructure. House Bill 3409 (2023) established a Community Green Infrastructure Fund, directing the DLCD to provide grants for community green infrastructure projects, and for the development and implementation of green infrastructure master plans. Green infrastructure plans must provide social, environmental, or economic benefits to an environmental justice community and be developed in coordination with that community.

Action 6B
Encourage Low Impact Development Practices and Green Infrastructure

Examples of how to implement this action:

- Continue to compile and provide online information on low impact development best practices
- Support updates to local development codes, improving local capacity to review and permit low impact development and green infrastructure designs
- Encourage communities to consider natural infrastructure in lieu of, or as a complement to, built infrastructure
- Consider how and where co-benefits of natural/green infrastructure will occur, including flood abatement, clean drinking water, lower water/wastewater utility rates, educational opportunities, and climate resilience
- Implement the Green Infrastructure Grant Program

Green Infrastructure - Defined in Oregon Statute

Oregon Revised Statute 197.469	Oregon Revised Statute 550.160
(a) Green infrastructure as defined in ORS 550.160; or	(5) "Green infrastructure" means infrastructure adapted to wet weather management that:
(b) Infrastructure that:	(a) Infiltrates, evapotranspires, captures and reuses storm water to maintain or restore natural hydrology;
(A) Mimics natural systems, or enables natural systems to be less stressed through water conservation, water protection or ecosystem restoration, at the neighborhood or site scale as part of an integrated approach in residential, municipal or industrial developments or water infrastructure; and	(b) Protects or restores natural landscapes;
(B) Implements community-based concepts, principles and practices to conserve and manage resources for future generations, sequester carbon and provide environmental and social benefits.	(c) Uses rain gardens, porous pavements, green roofs, infiltration planters, trees, tree boxes, bioswales or other green infrastructure strategies; or
	(d) Harvests rain water from an artificial impervious surface for nonpotable uses, including landscape irrigation and toilet flushing.

Emerging Stormwater Contaminant 6PPD-Quinone

Vehicle tires contain the chemical known as 6PPD to prevent tires from breaking down. When 6PPD reacts with ozone in the air, it forms 6PPD-quinone (6PPD-q), a substance found to be highly toxic to coho salmon and other aquatic organisms.[40] Tires break down through contact with roads and release particles into the environment. Stormwater from roads and parking lots wash the tire particles into streams and other water bodies, exposing fish and other organisms to this substance. Little is currently known about the human health effects of 6PPD-q. Salmon have cultural, commercial, and ecological importance and healthy populations are critical to the health and well-being of Tribes and their ability to practice Tribal Treaty Rights. Federal and state agencies and other partners are advancing research about possible stormwater treatment approaches including engineered green infrastructure systems.

The Department of Environmental Quality, Department of Fish and Wildlife, and city and county representives have formed a work group to investigate and study the scope of impacts of 6PPD-q in Oregon and search for policy solutions and effective control measures, including investigating the applicability of pervious pavement and other filtration techniques. The work group presented to the Fish and Wildlife Commission in 2025 and is considering practical measures to reduce the amount of this contaminant entering waterways.

Critical Issue | Water Infrastructure

Built and green (i.e., natural) infrastructure (also see Action 6B) used to store, transport, distribute, disperse, collect, and treat water is an important, but often overlooked, piece of our collective water management and stewardship responsibilities. Maintenance of our built water and wastewater infrastructure is critical for maximizing equipment longevity and minimizing the risk to water resources from equipment failures. Ensuring that Oregon's built and green infrastructure is well maintained and functioning is important for a variety of public health and safety reasons and protecting ecosystems, but also for meeting our state's economic needs.

It takes an extensive system of pumps, pipes, treatment, and storage facilities to deliver water to our homes, businesses, and fields every day. Built water infrastructure includes storage, drinking water, stormwater, irrigation-related, and wastewater treatment infrastructure. Natural areas, including forests, floodplains, and rivers, provide valuable storage, flood abatement, climate resiliency, climate mitigation, and water quality benefits while also providing important habitat for fish and wildlife.

Examples of built water infrastructure include:

- Storage facilities, e.g., dams and reservoirs
- Levees
- Wells
- Municipal/community drinking water treatment systems
- Canals and pipelines
- Pumps and pumping stations
- Headgates, headworks, and valves
- Spillways, siphons, drains, penstocks, and transmission lines
- Telemetry systems
- Measurement devices
- Fish screens and fish passage facilities
- Drainage pumps, ditches, and tiles
- Municipal/community wastewater treatment systems
- Fish screens and fish passage facilities
- Drainage pumps, ditches, and tiles
  Municipal/community wastewater treatment systems
- Stormwater conveyance and treatment systems
- Septic systems
- Tidegates

Examples of green/natural water infrastructure include:

- Rivers and streams
- Floodplains
- Riparian vegetation
- Wetlands and estuaries
- Meadows
- Forests
- Coastal areas
- Parks
- Urban elements like bioswales, green roofs, street trees, and lawns/gardens
- Soil saving practices (e.g., terraces, dikes, retention dams)

Action 7A

Maintain, Upgrade, or Decommission Water Infrastructure

Built and green infrastructure both require ongoing management and maintenance. Climate change and associated changes in weather patterns have new implications for infrastructure. Built infrastructure may need to be upgraded to improve resiliency, also providing an opportunity to improve fish passage (Action 11C), and improve water and energy efficiency and water conservation (Actions 4C and 10A). When wells, dams, or levees have significantly deteriorated, the costs of repair may exceed the expected benefits, and proper decommissioning and removal may be a less expensive and more environmentally beneficial alternative.

Protect and Enhance Green Infrastructure

Built infrastructure, such as pipes, tanks, dams, reservoirs, and wastewater treatment plants, are constructed by humans to accomplish a water management objective such as flood control, conveyance, storage, and treatment. In contrast, green infrastructure can meet an infrastructure need, but using a naturally occurring feature (e.g., floodplain, forest, wetland) or created or enhanced natural feature (e.g., constructed wetland) to provide multiple benefits for humans and the environment. Investing in green infrastructure projects helps communities adapt to and mitigate for climate change. There is overlap between this action and Action 11A, to protect and enhance the green infrastructure that provides valuable ecosystem functions and can sometimes reduce our reliance on built infrastructure to accomplish a similar function. For example, it can be more cost effective to enhance riparian vegetation to cool water rather than construct infrastructure to accomplish the same task.

> "We can modernize our flood protection infrastructure where appropriate, while fully incorporating the benefits of natural infrastructure and ecosystems. Combined, these will help mitigate impacts of increased flooding and drought, while reducing the impacts of sea level rise to coastal communities."
>
> -100-Year Water Vision (2020)

Green infrastructure can provide co-benefits such as flood abatement, clean drinking water, lower water/wastewater utility rates, educational opportunities, and climate resilience. Green infrastructure projects should be located to benefit environmental justice communities.

Plans Guiding Built Infrastructure Investments

Various planning documents prepared by cities, counties, utilities, or districts can help identify upcoming infrastructure investment needs.

Public Facilities Plans - Discussed under the critical issue "Land Use Planning," Statewide Planning Goal 11 and its administrative rules require cities with populations greater than 2,500 to prepare public facilities plans addressing drinking water, wastewater disposal and treatment, and stormwater management needs. These plans focus on the costs and timing of infrastructure needs and coordination among providers within the jurisdiction. Funding the development and implementation of these plans can avoid water quality impacts associated with deteriorating infrastructure or systems operating above their design capacity.

Water Master Plans – Oregon Health Authority requires existing and new community public water systems with 300 or more connections to develop a water master plan. The master plan considers a 20-year period and includes extensive system information including present and future system deficiencies, alternatives to address deficiencies, implementation schedule, and a financing program for construction. Business Oregon provides funding to help community systems prepare their water master plans and offers grant and loan programs to finance system improvements.

Wastewater Facility Plans – Failing wastewater systems increase the risk of contamination of both surface water and groundwater and can be a public health hazard. A wastewater facility plan presents alternatives to meet a community's wastewater needs and is often required when seeking funding for improvements. The Oregon

Department of Environmental Quality (ODEQ) must review wastewater plans at least every five years. Business Oregon provides support for developing wastewater facility plans and financing system improvements.

Support Irrigation Infrastructure Modernization

Irrigation infrastructure is used throughout Oregon, from small-scale to large-scale applications. Oregon is home to many irrigation districts, water control districts, drainage districts and water improvement districts which manage the distribution of irrigation water. In central and eastern Oregon, these districts often utilize manmade canals or flumes to convey and distribute water. Water losses often occur in unlined canals through porous soils, and evaporative losses occur from the water surface from both canals and flumes. In the last twenty years, irrigation districts have been implementing projects to pipe their distribution canals to reduce these losses. In cases where the applicant is going through the Allocation of Conserved Water Program at the Water Resources Department (OWRD), and a state or federal funding source is used to finance a portion of the piping, pursuant to statute and rule the minimum of 25% of the conserved water must be allocated to the State to remain instream. Some piping projects in Central Oregon have resulted significant flows permanently protected instream with water rights dating back to the 1800's.

There is a need to continue supporting irrigation modernization projects that lead to water conservation and benefit agriculture as well as fish and wildlife. Irrigation modernization grant programs at the Oregon Watershed Enhancement Board and OWRD are just two examples of funding sources that help finance irrigation infrastructure improvements.

Support Oregon's Well Construction Program

Oregon's well construction standards are designed to protect groundwater resources and the public by preventing contamination, waste, and loss of artesian pressure. With several thousand wells drilled each year, state agency oversight and inspection is critical to ensure wells are constructed using proper methods, materials, and equipment. The OWRD has made important efforts to modernize policies and procedures for well construction to provide more timely well inspections and better protection of the groundwater resources (House Bill 2145, 2021).

Homeowners with old, unused, neglected, or poorly maintained wells should contact the OWRD for information regarding the proper methods of decommissioning their wells.

The Water Well Abandonment, Repair, and Replacement Fund (WARRF), established by House Bill 2145 in 2021 authorized the OWRD to provide financial assistance to low- or moderate-income households where the well has gone dry or is no longer able to provide sufficient water for household use. The Special Legislative Session in December 2023 modified the focus of the fund to prioritize financial assistance to those domestic wells in areas recently impacted by drought or wildfire. In 2023, House Bill 2010 revised WARRF again to include eligibility for wells with contamination levels that exceed drinking water standards. As of July 2025, WARRF provided funding that restored water to 233 homes located within 17 counties across Oregon.

Dam Safety and Decommissioning

Oregon has a dam safety program, described in detail in Action 7C. Dams that are at the end of their useful life, pose a public safety risk, or no longer serve their intended purpose, may need to be removed. Dam removal projects should be coupled with ecological restoration activities to restore hydraulic and ecological function. The Department of Fish and Wildlife has identified priority artificial barriers across the state and is actively pursuing restoring fish passage at sites that maximize the return of native migratory fish to critical habitats, as described in Action 11D.

Action 7A

Maintain, Upgrade, or Decommission Water Infrastructure

Examples of how to carry out this action:

- Provide timely inspection of well construction, review of well logs, and educate drillers and pump installers to ensure construction standards are met
- Inventory, inspect, and make safety improvements to levees, accounting for future conditions associated with climate change
- Properly decommission infrastructure, such as a well, culvert, levee, or dam, at the end of its useful life
- Upgrade infrastructure to improve water and energy efficiency and conservation (e.g., pipe irrigation canals, leak detection and repair in municipal water distribution systems)
- Provide funding for planning, design, and construction of point source and nonpoint source water pollution control projects to upgrade infrastructure systems, protect, restore, and improve water quality
- Provide funding for projects based on USEPA "green" project eligibility
- Incorporate equity and community vulnerability assessments into infrastructure planning to inform strategies for repair, replacement, and funding infrastructure improvements
- Assess additional locations where levee accreditation could help lower floodplain insurance costs for low-income households and improve flood protection for vulnerable communities
- Continue to support the OWRD Well Abandonment, Repair, and Replacement Fund to provide financial assistance to low to moderate income individual households or members of federally recognized tribes in Oregon
- Incorporate environmental justice considerations in targeting funding and resources for water infrastructure improvements in underserved communities
- Support water and wastewater infrastructure investments that prioritize (efficient) infill development, provision of affordable housing, and jobs within walkable service areas

Improve Oregon's Levees

Levees are used around the country to protect low lying areas from river flooding, coastal flooding, and other floods that are intensified by high tides. Levees are very similar to embankment dams, in that they are generally constructed of local soils and intended to retain water without leakage or overtopping. Levees can affect riparian and floodplain functions and only provide flood protection if they are of sufficient height and stability. Even then, levees must be monitored during flooding, to identify and immediately address leakage and overtopping. Levee failure in some cases can be catastrophic, as was the case when a levee adjacent to the Columbia River failed, killing 15 people and destroying the City of Vanport in 1948. At the time, it was the second largest city in Oregon and the largest public housing project in the nation.

The U.S. Army Corps of Engineers (USACE) sponsors and certifies a portion of the levees in Oregon. The USACE keeps an inventory of those levees it sponsors and certifies. In exchange for assistance with inspections and emergency response, owners of those levees are required to maintain them to federal standards. These levees are well inventoried, regularly inspected and have a reasonable margin of safety. The USACE is not routinely involved in levees constructed to manage coastal (tide related) flooding. There are other levees in Oregon that have not been maintained to federal standards, nor are they part of the USACE certification program. Many of these levees have not been inventoried which means the condition and ownership status is unknown. Based on information from the USACE, there could be nearly 2000 levees that are not in their inventory.

The Department of Geology and Mineral Industries has compiled a dataset of levee-like features throughout parts of the Willamette Valley and the Oregon Coast. The dataset is a starting point for developing a geospatial inventory of levees. There are many structures in the inventory that are not levees and the inventory needs to be further refined. A geospatial inventory of levees is an important resource for assessing flood risk, flood mitigation planning, and for emergency response during flood events. It also benefits ecological restoration efforts by helping locate levees to

remove or breach to expand habitat for aquatic species. The 2021-2023 legislative session authorized $10 million to Business Oregon for levee grant funding available to provide financial assistance for levee projects that result in improvement, expansion, or repair of levees, flood control facilities, or flood control embankments.

New Standards for Levee Certification – Levees must be accredited to be recognized in the Federal Emergency Management Agency's flood insurance program. An accredited designation means that a levee is built and maintained to protect against a one-percent-annual-chance flood event, commonly known as the 100-year flood. To achieve accreditation, a professional engineer must certify the levee. Levee failures resulting from Hurricane Katrina (2005) spurred the U.S. Army Corps of Engineers to re-evaluate their levee inspection and certification program. New evaluation standards were established in 2012 for all levee certifications, including those that were previously completed.

Given the large number of un-accredited levees and public safety risk, Oregon should establish a levee safety program (like its Dam Safety Program), see Action 7C.

Wildfire Damage and Public Health Risk

Drinking water and wastewater infrastructure can be damaged during a fire in unexpected ways. Intense heat from wildfires can release toxic chemicals into a public drinking water system, interruption of electrical power can cause a loss of pressure in the system and risk of contamination, and systems served by surface water can experience a spike in sediment, minerals, and nutrients. Septic systems that sustained only partial damage during a fire may still need to be replaced. The ODEQ developed a website with several resources for addressing infrastructure issues following the 2020 fires.

Action 7B — Encourage Regional Water and Wastewater Systems

Many Oregon communities, particularly smaller ones, struggle to adequately fund drinking water and wastewater-related infrastructure. The high capital costs of infrastructure, construction, operation, ongoing maintenance costs, and the salary and training costs of retaining qualified personnel can be prohibitively expensive to communities with a small ratepayer base. In Oregon these tend to be rural, coastal, and/or small urban communities.

Developing a regional water and wastewater system may make sense if it is cost-effective. A regional system could include physical consolidation, system redundancy, or shared contracts, services, purchases, mutual assistance agreements, interties, and back-up supplies. State and federal agencies often provide incentives such as funding and technical assistance to encourage a regional approach to meeting water needs.

Oregon should encourage regional approaches to water and wastewater services, particularly if these approaches create efficiencies for smaller communities and support resilience to natural hazards and climate change. Business Oregon has recently completed a rulemaking allowing them to provide funding for regionalization projects. Organizations such as the Oregon Association of Clean Water Agencies can play a key role in making connections and encouraging regional approaches among water and wastewater systems.

Action 7B
Encourage Regional (Sub-basin) Approaches to Water and Wastewater Systems

Examples of how to carry out this action:

- Make use of shared contracts, services, and purchases
- Develop mutual assistance agreements between neighboring communities and water/wastewater systems
- Establish inter-ties and back-up supplies for water supplies
- Provide incentives to encourage regional approaches to water distribution, efficiency, and wastewater treatment
- Incorporate DLCD equity and community vulnerability assessments into asset management planning to inform strategies for repair, replacement, and funding infrastructure improvements
- Identify transition strategy for providing water and wastewater to urbanizable areas (within an urban growth boundary) consistent with comprehensive land use planning.

Action 7C

Support Dam and Levee Safety

Dam safety represents a significant area in which the state has responsibility for the communities located downstream from important but aging water impoundments.

A "dam" is a hydraulic structure built above the ground surface that is used to impound water. Dams include all related structures and together are sometimes referred to as "the works." Dams can include wastewater lagoons and other hydraulic structures that store water, attenuate floods, and divert water into canals. Many traditional dams are constructed on stream channels to form reservoirs. Dam owners include homeowners, farmers, irrigation districts, private industry, municipalities, associations, and public agencies.

As mentioned under Action 5B, dam safety and flood events are included in the state's Natural Hazard Mitigation Plan.

Establish a Levee Safety Program

Levees, described under Actions 5B and 7A, have received less recognition than dams regarding their potential for failure and ability to cause life and property loss. The US Army Corps of Engineers estimates that there could be as many as 2,000 levees in Oregon. However, the Water Resources Department (OWRD) is only aware of about 260 levees. Oregon needs to establish a Levee Safety Program, in concert with the Dam Safety Program, to protect public safety and increase resilience to climate change and natural hazards (e.g., floods, earthquakes).

Managing Oregon's Dam Safety Program

Oregon strives to maintain a good dam safety record to ensure public safety. The Association of State Dam Safety Officials notes that, while *"dams bring water, power, flood control, recreation, economic possibilities and many other advantages to people…people must understand that safe operation and maintenance is key to sustaining these advantages and avoiding potential disaster."*

Action 7C
Support Dam and Levee Safety

Examples of how to carry out this action:

- Authorize resources to determine if dams have safety deficiencies; evaluate and retrofit dams to meet new seismic and hydrologic standards
- Implement actions to improve the safety of dams
- Properly decommission dams and levees at the end of their useful life
- Coordinate interagency emergency response regarding dam inspection, communication, and evacuation
- Define the legal responsibilities of dam owners
- Dedicate grant and loan resources for rehabilitation of deficient dams
- Improve clarity of statute and rule regarding enforcement mechanisms to ensure dam owners follow through with Emergency Action Plan exercises and updates
- Map potential impacts to critical infrastructure (e.g. schools, hospitals, water treatment facilities) and demographics of who will be impacted by dam failures

The original focus of Oregon's dam safety program was the review and approval of designs for new dams. A majority of Oregon's dams were constructed decades ago, with some more than 100 years old. As a result, the dam safety program now focuses on evaluating the condition of existing dams through regular inspections and providing feedback to owners regarding needed safety improvements.

Oregon Revised Statutes authorize and direct the OWRD to take specific actions related to the design, construction, inspection, and safety of dams. The State Engineer for Water Resources oversees the Dam Safety Program and inspects all the state-regulated high hazard dams. Among their many duties, Oregon's watermasters conduct inspections of low hazard dams.

Those Subject to the Dam Safety Program – Approximately 1,200 dams in Oregon are at least 10 feet high and store 3 million gallons or more (9.2 acre-feet of water), making them subject to Oregon's Dam Safety Program. The

largest dams, however, are regulated by federal agencies. The OWRD is the lead public authority responsible for 941 non-federal dams.

The OWRD works with owners to bring these dams up to current safety standards. Many of Oregon's dams are old and could fail, greatly increasing the severity and consequences during major flooding. Additional resources are needed to determine if dams have safety deficiencies.

Hazard Ratings – Like most states, Oregon rates dams by hazard classification: high, significant, or low (Figure 3-10). A dam's hazard rating is based on what could happen if the dam fails, not on the condition of a dam. A high hazard dam, for example, means that failure would likely cause fatalities. There are currently 76 non-federal dams rated as high hazard. These dams are inspected annually.

A deficient dam has been declared to be "Potentially Unsafe" or "Unsafe" as defined in statute and described in rule.

For the purposes of FEMA grants (not in statute or rule), the condition of high hazard dams is evaluated using four categories: satisfactory, fair, poor, and unsatisfactory. The condition analysis of each high hazard dam is updated after its formal inspection.

Figure 3-10: Hazard Classifications for Dams

76	**High Hazard Dams** Failure will likely cause fatalities. These dams are inspected annually.
154	**Significant Hazard Dams** Failure will damage property but loss of life is unlikely. These dams are inspected every 2 to 3 years.
711	**Low Hazard Dams** Failure is unlikely to cause major property damage or loss of life. These dams are inspected every 5 to 6 years.
941	**Total Dams in the Program**

Source: OWRD, July 2025

Monitoring High Hazard Dams – Remote monitoring can detect a potential problem before there is harm to people and property. The most important information includes the current water level in the reservoir and any change in seepage flow through the dam. The OWRD is now authorized to require remote monitoring on deficient, high hazard dams.

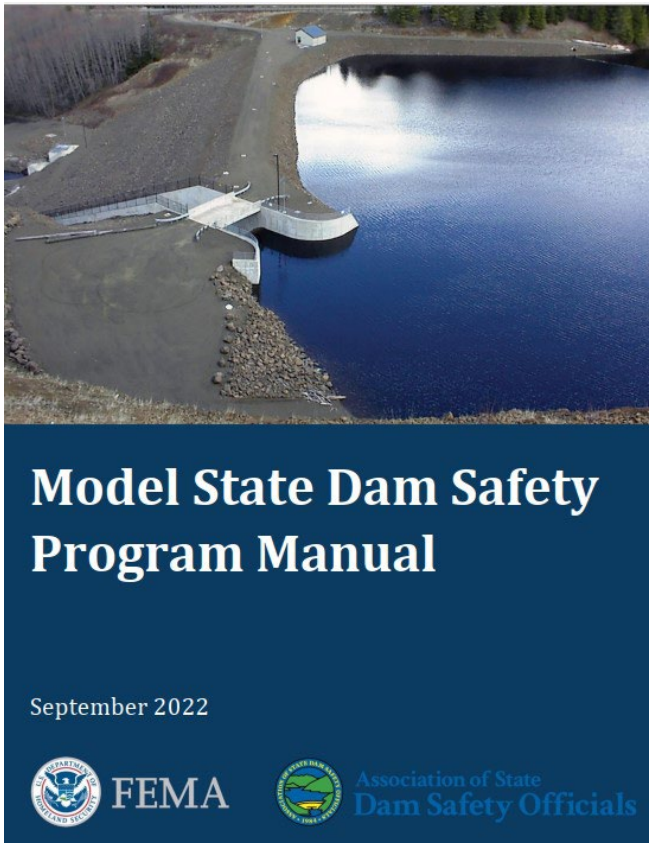
Emergency Authorities – In Oregon, if a dam is imminently unsafe, the OWRD will notify the owner and schedule a hearing to see if a water level restriction or other action is deemed warranted by an administrative law judge in accordance with the dam safety statutes and Oregon administrative law. The process takes several months unless the owner voluntarily signs a consent agreement.

Legal Responsibilities for Dam Safety – The Association of State Dam Safety Officials notes that dams are a unique type of infrastructure, because while public entities tend to own roads, bridges, and sewer systems, this is not the case with dams. Most dams in the United States are privately owned. Dam owner responsibility and liability is outlined in statute (ORS 540.459 and 491). Owners should know what their responsibilities are, including keeping the dam safe and taking immediate action if the dam begins to fail and threaten people or property.

Emergency Action Plans – An Emergency Action Plan (EAP) helps identify situations where a dam failure might occur and spells out actions that could save the dam and hasten evacuations. The 2017 Legislature passed a bill requiring owners or operators of high-hazard dams to develop an emergency action plan and file it with the OWRD, Office of Emergency Management, and the local county emergency agency no later than January 1, 2019. Dam owners are required by statute to update and exercise their EAPs periodically.

Emergency Inspection after Extreme Events – Oregon has no interagency agreements in place to inspect multiple dams damaged by an earthquake or widespread flood. Inspections will be difficult after a Cascadia Earthquake or flood if road access is no longer possible. Emergency access and dam inspections are essential to avoid dam failures

in the aftermath of a Cascadia Earthquake or significant flood. Additional arrangements are needed for an effective and coordinated response during extreme events so that the public can be reassured that dams are safe, or can be evacuated, if necessary.



Grant and Loan Programs – Most conventional loan programs cannot be applied to dam repair or maintenance. Many dams are privately owned and many owners do not have the financial resources necessary to rehabilitate their dams. This is especially true for dams that generate no income. It is essential to inspect, monitor and analyze those dams with known deficiencies. With older dams, there are often a great number of unknowns, uncertainties, and defects, including the reliability or existence of design information.

Recently, the Dam Safety Program and other grant programs provided some funds to dam owners to conduct engineering analysis of high hazard dams. Although Oregon has efficiently leveraged limited resources to improve the overall safety of state-regulated dams, many important activities have been deferred, some indefinitely. Establishing formal grant and loan programs would allow owners to make seismic and flood related upgrades, rehabilitate unsafe dams that still have value, or to provide funds for removal of dams that no longer provide benefits.

Federal sources of funding include the Federal Emergency Management Agency's (FEMA) High Hazard Potential Dam Grant and National Dam Safety Program Grant programs.

Ecological Impacts from Dams

Channel-spanning dams come with negative environmental impacts. They alter river ecosystems by shifting the flow regime, disrupting sediment and bedload movement, impacting water quality such as temperature and dissolved oxygen, blocking or slowing fish migration, and degrading overall habitat.

The existing Dam Safety Program provides for periodic review of dams, only in relation to human safety and property. Dams requiring upgrades to meet safety requirements may trigger fish passage laws. Periodic reviews for hydrologic or ecological harms would require additional authority and resources for several agencies.

Climate uncertainty, water scarcity, and public health and ecological crises all require that we share information in a timely and accessible manner. Agencies and many types of partners can provide the public, and one another, with information about our water resources and challenges to help everyone engage in water stewardship actions. Expanding our collective knowledge about water can increase the attention and care we devote to protecting our shared resource.

The health and sustainability of Oregon's water resources can benefit greatly from a variety of education and outreach efforts. The value of water and the role it plays in Oregon's economy and the environment is not always well understood or even recognized. Everyone can benefit from a reminder that our human activities and decisions have a significant impact on both the quantity and quality of our water and the many economic and ecological uses it supports.

Action 8A Support Implementation of K-12 Environmental Literacy Plan

Environmental Literacy Plan

In 2009, the Governor and the Oregon Legislature launched the development of an Environmental Literacy Plan as part of the No Child Left Inside Act. Oregon is the first state to pass legislation directly related to the development of an environmental literacy plan. Last updated in 2013, the Environmental Literacy Plan is aimed at helping students become lifelong stewards of their environment and community, exercising the rights and responsibilities of environmentally literate citizenship, and making choices to interact frequently with the outdoor environment. The program also supports teachers by providing professional development training, guidance for conducting research and assessment, maintaining a database of resources, and building capacity through partnerships (Oregon Environmental Literacy Resource Directory). In 2014, Oregon State University became the administrative body overseeing the Environmental Literacy Program to help implement the plan.

Other Resources

Children's Clean Water Festival - The Children's Clean Water Festival, held annually in the Portland metro area, is a community-supported event, organized by public, private, and non-profit organizations committed to water and environmental education in Oregon. The festival's goal is to teach fourth and fifth grade students that they can have positive impacts on water resources, including lessons on the water cycle, watersheds, stormwater, drinking water, water conservation, and wastewater. The festival's website currently provides 'Festival Lessons' that can be accessed anytime.

Oregon Envirothon – Oregon Envirothon is a hands-on, problem-solving education program and competition that teaches high school students about environmental sciences. Oregon Envirothon works in cooperation with local conservation districts, natural resource associations, educators, and environmental agencies to provide mentorship, training, and competition to high school students and their teachers.

Outdoor School - Oregon State University also serves in a leadership role for Oregon's Outdoor School Program, a week-long field-science curriculum for fifth and sixth graders, focusing on the environment, natural resources, economic development, and related careers. Since the late 1950s, nearly one million students have participated in studying natural sciences and the responsible use of natural resources alongside students from other schools. Participation in Outdoor School varies by school district and has not been available on a statewide basis.

Salmon and Trout Enhancement Program's Fish Eggs to Fry – The Oregon Department of Fish and Wildlife's Salmon and Trout Enhancement Program provides valuable tools, resources, and support to provide education opportunities in and outside the classroom as well as in the community. One of the most popular programs is "Fish

Eggs to Fry" where salmon or trout eggs are raised in a classroom incubator, giving students first-hand experience with how water quality impacts fish survival.

Project WET - Project WET, established in 1984, has a coordinating center at Western Oregon University, and other coordinating centers located nationally and internationally. The organization offers K-12 water related curricula for educators, available for a fee, providing an overview of water quality and quantity issues, focusing on topics such as watersheds, wetlands, oceans, sanitation and hygiene, water history, and more.

4-H Youth Development - The 4-H Youth Development Program is the largest out-of-school youth program in the United States. The program is over 100 years old and was developed to share new agricultural developments with young people in rural communities. Today 4-H opportunities are available in every Oregon county, delivered through Oregon State University Extension Service. Example learning topics relevant to water stewardship include agriculture, geology, forestry, and horticulture.

Action 8A
Support Implementation of K-12 Environmental Literacy Plan

Examples of how to implement this action:

- Support funding for implementation (e.g., Outdoor School, Children's Clean Water Festival)
- Natural resource agencies, community organizations, and others should engage in education for environmental literacy activities
- Incorporate environmental justice, and culturally specific water stewardship values in environmental literacy programs
- Engage and support culturally specific community-based organizations in the design and implementation of environmental literacy programs

Action 8B Provide Career Training for the Next Generation of Water Professionals

Challenges posed by climate change, aging infrastructure, poor water quality, population shifts, degraded instream habitat, and land use change have increased the demand for water professionals. Water professionals are needed in a wide range of specialties, including water and wastewater treatment, well drilling, science, engineering, policy, law, planning, engagement, and science communications.

An alarming national shortage of workers exists in the water utility sector, including water and wastewater treatment operators. This shortage will become more critical as a large percentage of the utility industry becomes eligible for retirement. Upcoming retirements from the Baby Boomer generation will impact other job sectors too, elevating a need for more graduates to fill the demand.[41]

A career in water provides an opportunity for a rewarding profession, competitive wages, and the satisfaction of delivering clean water to your community or supporting Oregon's fish and wildlife.

> "Communities with fewer resources are challenged to strategically plan for and invest in their water future and need access to a skilled workforce to implement, manage, and monitor water projects.
> We can begin investing now in strong community capacity and a skilled water workforce in every region across Oregon."
>
> .-100-Year Water Vision (2020)

Oregon State University hosts a website of water-related education and training programs offered by Oregon's public universities and community colleges. The Office of Community Colleges and Workforce Development also provides a listing of colleges that offer water-related courses, degrees, and programs throughout Oregon. The American Water Works Association, the Water Environment Federation, and the U.S. Environmental Protection Agency (USEPA) have partnered to create a website to promote career choices in the water sector geared toward jobseekers of all levels: workforwater.org.

Water and Wastewater Utility Workforce

During the 1970s and 80s, the water and wastewater treatment industry grew rapidly to fulfill the requirements of the federal Clean Water Act and the Safe Drinking Water Act. In the next ten years, approximately one-third of drinking water and wastewater operators will be eligible for retirement, and filling those jobs requires a new set of technical skills.[42] In 2020, the USEPA launched the America's Water Workforce Initiative to respond to this challenge, acknowledging the environmental and public health implications associated with operations and maintenance of essential drinking water and wastewater infrastructure. The Initiative identifies needed partnerships across federal, state, Tribal, and local governments along with public utilities, the private sector, community groups, and educational institutions. The Initiative's goal is to help make water a career of choice through education and sustained public outreach.

The USEPA also developed a grant program to build a pool of skilled and diverse workers in the water and wastewater utilities sector. During 2023, the Innovative Water Infrastructure Workforce Development Grant Program offered more than $20 million nationally for various workforce development activities.

Administrative challenges associated with providing water and wastewater services, like staffing and skilled trades to support and maintain municipal water systems, may have cascading impacts on the ability of cities and special districts to function. The Oregon Community College Association reports that out of the seventeen publicly chartered community colleges in Oregon, only Clackamas Community College offers a water and wastewater operator training program. Umpqua Community College offers a water quality technician program. Lane and Clackamas Community Colleges offer a water conservation technician program—specializing in the connection between energy and water efficiency. Certification and training programs are critical resources for plant operators.

Some water providers have initiated internship and apprenticeship programs to help fill the void for water operators. More state funding is needed to fund apprenticeship programs.

In 2023, the Oregon Legislature authorized $1.6 million to the Oregon Association of Water Utilities to construct a Water System Training Center. The facility is currently under construction and scheduled to be complete by the end of 2025.

Oregon Science, Technology, Engineering, and Math (STEM) Hubs

Legislation passed in 2015 led to the establishment of "Oregon STEM" and several regional Science, Technology, Engineering, and Math (STEM) Hubs across the state to increase access to STEM education and develop a skilled workforce. The program has since been expanded to include art, now referred to as "STE(A)M" learning opportunities. There are currently 13 STE(A)M Hubs that provide equitable learning opportunities for students through partnerships with local leaders, Pre K-20 education, after school programs, local industry, and community-based organizations serving youth. Oregon STEM published an impact report in 2023, which included a finding that STE(A)M Hubs advance equity for historically underserved students.[43]

Action 8B

Provide Career Training for the Next Generation of Water Professionals

Examples of how to implement this action:

- Determine whether career training programs are available and equipped to meet the demand for water professionals
- Offer job shadow programs to expose students to careers in water
- Continue funding support for water-related trade and science programs at Oregon community colleges
- Increase coordination between state agencies and universities to develop programs that foster interest in water-related fields and career progression for graduating students
- Offer paid apprenticeship or internship programs to expose BIPOC and underrepresented students and new professionals to careers in water
- Partner with Hispanic Serving Institutions (HSI) to increase support for water-related trade and science programs at Oregon community colleges and universities
- Partner with water/wastewater utilities to promote careers and provide on-the-job training

Well Construction
The increase in reported dry domestic wells in Oregon has also meant an increased demand for licensed well drillers. In 2024, Klamath Community College was awarded nearly $1 million from the state to purchase a drilling rig for a new apprentice program. Students will gain hands-on experience as one component to licensure through the Oregon Water Resources Department.

Other Careers in Water
Numerous programs for science, planning, engineering, law, and other water careers are available at community colleges and universities throughout Oregon. However, there is still a need to increase water professionals, including diversity, entering the work force to meet demand and fill openings left by retirements.

Agencies and professionals in the private sector could assist with recruitment through participation in K-12 career days, offering job shadow programs, and internships. Establishing and maintaining programs between state agencies and colleges and universities can also provide an opportunity for students to learn about water-related career paths.

Esther Shin, Assistant Watermaster, teaches an Oregon State University class about measuring streamflow.
Credit: Kim Fritz-Ogren

Action 8C Promote Community Education and Outreach

State and federal agencies offer a variety of educational resources and programs. Oregon is also home to an extensive network of community-based organizations that offer technical assistance and information on water quantity, water quality, and watershed-related issues. With 45 soil and water conservation districts and 76 watershed councils, Oregon is well positioned to advance locally led education and outreach efforts.

Many drinking water providers and non-profit organizations have also developed their own educational and outreach materials, making them available to the public. Oregon should continue providing support and technical training to soil and water conservation districts, watershed councils, and other on-the-ground organizations. State agencies need to continue to expand their role in community education and outreach, including supporting community-based organizations and smaller water providers. One way to do this is to increase outreach and educational resources, providing communications in multiple languages and making them accessible to a variety of learning styles.

The important role that state agency field staff play in on-the-ground education is further supported by Strategy Action 10E in Chapter 4.

Soil and Water Conservation Districts - In 1939, the Oregon Legislature passed legislation to establish conservation districts in Oregon. Oregon's soil and water conservation districts (SWCDs) are special districts which provide for the conservation of renewable resources and serve as an important educational resource. SWCDs work with local landowners and residents, natural resource organizations, natural resource users, and local, state, and federal governments and agencies to conserve natural resources, control and prevent soil erosion, conserve and develop water resources, and protect water quality. They also preserve wildlife, conserve natural beauty, and promote collaborative conservation efforts to protect and enhance healthy watershed functions. They are governed by an independently elected board of directors and are funded through grants, contracts for services, and in some cases a property tax levy. The Oregon Department of Agriculture provides statutory oversight and assistance to the 45 SWCDs, and maintains an interactive map showing district service areas. SWCD's also receive grant funding from USDA Natural Resource Conservation Service and the Oregon Watershed Enhancement Board (OWEB).

Watershed Councils - The 1995 Oregon Legislature unanimously passed House Bill 3441 to provide guidance on the formation of watershed councils. Oregon watershed councils are groups of volunteers who meet regularly in local communities to assess conditions in a given watershed and implement projects with willing property owners that support ecological restoration or enhancement that benefits local economies, fish and wildlife, people, water quality, and water quantity. Watershed councils work with local, state, and federal partners and private landowners and serve an important role in community education. Councils are designated by county governments and are expected to have broad and balanced representation and viewpoints. There are 76 locally designated watershed councils as defined by Oregon Revised Statutes 541.890 (14) and 541.910. Other watershed

Action 8C
Promote Community Education and Outreach

Examples of how to implement this action:

- Look for opportunities to keep Oregonians informed about the importance of water resources to people and the environment
- Look for opportunities to provide outreach, including informational materials about water-related programs (e.g., streamflow restoration, water conservation, transfers)
- Promote technical training for public and private partners
- Promote access to water-related recreational opportunities using state programs
- Develop a centralized location and outreach materials for people to access information about water conservation
- Develop and distribute informational materials related to the suite of tools available to protect instream flow
- Partner with community-based organizations to deliver water education to the public
- Provide resources for interested local organizations to conduct education and outreach to the communities they serve
- Increase outreach and education resources to produce communications in multiple languages and accessible to a variety of learning styles

organizations and groups exist, but do not meet this definition. The OWEB currently funds 56 of the 76 watershed councils and maintains an interactive map showing council service areas.

Water Utilities and Municipalities – Water and wastewater providers, including utilities and municipalities, contribute to public outreach and education. They offer a variety of opportunities to learn about the important role the public plays in protecting our water resources and affordability through tours, K-12 programs, and hosting college field trips and internships.

Select Educational Resources

State and federal agencies offer a wide range of educational resources addressing water conservation, water quantity and quality, environmental stewardship, and recreation. Select resources reflecting educational needs heard during the Strategy engagement efforts are listed below. Resources focusing on youth-specific education are provided in Action 8A.

Water Efficiency and Conservation

Access to information and tools for accomplishing water conservation was one of the most mentioned concerns during outreach and engagement for the 2025 Strategy. Additional information about implementing conservation practices are addressed in Strategy Action 10A.

The Water Resources Department currently offers the following resources that provide information regarding water conservation:

- Water Rights in Oregon – An Introduction to Oregon's Water Laws
- Water Conservation Fact Sheets (for residential, farm/ranch, and municipal users)
- Allocation of Conserved Water Program
- Instream Lease
- Instream Transfer
- Water Projects Grants and Loans and Irrigation Modernization Funding
- Guidebook for Municipal Water Management and Conservation Plan
- Guidebook for Agricultural Water Management and Conservation Plan

Agriculture and Forestry - At the federal level, the Natural Resources Conservation Service provides information about water conservation techniques and resources for farmers, ranchers, and forest landowners.

Graywater Reuse and Rainwater Harvesting - The Department of Environmental Quality (ODEQ) offers information about permitting and constructing graywater reuse systems, which can conserve water by reducing a business or household's demand on drinking water supplies. The Building Codes Division of the Department of Consumer and Business Services developed an Oregon Smart Guide to Rainwater Harvesting.

Water Quality Information and Advisories

The public needs access to information about the quality of water for drinking, recreating, or food harvesting (e.g., shellfish and fish).

The Oregon Health Authority (OHA) maintains several sources of information specific to drinking water. The Resources for Consumers webpage includes helpful links to information about water quality for public systems and private wells. A mapping tool is also available depicting the location of active drinking water advisories.

Harmful algal blooms (HABs), can make water unsafe in which to drink or recreate. HABs can also make it unsafe to consume fish from affected waters. The OHA has expanded its education and outreach resources and offers a communications toolkit for drinking water providers. The OHA also provides recreational advisories, informing the

public about the presence of HABs, high levels of bacteria at Oregon's beaches, and shellfish harvest closures. More information about HAB monitoring and advisory programs is provided in Chapter 1, Action 1A and Chapter 4, Actions 12A-12C.

Protecting Water Quality – While it is important for Oregonians to know how to access information about water quality, there are also ways that individuals can participate in protecting water quality. Here are just a few examples:

- Drug Take-Back Program, administered by the ODEQ, provides a convenient and safe way to dispose of unwanted or expired prescription and over-the-counter medicines. This prevents people from flushing medicines down the drain or putting them in a landfill, where they can degrade water quality and cause environmental harm.
- Oregonians that get their water from a domestic well can learn about well stewardship in the Well Owner's Handbook (English or Spanish), which includes information about proper installation and maintenance of domestic wells, wellhead protection, testing wells for contaminants, interpreting the results, addressing any contaminants OHA also provides resources through their Domestic Well Safety Program.
- Septic system owners can learn about proper care and maintenance to prevent groundwater contamination through the ODEQ's Septic Systems webpage. Additionally, the Oregon Septic Smart Initiative provides resources to ensure the longevity of the system and find an industry professional to inspect your system.

Environmental Stewardship and Recreation

Awareness and enjoyment of water resources helps people connect with the environment, which leads them to use water responsibly and promote water resource protection. Support for responsible, sustainable recreation is one way to encourage social investment in protection of these resources.

The Recreation Trails, Scenic Waterways, and grant programs for local governments administered by the Oregon Parks and Recreation Department (OPRD) help increase access to water-based outdoor recreation and enhance stewardship of the state's waterways. The Oregon State Marine Board offers numerous environmental and recreation-based boating safety programs and often partners with other agencies such as the Department of Fish and Wildlife (ODFW) and OPRD. Some of these programs include:

- Water Wits, a K-12 curriculum with interactive lessons in boating, water safety, and marine stewardship
- Interactive Boat Oregon Map of public boating access facilities, launch ramps, boating obstructions, Certified Clean Marinas, pumpouts and floating restrooms, clear gasoline locations, rivers where personal watercraft (e.g., jets skis) are allowed, boating regulations, and boating waterways.
- Boating obstructions dashboard, maintained by the Oregon State Marine Board
- Nationally accredited boater education courses
- Free online paddling education and promotion of Oregon Water Trails
- Aquatic Invasive Species Prevention Program
- Clean Marinas
- Clean Boaters
- ODFW's Angler Education Program

Canoe at Agate Lake.
Credit: Kim Fritz-Ogren

Action 8D Identify Water Research Needs and Partnerships

The water resources sector will need to continue identifying ongoing research needs that could use assistance from undergraduate and graduate students, public and private universities, research institutions, and other partners. Partnerships between higher education and both the public and private sectors can result in innovative solutions for addressing water quantity and quality challenges.

Research collaboration between agencies and higher education may be mutually beneficial, as research institutions can bring innovative tools, technology, and other resources to the effort, while agencies can bring expertise in data, evidentiary and scientific standards, and management knowledge.

Several state and federal agencies offer internship programs for students to gain real-world experience. Business Oregon, for example, has an internship program that includes work in clean technology and renewable energy. The Department of Fish and Wildlife, Department of Forestry, and Water Resources Department often provide summer internships or seasonal employment opportunities to support monitoring and assessment projects, or other field-based activities.

Some current and upcoming research needs that might be well suited for partnerships with higher education include:

- Prediction of water temperature through remote sensing (also see Action 1A)
- Research into the application of artificial intelligence (AI) into data processing (e.g., processing streamflow data) (also see Action 1C)
- Continued development of techniques to quantify ecological flow needs, particularly channel maintenance and pulse flows (also see Action 2A)
- Improved techniques for remote sensing of water use (also see Action 3A)

Action 8D
Identify Water Research Needs and Partnerships

Examples of how to implement this action:

- Continue to identify ongoing research needs at the local and state level
- Support partnerships with state and federal agencies, tribes, public and private institutions to address research needs
- Fund and/or participate in research initiatives
- Consider research initiatives that would address frontline communities' environmental and climate justice challenges

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CHAPTER 4

Objective 4: Meet Oregon's Instream and Out-of-Stream Needs

Oregon needs to further integrate and coordinate both the long-term planning and day-to-day management of Oregon's water resources among its natural resources and economic development agencies, at all levels of government. Key factors to consider include state-level and place-based water planning, wise water use and management, and the protection of ecosystems and public health. Our ecosystems need protection, enhancement, and restoration to increase resiliency. The Strategy's four objectives that seek to better understand and meet our instream and out-of-stream water needs all require adequate funding.

Chapter 4 describes several actions needed to adapt and mitigate for climate change and build a more secure water future for people and the environment.

Chapter 4 Actions at a Glance

Objective 4: Meet Oregon's Instream and Out-of-Stream Needs

Critical Issue – Water Planning

9A Support Place-Based Integrated Planning and Other Water Planning Efforts
9B Coordinate Implementation of Natural Resource Plans
9C Partner with Tribes, Federal Agencies, and Neighboring States in Long-Term Water Resources Management
9D Improve State Interagency Coordination
9E Lead Meaningful Community Engagement

Critical Issue - Water Use and Management

10A Improve Water-Use Efficiency and Water Conservation
10B Encourage Water Reuse Projects
10C Improve Access to Storage
10D Reach Environmental Outcomes with Non-Regulatory Alternatives
10E Provide an Adequate Field Presence
10F Strengthen and Improve Oregon's Water Quantity and Water Quality Permitting Programs

Critical Issue - Healthy Ecosystems

11A Improve Watershed Health, Resiliency, and Capacity for Natural Storage
11B Develop Additional Instream Protections
11C Prevent and Eradicate Invasive Species
11D Protect, Restore, and Provide Access to Instream Habitat for Fish and Wildlife
11E Develop Additional Groundwater Protections

Critical Issue - Clean Water

12A Ensure the Safety of Oregon's Drinking Water
12B Reduce the Use of and Exposure to Toxics and Other Pollutants
12C Implement Water Quality Pollution Controls

Critical Issue - Funding

13A Fund Development and Implementation of Oregon's Integrated Water Resources Strategy
13B Fund Water Resources Management Activities by State Agencies
13C Invest in Planning, Feasibility Studies, and Water Resource Project Implementation

Critical Issue | Water Planning

Water is a finite resource, and effective water planning supported by adequate data is an important tool to help support sustainable management for present and future generations of people as well as fish and wildlife. Water planning and management are crucial for balancing competing demands, mitigating water scarcity, protecting public health and the environment, and building resilience to climate change. Done properly, water planning can also facilitate dialogue, negotiation, and cooperation among interested parties to resolve conflicts and promote equitable access for instream and out-of-stream uses.

Water planning can occur in many forms and at different scales. Place-Based Water Planning was established as a permanent program in the Water Resources Department (OWRD) in 2023. Oregon currently has several water-infrastructure related planning tools (e.g., water management and conservation plans, Goal 11 facilities plans, water master plans, wastewater facility plans) but would benefit from more holistic and integrated water planning. Planning for streamflow restoration, conservation, and land management are also critical to improve our ecosystems. An effective statewide Strategy will require more extensive and integrated planning at the local or regional and state levels in the coming years.

Action 9A Support Place-Based Integrated Planning and Other Water Planning Efforts

Forging partnerships between local communities and state agencies through planning offers a unique opportunity for the implementation of a wide range of actions described in the 2025 Strategy. From land-use practices to natural resources management and emergency preparedness, communities are well-positioned to build trust, hold difficult conversations, and make progress on issues beyond what state agencies can do on their own.

Place-Based Water Planning

The 2012 Strategy tasked state agencies with creating a statewide framework for developing place-based integrated water resources plans. This resulted in the development of Draft Planning Guidelines that outline how communities can undertake place-based integrated water resources planning in partnership with state agencies. The process starts by building a collaborative and inclusive process among balanced water interests. Planning steps include characterizing water resources for the area and examining current and future instream and out-of-stream water needs. Ultimately, a Place-Based Water Plan is a hydrologically bound plan that includes a set of prioritized, strategic, and integrated solutions to meet multiple water needs.

Figure 4-1:
Features of Place-Based Water Planning

- Locally led collaborative process
- Voluntary, non-regulatory approach
- Includes a balanced representation of water interests
- Conducted in partnership with the state
- Addresses instream and out-of-stream needs, including water quantity, quality and ecosystem needs
- Utilizes an open and transparent process that fosters public participation
- Facilitates implementation of local solutions
- Builds on and integrates existing studies and plans
- Does not jeopardize existing water rights
- Recognizes the public interest in water
- Consistent with the principles in the Integrated Water Resources Strategy, and state laws and policy

Providing Financial and Technical Assistance

In 2015, the Oregon Legislature passed Senate Bill 266,[1] providing the OWRD with authority to issue grants, enter into contracts or agreements, and provide technical assistance to pilot place-based integrated water resources planning. Following a funding solicitation process, four areas were selected to form planning collaboratives and develop place-based integrated water resources plans. These planning collaboratives have been able to leverage this funding to pursue significant in-kind and cash contributions from other funders and organizations.

In addition to providing planning and financial support, state agencies also provide technical assistance to the planning collaboratives. The OWRD and Departments of Fish and Wildlife, Agriculture, and Environmental Quality contributed significant time and resources to the planning efforts to better integrate agency efforts at the local level. Many federal agencies, non-profits, private individuals, and foundations have also contributed resources, including staff, funding, and expertise.

Place-Based Water Planning continues to enhance inter- and intra-agency coordination and has improved access to agency data and information. The planning process has also created the space for sharing local knowledge and agency expertise about water issues. Continued investments are critical to ensure agencies can partner with communities and provide ongoing support.

Place-Based Integrated Water Planning Pilot Program

Consistent with the spirit of a place-based approach, the planning process and resulting plans reflect the unique characteristics of the areas they represent. Using a place-based water planning framework, the planning collaboratives (Figure 4-2) brought together individuals and organizations representing instream interests (such as fish and wildlife needs and recreation), out-of-stream interests (such as agriculture, municipalities, domestic, and industry), as well as representatives from local, state, federal, and Tribal governments.

These planning collaboratives, in partnership with the state, continue to build the capacity to collaboratively solve water problems, improve coordination of existing information and plans, foster partnerships among different water sectors and water users, leverage public and private investments to maximize impact, engage the broader public in community conversations about water, and encourage continuous improvements in water planning and management. Place-Based Water Planning can help Oregon communities identify and develop widely supported project concepts that can meet multiple needs. Projects that are collaboratively developed and yield multiple benefits generally have a competitive edge for implementation funding.

Planning collaboratives that formally adopt a plan can seek state recognition from the Water Resources Commission. Three planning collaboratives – the Upper Grande Ronde, Lower John Day, and Mid-Coast – have successfully adopted an integrated water resources plan, receiving the Commission's recognition in 2022. Implementation is underway with federal funding through the American Rescue Plan Act. The Harney planning collaborative took a slightly different planning approach due to pressing groundwater issues in the basin. The groundwater portion of the plan is complete, following an intensive groundwater study conducted by the US Geological Survey and the OWRD. The collaborative has finalized the surface water element of the plan and anticipates adoption and seeking the Commission's recognition of the integrated plan in 2025.

Figure 4-2:
Pilot Place-Based Integrated Water Planning Collaboratives

Upper Grande Ronde River Watershed Partnership
Convened by Union County. union-county.org

Lower John Day Place-Based Partnership
Co-convened by the Gilliam County Soil and Water Conservation District and the Mid- John Day/Bridge Creek Watershed Council. lowerjohndaypbp.com

Mid-Coast Water Planning Partnership
Initially co-convened by the City of Newport and the Water Resources Department. Other conveners include Gibson Farms, Seal Rock Water District, and Lincoln Soil and Water Conservation District. midcoastwaterpartners.com

Harney Community-Based Water Planning Collaborative
Co-convened by the Harney County Watershed Council and the Harney County Court. harneyswaterfuture.com

Action 9A

Support Place-Based Integrated Planning and Other Water Planning Efforts

Examples of how to implement this action:

- Promote success by continuing to support the places currently following the draft planning guidelines and as they develop integrated implementation plans
- Continue to provide financial and technical assistance to support collaborative water planning
- Develop or recapitalize funding pathways for plan implementation to achieve instream and out-of-stream objectives
- Promote peer-to-peer learning between communities pursuing collaborative water planning
- Refine planning guidelines, and implement process improvements
- Include public outreach and engagement activities to encourage participation by under-represented populations
- Consider OWEB Focused Investment Partnership model to support plan implementation
- Offer place-based planning training for interested people and community groups
- Support a range of local or regional planning efforts (e.g., OWRD administrative basin plan and rule updates, water management and conservation plans)

Independent Evaluation of Place-Based Water Planning

In 2021, the National Policy Consensus Center and Oregon State University's Cooperative Extension Program conducted an extensive independent evaluation of Place-Based Water Planning to document interested parties' perspectives regarding their experiences with the program as well as to suggest ways that the program could be improved. The Participatory Evaluation report highlights positive outcomes from the planning process, beyond simply creating a plan.[2] These included productive discussions between previously polarized water interests, increased local support for plan implementation, the ability to use the plan to leverage funding, identifying key data gaps, increased knowledge of water resources, and the establishment of an actively engaged water planning network. The report also highlights nine key lessons learned during the pilot and how place-based integrated water resources planning can be improved in the future.

The independent evaluation noted that the four planning collaboratives and the core supporting state agencies have invested considerable time, thought, and energy in putting the Legislature's vision for place-based planning into action. The journey to completed Plans has been neither easy nor short, but much learning, skill-building, and social network building has taken place on the part of the planning collaboratives and state agencies. State agencies now have a much better idea of where there are key data gaps and what steps the agencies can take to help fill them. The pilot Place-Based Water Planning program established a solid foundation that the state and communities can build on and improves the likelihood that Oregon can achieve the Strategy's goal of meeting instream and out-of-stream water needs while also addressing water quantity, water quality, and ecosystem needs.

Regional Water Planning and Management Workgroup

In 2022, the State-Supported Regional Water Planning and Management Workgroup was formed, made up of diverse interests, Place-Based Water Planning participants, Tribes, and agencies to develop a framework and path for state-supported water planning and management at the region and/or basin level. After holding facilitated discussions for a year, the workgroup made a set of recommendations to inform policy development, funding, and guidance around water planning and management as well as recommendations for the next generation of place-based integrated water resources planning.[3]

The workgroup report highlights the need to make significant investments in water planning to meet statewide goals and mandates for managing instream and out-of-stream water needs with a changing climate. Specifically, any state-supported regional water planning effort must be underpinned with the budgets and capacity needed to

do this work at the state level and to meet this need, state leadership must prioritize and address the current overarching system-level need for funding related to state agency data collection and analysis, agency capacity, and interagency coordination.

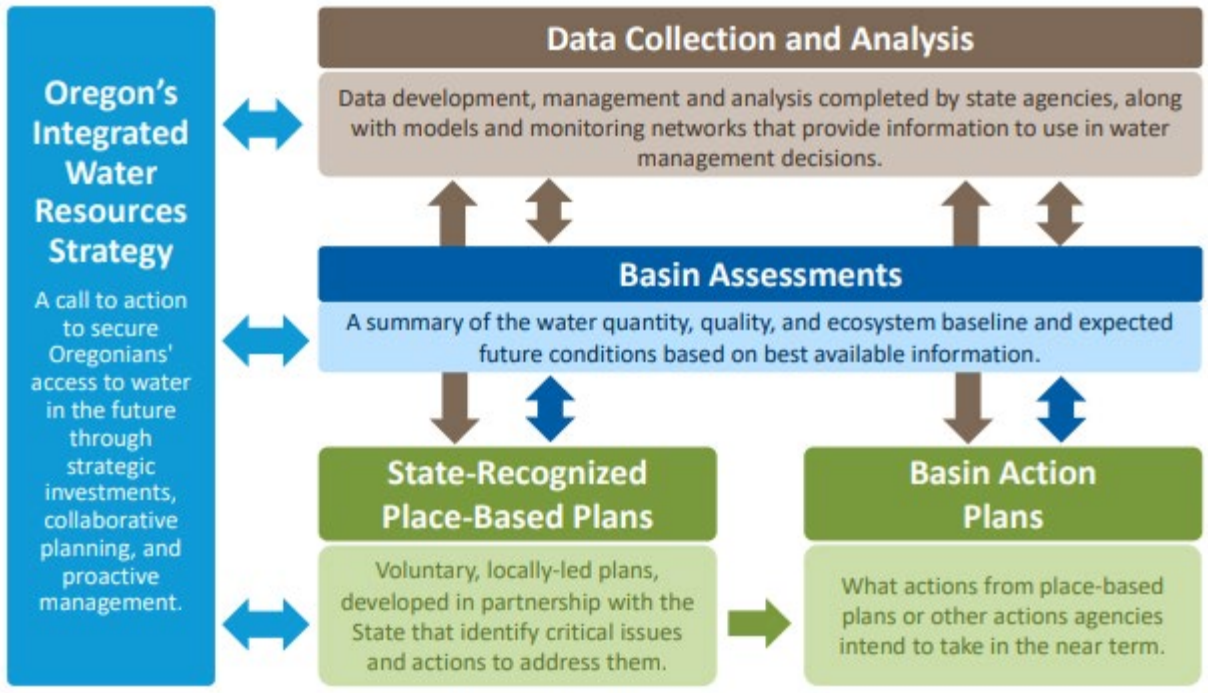
Next Steps for Place-Based Integrated Water Resources Planning

In 2023, the Oregon Legislature made the Place-Based Water Planning program permanent and allocated $2 million to the OWRD to support place-based integrated water resources planning. Work is underway to incorporate the lessons of the pilot phase, the independent evaluation, and recommendations of the Regional Water Planning and Management Workgroup into a permanent program. This work includes rule adoption (spring 2025), updated planning guidance (anticipated 2025), improved technical assistance and interagency coordination, and new grant solicitations. To succeed, Place-Based Water Planning must be championed by local leaders, coordinated with state agencies, and supported by instream and out-of-stream interests. Its continued success will require new partnerships, creative approaches to problem-solving, a continued commitment to improved coordination and integration, and sustained investments of time and money from the public and private sectors.

Other Water Planning Efforts

Administrative Basin Planning - Many western states have made water planning at the regional level an essential component to further develop and periodically update statewide water plans. In Oregon, water planning was completed at the OWRD administrative basin-scale and largely implemented through administrative rule adoption. However, this type of comprehensive river basin planning has not occurred in more than thirty years. Over the years, the OWRD has been able to update some of its rules with minor revisions, but a more comprehensive update would require planning-level support and data (e.g., basin assessments). Oregon will need to consider this gap in basin-level water planning in tandem with the next steps for place-based integrated water resources planning. Additionally basin-scale or regional assessments are essential for informing future updates to the Strategy, as directed in ORS 536.220, updated in 2023. The OWRD published An Updated Scope for the Stewardship and Supply Initiative legislative report in September 2024 outlining the approach and resources needed to pursue statewide basin assessments. The report includes several helpful figures (see Figure 4-3) to explain the possible relationship between the Strategy and other planning and data efforts.

Figure 4-3: Possible relationship between the Strategy and other data and planning efforts



"Learning from other successful models, Oregon can implement best approaches to ensure water planning and investment decisions are strategic and coordinated across jurisdictions, and with public and private partners. This system can successfully combine a state-level framework with local and regional planning and flexibility."

.-100-Year Water Vision (2020)

Other Basin Planning - Other communities across the state are pursuing integrated water resources planning at the basin scale. The Deschutes Basin Water Collaborative is developing a comprehensive water plan for the basin that aligns with Oregon's place-based planning model, building upon years of extensive studies and collaborative projects and solutions. The State of Oregon, State of Washington, and Confederated Tribes of the Umatilla Indian Reservation co-led the development of the Walla Walla Water 2050 Plan. The Partnership for Lake Abert and the Chewaucan assessed collaborative possibilities in the Chewaucan Basin and is working on joint fact-finding and a shared narrative report. Many other places across the state are ready to engage in water planning.

Water Management and Conservation Plans - Water management and conservation plans, typically developed by larger public water suppliers, are planning tools that lay out steps to meet long-term water demands in the future. These plans can be costly and often small water systems lack the technical or financial capacity to develop these on their own. Providing funding to support the development of municipal or agricultural water management and conservation plans could help those communities most in need.

Watershed Action Plans - Watershed councils work with state and federal agencies, regional Tribes, and their local communities to develop watershed assessments and watershed restoration action plans that are guided by state and federal aquatic species recovery plans. The watershed councils then seek grant funding and partnerships to implement the restoration actions and monitor the resulting improvements to habitat and water quality.

Focused Investment Partnerships – The Oregon Watershed Enhancement Board-funded Focused Investment Partnerships address ecological priorities by developing a strategic action plan that is then implemented through targeted restoration project investments. An example of a Focused Investment Partnership is the 2015-2021 Deschutes Partnership which has helped to restore stream flows and stream habitat conditions for salmon, steelhead, and resident trout in Whychus Creek and the lower Crooked River.

Action 9B Coordinate Implementation of Natural Resource Plans

One of the major challenges of taking on a regional, more integrated approach to water planning is that in any given basin, there are multiple parties and interests to convene. These include irrigation districts, municipal water providers, conservation districts, watershed councils, drainage districts, wastewater and stormwater utilities, local governments (counties/cities), and environmental groups. In addition to this list are the state, federal, and Tribal natural resource agencies with water, land, or fish management responsibilities, and other public, private, and nonprofit organizations with an interest in water management and resource issues.

Within a basin or sub-basin, multiple state and local planning documents that involve water management, directly or indirectly, exist. These plans can be

Action 9B
Coordinate Implementation of Natural Resource Plans

Examples of how to implement this action:

- Dedicate resources to coordinate and reconcile existing planning documents
- Support local governments to update their local comprehensive land use plans with current natural resource information (e.g., Goal 5 natural resources)
- Support water management and conservation plan development in conjunction with local land use planning to achieve sustainable water use
- Dedicate resources for state and local implementation of existing plans
- Support the application of equity and social justice principles in plan reconciliation and updates

contradictory or complementary. Coordination of these plans will lead to improved collaboration, resulting in greater benefits for natural resources.

A few examples of plans include water management and conservation plans (by a municipal water provider or irrigation district); fish conservation and recovery plans; biological opinions; basin plans for water allocation; Total Maximum Daily Load plans for improving water quality; water system master plans; and many local implementation plans. There are also local land-use plans, watershed restoration action plans, and locally developed agricultural water quality management plans. Taken together, these plans and their respective strategies engage many agencies and entities at every level.

In envisioning a place-based approach to water planning, these existing plans and programs do not go away, but instead provide a baseline of information, history, and rules that must be integrated into the water plan. A place-based approach can help reconcile and implement the state's programs and plans more effectively. Any new water planning initiative should account for the time and resources needed to compile, review, and reference relevant Tribal, federal, statewide or local natural resource plans.

Action 9C Partner with Tribes, Federal Agencies, and Neighboring States in Long-Term Water Resources Management

Partnerships with Tribes, federal agencies, and neighboring states continue to play an important and necessary role in Oregon's water resources management. Oregon is home to nine federally recognized Tribes, all of which have responsibilities for protecting and managing water resources. Federal agencies manage a large percentage of Oregon's landscape and Oregon shares groundwater and surface water, including three major rivers, with California, Washington, and Idaho.

State and Tribal Partnerships

The Strategy presents an opportunity to strengthen state and Tribal government-to-government relationships. State agencies are directed by law to improve working relationships with the nine federally recognized Tribes in Oregon. Agencies invite informal staff-to-staff coordination and formal government-to-government consultation on issues that may be of interest to Tribes. If requested, agency directors engage in formal consultation with Tribal leaders.

These consultations often revolve around cultural and natural resource issues, water needs and water rights, water quality monitoring, or watershed management, protection, and restoration. Tribal members are represented on various agency boards, commissions, and committees to provide perspective and guidance. A Consultation Task Force is currently developing standardized guidance for state agencies to improve the government-to-government processes. Agencies submit annual government-to-government reports on Tribal relations to the Legislature outlining engagement and consultation activities.

Action 9C
Partner with Tribes, Federal Agencies, and Neighboring States on Long-Term Water Resources Management

Examples of how to implement this action:

- Protect Tribal and state interests in shared bi-state surface water and groundwater basins
- Negotiate agreements such that water protected instream is shepherded across state lines to the mouth of the river
- Partner with neighboring states and Tribes to continue or improve managing shared resources
- Carry out actions identified in the 2023 Tribal Water Task Force Report
- Coordinate with Tribes on instream flow protection
- Conduct collaborative planning to develop water management approaches to protect species and avoid or minimize impacts to endangered or threatened species
- Identify who may benefit, or be impacted by, long-term water management approaches

Fisheries management is an area where state and federal agencies work closely with Tribal governments. In the Columbia River Basin, the Oregon Department of Fish and Wildlife (ODFW) works with the Columbia River Treaty Tribes (Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Confederated Tribes and Bands of the Yakama Nation), the Shoshone-Bannock Tribe, state fish and wildlife agencies in Washington and Idaho, the U.S. Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration on a variety of fisheries management and fish production issues under the *2008 - 2017 U.S. v. Oregon, Management Agreement*.[4] The agreement expired at the end of 2017, replaced by the *2018-2027 U.S. v. Oregon Management Agreement*.

To build upon existing working relationships with federally recognized Tribes, the ODFW has entered into Memorandum of Agreements (MOAs) with several Tribes to restore hunting and fishing opportunities and access for Tribal members while increasing Tribal sovereignty over management of fish and wildlife populations. The MOAs represent a voluntary, cooperative partnership to collaborate, share resources, and work as partners to develop and implement plans to protect, restore, and enhance fish and wildlife populations and their habitat within specific geographies of Oregon.

Tribal Water Quality Authorities - Tribes may apply to the U.S. Environmental Protection Agency (USEPA) for authorization to administer water quality standards under the Clean Water Act. This means they may obtain similar authority to the Oregon Department of Environmental Quality, referred to as "primacy." The Confederated Tribes of Umatilla Indian Reservation, the Confederated Tribes of Warm Springs Reservation of Oregon, and the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians have established such authority. State agencies must coordinate with Tribes to understand environmental impacts to Tribal resources of concern and how water resource management by the state may impact compliance with USEPA-approved Tribal Water Quality Standards.

State and Federal Partnerships

The role of the federal government in natural resources management, land management, and therefore, water resources management is significant. The federal government manages 53 percent of all land in Oregon, including 60 percent of forestlands. Appendix A discusses the roles of key federal agencies with water-related responsibilities. State and federal agencies often work together on cooperative studies, such as groundwater basin studies (Action 1B). Oregon also uses its Federal Consistency authority under the Coastal Zone Management Act to facilitate coordination between federal, state, and local authorities concerning federal actions in the coastal zone that have the potential to impact water resources. This authority enables the state to review federal agency activities and the issuance of federal permits in the coastal zone that have the potential to impact water resources for any inconsistencies with state and local regulations.

The federal government also owns or manages key pieces of water infrastructure, including federal reservoirs that store water for irrigation districts, cities, industries, and landowners. Many federal projects also produce and sell power from several hydropower facilities in the Northwest. The Bonneville Power Administration manages mitigation programs to offset habitat losses associated with hydropower projects.

Biological opinions are developed by federal agencies, such as the U.S. Fish and Wildlife Service, and outline ways to reduce and minimize the effects of federally funded, authorized, or permitted actions on Oregon's species and critical habitats, making certain such actions don't jeopardize listed species or adversely modify critical habitat. Biological opinions can impact water operations and management, especially the use of stored water involving federally owned or operated reservoirs. Implementing actions in a biological opinion often requires close coordination and open communication with others, especially state agencies with water management, water quality, and fish and wildlife responsibilities.

In 2016, National Marine Fisheries Service issued a Biological Opinion stating the Federal Emergency Management Agency's implementation of the National Flood Insurance Program (NFIP) jeopardizes species and habitat protected by the Endangered Species Act. In 2021, the Federal Emergency Management Agency issued a Draft

Implementation Plan to change how floodplains are protected, restored, and developed. State and local governments were being told they must adopt new standards, or they will be removed from the NFIP which would impact the ability for these communities to qualify for federal disaster assistance or funding for federal projects in the floodplain. Congress must periodically renew the NFIP's statutory authority to operate and the NFIP is currently authorized through September 2025. This emerging issue will require staff resources, at the state and local level, to understand and respond to the impacts of the biological opinion and associated implementation plan, and potential changes to the program.

Oregon Coastal Management Program – The National Oceanic and Atmospheric Administration funds and provides technical assistance for the Oregon Coastal Management Program, administered by the Department of Land Conservation and Development. The program supports local government management for hazard resiliency and other water related issues including nonpoint pollution control. Many additional federal agencies contribute to managing Oregon's coastal resources.

Municipal Watersheds – Many municipal water supplies in Oregon obtain their water from watersheds at least partially owned by the federal government. This requires municipalities to protect federal Endangered Species Act-listed species in their water management decisions. For example, the Portland Water Bureau has a Habitat Conservation Plan that was developed in partnership with federal agencies to protect fish and other species in the Bull Run Watershed.

Habitat Conservation Plans – A Habitat Conservation Plan (HCP) is a planning document is designed to accommodate economic development to the extent possible by authorizing the limited and unintentional take of federal Endangered Species Act listed species. There are several HCPs in place throughout Oregon.

The Deschutes Basin HCP has resulted in increased coordination across many interests which has helped the area navigate irrigation and wildlife challenges during consecutive years of drought. Over 10 years ago, Tribes, agencies, irrigation districts, and the public came together to forge a new approach to water management in the basin. The partners, led by the local irrigation districts, developed the Deschutes Basin HCP. The Deschutes Basin HCP was finalized and approved by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service in 2020, and 2023, respectively. The HCP offers many practices to better align the water management operations with the life-history needs of covered species. The aquatic species covered by the U.S. Fish and Wildlife Service in this HCP include the Oregon spotted frog and bull trout. The National Marine Fisheries Service permit covers steelhead and sockeye salmon - all federally listed as threatened.

Partnerships with Neighboring States

Oregon shares surface water resources with its neighboring states, including the Columbia River, Walla Walla River, the Snake River, and the Klamath River. It also shares significant groundwater aquifers with its neighbors, and coordinates data collection and sharing so that water managers on both sides of the border can manage the resource effectively. Oregon will continue to work with neighboring states to strive towards sustainable management of surface water and groundwater resources.

Oregon, Washington, the Confederated Tribes of the Umatilla Indian Reservation, and many others have come together to develop the Walla Walla 2050 Strategic Plan to guide integrated water resource management in the Walla Walla Basin. Senate Bill 1567 (2024) passed by the Oregon Legislature directs the state to work collaboratively with Washington and partner with federal agencies, Tribes, and water users to manage water resources in the Walla Walla Basin. The bill closely matches a House Bill 1322 passed in 2023 by the Washington Legislature. An important implication of the legislation is that water protected instream in Oregon can cross state lines into Washington and remain protected from appropriation.

United States, Canada, and Tribes: Columbia River Management

The Columbia River Treaty between the United States and Canada was ratified in 1964, bringing significant management efforts for flood control and power generation benefits to both countries. In 2024, certain aspects of the treaty were set to expire. The United States and Canada re-initiated earlier negotiations to modernize the Treaty in 2018. The U.S. Army Corps of Engineers and the Bonneville Power Administration, the agencies responsible for implementing the Treaty on behalf of the United States, conducted a multi-year effort to study these post-2024 Treaty issues. The *U.S Entity Regional Recommendations for the Future of the Columbia River Treaty after 2024* recommends that the United States pursue a number of modifications to the Columbia River Treaty, along with some unresolved domestic matters.[5] The U.S. Department of State is now leading efforts for updating the Columbia River Treaty.

Columbia Basin Restoration Initiative - The Columbia River Basin, which once sustained 10- 18 million salmon and a wide variety of native fish, has experienced significant change in the past 150 years. Dams constructed on the Columbia and Snake Rivers and their tributaries have decimated salmon and other fish populations, pushing them towards extinction. Four Columbia River Treaty Tribes alleged that the federal agencies operation of the dams violates the Endangered Species Act and the National Environmental Policy Act because it causes too much salmon mortality. Litigation began in 2001 and settlement was memorialized in the Biden Administrations December 14, 2023 Memorandum of Understanding and Motion to Stay the NWF v NMFS litigation. During mediation, the four Columbia River Treaty Tribes joined Oregon and Washington to create a strategy for restoring abundant salmon and other fish species to the Columbia Basin. This strategy became known as the Columbia Basin Restoration Initiative.

In September 2024, Oregon's Governor signed Executive Order No. 24-28 "directing coordinated and transparent implementation of Oregon's commitments to the Columbia Basin Restoration Initiative and the Resilient Columbia Basin Agreement." The Executive Order identifies various state agency responsibilities.

Federal Columbia River System Operations - The U.S. Army Corps of Engineers, Bonneville Power Administration, and Bureau of Reclamation prepared an Environmental Impact Statement under the National Environmental Policy Act for the Columbia River System in response to changing conditions in the basin. The system is comprised of 14 federal dam and reservoir projects in Idaho, Montana, Oregon, and Washington. The final Environmental Impact Statement, released in 2020, documents the review and environmental effects of implementing the Selected Alternative, proposing a variety of structural and operational changes.

Oregon, California, and Tribes: The Klamath River

Representatives from Oregon and California, several federal agencies, Tribal governments, counties, irrigators, and conservation and fishing groups signed the Klamath Basin Restoration Agreement[6] and Klamath Hydroelectric Settlement Agreement[7] in February 2010. The Upper Klamath Basin Comprehensive Agreement was later signed in 2014. These agreements set signatories on a path to comprehensive solutions for the Klamath Basin. However, Congress did not enact authorizing legislation, and the Klamath Basin Restoration Agreement expired in December 2015, and the Upper Klamath Basin Comprehensive Agreement was terminated in December 2017.

The Klamath Hydroelectric Settlement Agreement has been amended twice and continues to be in place. The Agreement lays out the process for additional studies, environmental review, and a set of decisions by the Secretary of the Interior regarding the removal of four PacifiCorp dams. This decision set in motion the largest dam removal project in United States history. The Klamath River Renewal Corporation is a non-profit organization formed to carry out the dam removal. Four hydroelectric dams on the Klamath River, one in Oregon and three in California, were removed in 2024. Restoration following the dam removal is expected to continue for five to ten years. Over the next five years, there is a significant opportunity for the Tribal nations, irrigators, and other interested parties in the Klamath Basin to consider integrating water rights and requirements under the federal Endangered Species Act. Doing so will require collaboration to consider reworking irrigation infrastructure and water management practices while also addressing species recovery.

Action 9D Improve State Interagency Coordination

Water-related responsibilities are distributed across multiple state agencies, making it critical that agencies coordinate to support one another's work. Agencies should seek to improve interagency coordination to ensure an efficient use of public resources. Agencies need communication tools to help Tribes, the public, local government, and community-based organizations navigate state agencies.

Interagency Permit and Grant Review

Agencies utilize interagency permit review teams to enhance coordination and ensure permit conditions or limitations meet the needs of multiple agencies. The Departments of Environmental Quality and Fish and Wildlife contribute to water right permit review for the Water Resources Department (OWRD), reviewing for impacts to water quality and fish and wildlife habitat.

Grants awarded for water acquisition, land acquisition, and habitat restoration projects often require review by multiple agencies. Some existing review teams include Oregon Plan Monitoring Team (for the Oregon Plan for Salmon and Watersheds), Oregon Watershed Enhancement Board Technical Review Teams, OWRD Feasibility Study Grants and Water Project Grants and Loans, and Business Oregon's process for awarding water infrastructure grants and loans.

Interagency Teams and Work Groups

Several state agencies perform monitoring activities, collect data, and have a need to share information to make timely decisions. The Oregon Stream Team represents many agencies with monitoring duties and has published a Monitoring Strategy to help guide these efforts. It is important to support work groups that provide for staff-to-staff coordination, as well as those that function at the leadership level. The Environmental Justice Council is a 13-member statewide council responsible for advising the Governor and natural resource agencies on environmental justice issues. The Water Core Team is made up of deputy-level representatives from approximately 15 state agencies that meet regularly to coordinate on water related policies and programs.

Implementing the Integrated Water Resources Strategy

Agency Strategy implementation requires coordinated efforts across many agencies. Many levels of agency staff need to be involved in creating, carrying out, and tracking activities included in Strategy biennial work plans. Agency budget processes should be used to coordinate funding requests needed to carry out Strategy actions.

State Agency Coordination Program

Twenty-five state agencies have a State Agency Coordination (SAC) Program, which is intended to assure that its "rules and programs affecting land use" comply with the statewide planning goals, and that agency actions are compatible with acknowledged city and county comprehensive plans and land use regulations. (See ORS 197.180, OAR 660-030 and OAR 660-031.) This process may identify a need for local governments to revise their local comprehensive plans. Most SACs were certified by the Land Conservation and Development Commission around 1990. Since that time, only the Oregon Department of Aviation and Oregon Department of State Lands have written a new State Agency Coordination Program. State agency coordination programs must be updated to keep pace with changes to statutes, rules, and the creation of new programs or authorities.

Action 9D
Improve State Interagency Coordination

Examples of how to implement this action:

- Update State Agency Coordination Programs in partnership with the DLCD
- Establish efficient procedures for cross-agency coordination and approval of relevant state agency permits
- Coordinate Strategy implementation, develop interagency biennial workplan for implementing Strategy actions
- Develop formal memorandum of agreement/understanding (MOA/MOU) between agencies to establish clear and transparent expectations for interagency cooperation where agencies share affiliated authorities/responsibilities
- Support new and existing interagency review teams or interagency work groups
- Create tools to help tribes, the public, local government, and community-based organizations navigate state agencies to address complex water issues
- Support the development and use of Oregon's Environmental Justice Mapping Tool
- Support interagency communication around community engagement (also see HB 3293 (2021))
- Support interagency coordination to implement water-related plans (e.g., Oregon's Natural Hazard Mitigation Plan, Oregon Plan for Salmon and Watersheds, etc.)

Action 9E Lead Meaningful Community Engagement

Public and community engagement efforts for the 2025 Strategy, the 2023 Secretary of State Water Advisory Report 2023-04, 2022 State of Water Justice Report, 2022 Oregon Water Justice Framework, 2020 Oregon Water Futures Project Report, and the 2020 100-Year Water Vision effort all document water insecurities and inequities in Oregon. Many of Oregon's Tribes have been excluded from decision-making, where those same decisions have resulted in degradation of water resources and inability to meet their community needs and often federally granted Treaty Rights. Issues across Oregon include inadequate infrastructure and drinking water quality, lead exposure in drinking water, affordability of water utility rates, inadequate water in the workplace, and climate change impacts. Populations experiencing related challenges include "frontline communities," or those that experience impacts "first and worst" and have fewer resources, capacity, safety nets, or political power to respond to water challenges. Oregon must find ways to equitably improve the safety, affordability, reliability, and availability of water for all.

Oregon's disproportionately impacted communities are experts based on their lived experiences and this expertise must be centered in climate resilience and water planning work. However, common community engagement challenges have limited meaningful engagement, such as resource allocation and trust-building with historically marginalized communities. The 2025 Strategy acknowledges that efforts must be made to enhance and expand community engagement to better identify workable solutions to improve water equity and security for everyone in Oregon.

> "Community leaders across Oregon have limited awareness of Oregon's water challenges, the urgency to act now, and potential water solutions.
>
> We can work with communities to build a culture and leadership that prioritizes water at the local, regional, and statewide levels."
>
> .-100-Year Water Vision (2021)

There are many reasons for inequities around water. Oregon established a system to issue water rights which includes inherent inequities that cannot easily be resolved. Oregon relies on the doctrine of prior appropriation to issue new water rights. The doctrine dates back to the 1800s, when federal homesteading acts awarded "surplus" lands to primarily white settlers. Under common law, settlers initially appropriated and retained water rights as riparian landowners, but those rights were subject to the rights of prior appropriators. Concurrently, Tribes predating white settler occupation, in most cases by thousands of years, were removed forcibly from their native lands and relocated to reservations (1800s). Meanwhile, racist, exclusionary laws also prevented Black and mixed-race people from settling in the Oregon territory (1840s and 50s) and expelled Chinese migrants from Oregon altogether (1882-1943). In 1909 Oregon codified the prior appropriation doctrine for issuing new surface water rights, effectively grandfathering in existing water rights acquired through inequitable land acquisition laws and policies. Later, through the Ground Water Act of 1955, the state codified the prior appropriation doctrine with respect to groundwater allocation, further cementing the inequities of the prior century.

On the heels of codification of prior appropriation, Tribes faced more challenges with respect to retention of what are arguably the most senior of water rights. During the 1950s, many Tribes faced termination, stripping them of sovereign recognition and ending federal trusteeship over the reservations. With termination came the further loss of lands used for hunting, trapping, gathering, and fishing and any water rights that may have supported those uses. Beginning in the mid-1970s, some Tribes have been restored to full sovereignty and are recognized federally again, but even so, many of the water rights associated with the original reservations have either been eliminated or diminished or remain under dispute. See Oregon Secretary of State, 2023, Advisory Report 2023-04, for more information about racial inequity and Oregon water rights.

Environmental Justice Council

Oregon's Environmental Justice Council is a resource for agencies to create authentic community relationships, design inclusive programs and projects, and communicate honestly with community members to create and sustain meaningful community engagement and public participation.

Diversity, Equity, and Inclusion Plans

Oregon's Diversity, Equity, and Inclusion Action Plan is a roadmap to advance racial equity and belonging across the state. The plan emphasizes the need for proactive measures to minimize the negative impacts of racism and outlines several actions to advance meaningful community engagement.

Figure 4-4: Environmental Justice Tools and Resources

Oregon's Environmental Justice Council was created by the Legislature to help protect Oregonians from disproportionate environmental impacts on minority and low-income populations. The Council is developing a statewide environmental justice mapping tool to help state agencies identify communities traditionally underrepresented in government processes and harmed by environmental and health hazards as required by House Bill 4077 (2022). The mapping project implementation is scheduled to begin in 2028.

Oregon's Climate Equity Blueprint (2021) was developed as part of the 2021 Climate Change Adaptation Framework and helps state agencies center equity at the forefront of climate adaptation work, not as an afterthought. The Blueprint provides a set of best practices for agencies to apply an "equity lens" as they design state policies, processes, and programs to address climate change. The Blueprint provides solutions to common challenges regarding meaningful engagement, which have been incorporated into the example actions for Action 9E.

Best Practices in Community Engagement

Oregon Revised Statute 541.551 (House Bill 3293, 2021) emphasizes the importance of engaging communities, especially those disproportionately impacted or underrepresented, in decisions related to the identification, scoping, design and implementation of water projects. The bill directed specific agencies to work together and create best practices in community engagement for water projects. As part of this process, each agency pursues their own procedures for acknowledging this work in the Oregon Administrative Rules.

In 2024, the six state agencies (Water Resources Department, Department of Fish and Wildlife, Oregon Health Authority, Oregon Watershed Enhancement Board, Department of Environmental Quality, and Business Oregon) identified in HB 3293 published 10 Best Practices in Community Engagement around Water Projects outlining the draft recognized best practices which represents input from many voices throughout Oregon. Draft best practices include:

1. Identify disproportionately impacted communities with interest in engaging in water project planning.
2. Define the water project purpose and goals, including what will be done to involve disproportionately impacted communities.
3. Develop new, or assess current, decision-making frameworks to identify opportunities to enhance access to the decision-making process for disproportionately impacted communities.
4. Invite Tribal communities in Oregon to participate in the water project, acknowledging their preferences and capacity for collaboration.
5. Co-create water project capacity opportunities that are inclusive, including to disproportionately impacted communities.
6. Build collaborative relationships with disproportionately impacted communities and ensure all parties' voices are heard in the water project.
7. Coordinate with the community and across water project participants to leverage resources, staff, and data.
8. Ensure water project communications and information are shared in a timely, transparent manner, and in languages and formats commonly used or preferred by disproportionately impacted communities.
9. Evaluate community engagement effectiveness before, during, and after the water project, based on communities' and projects' purposes and goals as well as capacities, and adapt future projects as appropriate.
10. Strive to monitor and document the positive and negative impacts of the water project on disproportionately impacted communities and their environments.

Action 9E

Lead Meaningful Community Engagement

Examples of how to implement this action:

- Provide resources for capacity-building for community-based organizations
- Use accessible and inclusive engagement strategies
- Create opportunities for communities to identify and engage decision-makers
- Conduct outreach to invite underserved/under-represented populations to participate in planning activities
- Provide funding for agencies and organizations to sustain engagement over the life of a project
- Provide resources for facilitation and coordination, and staff experts in outreach and engagement best practices
- Use best practices for engagement as identified in the State of Oregon Diversity, Equity, and Inclusion Action Plan and other documents, including cultural and language-specific needs
- Use Oregon's environmental justice mapping tool to evaluate potential impacted communities for state-led planning, engagement, policy development, and management activities

Critical Issue | Water Use and Management

Under Oregon law, all water within the state belongs to the public. Wise management and use of this precious public resource is a shared responsibility for all Oregonians. The choices we make may impact the quantity and quality of water available today and in the future. The Water Resources Department (OWRD) is responsible for allocating Oregon's surface water and groundwater supplies to a multitude of instream and out-of-stream uses. The OWRD is also responsible for determining the amount of water available for these diverse uses in basins and aquifers throughout the state, relying on modeling and measurements of surface water and groundwater conditions to help make those determinations.

The OWRD works with water right holders and domestic well owners to help manage their use. While the Department's focus is water supply, they work with other state agencies such as the Oregon Departments of Environmental Quality, Agriculture, Fish and Wildlife, and others, to manage Oregon's water in an integrated manner to meet diverse and often competing uses.

The state and water users partner to carry out water efficiency, reuse, and storage projects. State agencies provide technical assistance, permitting, regulation, compliance, enforcement, and in some cases funding, to support projects that steward our shared public resources.

Action 10A Improve Water-Use Efficiency and Water Conservation

Water conservation is one of the more widely recognized approaches to managing water demand and stretching limited supplies of water. As defined in state law, water conservation is a means of eliminating waste or otherwise improving the efficiency of water use by modifying the technology or method of diverting, transporting, applying, or recovering water.

This section notes many of the programs and funding resources that exist today and makes recommendations for improving access to information, incentives, and program participation. The next action, Action 10B, "Encourage Water Reuse Projects" addresses the water savings that might be gained from a reuse or recycled water project.

Water Conservation within Agriculture

Diverting an estimated 80 percent of the total water diverted in the state, agriculture is the largest user of water in Oregon, and therefore, offers the highest chance of conserving measurable amounts of water.[8] Statewide efforts should focus on increasing voluntary conservation and efficiency efforts in the agriculture sector. This could result in significant water savings statewide. Although there are several water conservation and efficiency technologies already in use by the agricultural community, there needs to be an increase in funding and incentive opportunities.

Many irrigators have worked extensively with both public and private sector partners to install and model some of the most modern water conservation techniques. These include more efficient irrigation systems, including weather-based irrigation systems, soil moisture controls linked to weather data and computer-controlled irrigation, drip irrigation, variable speed pumps that adjust to water-use needs, and piping or lining canals. Climate-smart agricultural practices such as no-till, dryland, and/or regenerative agriculture, and permaculture strategies also contribute to water conservation. Several irrigation districts, particularly in Central Oregon, have improved their water delivery systems through lining and piping projects to better manage water supplies. Many of these projects have been funded by the Water Resources Department's (OWRD) Water Project Grants and Loans Program, which may include dedicating water in-stream all or a portion of water savings due to infrastructure upgrades. The Farmers Conservation Alliance and Energy Trust of Oregon have also helped support the irrigation modernization

and water conservation projects. The Oregon Watershed Enhancement Board (OWEB) administers a statewide irrigation modernization grant program that supports drought relief and resilience.

The potential for reduced return flow or injury to other water users are also factors to consider when designing a water conservation project. Piping, lining, or other water efficiencies can greatly reduce the quantity and rate of return flows that traditionally make their way back to the stream or groundwater reservoir. However, return flows can also be a major source of nutrient, sediment, and thermal loading to waterbodies. Some Agricultural Water Quality Management Plans call for a reduction in return flows for that very reason. An alternative to piping irrigation canals may be covering them with photovoltaic panels to reduce evaporation and produce power. The North Unit Irrigation District was awarded $2.55M in 2024 in federal funding from the Inflation Reduction Act for the Main Canal Floating Photovoltaics Project. The North Unit Irrigation District will construct floating photovoltaic solar panels on the Main Canal of the Deschutes Project, serving as a case study to understand how the panels impact water efficiency and produce clean energy.

Crooked River pump station. Credit North Unit Irrigation District

Several funding resources exist to help water users make water-use efficiency gains. The Bureau of Reclamation offers competitive WaterSMART Water and Efficiency Grants, providing grants for water and energy efficiency projects. Examples of past awards to Oregon irrigation districts have helped pay for piping or lining canals and ditches and installing telemetry systems and related micro-hydro projects.[9]Federal funding for this program was enhanced through the Bipartisan Infrastructure Law, which designated $140 million for Water and Efficiency grants in 2023. Other funding sources are available from USDA's Natural Resources Conservation Service, OWRD, and OWEB.

Agricultural Water Management and Conservation Plans – Irrigation districts and other agricultural water suppliers may be required to prepare and submit a Water Management and Conservation Plan to the OWRD, described in more detail in Appendix B. Application of appropriate conservation tools may also lead to an increase in available water supplies to better meet their patrons' crop demands. Irrigation districts with plans approved by the OWRD can take advantage of certain statutory provisions that allow the transfer of water rights from one district user to another to prevent forfeiture of the rights due to non-use.

Allocation of Conserved Water Program – Described later, in Action 11B, Oregon's Allocation of Conserved Water Program allows a water right holder who plans to implement a water conservation project to legally use a portion of the conserved water on additional lands, while another portion is permanently protected instream. Examples of eligible conservation projects include lining or piping open or leaky canals or ditches, or changing from a less efficient water distribution system, such as flood irrigation, to sprinkler or drip irrigation. Irrigation modernization projects provide a valuable opportunity to legally protect conserved water instream.

Water Conservation within Industry

Water conservation in business and industry not only saves money by using less water, it can also save on energy required to heat water and run equipment. In manufacturing operations, service and retail establishments, and other businesses, there are ample opportunities to use water efficiently. Just like in the home, water-efficient toilets, faucets, showerheads, clothes washers, and dishwashers used in the industry setting can save significant amounts of water.

Water-intensive industries have an opportunity to use more efficient processes, or even recycled water (see Action 10B), for washing or flushing, in industrial processes, in chillers, and in cooling towers. Several water providers offer walk-through inspections to help commercial customers detect leaks or develop additional water-saving ideas. Some businesses also take the opportunity to convert their greenspaces to xeriscapes, or to install weather-based irrigation systems to improve irrigation efficiencies.

> "We can incentivize water conservation and reuse and invest in modern water delivery systems statewide. Efficiency gains and updated systems will help improve water reliability for cities and counties, tribes, ecosystems, and the many aspects of a thriving economy that depend on water."
>
> -100-Year Water Vision (2020)

Water Conservation within the Home and Cities

Water conservation is a tool that can be implemented in any water use sector and much has already been done to conserve water within our homes and businesses. Many municipalities have robust water conservation programs and resources for their communities. Replacing certain appliances, such as toilets, dishwashers, and washing machines with more water efficient models, adding faucet aerators to bathroom and kitchen sinks, or installing low flow showerheads to use less water are common activities. However, outdoor water use for residential or municipal irrigation (e.g., lawns, parks, and golf courses) provides a continued opportunity for water savings. The U.S. Environmental Protection Agency (USEPA) notes that outdoor water use accounts for more than 30 percent of total household water use, on average, but can be as much as 60 percent of total household water use in arid regions.[10] Water-saving technologies such as irrigation controllers, soil moisture sensors, and rain sensors can be incorporated into irrigation systems to improve their efficiency.

Municipalities or water utilities often provide residential customers with guidance or technical assistance to reduce residential water use. Many water providers in Oregon offer rebates for the purchase and installation of water efficient appliances; some also provide shower timers and leak detection kits free of charge to homeowners and businesses alike.

WaterSense Program - WaterSense, a partnership program started by the USEPA in 2006, offers a quick and simple way to find water-efficient products and services. A WaterSense label means a product has been certified to use at least 20 percent less water, save energy, and perform as well as or better than regular models. Since the program's inception through the end of 2022, it has helped consumers save a cumulative 7.5 trillion gallons of water and $171 billion in water and energy bills. In Oregon, more than 40 organizations, including non-profits, drinking water providers, and various distributors promote WaterSense labeled products. [11]

The WaterSense program also provides tips for reducing outdoor water use for household irrigation. The WaterSense Water-Smart Landscapes Guide provides information about choosing native or drought-tolerant plants, supporting soil health, and proper maintenance.

Municipal Water Management and Conservation Plans – Some municipal water providers are required to prepare and submit a Water Management and Conservation Plan to the OWRD, described in more detail in Appendix B. Examining conservation-based rate structures is a required element of Water Management and Conservation Plans. As a result, some water providers have modified their water rates, further driving down demands for water. Some municipalities have also offered incentive programs to replace lawns with xeriscaping.

Future Water-Use Efficiency and Conservation Programs

Water users in Oregon have many tools available to encourage water conservation and more efficient use of water resources. However, the state does not have a coordinated program to promote such tools. Developing such a program could include creating a user-friendly website, conservation materials for use by public and private partners, an on-line clearinghouse that highlights best management practices, funding, and technical resources. A clearinghouse could help water providers identify the potential for conservation and then design or improve their programs.

Conservation tools, such as those offered by the Alliance for Water Efficiency and the Water Research Foundation that help entities calculate the economic benefits of conservation programs, are good examples to feature in the clearinghouse. Having analytical tools easily available is of critical importance in determining the feasibility of investing in water efficiency and conservation programs. Lastly, because water and energy are so closely tied, water conservation goals and efforts should be coordinated with energy efficiency programs, see Action 4C.

Action 10A

Improve Water Use Efficiency and Water Conservation

Examples of how to implement this action:

- Establish a comprehensive water-use efficiency and conservation program that provides incentives and technical assistance to water users in all sectors
- Conduct a statewide water conservation potential assessment, considering high priority water management needs
- Prioritize and provide funding for agricultural water-use efficiency and conservation projects (often saving energy and supporting Action 4C)
- Support water conservation projects that use the Allocation of Conserved Water Program
- Develop or continue municipal incentives (e.g., xeriscaping rebates, metering, tiered rate structures)
- Develop an outreach strategy to expand participation in already-existing water-use efficiency and conservation programs
- Develop outreach materials, a user-friendly website, and online clearinghouse that highlights best practices, funding, and technical resources
- Ensure disadvantaged communities are not overburdened by mandatory or voluntary water conservation measures
- Borrow best practices and experience from energy efficiency programs in implementing water efficiency programs
- Partner with broadly supported well-developed energy efficiency programs that also save water (See Action 4C)
- Assess the value of establishing statewide efficiency standards
- Update state definition of “waste” for enforcement purposes

Action 10B Encourage Water Reuse

Water reuse is the practice of treating "used" water (or effluent) and making it available for another beneficial use. Reusing water can be an environmentally sound way to manage graywater or wastewater while conserving surface water and groundwater supplies.

Reusing water can provide many benefits to both water quantity and quality and support drought mitigation and climate adaptation and resiliency. In general, recycled water places fewer demands on freshwater, leaving more water instream or in the ground for other uses. Municipal reuse can provide a benefit to water quantity by reducing the demand on drinking water. Municipal reuse for irrigation can support green infrastructure and maintain soil moisture, helping to mitigate the urban heat island effect. Irrigating and maintaining healthy green infrastructure during the summer months helps ensure it can provide important stormwater management functions during the wet winter months. Reuse for agricultural uses may reduce the need for surface water withdrawals, helping to maintain stream flows and support a variety of beneficial uses.

Reuse laws and permitting processes take into consideration potential environmental and public health impacts. See Action 10F regarding strengthening and improving water quality and quantity permitting processes.

Reuse projects often require expensive equipment and infrastructure with ongoing operations, maintenance, and energy needs. Potential projects must evaluate the costs and benefits, including impacts to water affordability.

Reuse Terminology

There are many terms used regarding wastewater treatment and reuse, and the use of some of these terms varies by state agency or local government. The national organization WateReuse provides the following descriptions for commonly used water reuse terms:

- *Reused water* - water that is used more than once and has been treated to a level that allows for its reuse for a beneficial purpose
- *Recycled water* - treated domestic wastewater that is used more than once before it passes back into the environment
- *Reclaimed water* - used water that has been treated to be fit-for-purpose for reusing or recycling

Agency Roles

Oregon's policies encourage the reuse of water, so long as the use protects public health and the environment. Several agencies, including the Oregon Health Authority (OHA), Department of Environmental Quality (ODEQ), Department of Fish and Wildlife (ODFW), Water Resources Department (OWRD), and Department of Consumer and Business Services (Building Codes Division), are all involved in different aspects of water reuse projects.

The ODEQ is the lead agency in regulating the use of recycled water. The ODFW identifies potential impacts to fish and wildlife and instream flow targets from proposed projects.

The OWRD refers to recycled water as "reclaimed" water. The Department determines whether the reclaimed water use will cause harm to other water rights; it also tracks the reclaimed water use in the Water Rights Information System database, noting the source of the water and where and how the water will be reused. The OWRD has two exemptions in statute where a new water right permit is not needed for recycled water; when water is used for municipal purposes and when groundwater associated with an industrial or Confined Animal Feeding Operations permit is used for irrigation.

Types of Reuse

Three general categories of water reuse include:

- **The Use of Graywater –** Graywater refers to water from showers, baths, bathroom sinks, kitchen sinks, and laundries. Graywater can be reused for limited activities, such as subsurface irrigation, with minimal treatment. Homeowners and small businesses can reuse graywater for toilet and urinal flushing with the appropriate plumbing permit from a local building department. Outdoor reuse of graywater can occur by carefully planning reuse activities and obtaining a Water Pollution Control Facility graywater reuse and disposal system permit from the ODEQ.

- **The Use of Domestic Recycled Water** – Recycled water refers to treated effluent from a municipal wastewater treatment facility. Oregon has approximately 340 wastewater treatment facilities and there are more than 140 municipal facilities operating recycled water programs throughout Oregon. Communities have been taking advantage of State Revolving Fund loans for developing and upgrading recycled water systems.

- **The Use of Industrial Wastewater** – Industrial wastewater refers to treated effluent from an industrial process, manufacturer or business, or from the development or recovery of any natural resource. An example of industrial wastewater is water derived from the processing of fruit, vegetables, or other food products. A more recent development in industrial wastewater is the water left over from use as cooling water in data centers throughout Oregon.

Although water reuse activities in Oregon have been traditionally limited to non-drinking water purposes, a wide range of activities can occur, including irrigation of crops and pastureland and irrigation of urban landscapes. Cities commonly use recycled water to irrigate golf courses, athletic fields, and business parks. Recycled water can also be used for industrial cooling, dust control, street sweeping, and artificial recharge of groundwater.

Specific water reuse activities depend on the level of treatment and resulting quality. More reuse activities can occur with higher-quality water. As public awareness of water reuse benefits increases, additional innovative uses of water will become more common.

Recent Legislative Support

In 2023, the Oregon Legislature enacted provisions for expanding the application of reuse. The 2025 Oregon Legislature passed House Bill 2169 requiring the ODEQ to establish an Interagency Water Reuse Development Team that includes the ODFW, OHA, OWRD, and the Oregon Department of Agriculture to encourage and expand water reuse in Oregon. This team will continue the work directed in the 2023 legislative session to:

- Provide training and education to state agency staff on the benefits and drivers of water reuse projects and Oregon's policy to encourage and expand opportunities for water reuse
- Identify and address internal barriers and information needs within agencies, identify changes needed to overcome these barriers and work towards improving interagency collaboration
- Identify conflicts between agencies that must be resolved to expand water reuse in Oregon and work toward their resolution
- Ensure information and agency contacts regarding water reuse are current and accessible and that responses to information requests are consistent and timely
- Evaluate successful environmentally protective approaches used by other states' water reuse programs that could be implemented in Oregon
- Develop technical assistance guidance, or other resources for local governments, industries, and nongovernmental organizations seeking water reuse program development and associated permitting
- Establish goals and performance metrics on water reuse development in Oregon

Innovative Approaches

Direct-Potable Reuse – Direct-potable reuse refers to the treatment of wastewater to a quality high enough that it can be used for drinking water. The technology used to accomplish this treatment is often at the municipal scale and includes reverse osmosis or other membrane technology. Direct potable reuse projects can include piping highly treated water directly into a water distribution system or blending the treated water with raw water supply right before the drinking water treatment plant. States that commonly experience water supply shortages, such as Texas and California, have been using direct-potable reuse and other states are positioned to follow. In 2013, Texas became the first state to operate a direct potable reuse facility in the country.[12]

Regulations ensure that direct potable reuse projects manage risk to drinking water supplies and public health. Projects must comply with the Clean Water Act and Safe Drinking Water Act.

Environmental Restoration – Water recycling can support environmental restoration efforts or provide a co-benefit to the environment when restoration is not the primary driver for the project. Recycled water can recharge groundwater (see Action 12D) and has the potential to augment streamflows, supporting species that have been impacted by declining groundwater and low stream flows.

Fertigation – "Fertigation" generally refers to combined delivery of fertilizer in irrigation water. Oregon State University has been conducting studies on the use of wastewater effluent to fertilize crops, avoiding the need for chemical fertilizers. The technology used to treat and reuse the wastewater includes a two-stage hybrid membrane filtration that would remove bacteria but keep valuable nutrients including nitrogen, phosphorus, and potassium. The studies will help determine if this technology is economically viable for use by farmers.

Action 10B
Encourage Water Reuse Projects

Examples of how to carry out this action:

- Conduct a statewide assessment of the potential for additional water reuse, considering impacts, costs, and benefits to water quantity and quality, and management of water and wastewater systems
- Ensure that state agencies coordinate and communicate various policies, procedures, and regulations to facilitate reuse projects
- Provide incentives to increase and track water reuse
- Complete evaluation and updates of ODEQ and OWRD water reuse programs (House Bill 2169, 2025)
- Develop technical assistance capacity to promote and inform water reuse practices and projects
- Develop and maintain adequate staffing to support increased utilization of state reuse programs
- Develop water reuse rules to ensure implementation of an effective and protective reuse program
- Connect reuse actions to the Water Management and Conservation Plan Program
- Explore opportunities for the state, tribes, and other interested parties to partner on water reuse projects
- Evaluate who benefits, or is negatively impacted by, reuse projects
- Evaluate successful environmentally protective approaches used by other states' water reuse programs that could be implemented in Oregon
- Establish goals and performance metrics on water reuse development in Oregon

Action 10C Improve Access to Storage

The history of storing water in Oregon dates to the 1800s when projects consisted mostly of ponds or small dams across streambeds. As the state's population grew, so did the scale and purpose of these projects. Before long, developers and governments were building major dams and reservoirs to meet the increasing water demands for power production, flood protection, and out-of-stream needs during the dry summer months.

In Oregon today, there are more than 15,000 water rights authorizing the storage of surface water in reservoirs. Another 5,000 ponds were registered with the state in the mid-1990s. The Water Resources Commission adopted the state's water storage policy, identifying water storage as an integral part of Oregon's strategy to enhance public and private benefits from use of the state's water resources.[13] The policy acknowledges that both structural and nonstructural methods should be used in Oregon to store water, with preferences for storage that optimizes instream and out-of-stream public benefits and beneficial uses. In 1993, the Oregon Legislature codified the state's policy regarding water storage facilities, declaring it a high priority to develop environmentally acceptable and financially feasible multipurpose storage projects, and to enhance watershed storage capacity through natural processes using non-structural means (e.g., floodplain restoration). Watershed and floodplain protection and restoration to improve natural storage capacity is addressed Action 11A.

Below-Ground Storage — Aquifer Storage and Recovery and Artificial Groundwater Recharge

Oregon can improve access to below-ground storage by encouraging the increased use of Aquifer Storage and Recovery (ASR) and Artificial Groundwater Recharge (AR) for water storage. The use of these techniques is gaining interest, particularly in the northwest and north-central regions of Oregon, due to the smaller environmental footprint, moderate cost, and potential associated benefits for water quality, compared to above-ground storage. Areas of Oregon designated as "groundwater limited" or "critical groundwater areas" may have greater aquifer capacity to accommodate ASR and AR projects.

Forming partnerships between different user groups, such as a municipality that treats water and an irrigation district needing an alternative source of water, could help meet the financial and water quality obligations for below-ground storage, but risks and unintended impacts to water quantity also need to be considered.

Water that is treated to standards safe enough for drinking water is the only source water allowed for ASR projects. Direct injection of water also must be geochemically compatible with natural groundwater. This protects the groundwater resources, but can be an expensive standard to meet, particularly for non-municipal projects with large tracts of land. Grants for feasibility studies from the Water Resources Department (OWRD) have been used to explore potential aquifer storage projects. Business Oregon also offers an Aquifer Recharge Due Diligence Grant and Forgivable Loan Program.

The state has issued authorizations for approximately 20 ASR and 10 AR projects. Municipalities use below-ground storage to supplement their water supplies for their communities, as in the case of Baker City and the City of Beaverton. Farmers and ranchers use below-ground storage to supplement irrigation water during the summer months. A barrier to advancing AR/ASR projects includes a lack of OWRD's agency staff capacity and Department of Environmental Quality staff to evaluate water quality questions. Figure 4-5 compares both permitting paths.

Figure 4-5: Comparing Artificial Recharge and Aquifer Storage and Recovery Technologies

Category	Artificial Recharge (AR)	Aquifer Storage and Recovery (ASR)
Water Use	Primarily irrigation, industrial	Primarily drinking water
Recharge Method	Seepage systems, injection wells	Injection wells only
Water Quality Requirements	Recharge water cannot impair or degrade groundwater quality	Recharge water must meet drinking water standards
Water Rights	Rights required to appropriate source water and to pump recharged groundwater	Can use existing rights to store and use recovered water
Oregon Revised Statutes (ORS) **Oregon Administrative Rules (OAR)**	ORS 537.135 OAR 690-350-0120	ORS 537.531 to 537.534 OAR 690-350-0010 to 690-350-0030

Identifying Potential Below-Ground Storage Sites – In 2009, the OWRD created an inventory of potential below-ground storage sites.[14] Additional site-specific investigation is needed to pursue these potential storage sites, including consideration of local aquifer characteristics, infrastructure, water availability, cost-benefit relationships, water quality, and authorization requirements.

Above-Ground Storage — Reservoirs

Reservoirs have existed as a critical piece of Oregon's stored water landscape for many decades. They allow water to be captured and stored for later use, and some even generate hydropower. However, changing patterns of precipitation, snowpack, and heat have impacted the effectiveness of existing water storage systems. Reduced rainfall and snowpack are resulting in less water available for use during the high demand summer season, while earlier spring temperature increases and intensifying summer heat waves are increasing evaporation loss in reservoirs and further reducing supplies. These issues, combined with competing environmental demands, complicate considerations for new above-ground reservoirs.

Identifying Potential Above-Ground Storage Sites – As part of the Oregon Water Supply and Conservation Initiative (2008), the OWRD conducted an inventory of potential above-ground storage sites from past surveys conducted by different entities[15]. Most of these potential dam sites in the inventory are located on major stream channels. Since the time of these surveys, Oregon has moved away from locating dams on significant stream and river channels, in large part because of effects on fish and aquatic life that must migrate through these streams and water quality parameters such as temperature and dissolved oxygen. There has been very limited evaluation of above-ground storage sites that are located off-stream or at sites with little or no effect on fish and other aquatic life. Additional work is needed to locate and evaluate impacts of potential reservoir sites in locations that minimize impacts to ecosystems and that could be economically viable.

Evaluating Storage Infrastructure – Oregon should evaluate the status of its existing storage capacity and infrastructure, including determining the maintenance and rehabilitation needs of dams. To improve access to stored water, Oregon should continue to support the Dam Safety Program and identify multipurpose ways to expand the capacity of existing above-ground storage projects—by raising a dam's height, removing sediment, or repairing dams where safety restrictions have required lower water levels. Fish passage and other environmental issues must be considered when evaluating raising a dam's height.

In some cases, sediment accumulation has reduced storage capacity and dredging may restore its original capacity. Reservoir owners should be aware that dredging activities fall under the State Removal Fill laws enforced by the Department of State Lands and requires a permit. Reservoir dredging is intended to restore the original capacity, not to increase capacity.

Federal Reservoir Systems – The U.S. Army Corps of Engineers (USACE) and the U.S. Bureau of Reclamation (USBR) are key partners in the operation and management of key pieces of water infrastructure, including reservoirs used for power production, irrigation, and flood control.

Recently, the USACE completed a feasibility study, co-sponsored by the OWRD, to determine the potential to use stored water from the Willamette Valley Project reservoirs for multiple purposes. The study was needed because demands on the basin's water supplies have changed significantly since the dams were constructed, due to increasing population, development, irrigation needs, and the listing of fish species under the Endangered Species Act. The study evaluated several options for reallocating storage space that could better meet water needs not only for irrigation, the only use allowed under existing water rights, but also as a source of drinking water for communities, industries, and instream flow needs for listed fish species in the basin.

In 2020, the U.S. Congress approved the reallocation of storage space, designating 69 percent for fish and wildlife, 21 percent for agricultural irrigation, and 10 percent for municipal and industrial uses. There is a strong interest and desire among agencies, basin partners, and others to contribute to a longer-term water management plan that optimizes the use of a shared resource for all uses of water, both instream and out-of-stream. To fully carry out reallocation, several steps need to occur, including additional consultation under the Endangered Species Act, a water rights transfer, a new contracting process for municipalities and industries, as well as securing instream water rights to protect the release of stored water for fish and wildlife purposes.

Action 10C
Improve Access to Storage

Examples of how to carry out this action:

- Encourage increased use of environmentally acceptable below-ground storage sites and practices
- Assess and make improvements to the Aquifer Storage and Recovery and Artificial Recharge Programs to promote and increase the use of this tool in a manner that protects public health, water quality, and ecosystems
- Carry out implementation of the Willamette Basin reallocation study recommendations as directed by Congress in the Water Resources Development Act of 2020
- Investigate potential off-channel sites for environmentally acceptable above-ground storage projects
- Evaluate the status of storage infrastructure, including the maintenance and rehabilitation needs of reservoirs, and potential for expanding existing storage capacity
- Investigate the use of existing reservations of water during planning efforts
- Consider equity, environmental justice, and water insecurity in the prioritization of storage sites

Evaluating Reservations for Storage

The 1987 Instream Water Right Act included a provision for Oregon Department of Agriculture to request a reservation of water for future economic development (ORS 537.356 through 537.358). A reservation sets aside an amount of unappropriated water in some basins for storage to meet future needs. The Water Resources Commission assigns an amount and a priority date, although it is not the same as a water right application or permit. Approval of a reservation does not mean that any future application will be approved, or that a reservoir may be constructed. Water users wishing to access reserved water must submit a water use application to the OWRD, referencing the reservation. The OWRD then reviews the application based on current, applicable public-interest review standards and applicable basin rules regarding the reservation.

Reservations are in place in six basins: Grande Ronde, Hood River, Malheur, Malheur Lake, Owyhee, and Powder River, and are established by rule in basin programs. To date, there have not been any successful applications for reserved water. Any pursuit of multi-purpose storage under these reservations would likely be challenging.

Action 10D Reach Environmental Outcomes with Non-Regulatory Alternatives

Water conservation, storage, and reuse are a set of conventional tools for meeting water needs, used in conjunction with state and federal regulatory tools that protect water resources for future generations. We also need to consider non-regulatory and market-based approaches to meeting our collective and often competing demands for water and consider holistic strategies to meet water quality, water quantity, and ecosystem needs.

Potential solutions include voluntary actions by water users that often include funding and technical assistance from agencies. Oregon should continue to explore new alternatives and promote and expand existing programs.

Related Strategy Actions

Many actions described throughout the Strategy require voluntary participation to provide positive environmental outcomes, and many require strong partnerships with senior water users. These programs and related Strategy Actions include:

- Water efficiency/conservation projects and allocation of conserved water, Actions 10A and 11B
- Aquifer Recharge (AR) and Aquifer Storage and Recovery (ASR) projects, Action 10C
- Ecological restoration on public or private property, Actions 11A, 11C, 11D
- Water transfers and leases, Action 11B
- Voluntary agreements among water users within one basin to limit water use, Action 11E
- Source water land acquisition, Action 12A
- Pesticide Stewardship Partnership participation, Action 12B

Conservation Reserve Enhancement Program (CREP)

The Conservation Reserved Enhancement Program (CREP) is administered by the U.S. Department of Agriculture Farm Services Agency and supports private-land conservation. This voluntary program pays farmers and ranchers to remove environmentally sensitive land from production, paying them an annual rental rate and other incentives. This is an important tool that can be used to pay to retire groundwater rights in basins where groundwater is overallocated. In Harney County, the CREP contract includes a provision requiring the cancellation of the water right in trade for CREP payment. A CREP contract payment period is typically 10-15 years. In 2018, eligible partners expanded beyond individuals, state and Tribal governments to also include non-governmental organizations such as non-profits, private companies, and foundations.

Conservation Stewardship Program (CSP)

The Natural Resources Conservation Service administers the Conservation Stewardship Program, paying agricultural producers to implement practices that benefit wildlife, improve soil health, reduce water quality

Action 10D
Reach Environmental Outcomes with Non-Regulatory Alternatives

Examples of how to carry out this action:

- Research and develop-voluntary, non-regulatory tools to meet environmental outcomes
- Continue to develop water quality trading programs
- Develop voluntary water markets to restore streamflow in priority stream reaches
- Develop protocols for translating streamflow restoration into credits and accounting strategies
- Investigate and establish incentives for voluntary efforts to achieve positive environmental outcomes
- Make improvements to transfer processes and develop potential adaptive transfer tools, including instream leases and transfers
- Develop an outreach strategy for informing the public about non-regulatory alternatives
- Support agencies to provide technical assistance regarding voluntary efforts
- Develop a voluntary agreement framework (O.R.S. § 537.745) for groundwater right holders
- Partner with federal agencies with Conservation Reserve Enhancement Programs to permanently retire groundwater rights where groundwater resources are overallocated
- Identify community benefits from improved environmental outcomes

impacts and reduce irrigation. The program can be used to fund innovative agricultural practices like multi-species cover crops or deep-rooted cover crops that break up compacted soil.

Water Quality Trading

The Oregon Environmental Quality Commission approved rules in 2015 establishing a voluntary water quality trading program to facilitate pollution reduction and protect the quality of Oregon's waterways. The rules provide clarity for regulated entities, the public, and Department of Environmental Quality staff.

Cities and utilities have utilized water quality trading to address temperature pollution challenges. The City of Medford partnered with The Freshwater Trust to establish leases with landowners to plant trees along the Rogue River. The City of Ashland implemented a similar project, also in partnership with The Freshwater Trust. Clean Water Services implements a water quality credit trading program that includes flow enhancement and riparian planting activities. The Clean Water Services 2022 Annual Water Quality Trading Report said they had implemented 200 planting projects along streams in the Tualatin River Watershed that have generated a total of 614 million kcal/day of thermal credit since they established the program in 2004.

The Metropolitan Wastewater Management Commission of the Eugene-Springfield area partnered with The Freshwater Trust to implement a temperature project in the Willamette River basin. Streamside planting is expected to be completed in 2027.

The Deschutes Water Bank

The Deschutes River Conservancy has developed an expanded water bank program to help manage water resources in the basin. The Deschutes Water Bank provides a platform for both permanent and temporary voluntary water transactions among water users in the region. The goal of the Bank is to support flexible market-based opportunities to help address and balance complex water use and water management objectives. Example water transactions include permanent instream transfers, instream leasing, irrigation district "district-to-district" transfers, and mitigation banking.

House Bill 3806 (2025) authorizes the Water Resources Commission to approve, after meeting several conditions, a Deschutes River water bank pilot program for surface water. The pilot program provides a voluntary, market-based tool to allow for management and movement of water to increase supply reliability for junior irrigation districts, provides cities with access to groundwater mitigation, and restores instream flows in the Deschutes River. The pilot program does not replace the use of the Allocation of Conserved Water statute or instream leasing and Deschutes Groundwater Mitigation Programs. The authorizing legislation states the pilot program will sunset on January 2, 2034.

Action 10E Provide an Adequate Field Presence

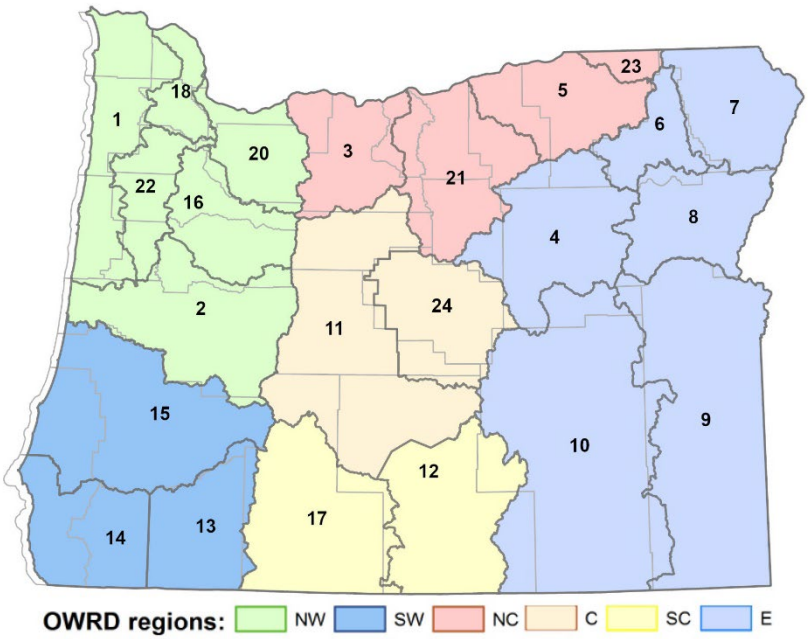
Several of Oregon's natural resources agencies have personnel in the field. Adequate field capacity is needed for data collection, inspections, technical assistance, and effective coordination between agencies and partners.

Field personnel are well positioned to work with local, state, and federal water managers, watershed councils, local planners, county commissions, and other entities in the community with responsibility for water. These individuals are also on the front lines of public education with broad and deep policy, technical, and legal expertise in their disciplines. They are the state's first responders to requests for technical assistance or information and an integral part of fulfilling the agencies' statutory authorities. The state's watermasters, biologists, water quality specialists, basin coordinators, and other field staff have a unique opportunity to strengthen ties and build relationships with local communities.

Data Collection - Field personnel collect data, including hydrological, biological, and chemical data. Field-related work also involves installing and calibrating water measurement and monitoring equipment as well as conducting instream flow studies.

Inspections and Enforcement – Field personnel protect public and environmental health through inspections and enforcement activities. Field personnel conduct site inspections, confirm compliance with permit conditions, guard against waste and contamination, inspect for hazards, and pursue enforcement actions when necessary. Inspection activities associated with dam safety are supported by Action 7C.

Figure 4-6: OWRD Watermaster Regions and Districts



Partnerships between the Oregon Liquor and Cannabis Commission, the Department of Agriculture, Water Resources Department (OWRD), and local law enforcement have been instrumental in identifying and halting illegal water use associated with hemp and marijuana growing operations.

Water Distribution – At the OWRD, field personnel implement Oregon water law and the doctrine of prior appropriation. Under the doctrine, the state's watermasters and assistant watermasters are responsible for regulating and distributing water, curtailing the water use of junior water right holders during times of water shortage, and enforcing water right permit conditions.

Action 10E

Provide an Adequate Field Presence

Examples of how to carry out this action:

- Review and assess agency staff workloads; establish priorities and seek efficiencies
- Improve regulatory tools, including updating laws, modernizing technology and enforcement tools, and providing (cross) training
- Improve the ability for field staff to conduct education and outreach within their districts; develop outreach materials to have on hand when interacting with the public
- Enhance all natural resources agencies capacity to conduct field studies and work directly with water users and conservation interests
- Support cross-agency communication to expedite regulatory enforcement
- Employ staff in rural and remote areas to respond to and assist more communities across the state
- Increase field staff capacity to build and maintain relationships with communities, community-based organizations, and farmworker advocates
- OWRD to provide guidance to field personnel on administering instream water rights
- Provide access to training that addresses equity, environmental justice, and community engagement
- Develop culturally appropriate education materials

The OWRD's limited number of field staff is noteworthy, given the large geographic territory and responsibilities (Figure 4-6). In southeast Oregon, District 10, has just two staff responsible for regulating and distributing water in an area covering 11,700 square miles, the largest district in the state. In northwest Oregon, the District 16 watermaster oversees several hundred dams of various sizes and configurations that need routine inspection and site visits. In this district alone, there are 14,700 water rights that authorize the use of groundwater, surface water, and storage for a variety of uses. The OWRD needs adequate field personnel to distribute and regulate water rights to protect instream and out-of-stream uses.

Support Needed for Field Personnel

Training – Investing in field activities means more than just increasing the number of staff, it also refers to investing in technical training and distribution of workload. There is a need for more advanced equipment and software. Utilizing new tools and technologies may require additional education, training, and certification. Agencies also see the benefit of cross-training staff in the field, so that employees are familiar with multiple issue areas and can assist in the work of other staff or even other districts.

Regulatory Tools – The legal and statutory framework underpinning agency activities needs to be up-to-date, clear, and responsive enough to keep up with modern day water use. Needs vary across agencies, but for the OWRD, they include improving property access agreements and making enforcement tools more responsive. Communities where field presence is robust and public education is strong and consistent exemplify compliance with rules and laws. Areas of the state with a long tradition of regulation and partnership have higher rates of compliance, resulting in more timely and efficient water management.

Technology that is available to field staff (information, equipment, communications platforms, and transportation) must be efficient and accessible to be useful.

Coordination and Communication – Strengthening Oregon's field-based work will require financial investments in communications equipment, information platforms, and outreach materials. It also means finding more efficient ways to coordinate and partner with other agencies to carry out our shared responsibilities. The Department of Fish and Wildlife (ODFW) and OWRD often coordinate on instream flow needs, streamflow restoration efforts, water use measurement projects, and voluntary initiatives or projects. The ODFW staff determine potential impacts to fish, wildlife, and habitats from proposed allocations of water and can recommend conditions and/or mitigation to offset the impacts.

Watermasters Terra Kemper and Matt Anderson removing a defective gage station.
Credit: Garrett Steensland

Action 10F Strengthen and Improve Oregon's Water Quantity and Water Quality Permitting Programs

Several natural resources agencies in Oregon are engaged in water-related permitting. Just like the field staff described earlier, permit reviewers frequently answer calls or questions from water users, realtors, and others, conduct records research, and process case files. It is imperative that agencies have enough well-trained permitting staff in place to process requests in a timely, accurate manner. It is also imperative that state agencies coordinate with Oregon's Tribes who have developed water quality standards to ensure state actions support efforts to meet those standards.

For staff to be effective, improving and expanding staff training and interagency coordination is critical. Investments need to be made to update technologies, manuals, and procedures that continue to improve transparency, efficiency, permit application processing time, and consistency between sections of the respective agency. Interagency staff need access to accurate, quality data on which to design projects or base permitting decisions, supporting the need for continued development of the Oregon Water Data Portal. Staff also need appropriate communications resources to inform permittees about their permit conditions.

Water Quantity Permits

The Water Resources Department (OWRD) administers several water right programs, described in more detail in Appendix B. Staff are responsible for preparing, reviewing, and processing water use permits, limited licenses, temporary drought permits, permit amendments, extensions, transfers (temporary and permanent), certificates, instream leases, conserved water projects, hydroelectric permits, reclaimed water use registrations, among others. The OWRD oversees water management and conservation planning efforts of local entities and completes adjudication proceedings.

The OWRD needs to evaluate each permitting program to ensure that it is helping to accomplish its mission to ensure sustainable water supplies for both instream and out of stream purposes. The OWRD is currently evaluating ways to modernize and streamline the water rights application process.

Water Right Permits and Certificates - In Oregon, reviewing water right permit applications is done in partnership with other state agencies. The Oregon Departments of Fish and Wildlife and Environmental Quality (ODEQ) regularly review new water use permit applications to ensure that the proposed use is not detrimental to fish, wildlife, and habitats and the use is consistent with existing water quality standards, as outlined in OWRD rules. The OWRD sends notice to affected Tribes, local, state, and federal agencies, and others, as outlined in administrative rule. The Department also has specific engagement requirements with certain Tribes as defined by settlement agreements.

In many cases, a new permit application can only be approved if it is conditioned in certain ways or mitigation is provided to offset impacts due to water quality and quantity. Failure to meet some permit conditions cannot be rectified and can result in cancellation of the permit. Early, up front customer service at permit-issuance helps water users avoid later compliance issues.

The OWRD was allocated $3 million of American Rescue Plan Act (2021) funding to work on water right related backlogs for the 2021-23 biennium. The OWRD focused resources on three major backlog areas: water rights, transfers, and reviewing claims of beneficial use for possible certificate issuance. Approximately $1.5 million of the funding remained unused at the end of the biennium, however the 2023 Legislature reauthorized the remaining amount to be used on backlog reduction throughout the 2023-25 biennium. Figure 4-7 shows the progress that has been made on reducing the three different types of permit and certificate backlogs.

Figure 4-7 Water Resources Department Backlog Reduction Efforts Between 2021 and 2024

Date	Water Rights	Transfers	Claims of Beneficial Use	Total
July 1, 2021	657	310	1220	2187
January 1, 2024	561	398	882	1841

Water Right Transfers - Having a water right certificate opens the door to other tools, such as transfers, that allow water users to change where their authorized water is diverted from, where it is used, or what it is used for. There is growing interest in the use of water right transfers to move water around to support out-of-stream uses, streamflow restoration, and economic growth. This interest is driven by the fact that most of the surface water in the state has already been allocated and securing additional water through a new water use permit is difficult. This is especially true for obtaining water during the summer, when out-of-stream demands are high, instream needs for species are critical, and supplies are scarce.

The filing of transfer applications has steadily increased during the past twenty years, a growing trend in most western states. The program includes options for permanent transfers, temporary transfers, and instream leases. The Allocation of Conserved Water Program, described under Action 11B, is an innovative conservation tool available as part of the water right transfer program.

Water Quality Permits

The ODEQ administers several water quality related permits and the Department of State Lands administers removal/fill permits. These programs need continued evaluation and support to improve permitting effectiveness. Permitting managed by the ODEQ includes:

- National Pollutant Discharge Elimination System (NPDES)
- Water Pollution Control Facility (WPCF)
- Onsite Septic System
- Municipal Separate Storm Sewer System
- Section 401 Certifications
- Underground Injection Control
- Graywater Reuse and Disposal System

Action 10F

Strengthen and Improve Water Quantity and Water Quality Permitting Programs

Examples of how to carry out this action:

- Expand staff training opportunities, including interagency trainings; provide adequate staffing
- Update technologies, processing manuals, and expand guidance documents for transparency
- Develop outreach materials and follow-up procedures to help water users understand the application process and permit, transfer, or extension requirements
- Develop a statewide mitigation strategy in coordination with relevant state agencies (DEQ, ODFW, OPRD, OWRD)
- Create stronger linkages among partner agencies
- Develop and implement a workplan to improve the quality and timeliness of individual National Pollutant Discharge Elimination System permits
- Regularly update Oregon's water-related permitting guide (formerly 2017 Strategy Action 2E)
- Improve the timeliness of water right transactions and reduce backlogs
- Modernize and create more efficient and user-friendly permitting processes while maintaining protections for public process and the environment
- Incorporate climate change forecasting into water availability analyses and permitting decisions (also see Action 1D)
- Develop programs and resources to support BIPOC farmers and business owners, as well as farmers and business owners for whom English is not a primary language, in obtaining and managing permits and other authorizations
- Improve resources for NPDES monitoring and permitting to help attain water quality that aligns with fish consumption standards for Oregon Tribes
- Support continued development of the Oregon Water Data Portal to provide interagency access to accurate, high quality water data for permits

Critical Issue | Healthy Ecosystems

Responsibility for managing, stewarding, protecting, and restoring Oregon's ecosystems falls to all Oregonians across a broad range of local, state, federal, and Tribal agencies, as well as on private landowners, interest groups, and local organizations. Oregon has a rich history of work in this area, using numerous tools and institutions to help address and improve ecological conditions. Chapter 2 described the actions needed to support measurement and monitoring efforts and better define instream and ecosystem water quantity and quality needs. This "Healthy Ecosystems" section describes five actions to protect and improve ecosystem function and climate resilience. Actions address improvements needed in watershed protection and restoration, instream habitat and fish passage, instream flow protections, invasive species eradication, and groundwater protections. Protection, restoration, and responsible management of ecosystems offer the additional benefit of climate change mitigation.

Oregon's Ecosystems Provide Critical Benefits

Generally, the term "ecosystem" refers to a system of interdependent relationships between organisms and their surrounding environments. Healthy ecosystems provide a wide variety of benefits to Oregon's fish and wildlife as well as our communities. Oregon's ecosystems provide high quality water, carbon sequestration, flood control, fish and wildlife habitat, and productive soils while sustaining economically viable activities such as farming, ranching, fisheries, timber harvesting, power generation, and outdoor recreation.

By degrading or neglecting the natural functions of ecosystems, we risk jeopardizing the fish and wildlife that depend on these systems as well as our own quality of life. Ecosystem degradation subsequently results in a need to engineer unnatural solutions that attempt to mimic ecological functions, often at a great expense that yields a lesser quality function. For instance:

- Fish and wildlife populations are more expensive to maintain through restoration actions and hatchery operations than through the maintenance and protection of natural habitat and watersheds that provide clean, cold water;
- It costs far more to obtain drinking water when treated by a multi-million-dollar facility than maintaining a relatively healthy watershed that naturally provides a clean source of water;
- Flooding is far more frequent and costly when waters cannot be well absorbed by the physical environment and wetlands or stream floodplains cannot attenuate flood waters; and
- Crop production costs are higher when soil productivity is compromised.

Habitat and Ecosystem Functions

Flowing Water and Riparian Areas – Flowing water habitat includes all naturally occurring freshwater streams and rivers, including perennial, intermittent, and ephemeral streams and rivers, as well as springs and seeps. These systems support a wide variety of species, including fish, invertebrates, amphibians, birds, plants, and algae. Human activities such as constructing dams, deepening, widening, or straightening stream channels have had the unfortunate impact of degrading habitat and water quality. Methods to enhance the amount of water remaining instream are discussed in Action 11B. See Action 11D for recommendations regarding improving flowing water (e.g., stream) habitat including stream channel restoration and fish barrier removal.

Riparian areas are plant communities located in a zone of transition from an aquatic ecosystem to a terrestrial ecosystem, often containing a mix of trees and shrubs adjacent to a stream or river. Riparian areas provide important functions like bank stabilization, shade to keep water cool for fish, filtration of runoff before it enters the stream, and habitat for many species. Riparian habitats directly affect natural water storage, hydrology, water quality, water temperature, and habitat quality through their ability to hold and slowly release water, filter and

biologically process nutrients, and provide shade and habitat. Riparian ecosystems are dependent upon surface or subsurface water through the zone's soil-vegetation complex to support their overall health.

Oregon should continue encouraging efforts to prevent further degradation and improve riparian conditions through enforcement of existing regulations and voluntary restoration, such as the efforts conducted under the Oregon Plan for Salmon and Watersheds[16], Oregon's Agriculture Water Quality Management Plans[17], Forest Practices Act[18] and Riparian Lands Tax Incentive Program[19].

Floodplains - Floodplains are diverse habitats, adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding. These areas, if left undisturbed, act to store excess floodwater which can protect downstream property from flooding and release water slowly, later in the year. They also provide valuable habitat for fish and wildlife. In the Willamette River Basin, flood control modifications have largely disconnected the Willamette River from its braided channels, oxbows and sloughs—wetland types that are remnants of its historical river channel. This fundamental disconnect in the valley's hydrologic regime has changed the character of the valley's floodplain and wetlands and greatly altered their storage, filtration, and habitat functions.

Reconnecting rivers and streams to their floodplains; restoring stream channel location and complexity; removing dikes and revetments; allowing seasonal flooding; restoring wetland and riparian habitats; and removing priority high-risk structures within floodplains[20] and other actions described in Oregon's State Wildlife Action Plan can restore floodplain functions.

Wetlands - Wetlands are distinct ecosystems that are flooded or saturated with water either temporarily (seasonally) or permanently. They provide valuable functions such as nutrient cycling, water storage, reduced flooding, clean water, recreation, and support a high diversity of microbes, insects, amphibians, birds, and other species. Wetlands can be found in a wide variety of locations, within floodplains, isolated in uplands, or near the ocean.

Large wetlands in Oregon, such as the Klamath Basin National Wildlife Refuge Complex and Malheur Wildlife Refuge support continental bird diversity by providing habitat for migrating species. In southern Oregon, the Lower Klamath National Wildlife Refuges' shallow marshes, open water, and grassy uplands support one of the most biologically productive refuges within the Pacific Flyway migration route. Approximately 80 percent of the flyway's

Twin Lake near Hells Canyon, Oregon. Credit United States Forest Service

migrating waterfowl pass through the Klamath Basin on both spring and fall migrations.[21] The refuge provides habitat for 25 species of special concern listed as threatened or sensitive by California and Oregon.

Land development has changed Oregon's landscape, eliminating and degrading wetlands and waters. Oregon has lost about 40 percent of its original wetlands. The U.S. Fish and Wildlife Service (USFWS) estimates that Oregon has 1.4 million acres of wetlands today, compared to about 2.3 million acres of tidal and non-tidal wetlands that covered the same area in the late 1700s.[22] A 2024 USFWS Study reports that under a high sea level rise climate change scenario, all salt marsh is predicted to be lost in Oregon by 2100.[23] Oregon must protect our remaining wetlands through rigorous permitting (e.g., Department of State Land's Removal-Fill permitting) and conservation on public and private lands. The state must also restore degraded wetlands to regain water storage capacity and other hydrologic benefits and support the many declining species reliant on these ecosystems.

Estuaries - An estuary is a zone of transition between the marine-dominated systems of the ocean and the upland river systems, a zone which yields one of the most biologically productive areas on Earth. Estuaries provide important habitat for many fish and wildlife species for rearing, nesting, foraging, and as a migration route. They also provide valuable flood attenuation, an important consideration under climate change scenarios that predict sea level rise and more frequent coastal storms. Numerous species can be found in Oregon's estuaries, such as salmon, herring, flounder, crabs, oysters, clams, ducks, geese, shorebirds, and harbor seals.

There are 22 major estuaries in Oregon. Although most estuaries along the coast are relatively small, the Columbia River estuary at Astoria is the largest in area at more than 80,000 acres. Some of the issues affecting the health of Oregon's estuaries include increased sedimentation and nutrient loading, introduced nuisance and invasive species, recreational and development pressures, and low freshwater inflows. Climate change and increased demand for out-of-stream uses will further impair freshwater inflow, impacting the salinity gradient, sedimentation, and nutrient loading of the estuary, and, therefore, the productivity of fish, shellfish, and other estuarine life. Managers along the West Coast are also concerned about how sea-level rise and ocean acidification will alter estuaries and impact threatened species.[24] Some communities are restoring tidal inundation to estuarine lands to build resiliency for coastal sea level change and tidal flooding.

Forests - Oregon's forests help filter drinking water, keep water cool, provide habitat for diverse animal and plant species, supply oxygen, moderate temperatures and rainfall, store atmospheric carbon, and support Oregon's economy. Healthy forests promote soils that provide natural filtration to keep streams clean and water quality high. Nearly 50 percent of the state, or 30 million acres, is classified as forestland.

Most of Oregon's municipal water systems rely on water that originates from forestlands, including those managed for wood production. At the state scale, data collected from the Department of Environmental Quality's ambient monitoring network indicates that public forestlands have the highest percentage of excellent or good water quality sites, compared to agriculture, urban areas, rangelands, and mixed land uses.[25] However, the ambient monitoring network encompasses all lands designated under a general forest land use type which includes private industrial forest lands, state forests (harvestable and/or non-harvestable), state parks, protected areas, and federal forest lands. It is not intended to assess water quality in or downstream of wildfire areas or actively manage timber lands where decreased canopy cover, forest management, and pesticide use may impact water quality.

Forests are part of the essence of Oregon, and our waters benefit from their sound management. However, many federal forestlands, particularly in drier regions, have massive ecological restoration needs. The rising expense of owning forestland and the land's growing value as real estate increases economic pressure to sell private forestland for development. As forests are converted to other uses, this leads to habitat fragmentation and displaces the species that rely on forest ecosystems. Increased home density within forested areas, coupled with increased wildfire risk from climate change, elevates the need for forest management to reduce fire risk.

Forest diversity can offer a range of benefits when land managers account for values such as wood production, aesthetics, recreation, habitat, water quality, and clean air. The Forestry Program for Oregon emphasizes the importance of efforts to maintain healthy, resilient, and functional forested areas, in part, for the benefit of water resources.[26] Keeping forests as forests, however, requires public support, investment, and resource protection policies that make continued forest ownership an economically viable alternative to conversion.

Oregon's Ecosystems Support Economic Health

Oregon's ecosystems sustain economically viable activities such as farming, ranching, fisheries, timber harvesting, power generation, and outdoor recreation, while providing high quality water, carbon sequestration, flood control, fish and wildlife habitat, and productive soils.

Navigation - Oregon's waterways have long served as important routes for travel and trade. According to the American Society of Civil Engineers (ASCE) Infrastructure Report Card,[27] Oregon boasts 680 miles of inland waterways, ranking 15th nationally. Many of the agricultural products grown in Oregon and elsewhere in the United States move down the Columbia River by barge. Instream flows sufficient for navigation facilitate ocean-going and river-going commerce and promote economic activity at ports and cities throughout Oregon.

Water-Related Recreation and Tourism - The focal point of many recreational activities in Oregon is often a river, waterfall, lake, wetland, or snow-covered mountain. Water resources offer opportunities for skiing, boating, kayaking, rafting, canoeing, camping, hiking, fishing, and observing wildlife, all of which greatly contribute to Oregon's economy. In their 2020 analysis, Earth Economics[28] estimated that all outdoor recreation in Oregon generates $15.6 billion annually in consumer spending, and supports 224,000 direct jobs—$9.3 billion in wages and salaries.

Many of Oregon's counties receive a significant boost to their local economy from those who travel to participate in fish and wildlife recreation activities. The economic value of fish and wildlife recreation is one of the many reasons for protecting water instream for the benefit of future generations.

Many of the state's day-use parks and overnight camping facilities reside along rivers and lakes. The Oregon Parks and Recreation Department manages more than 250 properties that include day-use areas and overnight camping facilities available for public use. Each year, these facilities[29] host over 50 million daytime visitors and 3 million campers.

Boating and kayaking are popular recreational activities as well, with more than 159,000 recreational boats in the state.[30]According to the Earth Economics analysis of outdoor recreation in Oregon, in 2019, boaters spent over 6.8 million activity days power boating, over 650,000 activity days canoeing, kayaking, rowing, or tubing, and over 500,000 activity days on personal watercraft (jet skis, etc.). Boaters divide their time evenly between rivers and lakes/reservoirs. The Columbia and Willamette Rivers are the most popular rivers, and Lake Billy Chinook, Brownlee Reservoir, Detroit Lake, Wallowa Lake, Prineville Reservoir, and Diamond Lake are the most visited lakes and reservoirs.

Fisheries - Healthy fisheries support the traditional and cultural identity of many Oregon communities. Northwest Tribal communities, for example, rely on salmon and other fish species as a major food source and a foundation of life, culture, economy, and spirituality. Because of Oregon's collective interest in the health of its fisheries, management responsibilities are shared among state, federal, and Tribal agencies.

Adequate instream flows are necessary to support Tribal Treaty Rights and Oregon's recreational and commercial fisheries. Native fish such as salmon, steelhead, and trout are an Oregon icon and support a vigorous recreational and commercial fishing economy. In their 2020 analysis of outdoor recreation in Oregon, Earth Economics reported that in 2019, anglers spent over 3.5 million activity days fishing Oregon's waters. The Recreational Boating & Fishing Foundation[31] reported that, as of 2019, the number of anglers in America aged 6-years or older reached 50.1 million, accounting for approximately 1/6 of all Americans.

Hatcheries - The construction of dams beginning in the 1800's, has had negative impacts to fish populations, leading to the construction of fish hatcheries to mitigate fish losses and augment fisheries. The need for hatcheries continues today, with hatcheries distributed across the state.

The Oregon Department of Fish and Wildlife operates more than 30 hatcheries and several rearing ponds statewide. Five of the hatcheries include Tribal co-management. These facilities raise salmon, steelhead, and several species of trout. Hatcheries play a vital role in the state's overall efforts to maintain healthy fish populations and supplement recreational and commercial harvests. Each year, the state raises and releases 45 million fish on average from hatcheries. Clean, cold water is critical for the proper functioning of these facilities.

Action 11A Improve Watershed Health, Resiliency, and Capacity for Natural Storage

Ecosystem resilience is the capacity to absorb and adapt to disturbance and change while maintaining essential functions. Healthy water resources are directly related to the resiliency of an ecosystem. Oregon's floodplains, rivers, riparian areas, wetlands, estuaries, forests, and other uplands provide essential habitat for fish and wildlife and valuable benefits for humans. These places have been modified to support human needs including flood control, irrigation, navigation, hydropower, recreation, land development, and other uses. Watershed protection and restoration is needed at many scales, including uplands and lowlands, to improve degraded habitat, restore resiliency, improve water quality, and increase capacity for natural storage. While Action 11A addresses the need to improve watershed health, Action 11D specifically addresses instream habitat improvements including fish passage.

This section describes existing statewide planning documents guiding ecosystem protection, restoration, and recovery. Actions outlined in these documents are voluntary, so success may depend on public-private partnerships and a variety of funding sources.

The Oregon Plan for Salmon and Watersheds

The Oregon Plan for Salmon and Watersheds (the "Oregon Plan"), is a statewide initiative launched in 1997 to help restore healthy watersheds that support the economy and the quality of life in Oregon. The Oregon Plan has a strong focus on salmon, largely because of the significant cultural, economic, and recreational importance to Oregonians—and because they are important indicators of watershed health. The Oregon Plan makes recommendations to improve water quality and quantity and to address factors that contribute to declines in fish populations and watershed health. Many of these measures are voluntary and depend upon the willingness of private citizens to implement restoration projects. These voluntary measures continue to be fundamental to the success of the Oregon Plan.

Landowners and other private citizens, community organizations, interest groups, and all levels of government come together to organize, fund, and implement these measures in a coordinated manner. Oregon's watershed

"We can increase investments in watersheds to store, filter, and deliver water for fish and wildlife."

-100-Year Water Vision (2020)

councils, soil and water conservation districts, land trusts and water trusts assist landowners with projects and lead restoration and land and water protection efforts in many watersheds throughout the state. The Oregon Plan has bolstered interagency and state-federal coordination and collaboration.

The Oregon Watershed Enhancement Board (OWEB), along with several state agencies, federal agencies, and non-profit organizations provide financial assistance for these restoration projects. The U.S. Department of Agriculture's Natural Resources Conservation Service, U.S. Bureau of Land Management, National Fish and Wildlife Foundation, the U.S. Environmental Protection Agency, the U.S. Forest Service, the U.S. Fish and Wildlife Service, NOAA Fisheries, and the Oregon Departments of Fish and Wildlife and Environmental Quality are actively funding watershed restoration projects. As part of its responsibilities, the Bonneville Power Administration funds regional efforts to protect and enhance fish and wildlife populations affected by federal dams in the Columbia River Basin. Other state agencies may administer programs or undertake actions that help advance the work of the Oregon Plan.

Future conservation efforts will be enhanced by continuing to implement and build upon the successful collaborative efforts of the Oregon Plan for Salmon and Watersheds, and other relevant documents including Oregon's State Wildlife Action Plan, Northwest Power and Conservation Council's Columbia River Basin Fish and Wildlife Program, Conservation and Recovery Plans and Biological Opinions, and water quality implementation plans. The Integrated Water Resources Strategy should be used to strengthen and forge new partnerships.

State Wildlife Action Plan (formerly the Oregon Conservation Strategy)

The State Wildlife Action Plan (SWAP), formerly referred to as The Oregon Conservation Strategy, was developed in 2006, for the goal of maintaining healthy fish and wildlife populations by maintaining and restoring functioning habitats, preventing declines of at-risk species, and reversing declines where possible. The SWAP is revised every 10 years, with the next updated version available in 2026. The Oregon Department of Fish and Wildlife (ODFW) leads the implementation of the SWAP.

The SWAP takes a non-regulatory, statewide approach, while recognizing that conservation issues vary by region and must be tailored to the unique needs of the fish, wildlife and human communities that coexist. The SWAP engages citizens in addressing Oregon's conservation needs by offering recommended voluntary actions and tools and encourages monitoring key species and attributes of ecosystems as well as measuring the effectiveness of conservation actions.

The SWAP has several components, including identifying key conservation issues (e.g., climate change, water quantity/quality), conservation opportunity areas, and 294 strategy species of greatest conservation need.

A Restoration Tool – Beaver Modified Landscapes

American beaver (*Castor canadensis*), Oregon's state animal, are common to Oregon's riparian areas and waterways (rivers, streams, lakes, ponds, marshes, and wetlands) where they have an ample supply of food and year-round water flow for shelter and protection from predators[32]. Beaver-modified floodplains and wetlands can trap sediment, filter or bind excess nutrients and toxic chemicals, thereby improving water quality. The sponge-like properties of these floodplain-wetland habitats may also reduce the severity of drought, wildfire, or flooding events.[33] Many planning and conservation efforts have identified the importance of beaver and beaver-modified habitats (e.g., beaver dams, pools, and wetlands) for Oregon's state sensitive and federally listed fish and wildlife species in a changing climate[34,35,36,37,38,39,40,41]. In 2023, the ODFW published the 3-Year Action Plan for Beaver-Modified Landscapes, August 2022-2025, which outlines goals and actions to be taken by the ODFW to advance the protection and restoration of beaver-modified habitat in Oregon[42]. The ODFW has established 10 Beaver Emphasis Areas as focal areas for implementing the plan's actions and increasing collaborations with interested partners to

collect beaver activity data, restore beaver habitat, and/or advance opportunities for human-beaver coexistence. Additionally, ODFW is:

- developing tools and shared resources (e.g., partnering with the Oregon Department of Forestry to implement beaver activity survey protocols[43])
- developing a Fish Passage Application Form and guidance for beaver coexistence flow devices
- developing a Beaver Habitat Guidance Manual
- updating beaver management rules, tracking, and reporting
- hosting Beaver Action Plan Partnership meetings
- providing financial and technical assistance to partners (e.g., Project Beaver's Best Management Practices for Pond Levelers and Culvert Protection Systems
- partnering with OSU to conduct a beaver coexistence social science study to advance beaver-modified floodplain landscapes, where appropriate, in Oregon

Wetlands and slow-moving water created by beaver dams provide key habitat for amphibian, reptile, fish and bird populations. Beaver dams, pools, and off-channel habitats such side-channels and meanders, provide juvenile rearing and overwintering areas for salmon and steelhead.

Legislation from the 2023 legislative session (House Bill 3464) acknowledged the benefits of beaver to fish, wildlife, habitat, and humans in a changing climate and removes beavers from the "predatory animals" definition under ORS 610.002 to simplify management of beaver in Oregon.

While beavers play an important role in healthy ecosystems, their burrowing, foraging, and damming activities can damage timber, crops, landscaping, human infrastructure, and property, so balanced solutions are needed. Installing planting protections (e.g., fencing, gritted paint) or beaver flow devices (e.g., pond levelers, culvert exclusion devices) can reduce beaver-human conflict and prevent further property damage. The ODFW's Living with Beaver[44] guidance document provides facts about Oregon's beaver and tips for coexisting with them on the landscape. Additionally, the U.S. Fish and Wildlife Service developed a Beaver Restoration Guidebook, updated in 2023, summarizing information for landowners, restoration practitioners, managers, and other parties who are interested in working with beaver to restore streams, wetlands, and floodplains.


The Beaver Restoration Guidebook

Working with Beaver to Restore Streams, Wetlands, and Floodplains

Version 2.02, March 23, 2023

Photo credit: Worth A Dam Foundation (martinezbeavers.org)

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Funded by

North Pacific Landscape Conservation Cooperative

Version 2.02. Get the latest version at: https://www.fws.gov/media/beaver-restoration-guidebook

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The Private Forest Accord Grant Program

The Private Forest Accord Mitigation Fund and its associated grant program (known as the PFA Grant Program) was established in the 2022 Legislative Session (Senate Bills 1501 and 1502; House Bill 4055) as an outcome of the landmark agreement between timber and conservation groups designed to enhance aquatic resource protections in the Forest Practices Act while providing long term regulatory assurances for the timber industry. The Private Forest Accord Grant Program, administered by the ODFW, is an incredible opportunity to move the dial toward conservation and recovery for some of Oregon's most sensitive fish and amphibians. With significant investment from the State of Oregon and timber harvest tax revenue, the Private Forest Accord Grant Program will be capable of delivering nearly $15 million in conservation grants every year (up to $250 million over the life of the program). Watershed-scale investments in projects like stream habitat restoration, removal of barriers to fish passage, cold water and flow protection, beaver-modified habitat creation, and more will create statewide benefits for the species covered by the Private Forest Accord Habitat Conservation Plan.

Soil Health Improves Watershed Health

Soil health describes the overall composition of soil, including soil structure, the water and nutrient holding capacity of the soil, the amount of organic matter in the soil and the continued capacity of the soil to function as a biological system. Healthy soils with a high percentage of organic matter and water holding capacity provide both climate mitigation and climate adaptation resilience. Climate-smart agricultural practices provide an opportunity to improve soil health, increase plant and wildlife diversity, and protect and improve water quality. Soil and water conservation districts, the Oregon Department of Agriculture, Oregon State University, and the U.S. Natural Resources Conservation Service can all serve as resources for providing technical assistance, outreach, education, financial incentives to guide voluntary efforts to improve soil health and implement climate-smart agriculture. The Oregon Agriculture Heritage Program at the OWEB provides grants for projects that improve soil health and increase carbon sequestration on natural and working lands.

Action 11A

Improve Watershed Health, Resiliency, and Capacity for Natural Storage

Examples of how to carry out this action:

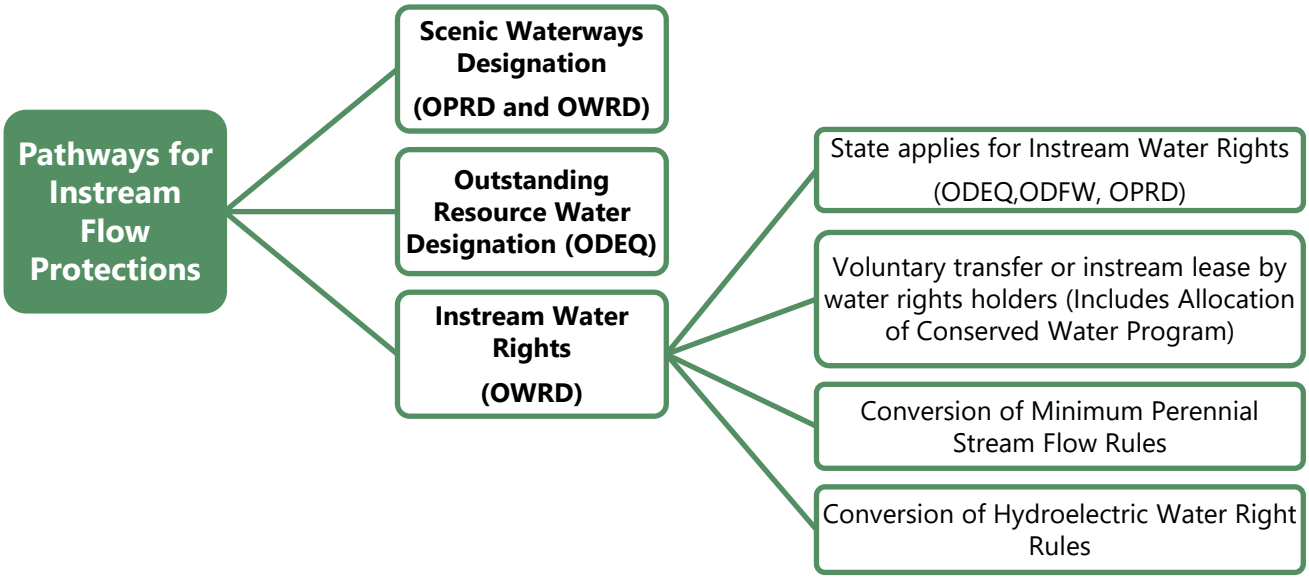
- Protect and restore instream habitats and watersheds to build climate change resiliency
- Improve and protect riparian conditions to create a healthy buffer between aquatic ecosystems and adjacent land use and development to provide fish and wildlife habitat and protect water quality
- Restore meadows, wetlands, and hydraulic connectivity to side channels and floodplains to maintain critical functions like processing nutrients, providing habitat, and natural storage
- Protect and restore estuarine conditions to maintain the natural mixing of freshwater and marine systems and allow for safe tidal inundation to build resiliency for sea level change and flooding
- Protect and restore beavers, beaver habitat, and beaver-modified habitat
- Protect and restore floodplains and native riparian-floodplain vegetative communities
- Identify and implement actions to protect and maintain drinking water source areas quality and quantity in upland and forested areas
- Collaborate and/or consult with Tribes as needed to prioritize locations targeted for protection and restoration and restore access to First Foods
- Invest in restoration projects led by Tribes, low-income communities, and communities of color to discover new approaches and best management practices that meet community goals for clean water
- Strengthen protections under Oregon Statewide Land Use Planning Goal 4 which limits development on non-federal forestlands.
- Implement climate-smart agricultural practices to improve soil and watershed health

Action 11B Develop Additional Instream Protections

In many areas of Oregon, streamflows are very low or even non-existent during late summer months, largely due to human causes like diversions for irrigation or other beneficial water uses. Low streamflow conditions are made worse by periods of intensive water use or drought. Low streamflows often mean higher water temperatures and increased nutrient concentrations, contributing to poorer water quality for fish, wildlife and humans. Oregon needs to conserve and protect streams by developing additional instream flow protections and seek opportunities for enhancing and restoring streamflow.

Several laws, policies, and regulations that can be used to protect Oregon's rivers and streams are described in detail in Appendix B. The primary pathways for protecting water instream are illustrated in Figure 4-8 and described below.

Figure 4-8: Pathways to Protect Water Instream



Scenic Waterways Designation

In 1970, Oregonian's voted to establish the Scenic Waterways Program to allow designation of a river or lake to protect its unique character and protect it from future degradation. The construction of dams or other impoundments are prohibited within a scenic waterway. Designation limits new surface water rights within or above scenic waterways as well as groundwater rights where pumping (individually or cumulatively) will reduce surface water flows. Land use activities that can affect a scenic waterway or adjacent land are also regulated, including constructing roads or buildings, mining, and forest harvesting.

The Oregon Parks and Recreation Department (OPRD) administers the Scenic Waterways Program. The Governor designates a candidate river or lake as State Scenic Waterway after a recommendation from Oregon Parks and Recreation Commission and concurrence from Oregon Water Resources Commission.

A portion of the Nehalem River was the most recent waterbody receiving scenic waterway designation, in 2019. There are currently portions of 22 rivers and one mountain lake designated as scenic waterways.

The public can participate in additional waterway protection by supporting the OPRD process for designation. The OPRD must conduct Scenic Waterway Studies to assess waterway eligibility, including engagement with state and federal agencies, Tribes, local governments, landowners, conservation groups, and others.

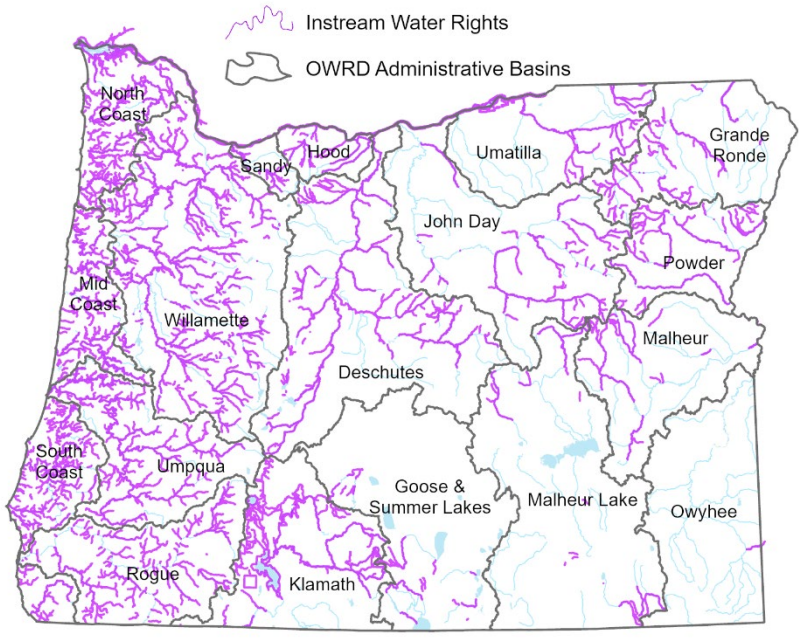
Outstanding Resource Water Designation

An Outstanding Resource Waters designation by Oregon's Environmental Quality Commission adds water quality protections, including restrictions on point source discharges to identified streams or lakes. Designation protects high quality water from degradation, thereby protecting exceptional ecological characteristics, and other outstanding values of the waters. In July 2017, the North Fork of the Smith River and its tributaries and associated wetlands became the first Outstanding Resource Water designated in Oregon. In 2021, Waldo Lake and Crater Lakes were designated as Outstanding Resource Waters.

Instream Water Rights

As described in Appendix B under the Instream Water Rights Act, the Department of Fish and Wildlife (ODFW), OPRD and Department of Environmental Quality can submit applications to protect water instream for uses such as fish and wildlife, water quality, recreation, and scenic values. The state's policy is to obtain an instream water right on every stream, river, or lake which can provide significant public benefits. There are almost 1,600 certificated instream water rights across the state covering approximately 10,000 river miles (only about 7% of Oregon's streams). Therefore, Oregon needs to continue establishing additional instream water rights to protect instream flows, resolve existing protested instream water right applications, and expand the scope and scale of its toolbox to conserve and restore flow.

Figure 4-9: Instream Water Rights
July 2025



Additional data needs regarding instream water rights were discussed in Chapter 2, Action 2A, including the need to identify the full suite of flows and temperature conditions necessary to support species habitat (e.g., ecological flows) to inform the amount of flow requested in instream water right applications. A potential ODFW rule change may be necessary to incorporate a broader range of techniques that lead to protection of ecosystem needs, including consideration of temperature-based flows.

Oregon's original Water Code formalized a system of water allocation that did not consider water for instream uses, causing Oregon's freshwater habitats to quickly become degraded. Because the Instream Water Right Act was not enacted until 1987, most instream water rights today are quite junior compared to existing out-of-stream water rights, some of which date back to the 1800s. The practical effect of the junior status is that instream flows, even when identified in an instream water right, are often not fulfilled during the summer months. As a result, actual flow protections often cannot be realized under Oregon law based on prior appropriation. In most instances, achieving instream water right flow targets will depend on both healthy, functional watersheds and voluntary partnerships with senior water right holders to be effective.

Instream Transfers and Leases and Flow Restoration - The Instream Water Rights Act also allows water users with valid, existing surface water rights to voluntarily transfer water instream to restore streamflow through a program administered by the Water Resources Department (OWRD). An out-of-stream use, such as irrigation for agricultural crops, can be transferred instream to restore flows on a temporary or permanent basis with the priority date of the original right. The water user has the option of transferring an entire water right instream, or a portion

thereof. One of the basic tenets of instream transfers and instream leases is ensuring that other water users are not injured as a result of the changes to the use. Education and incentives are needed to encourage voluntary actions such as instream transfers or leases.

Instream flow restoration activities have predominantly occurred in a handful of basins, although streamflow restoration needs have been identified in every basin. As of July 1, 2025, there were 447 active instream leases and instream transfers in place. Active instream leases resulted in nearly 3500 cubic feet per second (cfs) protected instream, with most of that flow reflecting leases for hydroelectric power generation. Approximately 432 cfs is kept instream associated with permanent or long-term transfers. In addition, the majority of water put instream on a permanent basis is associated with senior water rights, resulting in an impactful instream benefit.

Flow restoration through instream transfers and leases benefits greatly from active partnerships between the state, Tribes, soil and water conservation districts, watershed councils, irrigation districts, private landowners and Oregon's conservation organizations, including The Freshwater Trust, the Deschutes River Conservancy, Trout Unlimited, and others. Incentives offered by these organizations and others can help land remain productive and profitable, while also benefitting freshwater ecosystems. State funding sources can also pay individuals to transfer or lease water instream. The OWRD's Water Projects Grants and Loans can fund projects and the Oregon Watershed Enhancement Board offers water acquisition grants that fund transfers, leases, water conservation projects, and other water use agreements where ecologically beneficial. The state needs to increase resources and capacity to expand flow restoration efforts. Biological flow targets help guide agencies and other collaborators in voluntary restoration efforts and long-term basin planning that benefit fish, wildlife, and their habitats. Developing and implementing strategies that identify and target watersheds with the highest instream flow needs helps to expand voluntary streamflow restoration beyond current efforts, on both public and private lands.

Action 11B
Develop Additional Instream Protections

Examples of how to carry out this action:

- Designate Scenic Waterways where needed to protect recreation, fish, and wildlife uses
- Designate Outstanding Resource Waters where needed to protect extraordinary water quality or ecological values
- Establish additional instream water rights where needed to protect the full suite of flows for fish and wildlife, water quality, recreation, and scenic attraction
- Promote utilization of voluntary OWRD programs including Allocation of Conserved Water and instream transfers and leases to restore flow instream
- Expand education, funding opportunities, and use of voluntary programs to protect and restore streamflow, lake levels, and cold water refugia
- Increase resources and capacity to expand the geographic range and increase effectiveness of flow restoration efforts by identifying flow restoration priorities and focusing resources to priority areas
- Update ODFW Rules (OAR 635-400; last modified in 1989) to incorporate a broader range of techniques to determine flow amounts to protect ecosystem needs including consideration of temperature-based flows
- Increase compliance with water rights laws (Also See Actions 10E and 10F)
- Improve process for resolving instream water rights protests

Some wastewater and stormwater utilities in Oregon may pursue purchasing or leasing water rights to keep cold, clean water instream while meeting their compliance requirements, particularly when coupled with reuse (see Action 10B). This approach has the potential to help meet temperature TMDL requirements in some watersheds. Water quality trading data is available for many projects across Oregon.

There are also some federal funding sources to support flow restoration, including the National Fish and Wildlife Fund and Bonneville Power Administration's Columbia Basin Water Transactions Program.

Allocation of Conserved Water - The Allocation of Conserved Water Program at the OWRD allows a water user who conserves water to use a portion of the conserved water on additional lands, put the portion of water to a new use, lease or sell the water, or dedicate the water to instream use. To participate in the program, the water user

must make a physical change to their water delivery system, being a change to how the water is distributed (piping of a canal) or making efficient changes to the on-farm delivery system (changing from pivots to drip irrigation). Use of this program is voluntary and provides benefits to both water right holders and instream values. One program requirement is that at a minimum, 25% of the conserved water is dedicated instream. As of July 1, 2025, the OWRD had approved 129 applications resulting in approximately 268.463 cfs permanently protected and 90.644 cfs temporarily reserved instream.

Conversion of a Hydroelectric Water Right - Oregon Administrative Rules (OAR 690-054) outline procedures for converting a hydroelectric water right to an instream water right in accordance with ORS 543.305. Hydroelectric water rights that have not been used in five years, have expired, or are voluntarily retired can be converted to an instream water right. The point of diversion and priority date of the hydroelectric water right apply to the instream water right, which is held in trust for the people of the State of Oregon.

Action 11C Prevent the Spread of Invasive Species

The Oregon Invasive Species Council defines an invasive species as a non-native species that can cause economic or environmental harm or cause harm to human health. It can be a plant, animal or any other biologically viable species that enters an ecosystem beyond its native range. Invasive species disrupt the natural function of an ecosystem by competing and replacing native species and disrupting the natural habitat.

Oregon experiences threats from invasive species in both aquatic and terrestrial ecosystems. Aquatic invasive species can flourish in waterways, reducing water quality, competing with native plants, and clogging boat, hydropower, municipal, and irrigation infrastructure. Native plant species in riparian and wetland areas adjacent to waterways face competition from invasive species, limiting their capacity to provide benefits such as shade, shelter, and food. Invasive species can also impact the health of uplands, where well-managed forests are critical to protecting source water quality.

Climate change is expected to increase the introduction and spread of invasive species. Disturbances to natural and working landscapes from severe storms, flooding, and wildfires can damage or kill native plant communities, making them vulnerable to non-native invaders. Increased temperatures may increase the range of invasive species, requiring diligent monitoring to identify new infestations before they become problematic.

The scale and pace of invasive species management will need to increase accordingly. Multi-agency coordination is critical for timely and effective eradication and management. A good example of this is the state's response to the Emerald Ash Borer that threatens native ash trees along our rivers and streams, as well as ornamental ash trees located throughout neighborhoods, parks, and cities.

Impacts to First Foods

Invasive species can cause major changes to ecosystems, reducing biodiversity and the availability of Tribal First Foods that are essential to Tribal traditions and culture.

Action 11C
Prevent and Eradicate Invasive Species

Examples of how to carry out this action:

- Support and continue funding for the Aquatic Invasive Species Prevention Program
- Support and continue funding for the Oregon Invasive Species Council
- Identify and implement projects to support the State Wildlife Action Plan to prevent new introductions, and decrease the scale and spread of infestations
- Continue to implement and enforce ballast water management regulations
- Provide technical assistance and landowner education for invasive species detection and potential control and management actions on agricultural and forestlands
- Couple invasive species eradication with native species restoration efforts (see 11A)
- Support protection of culturally significant plants, animals, and ecosystems from invasive species
- Promote the propagation, growth, and sale of native plants

Invasive species management must consider ecological processes that relate to the sustained production of First Foods and be done in a way to prevent impacts to Tribal people reliant on those resources.

Aquatic Invasive Species

Quagga and zebra mussels, along with hydrilla (a waterweed), and Northern Pike are currently among the top aquatic species of concern to keep out of Oregon. Quagga and zebra mussels and aquatic vegetation can be easily transported by trailered watercraft and have spread rapidly in portions of the United States due to their adaptability, lack of natural predators and physical transport. Species like Eurasian watermilfoil and New Zealand mudsnails already contaminate some Oregon waterbodies.[45]

The Aquatic Invasive Species Prevention Program and invasive species actions contained in the Department of Fish and Wildlife's State Wildlife Action Plan (SWAP) provide key tools for fighting invasive species. Key elements of the SWAP are to prevent new introductions of invasive species, control the scale and spread of infestations, and eradicate invasive species, if possible, through boat inspection stations. Inspections act as a line of defense and an opportunity to educate the public about the risk of aquatic invasive species entering our state.

Ballast Water – The discharge of ballast water, used to provide stability for large commercial ships, is a primary pathway of concern for introducing non-native species from foreign ports, potentially threatening our regional waterways. The Department of Environmental Quality (ODEQ) implements and enforces ballast water management regulations to reduce the risk of introducing new aquatic invasive species by prohibiting ballast water discharge unless it meets specified criteria. Since 2012, the ODEQ ballast water program has been supported by a 50-50 cost share between the General Fund and a fee on regulated vessels using Oregon waters. In addition to monitoring vessels for pre-arrival ballast management compliance, the ODEQ identifies high-risk arrivals and conducts vessel inspections and compliance verification sampling on at least 12 percent of vessels calling on Oregon ports.

Invasive Species in Forests

Invasive species also cause issues in uplands, and their impact on Oregon's forests can lead to water quality and quantity concerns. Diseased or dying trees, on a large scale, are unable to provide the watershed benefits of filtering and storing water. The Oregon Department of Agriculture (ODA) and Oregon Department of Forestry coordinate on monitoring and response to invasive species on forestlands (Figure 4-10).

Figure 4-10: Invasive Species Common in Oregon Forests and Uplands

Insects:	Diseases:
Asian giant hornet	Sudden oak death
Elongate hemlock scale	White pine blister rust
Emerald ash borer	Port-Orford-cedar root disease
Larch casebearer	
Mediterranean oak borer	
Spongy moth	

Urban Forests - Maintaining and increasing tree canopy in urban areas can help both mitigate and adapt to climate change. Urban trees are also vulnerable to climate change and threats from pests and disease. The Urban and Community Forestry Program through the Oregon Department of Forestry is collaborating with the Department of Land Conservation and Development on the Community Green Infrastructure Grant Program that can help fund climate resilient green infrastructure projects.

Invasive Species in Agriculture

Invasive species can threaten the health and profitability of crops, and the ability of agricultural infrastructure to work properly. Aquatic invasive species can clog irrigation intakes or ditches. Irrigation structures that create shallow pools can elevate water temperatures that are unsuitable for native aquatic species but are tolerated or preferred by invasive species.

Invasive species management, including pesticide and herbicide use, must avoid negative impacts to soil, water, and air. Pesticide or herbicide residue or runoff can find its way into local waterways, potentially harming aquatic wildlife

or polluting drinking water sources. The Oregon Invasive Species Council provides extensive resources on their website. They have developed a Digital Information Hub that provides species profiles of the numerous invasive species of concern for agricultural landscapes.

Action 11D Protect, Restore, and Provide Access to Instream Habitat for Fish and Wildlife

Freshwater ecosystems including perennial, intermittent, and ephemeral rivers and streams, seeps and springs, and wetlands are essential for providing habitat to many at-risk species, including important spawning and rearing habitat for salmonids, amphibians, freshwater mussels, and other invertebrates. However, most river systems in Oregon have been heavily modified to achieve various flood control, irrigation, navigation, hydropower, recreation, and other water supply benefits. The construction of roads and their associated bridges, culverts, and tidegates have altered many river and stream systems. These modifications have greatly reduced the amount of accessible stream habitat for many aquatic species, degraded habitat and water quality, and caused the decline of many species and subsequent Endangered Species Act listings.

Oregonians can be proud of the work that has been done to protect and restore the condition of rivers and streams throughout the state. Tens of thousands of degraded stream miles have been improved through riparian habitat projects, removal of fish passage barriers, instream habitat enhancement, and restoration of streamflows. These efforts have helped improve the ecological and economic health of Oregon's fish, wildlife, and communities. Our cooperative, community-level approach to watershed and stream restoration, through partnerships developed under the Oregon Plan for Salmon and Watersheds, has significantly improved water quality and fish and wildlife habitat. Oregon should build upon this good work to further enhance stream restoration and fish protection efforts.

Habitat for Aquatic Species

Freshwater habitats contain an incredible proportion of Oregon's biodiversity. Water is crucial for all fish and wildlife, and high quality freshwater aquatic systems provide essential habitat for many at-risk species. Beyond the multitude of Oregon's iconic fish species, many species of wildlife, such as the Oregon Spotted Frog, rely on instream habitat for a portion or all their life cycle.

Credit Ryan Hagerty / USFWS

Installing fish screens, replacing culverts with bridges, building fish-friendly culverts, constructing fishways, stabilizing road fill material, and removing obsolete infrastructure (also see Action 7A) are all techniques that can be used to restore and protect fish, habitat, and passage for fish.

Ways to improve instream habitat conditions include protecting streams from degradation, including channelization, riparian vegetation removal, erosion, runoff, and pollution, and restoring channel and floodplain function and complexity with restoration projects. For example, ongoing efforts to replace culverts present opportunities for developing, testing, and implementing methods to maximize habitat connectivity for a variety of aquatic and terrestrial species. Wildlife crossings are becoming more popular on busy roads as well. There are many regional, state, and local documents and plans outlining species-specific protection and recommended habitat improvements, including the State Wildlife Action Plan (SWAP). The SWAP provides a list of "strategy species," or species of greatest conservation need, along with voluntary conservation actions and resources to benefit those species.

Fish Passage – Barriers such as dams, dikes, road fill, culverts, and tide gates change hydrological conditions and alter natural flow regimes. Many of these artificial obstructions create safety hazards for fish, can prevent fish passage altogether, alter transport of sediment, boulders, gravel, and wood, and create an uneven distribution of habitat.

The Department of Fish and Wildlife works with owners or operators of artificial obstructions in several ways to address barriers to fish passage, including administering a cost share program for voluntary upgrades. Recognizing the unique nature of migratory fish in the Pacific Northwest, many other agencies and organizations have helped Fish and Wildlife to compile data on fish passage barriers throughout the state. Compiling this information is a first step in a long-term process to fill existing gaps related to fish passage data and fish habitat distribution data, with the hope of integrating the two datasets to further fish passage restoration opportunities.

This ongoing effort has resulted in the identification of approximately 45,000 potential barriers to fish passage, which includes both natural (waterfalls, steep gradients, etc.) and artificial obstructions (dams, bridges, culverts, tide gates, etc.). Almost 70 percent of the potential barriers that were compiled are culverts. Although significant progress has been made to compile data on fish passage barriers and fish habitat distribution, more work is needed to fill data gaps, including the inclusion of several local, county, Tribal, and federal agency inventories and information regarding barriers on private land. Oregon should continue to address and/or remove barriers, particularly at high-priority sites identified on the Department of Fish and Wildlife's Statewide Fish Passage Barrier Priority List. Removal of fish barriers may offer public safety benefits and reduce the economic liability associated with the fish barrier.

The National Oceanic and Atmospheric Administration has developed West Coast Fish Passage Guidelines to communicate the importance of considering climate, hydrologic, geomorphic, and biologic processes when designing fish passage for salmonids. Native fish such as Pacific lamprey, sculpins, and sturgeons are not as strong swimmers as salmonids and generally get less attention in fish passage and screening discussions. However, the Pacific Lamprey Conservation Initiative and its technical advisory committee, the Lamprey Technical Workgroup, have released several publications that provide guidance for fish passage and screening for native lamprey.

Fish Screening – Another aspect of fish protection is fish screening, an important part of the Oregon Plan's efforts for the protection, restoration, and recovery of native migratory fish, such as salmon and steelhead. Fish screening significantly reduces juvenile fish mortality at water diversions by preventing fish from entering diversion ditches, machinery, pumps, or irrigated fields. Since the early 1990s, the state has required fish screening and/or bypass devices as a condition of approval for surface water permits and transfers, when applicable. The Department of Fish and Wildlife operates the state's fish screening program and has helped install more than 1,500 fish screens through its cost-share and tax credit programs. The 2023 Legislature extended the sunset for fish screen tax credits through January 1, 2030. Oregon should continue to require fish screening at new diversions and work to screen unscreened diversions, particularly at priority sites.

Historic Klamath Dam Removal Effort

Many dam removal projects occur throughout the state in an effort to restore ecosystems and fish passage. As introduced in Action 9A, a historic dam removal project in Oregon and California was completed in 2024. Four PacifiCorp dams, JC Boyle, Copco No. 1 and 2 and Iron Gate, located on the Klamath River were all removed, and as of August 28th, 2024, the river was free-flowing and providing access to over 400 stream-miles of historic spawning and rearing habitat for Chinook, Coho, steelhead, and lamprey. Almost immediately post-removal, hundreds of fall Chinook were observed spawning in the Oregon portion of the project area. The dam removals are expected to improve water quality, reducing stagnant water that can support harmful algal blooms (HABs), and support the cultural lives, health, and economic well-being of Native American communities in the Klamath Basin.
This dam removal project took decades of negotiations and is currently the largest dam removal project in the country, possibly the world. The Klamath River Renewal Corporation leading the effort has contracted with the Yurok Tribe to revegetate the land exposed from draining the dams. Restoration activities along the Klamath River

will continue for about the next 10 years. More information about the project can be found on the Klamath River Renewal Corporation's website.

One of four dams removed on the Klamath River, the JC Boyle Dam (left) before removal, and following removal (right). Credit: ODFW

Action 11D

Protect, Restore, and Provide Access to Instream Habitat for Fish and Wildlife

Examples of how to carry out this action:

- Implement Oregon's fish screening and passage laws
- Continue to update the inventory of fish passage barriers and priority unscreened diversions
- Address and/or remove barriers, particularly at high-priority sites identified on the Department of Fish and Wildlife's Statewide Fish Passage Barrier Priority List
- Support fish screening efforts
- Build upon existing ecological planning and restoration efforts by incorporating fish screening and passage needs and enhancing instream habitat conditions (e.g., water quality, channel complexity)
- Update streamflow restoration priority areas using new species distribution, climate change projections, hydrologic data, and water quality impairments related to streamflow
- Couple stream restoration projects with voluntary flow restoration projects (see Action 11B)
- Restrict livestock access to riparian areas and streambeds through regulatory compliance, where applicable, and support cooperative fencing programs/efforts
- Provide financial and technical assistance, when applicable, to landowners and other interested parties to implement projects that improve fish habitat and mitigate risks to natural resources (e.g., road construction with fish-friendly culverts, large wood placement)
- Ensure fish screening and fish passage laws are addressed in FERC hydroelectric project relicensing or when adding hydroelectric generation to an unpowered dam

Action 11E Develop Additional Groundwater Protections

The Oregon Atlas of Groundwater Dependent Ecosystems, published in 2022, found that more than a third of all streams and rivers depend on groundwater, and about two-thirds of all lakes and ponds do as well[46]. Groundwater discharge contributes to springs, wetlands, and streamflow throughout the state, often providing sustained flows and vital cold water for aquatic species during summer months. Contributions from groundwater support ecosystems (known as groundwater-dependent ecosystems) and human systems alike. Just as this Strategy calls for the development of additional instream protections (Action 11B), it also calls for the development of additional groundwater protections. Such protections should support a goal of sustainable groundwater management to benefit groundwater dependent ecosystems as well as water rights and public health.

In some locations of the state, groundwater withdrawals are occurring at a rate greater than what can be replaced with rain or snow. Consecutive years of drought and climate change are intensifying this situation. Groundwater contamination is also an issue, with ongoing nitrate contamination in the Lower Umatilla Basin, Northern Malheur County, and Southern Willamette Valley Groundwater Management Areas, proving to be a difficult problem to improve or resolve.

The Groundwater Act of 1955 (see Appendix B) established the authority for groundwater management and monitoring for the preservation of the public health, safety, and welfare. There are existing regulatory programs designed to protect groundwater quantity and quality, however, they are limited in effectiveness by the resources allotted to the respective responsible agencies and programs. Additionally, rules that guide groundwater management sometimes need to be updated to reflect new scientific analyses and current conditions.

Designate and Manage Groundwater Administrative Areas

Introduced in Action 1A, the Water Resources Department (OWRD) oversees 22 Groundwater Administrative Areas designated to limit further water level declines or groundwater interference with surface water. Specific rules apply to each Groundwater Administrative and Limited Area and may include withdrawing the area from future allocation, curtailing existing uses, or mitigating for new uses where groundwater is hydraulically connected to surface water. Adequate data (see Actions 1A and 1B) and agency capacity are needed to designate and manage Groundwater Administrative Areas.

Improve Water Quality in Groundwater Management Areas

Introduced in Chapter 1, Action 1A, the Department of Environmental Quality (ODEQ) may designate a Groundwater Management Area when monitoring and assessment shows evidence of groundwater contamination (ORS 468B.175-188). Commonly tested contaminants include nitrates, bacteria, and arsenic. Groundwater Management Areas can be designated for other contaminants, although the only current designations are due to nitrate. The three areas designated due to nitrate contamination are the Lower Umatilla Basin, Northern Malheur County, and Southern Willamette Valley. Common sources of nitrate contamination are agricultural use of fertilizers, manure, and septic systems.

Once a Groundwater Management Area has been declared, a local groundwater management committee is formed and then works with state agencies to develop an action plan to address the contamination. The ODEQ must coordinate projects and activities of other agencies designed to reduce impacts on groundwater from:

- Commercial and industrial activities;
- Commercial and residential use of fertilizers and pesticides;
- Residential and sewage treatment activities; and
- Any other activity that may result in contaminants entering the groundwater.

Statute outlines additional requirements that include promoting public awareness, awarding grants for projects that address contamination, coordination with federal agencies, and more.

The Oregon Nitrate Reduction Plan for the Lower Umatilla Groundwater Management Area was published in 2024. Multiple state agencies are collaborating on the implementation of this plan to reduce nitrate contamination in groundwater to protect the health of people residing in parts of northern Morrow and northwestern Umatilla counties.

Passed by the Oregon State Legislature in 2025, Senate Bill 1154 updated processes for managing ground water quality contamination concerns to be more proactive, integrated across state agencies and prioritize engagement with local entities. At its core, this legislation lays out a new process for assessing groundwater quality data and concerns, preparing an action plan, implementing regulations, and taking any other necessary actions to address ground water quality, while also promoting increased monitoring, reporting, and coordination to protect public health and water resources.

Action 11E
Develop Additional Groundwater Protections

Examples of how to carry out this action:

- Implement actions for sustainable groundwater management through voluntary, incentive-based, and regulatory means
- Develop clear objectives and metrics for defining sustainable groundwater management
- Designate groundwater limited areas
- Protect groundwater through proper well construction (also see Actions 7A, 12A)
- Identify and protect and/or restore springs, cold water discharge to surface water, and wetlands (also see Action 11A)
- Prioritize resources where frontline communities are experiencing unsafe drinking water, with potentially serious health consequences (also see Action 12A)
- Implement improvements to groundwater quality management (Senate Bill 1154, 2025)
- Explore methods to protect groundwater in situ

Groundwater Management Rulemakings

Beginning in 2023, the OWRD worked with the Water Resources Commission to conduct a groundwater allocation rulemaking to update the state's process for issuing new groundwater rights in a manner more sustainable and more protective of existing water rights. The updates focus on the definition of "water is available" for future allocation and redefines the criteria for determining availability based on best available science while honoring the doctrine of prior appropriation. For example, the Ground Water Act of 1955 refers to determining and maintaining "reasonably stable groundwater levels," but the term was not defined in rule. Acknowledging the hydraulic connection between surface water and groundwater, these updated rules also set criteria to address the potential impacts of new groundwater permits on already depleted streams and other surface waters. The updated rules were adopted by the Water Resources Commission in September 2024.

The OWRD is also working with various community working groups in the Harney Basin to reduce groundwater use by rulemaking and other means. The proposed rulemaking is in response to findings from the Department's observation wells and the 2022 Harney Basin groundwater study. The study found that groundwater withdrawals are not being recharged where groundwater withdrawals in the lowlands of the basin exceed natural recharge by 110,000 acre-feet per year. If adopted, the proposed rules would designate a Critical Groundwater Area to control groundwater use in over-appropriated areas of the basin.

Voluntary Agreements

Voluntary agreements are a cooperative management tool available to groundwater users. Oregon Revised Statute 537.545 authorizes the Oregon Water Resources Commission to approve such agreements among groundwater users from the same groundwater reservoir. These agreements must align with the intent, purposes, and requirements of the Ground Water Act of 1955, including the provisions pertaining to the designation of Critical Groundwater Areas. However, the statute is not limited to those reservoirs that have a Critical Groundwater designation. One possible benefit of a Voluntary Agreement is allowing groundwater users to act before

groundwater resources become unsustainable and a Critical Groundwater Area designation or other control measures are necessary to protect the resource. Another potential benefit is the ability of groundwater users to enter into agreements that implement best practices that may be as or more effective than those tools available through a Critical Groundwater Area designation or other control measures.

Related Strategy Actions

Many Strategy actions seeking to improve water management, increase water efficiency and water conservation, and protect people and the environment from pollution have the combined benefit of protecting surface as well as groundwater. Just a few such actions are listed below to illustrate the wide range of Strategy actions that seek to protect groundwater quantity and quality:

Strategy Actions to Protect Groundwater Quantity

- Conduct additional groundwater studies (Action 1B)
- Improve water use measurement and reporting (Action 3A)
- Support modernization of Oregon's Well Construction Program (7A)
- Provide outreach and educational resources for communities regarding water conservation (Action 8C)
- Improve water-use efficiency and water conservation (Action 10A)
- Encourage water reuse projects to reduce use of potable water for non-potable uses (Action 10B)
- Support voluntary programs to reduce the amount of irrigated land (e.g., Conservation Reserve Enhancement Program) (Action 10D)
- Provide an adequate field presence to identify and address illegal water use (10E)
- Strengthen water quantity permitting programs (10F)
- Restore wetlands and floodplains to increase capacity for natural storage (Action 11A)
- Fund water resource management activities such as distribution (Action 13B)

Strategy Actions to Prevent Groundwater Contamination

- Fund water resource management activities such as groundwater quality monitoring (Action 1A, 13B)
- Plan and prepare for flood events to minimize water quality issues (e.g. sewage releases into the environment) (Action 5B)
- Protect groundwater quality from contamination through proper well construction or decommissioning (Action 7A)
- Support modernization of Oregon's Well Construction Program (7A)
- Repair or upgrade wastewater infrastructure that poses a risk to groundwater contamination (Action 7A)
- Provide outreach and educational resources regarding domestic well and septic system maintenance/ownership (Action 8C)
- Engage with communities to develop plans to address contamination (Actions 9A, 9E)
- Provide an adequate field presence to identify sources of pollution (10E)
- Strengthen water quality permitting such as the TMDL program (Action 10F)
- Protect and restore watersheds, including wetlands, floodplains, etc. (Action 11A)
- Protect municipal drinking water source areas (Action 12A)
- Reduce pesticide use and educate pesticide users through the Pesticide Stewardship Partnership (Action 12B)

Tools to protect water quality, and thereby protect public health and the environment, are shared among many entities. Actions described throughout this section are needed to increase the protection of our drinking water, reduce the use and exposure to toxic chemicals and other pollutants, and reduce point and nonpoint sources of pollution of our surface and groundwater through sound land management and implementation of regulatory authority.

Action 12A Ensure the Safety of Oregon's Drinking Water

Drinking water is vulnerable to contamination in many areas of the state. Some drinking water contaminants, such as bacteria, may cause acute health effects that generally occur within a few days or weeks. Long-term exposure to other chemical contaminants, such as nitrate or arsenic, may cause cancer or organ damage. Additionally, climate change may worsen contamination of drinking water through a variety of effects, including increased frequency and magnitude of droughts, floods, and toxin-producing harmful algal blooms.

Appendix B provides a detailed overview of the laws and regulations protecting surface and groundwater quality and drinking water quality. The Oregon Health Authority (OHA) and the many water system operators across the state are instrumental in making sure the water that enters our homes is safe for consumption and use. They need adequate resources to carry out the applicable federal and state laws help to protect public drinking water, including:

- Federal Clean Drinking Water Act
- Federal Safe Drinking Water Act
- Oregon's Drinking Water Quality Act
- Oregon's Reduction of Lead in Drinking Water Act
- Oregon's Domestic Well Testing Act

Regulating Public Water Systems

In Oregon, public drinking water systems are categorized based on the number of people they serve and the nature of their service. Community water systems, such as those operated by cities, rural municipalities, and manufactured home parks serve more than 25 people year-round and typically rely on groundwater wells or surface water sources like rivers and lakes. These systems are regulated by the Oregon Health Authority's Drinking Water Services (OHA-DWS) and must comply with the federal Safe Drinking Water Act. Very small systems, which serve fewer than 25 people or have fewer than 15 connections are also regulated by OHA-DWS but may have less stringent monitoring requirements due to their smaller size. In contrast, private and domestic sources are not considered public water systems and are not regulated under the Safe Drinking Water Act. Private domestic wells, which serve individual homes or farms, draw groundwater and are regulated only in terms of well construction and siting by the Oregon Water Resources Department (OWRD). Water quality for these wells is the homeowner's responsibility. Similarly, private surface water sources, such as streams or springs used for drinking water by a single household may require filtration and disinfection but are not monitored by OHA. Water rights for these sources are overseen by OWRD, but water quality remains the responsibility of the user.

Oregon Very Small Water Systems - Water systems that were called "State Regulated" have been renamed to "Oregon Very Small" (OVS) systems, effective January 1, 2022. The technical description of an OVS is a system serving 4 to 14 service connections and commercial or public premises used by 10 to 24 people at least 60 days per year. Regulations for OVS systems are streamlined to balance public health protection and consistent implementation of the rules. The OHA provides technical assistance to OVS systems; however, these systems are not eligible for federal funding and currently state funding is not available for these systems for their infrastructure projects. Additionally, the Oregon Health Authority website provides several helpful resources for Oregon's OVS water systems.

Figure 4-11: Online Public Water System Information

The Oregon Legislature has recently demonstrated support for increasing resources for small systems. House Bill 2010 (2023) allocated funding for the Oregon Association of Water Utilities to study the needs and vulnerability of small and very small community water systems and design and construct water utility training center.

Find Data on Public Water Systems

https://yourwater.oregon.gov/

Oregon Health Authority Drinking Water Services maintains an online searchable platform to display data on public water systems in Oregon. You can find data such as coliform and chemical test results, violations, enforcements, public notices, and basic system information, such as sources used, treatment applied, and contact information.

Private and Domestic Sources

Private and Domestic Wells – In rural areas, private wells are more commonly used to provide drinking water than public water systems. In fact, more than 90 percent of people living in rural areas rely on groundwater from such wells to meet their drinking water needs. The Safe Drinking Water Act applies to public water systems; however, it does not regulate private wells providing water for fewer than 10 individuals.

Pursuant to Oregon's Domestic Well Testing Act, the owner of a property with a private well must test for nitrate, coliform, and arsenic, but only if the property is being sold or changing ownership. There is currently no authority for the OHA to enforce this requirement. Public health officials estimate a 10 to 20 percent compliance rate. An amendment to the Domestic Well Testing Act requiring laboratories to electronically report testing results associated with real estate transactions could increase compliance and improve public safety.

The 2025 Oregon Legislature enacted House Bill 3525 which requires landlords to collect and test samples of drinking water for certain contaminants if the dwelling unit has one or more exempt wells located within a groundwater management area under ORS 468B.150. This legislation requires landlords to test for arsenic, coliform bacteria, lead, and nitrates and provide test results to the tenant and the OHA and specifies information that must be provided by landlords to tenants.

The OHA's Environmental Public Health Program administers the Domestic Well Safety Program, providing information about water quality testing, treatment, maintenance, and other resources. OHA's Well User Resource Toolkit includes a wide array of fact sheets, contacts, and Water Well Owners Handbook, developed jointly by OHA and the OWRD, available in English and Spanish.[47]

Since 2023, at the direction of the Governor and the Oregon Legislature, OHA has delivered direct safe water services to residents of the Lower Umatilla Groundwater Management Area in Morrow and Umatilla Counties due to elevated risk of high nitrate in domestic well water. OHA together with the Oregon Department of Human Services and local county public health and community based organization partners conducts outreach to alert residents to the health risks and provide free well water testing and follow on drinking water delivery and water treatment systems to households whose wells test at or above the maximum contaminant level of 10 milligrams nitrate per

liter of water, a health action level set by the US Environmental Protection Agency (USEPA). All services are delivered in English and Spanish. More information is available at testmywell.oregon.gov.

The 2025 Oregon Legislature enacted Senate Bill 1154, modifying the state's process for designating groundwater quality areas of concern and ground water quality management areas. The legislation includes direction to OHA to identify populations at risk of exposure to contaminants through drinking water (both domestic wells and public water systems) in these areas and develop plans to mitigate public health hazards.

> "We can invest in resilient built and natural water infrastructure and reduce pollutants to provide clean water for all Oregon communities."
>
> -100-Year Water Vision (2020)

Private and Domestic Surface Water Systems – In rural areas, some private and domestic water supplies are sourced from surface water. Just like domestic wells, these systems are not regulated for drinking water quality.

Drinking Water Source Protection

Whether people obtain their drinking water from a private well, a small community system, or a large municipal system, the original source of that water is from groundwater, surface water, or a combination of the two. Therefore, the means for protecting the safety of Oregon's drinking water includes protecting and managing those sources. Protecting the source of our drinking water can be accomplished by many parties, including individuals, private landowners, businesses, municipalities, Tribes, and agencies. Land use planning, watershed management, watershed ownership, proper well construction, and wellhead protection are all useful ways to protect Oregon's drinking water. The Oregon Department of Environmental Quality's (ODEQ) Clean Water State Revolving Fund (CWSRF) program can fund source water protection, planning, design, and construction projects including land acquisition, measures to prevent or mitigate pollution in watersheds, and watershed protection. CWSRF cannot fund physical improvements to drinking water infrastructure.

Land Use Planning – Described in Chapter 3, land use planning has the potential to protect drinking water sources from incompatible land uses. Data regarding the location of drinking water supplies (e.g., private wells, watersheds for municipal systems) can be used to inform land use zoning to limit incompatible land uses. Planning and implementing low impact development techniques may protect water resources. Also see Strategy Actions 5B, 6A, 6B, and 9D.

Watershed Management – The way we manage land for urban, agricultural, and forestry uses influences the quality of water within a given watershed. Land management practices such as limiting stormwater runoff, minimizing erosion, limiting use of pesticides and herbicides, maintaining septic systems, and maintaining healthy vegetation and stream buffers may all reduce impacts to shared water resources. Agencies require adequate resources and personnel to implement and enforce existing laws and regulations to limit the pollution of surface and groundwater sources, including conservation easements. Also see Strategy Actions 5B, 7A, 10F, 11A, 12B, and 12C.

Watershed Ownership– Land ownership of a community's drinking water source area is an effective way to manage water quality and quantity. Land ownership allows land management and creates the opportunity to implement practices that maximize watershed health, groundwater recharge, and natural filtration.

Limited water supply options on the coast have led many coastal communities to prioritize acquisition of their watersheds from willing sellers to protect the quality and reliability of their water supply. The 2023 Legislature (House Bill 2010) created a Drinking Water Source Protection Program at the Oregon Watershed Enhancement Board to provide land acquisition grants for drinking water source protection. The 2023 Legislature made a one-time investment of $5 million in funding which has been fully committed in grant agreements. No additional funding is available in the program at this time.

Proper Well Construction – Proper well construction is critical for protecting the state's groundwater. Wells are often used for domestic, municipal, industrial, environmental monitoring, or agricultural purposes. The Well Construction and Compliance Section at the OWRD is responsible for several program areas to ensure that wells are properly constructed, altered, maintained, and decommissioned to prevent contamination, loss of artesian pressure, and waste of Oregon's groundwater resources. Also see Strategy Actions 7A and 11E.

Wellhead Protection – A local government may choose to protect any wellhead protection area that is within their jurisdiction. Often wellhead protection areas extend into other jurisdictions, for example, from a city into a county. Amendments to a county comprehensive plan can be used to protect wellhead protection areas identified by a city. Also see Strategy Actions 6A, 9B and 9D.

Source Water Assessments for Public Water Systems

A source water assessment evaluates the potential contamination sources to a public water supply. An assessment is used to develop and voluntarily implement a drinking water protection plan. The ODEQ has completed source water assessments for public water supplies that use surface water as their source. The OHA is updating delineated drinking water source areas and potential contaminant inventories for groundwater-supplied systems.

Many municipal watersheds are located on U.S. Forest Service lands, however source areas for smaller communities often include multiple private and public landowners. Source water assessments include property ownership information that allows drinking water providers to involve landowners when developing protection strategies for source water protection.

Source water assessments also provide key information that enable communities to focus limited resources on higher risks within their drinking water source area. The information can be supplemented with local water system and community knowledge and help address local water quantity and water quality challenges.

Source Water Protection Plans

Local communities can protect their drinking water by developing a protection plan that starts with identifying the water source and potential risks. A source water assessment helps map the supply area (drinking water source area) and highlight threats like pollution or runoff. Based on this, communities can create and implement strategies such as land use controls, public education, and emergency planning. Collaboration with local partners and ongoing coordination are key to keeping the water supply safe. State agencies often provide guidance and funding to support these efforts.

Contaminants of Emerging Concern (CECs)

Improved testing methods now reveal some chemicals previously undetected during sampling events. These chemicals are referred to as "contaminants of emerging concern" (CECs) because the risk to human health and the environment associated with their presence, frequency of occurrence, or source may be unknown. State and federal agencies are working to improve the understanding of several CECs, particularly pharmaceuticals, personal care products, and perfluorinated compounds, among others. Monitoring of public drinking water for CECs should be increased to determine the occurrence and concentration of contaminants. This data is crucial to assess whether and how such contaminants may pose individual, cumulative, or synergistic health risks to the public. This monitoring data can be used in conjunction with the USEPA's Unregulated Contaminant Monitoring Rule data (also see Appendix B) to evaluate connections among source sensitivity, potential contaminant sources in the area, and overall system vulnerability to contamination.

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) – The recent discovery of the widespread presence of perfluoroalkyl and polyfluoroalkyl substances (PFAS) in drinking water sources has gained attention from the USEPA. PFAS are also referred to as "forever chemicals" as they break down very slowly. The Oregon Health Authority's website provides a list of potential health risks from PFAS including reproductive, developmental, liver,

kidney, and immunological effects. Between 2021 and 2023, the OHA sampled 143 public water systems, finding that 22 of the systems had detections of at least one PFAS compound. Sampling results can be found at Drinking Water Data Online.

In April 2024, USEPA announced the final national drinking water standards for six PFAS substances. USEPA's rule includes initial monitoring of all community and non-transient non-community public water systems that must be completed by April 2027, ongoing routine compliance monitoring after that date, and would allow OHA to require action where PFAS exceed a Maximum Contaminant Level (MCL) in drinking water at those systems in Oregon beginning in April 2029. Oregon has two years to adopt rules and apply for primacy from USEPA or request an extension.

In May 2025, USEPA announced planned changes to the PFAS drinking water rule, which include maintaining the MCLs for two of the six PFAS substances and reconsidering the regulatory determinations for the other four. The USEPA is also considering extending the compliance date for the MCLs to 2031 and establishing a federal exemption process for possibly going beyond 2031. The USEPA also announced its new PFAS OUT initiative, an effort that will connect with every public water system needing capital improvements for compliance with USEPA technical assistance. The USEPA plans to propose a rule for these changes fall 2025 and finalize the rule spring 2026.

Manganese – Manganese is a naturally occurring element found in rocks, soil, water, air, and the food we eat. Humans need to consume small amounts of manganese to stay healthy. Some parts of Oregon have been identified as having elevated manganese in their drinking water which, may not be safe for long-term consumption. With additional study, manganese may eventually become regulated under the Safe Drinking Water Act. The OHA has developed a Manganese Fact Sheet in English and Spanish.

Arsenic – Arsenic is a naturally occurring element found in soils and groundwater. Drinking water with high levels of arsenic may lead to serious health conditions including cancer, nervous or reproductive system issues, and diabetes. Public water supplies are tested and treated for arsenic. People using a private well for their drinking water must test their well to know if it contains harmful levels of arsenic. The OHA has developed an Arsenic and Drinking Water Fact Sheet.

Drinking Water Emergencies

Equipment failures, harmful algal blooms, contamination by pathogens, natural hazards including drought (Action 5A), floods (Action 5B), and earthquakes (Action 5C), and chemical releases/spills (also see Action 12B) are just some events that can contribute to drinking water emergencies. The OHA requires public water systems to develop and maintain an emergency response plan. Community water systems serving more than 3,300 people also must conduct a risk and resilience assessment.

Oregon's statewide emergency response system must be designed to quickly respond to drinking water emergencies. All water providers should be encouraged to join the Oregon Water/Wastewater Agency Response Network, a statewide mutual aid agreement specific to water and wastewater agencies that provides access to equipment and personnel. The Regional Disaster Preparedness Organization and the Regional Water Providers Consortium in the Portland Metro area are two such networks that can help with the development of regional emergency preparedness, response and recovery, and coordination of resources.

Desalination

Rising sea levels, over-pumping, or storm surges may lead to salt-water intrusion in some coastal aquifers.[48] Desalination is a technique that allows communities to stretch limited water resources by removing salt and other contaminants using reverse osmosis technology. Some of the greatest challenges to building a desalination plant include intense energy requirements to treat the water; expansive coastline to site an energy source, pumps, pipes, inflows, and outfalls; damage to marine organisms during water intake; and brine disposal options. These challenges make desalination one of the most expensive sources of drinking water.

Despite the challenges associated with desalination, many states are including it in their water supply strategies. In 2024, the U.S. Department of Energy announced $75 million in funding over five years for a desalination innovation hub. The innovation hub will be used to find solutions to the technical barriers associated with desalination.

Access and Affordability

Access to drinking water in Oregon is not equitable, with some people experiencing contaminated water coming from their tap, others unable to afford their utility bills, while others lack water access in workplaces. The State of Water Justice in Oregon report and Secretary of State Advisory Report 2023-04 outline these and many other challenges facing frontline communities across the state.

House Bill 2010 (2023) directed the Legislative Policy and Research Office to research and report on approaches and funding sources for an ongoing statewide assistance program for low-income ratepayers of drinking water, wastewater, and stormwater services. The report, Approaches and Funding for Low-Income Water Ratepayer Assistance and Household Infrastructure in Oregon was published in 2024. Legislation also expanded eligibility for the Water Well Abandonment, Repair, and Replacement Fund (WARRF) to cover household water wells with contamination levels that exceed drinking water standards. The OWRD administers the WARRF program, prioritizing financial assistance for low-to-moderate income households in areas impacted by drought or wildfire.

Addressing water access and affordability at a statewide scale will continue to be challenging, as water distribution happens at many scales (e.g., domestic well, municipal water system, etc.) and does not lie within the purview of one agency. Solutions to water access and affordability will need to reflect the varied circumstances found across urban and rural parts of the state.

Action 12A

Ensure the Safety of Oregon's Drinking Water

Examples of how to carry out this action:

- Assist drinking water systems of all sizes; increase technical, administrative, and funding resources for small and very small water systems (less than 15 connections)
- Protect drinking water sources (e.g., proper well construction, onsite septic system maintenance, responsible land management, nutrient reduction, riparian/upland/forest restoration, watershed land acquisition and conservation)
- Increase understanding of occurrence and health implications of contaminants of emerging concern (e.g. pharmaceuticals, personal care products, microplastics, nanoplastics, perfluoroalkyl and polyfluoroalkyl substances (PFAS)).
- Encourage water providers to join the Oregon Water/Wastewater Agency Response Network
- Increase domestic well testing and provide updated support materials and education (including translations, when needed) (Also see Action 1A)
- Amend Domestic Well Testing Act to require laboratories to electronically report domestic well testing results associated with real estate transactions to the state
- Increase resources for education, outreach, monitoring, and treatment for disadvantaged/underserved domestic well users
- Support resiliency efforts for maintaining operation of drinking water systems during emergencies (e.g., solar/renewable energy, battery storage)
- Seek alternative to EPA's definition of "disadvantaged communities" to increase eligibility for funding drinking water improvements in underserved communities in urban areas

Action 12B Reduce Use of and Exposure to Toxics and Other Pollutants

Protecting Oregonians from the impacts of toxic pollutants is a top priority for the Department of Environmental Quality (ODEQ) and Oregon Health Authority (OHA). Thousands of toxic chemicals are in products that are used daily. Old chemicals that may not be sold today but are stored in homes, schools, and businesses also pose risks. These chemicals are released into Oregon's air, water, and land as toxic pollutants in a variety of ways. Once in the environment, toxic pollutants can adversely affect the health of people and other living organisms. Additional pollutants including plastics and micro-plastics also pose risks to human and aquatic life, with the full impact of these waste products still being studied. Accidents, including chemical spills and train derailments also pose environmental and public health risks, emphasizing the need for prevention, planning, and expedient clean-up. Toxic pollutants that affect air, land, and water quality intersect with and become cumulative impacts that disproportionately affect frontline environmental justice communities.

Addressing permitted discharges of pollutants, TMDLs, point and nonpoint sources of pollution, are covered in Strategy Action 12C.

Toxics Reduction Strategy

The ODEQ's 2018 Toxics Reduction Strategy emphasizes collaboration and partnerships with other agencies and organizations to reduce priority toxic chemicals in the environment and exposure to such chemicals by people.[49] The strategy emphasizes reducing toxic pollutants at the source, rather than managing them after they are generated. Executive Order No. 12-05 ("Environmentally Friendly Purchasing and Product Design") provides additional support for ODEQ's Toxics Reduction Strategy by focusing the work of other state agencies on reducing toxics.[50] The Executive Order has become the official policy of the Department of Administrative Services and resulted in low toxicity procurement guidelines for state agencies, and other public entities that join state price agreements.

Two other high priority short-term actions identified in the 2018 Toxics Reduction Strategy were to expand and enhance the Pesticide Stewardship Partnership program and ensure support for pesticide waste collection events.

Water Quality Pesticide Management Plan

As the lead agency for the Federal Insecticide, Fungicide, Rodenticide Act, the Oregon Department of Agriculture's (ODA) Pesticides Program holds the primary responsibility for pesticide registration and use regulation. Oregon's Pesticide Management Plan for Water Quality Protection outlines the roles, policies, and legal authorities of each government agency with responsibilities to protect Oregon's water resources from pesticides and the process by which these activities will be coordinated. Under this plan, the ODA created an interagency team, the Water Quality Pesticide Management Team (WQPMT), composed of representatives the Department of Forestry, ODEQ, OHA, Department of Fish and Wildlife (ODFW), and Oregon State University. The goals of the WQPMT are to:

- Select and prioritize pesticides of interest and pesticides of concern;
- Establish guidelines and reference points;
- Conduct watershed vulnerability assessments;
- Design, conduct, and guide monitoring efforts (including the Pesticide Stewardship Partnership Program monitoring);
- Recommend and facilitate management options; and
- Develop communication strategies.

Pesticide Stewardship Partnerships

The Pesticide Stewardship Partnership (PSP) Program, led by the ODA, is a voluntary program that relies on local partnerships to monitor pesticide levels in waterways and implement solutions to protect water quality while managing pests and maintaining crop yield. Efforts include technical assistance, outreach, and education-based projects. The PSP works as a feedback loop with the water quality sampling data continuously being used to evaluate pesticides of concern, the effectiveness of education, and collaborative projects on an annual basis.

Credit Hood River Soil and Water Conservation District

The goals of the PSP Program are to:

- Identify potential concerns and improve water quality affected by pesticide use around Oregon.
- Combine local expertise in water quality sampling results to encourage voluntary changes in pesticide use and management practices.
- Find ways to reduce pesticide levels while measuring improvements in water quality and crop management.
- Advance measurable environmental improvements, making Oregon waters safer for aquatic life and humans.

As of 2025, there are PSPs established in nine watersheds: Amazon, Clackamas, Hood River, Middle Deschutes, Middle Rogue, Pudding, Yamhill, Walla Walla, and Wasco. PSP areas can be found at the Oregon Department of Agriculture website. Several of the partnerships have shown improvements in water quality in response to education created around water quality data and subsequent changes in pesticide management practices. These successes demonstrate the Pesticide Stewardship Partnership approach can be an effective alternative to traditional regulatory approaches dealing with "nonpoint" sources of chemicals in water.

Pesticide Waste Collection - Pesticide waste collection events are part of the PSP program and provide an opportunity to bring pesticides from agricultural growers and other commercial or institutional pesticide users for free disposal. Some state pesticide collection funds are transferred to county and regional entities (representing Hood, Sherman, and Wasco counties) that operate permanent hazardous waste collection facilities to support periodic free agriculture pesticide collections for local growers and other pesticide users.

Contaminated or Hazardous Sites

Sites, facilities, or structures that were once used for industrial, military, transportation, energy, or other purposes may have historical releases of hazardous substances that pose a threat to water resources. The nature and degree of such threats depend on the types and amounts of contaminants, when they were released, the likelihood of migration to surface water or groundwater, and remedial actions completed, if any.

Addressing hazardous and contaminated sites is not only important for protecting environmental and public health but can also lead to economic development opportunities for local communities. The redevelopment of brownfields—sites where future use may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant—is changing the way contaminated property is perceived and addressed. In Oregon, brownfields have been cleaned up and turned into new businesses and created new jobs. Brownfield redevelopments include urban community gardens; mixed-use developments that include housing, retail, and commercial facilities this includes food bank operation centers; thrift stores; and health-care centers in rural Oregon communities. Community health concerns and environmental justice are integrated throughout brownfield redevelopment and reuse planning to prevent future exposure to contamination.

Underground Storage Tanks – Oregon's Leaking Underground Storage Tank Program, administered by the ODEQ, identifies and addresses hazardous or contaminated sites and prioritizes investigative and remedial actions based on threats to human health and the environment with a focus on protecting sensitive water resources. Site owners complete most work on a voluntary basis, with program oversight. The program uses enforcement mechanisms to eliminate or treat discharges to sensitive water resources as needed. This includes use of the ODEQ's Orphan Site Account when site owners are unknown, unable, or in some cases unwilling, to perform immediate cleanups.

Abandoned and Derelict Vessels - There are hundreds of hazardous boats and ships in Oregon's public waterways, including large tugboats, barges, former military vessels, and recreational vessels. In April 2023, the Department of State Lands (DSL) began working to propose a comprehensive program for abandoned and derelict vessels in Oregon, including identifying funding needs and potential sources. The passage of House Bill 2914 (2023) directed the DSL to develop the program in coordination with other state agencies including the State Marine Board, ODEQ, and the State Parks and Recreation Department.

Polychlorinated Biphenyls (PCBs) – Monsanto Company manufactured many products (e.g., coolants, hydraulic oils, paint, caulk, copy paper, etc.) that contained PCBs. PCBs are highly toxic and were banned in 1977, however, they persist in Oregon's land and water. In December of 2022, Monsanto was ordered to pay Oregon $698 million to address remediation associated with PCBs. Senate Bill 1561(2024) established the Oregon Environmental Restoration Fund. This Fund, comprised of money received from the Monsanto Settlement Agreement, will be managed by the Environmental Restoration Council. The Environmental Restoration Council is administered by the Oregon Watershed Enhancement Board.

Action 12B

Reduce the Use of and Exposure to Toxins and Other Pollutants

Examples of how to carry out this action:

- Update and implement the ODEQ's 2018 Toxics Reduction Strategy
- Implement green chemistry executive order, including revising purchasing practices related to toxic chemicals
- Update and implement Water Quality Pesticide Management Plan
- Support Pesticide Stewardship Partnerships and enhance program to focus on environmental justice communities
- Continue "take back programs" and develop partnerships with community-based organizations and tribes to facilitate culturally relevant "take back programs"
- Continue to identify and address hazardous or contaminated sites (e.g., Lower Umatilla Basin nitrate contamination, brownfields, abandoned/derelict vessels)
- Prevent blue-green algae (including Harmful Algal Blooms or HABs) from forming beyond natural background levels and support advisory/notification efforts
- Support implementation of the 2023 ODEQ Freshwater Cyanobacteria Harmful Algal Bloom Strategy
- Monitor recreational waters and inform the public when contaminants are present, including communications to reach non-English speaking, low-income, tribal, and rural residents and businesses
- Update Oregon's water quality criteria for toxic pollutants to protect aquatic life and human health based on the latest science
- Support programs and organizations to help communities and utilities prevent, prepare for, and respond to chemical spills
- Support no-till, organic, and regenerative agricultural practices that reduce herbicide, pesticide, and fertilizer use
- Engage historically or currently impacted communities in design of toxics source reduction and clean-up efforts so that they can experience the benefits of the effort, such as utilizing Community Benefits Agreements

Unused Medications

Often, unused or expired medications are disposed of by flushing down drains in homes, care facilities, medical clinics, and hospitals. Wastewater treatment plants and septic systems, depending on the level of treatment, may only partially treat pharmaceuticals which allows certain chemical compounds to reach surface water or groundwater resources. Risks to aquatic organisms by long-term exposure to pharmaceuticals are still being studied.

More than 50 Oregon communities have established permanent, free collection boxes for unused medications. Collection box locations are listed on the Oregon Health Authority website. The U.S. Drug Enforcement Agency offers a national drug take-back event twice a year, in April and October. The ODEQ also administers the Drug Take-Back Program, in partnership with the Oregon Board of Pharmacy.

Public Health Advisories for Recreational Water Bodies and Public Water Systems

Public health advisories alert the public to water quality issues and help prevent exposures to toxics and other pollutants that may negatively impact human health. Millions of people participate in recreational activities each year, including harvesting shellfish, fishing, swimming, boating, and enjoying Oregon's coastline. State agencies use a variety of approaches and tools to protect people living, working, and playing near beaches, rivers, lakes, and other water bodies. In addition to advisories, it is critical that land management activities do not contribute to further water quality degradation (see Action 12C).

Harmful Algal Bloom (HAB) Advisories –An overgrowth of cyanobacteria in lakes, rivers, and ponds can result in the development of a harmful algal bloom (HAB), which can produce extremely dangerous toxins (cyanotoxins) that can sicken or kill people and animals. HABs have become increasingly common across Oregon, impacting recreational waters as well as drinking water supplies. In July 2018, the City of Salem's drinking water source, North Santiam River, became contaminated with cyanotoxins, causing a public health emergency. Since then, the OHA has developed regulations that require drinking water systems using surface water sources susceptible to HABs to routinely test for cyanotoxins and publish advisories if health advisory levels are exceeded.

The OHA is the agency responsible for issuing recreational HABs advisories for lakes, reservoirs, and rivers, educating the public about HABs at waters used for recreation, and encouraging local water body managers to post onsite warnings when OHA issues an advisory. OHA uses a combination of visual identification by experienced assessors, satellite imagery, and laboratory testing of water samples confirming the presence and quantity of a harmful algae species or the toxins they produce. Current cyanobacteria recreational advisories can be found on the OHA website.

See Action 12C for the ODEQ's HABs Strategy for reducing the occurrence of HABs.

Credit Oregon Health Authority

The Oregon Beach Monitoring Program – The OHA and the ODEQ are responsible for monitoring recreational water quality at coastal beaches in Oregon. Marine waters are tested for the bacterium enterococcus, which is an indicator of the presence of other illness-causing organisms. Enterococcus is present in human and animal waste and can enter marine waters from a variety of sources such as streams and creeks, stormwater runoff, animal and

seabird waste, failing septic systems, sewage treatment plant spills, or boating waste. When bacteria levels are above normal, a water contact advisory is issued.

The goal of the program is to protect public health by providing information about water quality, monitoring water quality standards at beaches, and promoting scientific research. The public can sign up for email alerts to receive notices when advisories have been issued at certain beaches.

Fish and Shellfish Consumption – Fish and shellfish can accumulate toxic chemicals from legacy contamination, spills, or toxic algal blooms, posing health risks to those who consume them. The ODEQ establishes the level of protection needed to ensure public health, by setting human health toxics criteria based on fish consumption rates. Oregon's fish consumption rate is 175 grams per day is one of, if not the highest in the nation, in recognition of the consumption rates by Tribes, subsistence fishers, and Asian and Pacific Islanders in the Pacific Northwest. The OHA issues fish consumption advisories, due primarily to moderate-to-high mercury levels or PCBs (polychlorinated biphenyls) found in locally-caught fish. The ODA and ODFW jointly issue shellfish safety closures to protect recreational shellfish harvesters from consuming clams or mussels contaminated with harmful biotoxins. The ODA also maintains an online website with biotoxin results, recent news releases, and encourages the public to call the shellfish safety hotline before harvesting.

Action 12C Implement Water Quality Pollution Controls

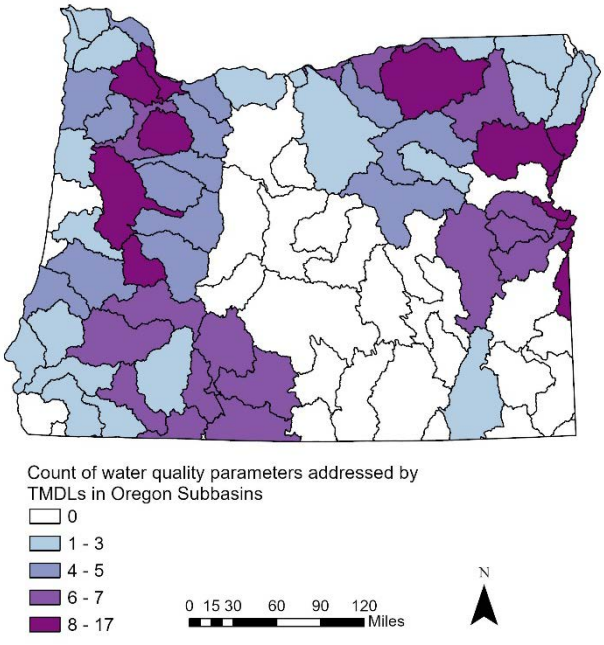
It is important that land management activities and their associated point and nonpoint sources of pollutants are managed to protect water quality for humans and the environment. The Clean Water Act, described in Appendix B, administered by the Oregon Department of Environmental Quality (ODEQ), provides the regulatory structure for addressing point and nonpoint sources of pollution.

Total Maximum Daily Load (TMDL) Implementation

A Total Maximum Daily Load (TMDL) describes the maximum amount of a pollutant from all sources: municipal, industrial, agricultural, commercial, surface runoff and background; that can enter a waterway without violating clean water standards associated with the Clean Water Act. The ODEQ sets TMDL limits and communities work together to develop TMDL implementation plans. TMDL plans identify pollution controls across agricultural, forest, urban, and rural residential land uses to protect and improve water quality.

It is important to continue developing and implementing TMDL plans for waterbodies that do not meet water quality standards. This includes developing TMDLs for the remaining waterbodies and pollutants on Oregon's 303(d) impaired waters list and for those added in the future, in accordance with the federal Clean Water Act. It also includes reviewing and updating existing TMDLs and providing oversight to ensure that TMDL implementation measures are effective. By the end of 2023, the ODEQ completed 46 TMDL actions that require pollutant reduction on more than 200,000 miles of streams and rivers

Figure 4-12: Number of 303(d) listed parameters addressed by TMDLs in each Oregon sub-basin



in Oregon. In total, these TMDLs address 28 water quality parameters listed on the 303(d) list of impaired waters. The map in Figure 4-12 summarizes the number of parameters that have been addressed by a TMDL for each subbasin in Oregon. The full list of water quality parameters addressed can be found on the ODEQ's TMDL website.

Three Oregon Tribes have authorization from the US Environmental Protection Agency (USEPA) to administer water quality standards under the Clean Water Act; the Confederated Tribes of Umatilla Indian Reservation, the Confederated Tribes of Warm Springs Reservation of Oregon, and the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians. State agencies must coordinate with Tribes to understand environmental impacts to Tribal resources of concern and how water resource management by the state may impact compliance with USEPA-approved Tribal Water Quality Standards.

In 2024, the USEPA signed a final rule that changes how Clean Water Act water quality standards are applied to Tribal Reserved Rights. Historically, the USEPA has addressed Tribal Reserved Rights under the Clean Water Act on a case-by-case basis in state-specific actions. This practice led to uncertainty for Tribes, states, and entities looking to comply with Clean Water Act requirements. The USEPA's final rule provides clarity and transparency by revising the federal water quality standards regulation to better protect Tribal Reserved Rights under the Clean Water Act. With this rule, the USEPA is ensuring that water quality standards are established taking into consideration Clean Water Act-protected aquatic and aquatic-dependent resources where Tribes hold and assert rights to those resources under federal treaties, statutes, or executive orders. The Tribal Reserved Rights rule is being reviewed for recission by the current federal administration.

Oregon's Nonpoint Source Management Program Plan

A nonpoint source of pollution is any pollution entering a waterbody that does not come directly from a visible source such as a pipe or ditch. Unlike end-of-pipe (point source) pollution that originates from industrial and sewage treatment plants, nonpoint source pollution comes from many diffuse sources, including runoff from agricultural, forest, and ranching activities, construction sites, home landscaping, and road surfaces.

The ODEQ leads the development of the statewide Nonpoint Source Management Program Plan, which identifies programs and actions that will be implemented by multiple state agencies, local governments, non-governmental organizations, and local citizens. The program's multi-agency strategy, including the Department of Agriculture (ODA) and Department of Forestry, involves using water quality management programs in conjunction with regulatory, voluntary, financial, and technical assistance. The program's primary components are assessment, planning, implementation, and education.

The federal Clean Water Act provides states, territories, and Tribal governments opportunities for funding to address nonpoint pollution, commonly referred to as Section 319 grants. These grants can be used for technical assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of specific nonpoint source implementation projects. In 2010, Oregon was awarded more than $1.38 million in Section 319 grants for 33 projects that address nonpoint source pollution. Since 2015, the amount of 319 funds Oregon has received annually has been reduced by 30-percent due to the disapproval of the states' Coastal Nonpoint Source Pollution Program under the Coastal Zone Reauthorization Amendment (CZARA), see description below. In 2022 and 2023 only $135,067 and $137,567, respectively, grant funds were available to support on the ground projects from the state's total 319 allocation. The ODEQ has submitted a revised program plan to USEPA and is awaiting approval in 2025, which would allow for greater 319 grant funding.

The Nonpoint Source Management Program Plan refers to many other state programs that manage nonpoint sources of pollution. A selection of these programs is described below.

Agricultural Water Quality Management Plans – The ODA's Agricultural Water Quality Program is part of the state's effort to address the federal Clean Water Act, ensuring that farmers and ranchers do their part in meeting water quality standards. There are 38 area Agricultural Water Quality Management Plans and rules around the state.

The ODA's water quality specialists work with farmers, ranchers, community leaders, and other interested parties who serve as members of local advisory committees for each management area. Each committee identifies local agricultural water quality problems and opportunities for improvement.

Soil and water conservation districts (SWCDs) work with the ODA as the Local Management Agency for implementation of voluntary actions related to the Agricultural Water Quality Program. Statutes require the ODA to work with SWCDs to the greatest extent practical. The SWCDs provide technical assistance, seek funding, and implement projects to protect and improve water quality.

Coastal Nonpoint Pollution Control Program – The Coastal Zone Act Reauthorization Amendment (CZARA) established the national Coastal Nonpoint Pollution Control Program requiring coastal states to address nonpoint source pollution. The Department of Land Conservation and Development and ODEQ lead the state's management of the program and receive federal funding under Coastal Zone Management Act and the Clean Water Act, respectively. Oregon has not met CZARA requirements since 2015 due to forestland management issues. Oregon's timber harvesting rules were not providing adequate water quality protection. New rules and rule revisions to the Forest Practices Act in 2022 are expected to result in improved water quality associated with private forestland management along the coast.

Farm Bill Programs – There are several Farm Bill conservation programs, administered through the Natural Resources Conservation Service, for agricultural producers and landowners. Oregon ranchers have worked with public and private sector partners to install and monitor effective habitat restoration techniques, including fencing and building stock water troughs to protect sensitive riparian areas from livestock.

Forest Practices Act Implementation – Non-federal forestland is managed in accordance with the Forest Practices Act (see Appendix B), as well as individual management plans based on geographic area (Northwest, Southwest, and Eastern Oregon). Example actions that can help prevent pollution of waterways include leaving vegetated buffers adjacent to streams, road placement and drainage to minimize runoff, and avoiding harvesting on steep slopes.

Harmful Algal Blooms (HABs) Strategy – Once a waterbody is identified as having HABs, the ODEQ is responsible for investigating the causes, identifying sources of pollution, and writing a pollution reduction plan. The Department developed a Harmful Algal Bloom Strategy in 2011 to describe and recommend improvements to an overall strategy that they can implement in order to prevent and control, where possible, HABs in Oregon.[51] In 2023, the Department also published a Freshwater Cyanobacteria Harmful Algal Blooms Strategy that supports the continued implementation of many of the actions in the 2011 Strategy, but is written more specifically for agency staff and identifies additional needs to expand current operations[52].

Stormwater in Urban Areas

Stormwater runoff often contains pollutants that can adversely affect water quality. Strategy Action 6B calls for promoting low impact development and green infrastructure practices to reduce and manage stormwater. Strategy Action 7A supports the need to maintain and upgrade stormwater infrastructure, which is often a combination of built and green infrastructure.

National Pollutant Discharge Elimination System (NPDES) permits, issued by the ODEQ (see Appendix B), are required for certain stormwater discharges that

Credit Portland Bureau of Environmental Services

leave a site through a "point source," often a pipe, and reaches surface waters either directly or through storm drainage. A municipal separate storm sewer system, or "MS4", is a conveyance or system of conveyances (e.g., roads with drainage systems, municipal streets, catch basins, curbs, gutters, manmade channels or storm drains) owned or operated by a governmental entity that discharges to waters of the state. The population of an urban area determines whether they require an MS4 discharge permit. Oregon needs to ensure the effective management and oversight of stormwater in urbanized areas through the implementation of NPDES and MS4 permits, TMDL Implementation Plans for Urban Designated Management Agencies, best management practices, or through comparable voluntary plans.

Septic Systems in Rural Areas

State law provides the ODEQ with regulatory authority over onsite (e.g., septic) sewage treatment and disposal. More than one million Oregonians, or about 35 percent of the state's population, use onsite sewage systems, also known as septic systems. Most of these are single-family homes in rural areas without access to community sewer systems.

A failing septic system increases the risk of contamination of both surface water and groundwater and can be a public health hazard. Septic systems are required to be inspected at the time of construction to ensure they are correctly installed and functioning properly. Ongoing maintenance carried out by the system owner is critical to avoid system failures. Businesses that install septic systems or provide pumping services are regulated through a statewide licensing program. The ODEQ provides direct service for onsite system permitting and installation in the counties of Baker, Coos, Curry, Grant, Jackson, Josephine, Morrow, Union, Wallowa, and Wheeler. The 26 remaining counties work directly with their local governments for permitting and installations, with oversight from the state.

The ODEQ has established a new program, Oregon Septic Smart, to provide Oregonians with easy access to information and improve access to certified industry professionals that can perform septic system inspections. The ODEQ also administers an Onsite Financial Aid Program to provide grants and low-cost loans to address failing septic systems. The program will utilize $15 million in federal American Rescue Plan Act funds that the 2021 Oregon Legislature allocated to the ODEQ. The ODEQ maintains a list of additional financial resources for onsite septic systems on their website

Action 12C

Implement Water Quality Pollution Controls

Examples of how to carry out this action:

- Continue to develop and implement TMDLs for water bodies that do not meet water quality standards
- Continue to address nonpoint sources of pollution across all land uses
- Ensure effective management and oversight of stormwater in urbanized areas
- Assist communities with septic system challenges, including technical and funding resources for underserved communities
- Continue to update and revise TMDLs to conform with current temperature standards
- Continue to work with Designated Management Agencies, as defined in each TMDL, to achieve water quality standards
- Develop more programmatic implementation plans for common TMDL issues
- Continue to meaningfully engage with communities within the boundaries of new and updated TMDL's
- Review TMDL prioritization process to ensure geographic equity among places with a completed and approved TMDL
- Recognize role of water management and water withdrawals in meeting TMDL objectives

Critical Issue | Funding for Oregon's Waters

The 2023 Secretary of State Advisory Report regarding water security (Report 2023-04) identified that natural resources state agencies are chronically underfunded and understaffed in relation to their respective responsibilities[53]. Meeting the water challenges of today and tomorrow will require an increased investment in state agencies and programs.

Most Strategy actions require some type of funding, whether it is to hire or keep agency staff, purchase equipment, hire a specialist/consultant, or plan, design, and implement a project. Recently the Legislature has increased the state's spending on water. Notable water investments from the 2021, 2022, and 2023 Legislative sessions are provided below. Future Strategy workplans and progress reports will provide an opportunity to link legislative investments with state agency actions that support Strategy implementation.

This section concludes with three distinct Strategy Actions: funding the development and implementation of the Strategy, funding water resources management by state agencies, and assisting with local or regional water challenges by funding planning, feasibility studies, and instream and out-of-stream water projects.

The Business Case for Investing in Water

The Business Case for Investing in Water in Oregon[54] outlines the risks, opportunities, and benefits associated with making some specific investments in water. The report finds that "Oregon should invest in ways that increase resiliency and flexibility and should do so in advance of crises rather than in response to crises." Figure 4-13 outlines the reports' five guideposts for investment and shows the corresponding critical issues and actions in the Strategy.

Figure 4-13: Business Case Guidance for Investment and Associated Strategy Actions

Business Case Five Guideposts to Meet Oregon's Current and Future Water Challenges	Critical Issues and Actions in the 2025 Strategy Aligned with Guidepost
Invest in whole-watershed and **nature-based approaches** for a range of benefits including future avoided costs of potential negative impacts from climate change	Instream and Ecosystem Needs, Actions 2A-2C Land Use Planning, Action 6B Water Infrastructure, Action 7A Healthy Ecosystems, Actions 11A-11E Funding, Action 13C
Fund innovative governance and **policy adaptations** to increase flexibility of water management and capitalize on collaboration and creativity	Water Use and Management, Actions 10D-10F Healthy Ecosystems, Action 11E Funding, Action 13B
Focus on **modernizing infrastructure** across the landscape in ways that help address specific risks like flooding, stormwater management, reduced summer baseflow, shrinking glaciers, fish passage, etc.	Energy and Water, Actions 4B-4C Water Infrastructure, Actions 7A, 7C Healthy Ecosystems Actions 11A, 11D
Enhance water justice by authentically **engaging frontline communities** in policy and power and targeting investments so that benefits are distributed to these communities equitably	Water Planning, Action 9E Funding, Actions 13C, 13C
Recognize and invest to **support Tribal economic, spiritual, and cultural values** for water and fish and engage with Tribes as sovereign co-managers of the resource	Instream and Ecosystem Water Needs, Actions 2A-2C Out-of-Stream Water Needs, Action 3C Water Planning, Action 9C Healthy Ecosystems, Actions 11A-11E Clean Water, Actions 12A-12C Funding, Actions 13B, 13C

"Oregon faces significant threats to its environment, economy and way of life from current and future water-related risks and challenges. Oregonians have demonstrated that they have many of the required strategies and tools at hand and have the expertise and motivation to develop new approaches when necessary. Wielding the tools and deploying the strategies, however, requires major investment not just once, but for the foreseeable future. The necessary investment cannot be underestimated and requires determination, commitment and engagement across all sectors, agencies, communities and levels of government and power. Importantly, it also requires inclusion of frontline communities that have been traditionally left out of decision-making and power over water including Tribes, low-income communities, rural communities, communities of color and others."

-The Business Case for Investing in Water in Oregon (2023)

Recent Legislative Investments in Water

2021 Legislative Water Package

The 2021 Oregon Legislature made historic investments in Oregon's water future, with the passing of a $538 million water package. Approximately $500 million of the funding package came from the federal American Rescue Plan Act (ARPA). This funding resulted in investments in many types of water infrastructure across Oregon, through grants, loans, and direct appropriations and came at a time when many communities experienced several years of consecutive drought and/or devasting wildfires. While funding was provided to agencies for additional staff capacity, much of the water package included pass-through funding where agencies used the money for contracting services or increasing funding through grant and loan programs. Continued funding for agency day-to-day operations remains a consistent funding challenge.

Figure 4-14: Investments from the 2021 $538 Million Water Package (House Bill 5006) and Related Strategy Actions

Investment Amount	Description	Related Strategy Actions
$275.7 M	Direct appropriations of ARPA funding for drinking water, wastewater, and stormwater infrastructure projects throughout Oregon	13C, 12A-12C, 7A-7C
$135.7 M	Public works funds and financial assistance programs to repair and replace water infrastructure	13C, 12A-12C, 7A, 7C
$46.5 M	Regional and basin-specific projects (Deschutes and Willamette Basins, Wallowa and Newport dams, Umatilla County)	13B, 13C, 9A, 10A-10C, 7A-7C
$39.9 M	Water Projects Grants and Loans, Feasibility Grants	13B, 13C, 5B, 10C-10F, 7C
$11.2 M	Modernize the data collection and technology used to monitor Oregon's water supply	13B, 1A-1C
$17.7 M	Water quality improvements (including research and technical assistance, TMDL development, fish screen/passage projects)	13B, 1A, 11B, 11D, 12A-12C, 7A
$6.5 M	Make Oregon's water infrastructure safer and more resilient (including dam safety)	5A-5C, 12A-12C, 7A, 7C
$5 M	Update Integrated Water Resources Strategy, regional water planning workgroup, place-based integrated planning, statewide business case assessment	13B, 13C, 9C, 6A, 12A

2022 Legislative Investments

During the 2022 Legislative Session, House Bill 5202 identified $25 million in funding to support Oregon's waterways and wetlands and to protect fish and other aquatic species during times of drought. Funding provided support for the Oregon Watershed Enhancement Board's (OWEB) voluntary water acquisitions program, the Oregon Department of Fish and Wildlife's (ODFW) fish passage barrier removal program and temperature and flow monitoring, and the Oregon Conservation and Recreation Fund. This funding provided meaningful benefits to drought-imperiled rivers, wetlands, and fish. Specifically, it funded:

- Increase in real-time temperature and streamflow gages throughout the state,
- Temperature loggers and staff time to identify and map cold water refugia areas that provide critical habitat for fish in times of drought when rivers reach lethal temperatures,
- Increase in OWEB's existing Water Acquisition Program which compensates water users who voluntarily choose to engage in instream transfers,
- ODFW staff and legal capacity to address a backlog of instream water right protests awaiting contested case hearings,
- Funding to improve fish passage to cooler habitats, and
- Increase in habitat restoration projects funded through the Oregon Conservation and Recreation Fund that improve drought resiliency of our rivers, waterways, and aquatic habitat.

2023 Drought Resilience and Water Security Package

The 2023 Oregon Legislature passed a $143 million Drought Resilience and Water Security Package, marking an important milestone in achieving support for many Strategy actions that address not only drought resilience, but many parts of water security. A fifteen-page summary of the 2023 Drought Resilience and Water Security Package lists the numerous pieces of legislation that support building drought resilience across Oregon. This funding package contains seven priority "focus areas," related to actions found throughout the Strategy.

1. **Water Project Investments – $68.9M**
   Funding associated with water project investment included direct appropriations for a range of water infrastructure projects, support for irrigation modernization projects, and a new grant program to complete feasibility studies and testing for potential aquifer recharge projects.

2. **Water for Fish: Instream Priorities and Watershed Health - $35.2M**
   Increased investments were made to Oregon Department of Fish and Wildlife's existing Fish Passage Fund and to the Oregon Conservation and Recreation Fund to improve wildlife passage and mobility and increase drought resilience in natural systems. Various funding sources were allocated for restoration across the state, including wetlands, floodplains, and watersheds impacted by western juniper.

3. **Water for Farms: Agricultural Resilience and Food Security - $9.7M**
   Funding has been allocated to help small-scale agricultural producers increase their resilience to drought and support the Oregon Community Food Systems Network to develop food hub infrastructure and drought resilience. Support was also provided for increasing access to agricultural water technical assistance through Oregon State University's Extension Service and Agricultural Experiment Station.

4. **Data and Analysis - $8.8M**
   Notable investments included funding to update the statewide water availability model, continued support for the Oregon Water Data Portal, and expanded authority for the Water Resources Department to require water use reporting.

5. **Planning, Coordination, and Capacity - $8.3M**
   This focus area included permanent funding for Place-Based Integrated Water Resources Planning, grants to support other types of planning and coordination, and staff to address water distribution and water rights and protest backlog reduction.

6. **Water for Families: Drinking Water Security - $7.5M**
   Drinking water security will be enhanced by a new grant program to help water suppliers protect drinking water source areas, administered by the OWEB. Additional investments include funding to research small community water system vulnerability and funding to expand the existing Water Well Abandonment, Repair, and Replacement Fund (WARRF).

7. **Outreach and Engagement - $4.4M**
   This funding focus area included $1.6M for the construction of a water system training center, to be managed by the Oregon Association of Water Utilities, facilitation support to continue the Tribal Water Task Force, and resources for the University of Oregon's Just Futures Institute to research and address water needs of environmental justice communities.

Oregon's Water Caucus

The Oregon Legislature's Water Caucus is a bipartisan, bicameral group of state legislators and staff committed to fostering a resilient water future for all. The Water Caucus recognizes that tackling complex water challenges requires focused leadership, innovation, and long-term commitment to learning and working together. Core functions include facilitating learning, convening conversations, promoting informed decision-making, and elevating the priority of water-related policies and investments. The Caucus includes members of diverse backgrounds and is led with balance across the Legislature's House and Senate as well as the state's major political parties.

Remaining Funding Gaps

Funding needs remain even after the two consecutive biennia of significant investments in water infrastructure, planning tools, and technical assistance. Agencies continue to need funding for data and analysis to inform near and long-term decision-making. Underinvestment in water infrastructure has been a problem for decades and will take time to adequately address. Small communities continue to need technical and financial support for water infrastructure, including assistance in pursuing grants. Senior water rights holders in the agricultural sector need financial incentives to dedicate water instream. Some agencies have seen flat funding for carrying out regulatory responsibilities and water management duties that do not keep up with increased costs or increased responsibilities. Agency funding for technology infrastructure and administrative support have not increased proportionally with growth in some agency programs.

> *"The state's water infrastructure suffers from decades of disinvestment and natural resource agencies lack funding and capacity to properly enact their duties."*
>
> -Secretary of State Advisory Report 2023-04 (2023)

Action 13A Fund Oregon's Integrated Water Resources Strategy

Agencies need funding to carry out a robust public process in updating the Strategy, as well as guide the ongoing implementation of the Strategy actions. The Water Resources Department lacked a full-time position dedicated to Strategy implementation after 2018. The Department regained a permanent, full-time position in 2023. The 2023 Legislative session also resulted in the addition of staff positions at other agencies to support the Strategy, including one staff member to the Department of Agriculture, two at the Department of Environmental Quality, and three at the Water Program at the Department of Fish and Wildlife. All natural resources agencies need adequate capacity to participate in the Strategy, especially those with statutory responsibilities.

Action 13A

Fund Development and Implementation of Oregon's Integrated Water Resources Strategy

Examples of how to implement this action:

- Fund implementation of the Integrated Water Resources Strategy
- Fund the development and implementation of biennial Strategy workplans
- Fund the required Integrated Water Resources Strategy updates, including support from partner agencies
- Fund communication resources regarding the Strategy including web-based information and translations
- Fund the development of biennial progress reports to communicate progress on Strategy implementation

Since 2009, Oregon has been required to update the Strategy every five years. However, in 2023, the Oregon Legislature extended this period to a maximum of every eight years, also adding the requirement for developing a biennial agency work plan to implement the Strategy. These changes go into effect after the adoption of the 2025 Strategy. Staff support across many agencies will be needed to coordinate efforts in developing the biennial work plan and implementing the Strategy's four objectives and 48 actions.

Ongoing Strategy implementation requires effort for coordination and communication. Updating the Strategy involves coordination with Tribes, interested parties, the public, multiple federal and state agencies, briefings of boards and commissions, and countless hours collecting information on Oregon's water-related policies, programs, and practices. Consistent resources for agencies for Strategy coordination, implementation, and updates will allow for steady progress towards understanding and meeting our states instream and out-of-stream needs.

Action 13B Fund Water Resources Management by State Agencies

Although some of the Strategy actions fall under the purview of the private sector, nonprofit organizations, or academic institutions, most actions will fall to the public sector, particularly state agencies. The state plays a complex role when it comes to water resources management; it serves the public interest in economic development, the environment, public health, and public safety.

Oregon has made historic investments in water over the last two biennia. It is important to continue to build upon these investments, while not losing sight of core responsibilities related to water. This action is intended to be broadly interpreted to include the many supporting roles natural resources agency personnel play in water management. For example, information technology, administration, education, communication, research, and monitoring are all critical activities that support effective water management.

For day-to-day operations at state agencies, there are many examples of Strategy implementation activities that require funding:

- Coordinating and partnering with other agencies and public and private entities
- Updating plans and participating in federal, state, and local planning activities
- Improving scientific information, including data collection, analysis, sharing, and use in decision-making
- Updating technical tools, including software, databases, maps, models, field equipment, and education/outreach materials
- Protecting and restoring instream flow, habitat, and access, including fish passage and fish screening
- Providing engineering, scientific, permitting, regulatory and other technical expertise to partners, interested parties, and customers
- Measuring and distributing water
- Assessing, developing, issuing, and denying or renewing permits that are protective of water resources
- Conducting compliance, public health/safety monitoring and inspections
- Enforcing compliance with permits (water rights, water quality, removal-fill, etc.), statutes, and regulations
- Monitoring for and preventing invasive species, toxics, pollution, and hazards

Agency Budgets Support Local Governments and Districts

Many state agency budgets provide funding for local, on-the-ground organizations. For example, the Oregon Watershed Enhancement Board provides funding for watershed councils and soil and water conservation districts, in collaboration with the Oregon Department of Agriculture. The Department of Land Conservation and Development provides technical assistance and funding for local governments relating to comprehensive land use planning and coastal resiliency.

Sources of Agency Funds

Oregon's natural resources agencies' operating budgets depend on a variety of funding sources, and the source can dictate the activities of an agency's time, staff, and resources. There are four primary funding mechanisms for most natural resources agencies: General Funds, lottery funds, federal funds, and fees. Economic development activities are often partially supported by fee revenues or contract funds for work performed. Environmental protection activities have often depended on public funds.

The General Fund is used for a variety of public purposes and the amount of General Fund is limited, meaning there is competition for these dollars. The legislatively approved budget for 2023-25 shows the General Fund investment in natural resources agencies equated to almost 2 percent, or $606 million, of the $31.9 billion General Fund budget. The budget for 2021-2023 was also about 2 percent of the General Fund, however, the previous decade consistently allocated closer to 1 percent of the General Fund to natural resources agencies.

Over the years, natural resources agencies have become increasingly reliant on lottery funds and federal funds, which are often geared toward specific, local projects, rather than maintaining core functions and daily operations. Many natural resources agencies also rely on permit fees however, these funds do not cover the real cost of conducting transactions.

An agency's ability to maintain consistent levels of staffing and services requires consistent General Fund and fee revenue. When fee revenue is low, an agency must administratively manage the budget to control costs. This includes leaving positions across the agency open as they become vacant and shifting General Funds, or other available funding sources, to cover fee gaps. This ultimately results in misalignment between staffing levels and workloads agency wide. Often, as water becomes scarcer, the work required of natural resources agency staff becomes more complex and time consuming and fees are typically not enough to recoup the costs.

Action 13B

Fund Water Resources Management Activities by State Agencies

Examples of how to implement this action:

- Fund those water management activities for which the state has responsibility
- Ensure increased and adequate funding from the General Fund
- Seek additional funding sources (e.g., federal funding, bonding)
- Provide funding for agency operations and equipment (e.g., administration, information technologies, interagency coordination, data acquisition and management)
- Allow agencies to adjust fees to ensure that their programs protecting water resources are sustainably funded
- Evaluate and implement opportunities to improve equitable delivery of services by state agencies
- Support agency capacity to carry out the Strategy
- Provide ongoing support for the Oregon Water Data Portal to provide a platform for state agencies and partners to share data and information with the public to support water-related decision making
- Provide equitable access to technical assistance (e.g., state agencies, SWCDs) for communities

Federal funding sources can help support targeted agency projects; most recently, they provided a much-needed boost to help replace and upgrade water infrastructure. Many federal funding opportunities require state matching funds, highlighting the need to have state resources available to leverage federal dollars. Federal funding for many core environmental protection programs carried out by the state, such as the Clean Water Act, have remained flat for many years. As a result, program service levels have been reduced, elevating the need for additional sources of funding.

Action 13C

Invest in Planning, Feasibility Studies, and Project Implementation

Agencies often administer grants and loans to support many types of instream and out-of-stream projects. This role carries with it responsibility for distributing public funds in an equitable manner, addressing racial and environmental justice. Oregon's DEI Action Plan provides guidance for investments, stating they should be targeted to historically and currently under-resourced populations and/or organizations. Project funders should also consider how project outcomes might negatively impact water affordability. Resources have historically been limited to providing financial assistance to low-income households for water and wastewater utilities.

The Federal Justice40 Initiative provides an aspirational model for identifying disadvantaged communities and prioritizing investments to benefit those same communities. Specifically, the Initiative requires that 40-percent of overall benefits of certain climate, clean energy, and other federal investments flow to disadvantaged communities marginalized by underinvestment and overburdened by pollution.

Planning

Planning is done successfully by ensuring that resources exist to help organize people and facilitate the conversation. It also takes resources to gather existing information and to complete new technical assessments that fill key knowledge gaps. In any planning effort, communication and outreach are fundamentally important and require investment of both time and resources.

Investments are needed to support existing state agency planning programs and new planning initiatives. The Water Resources Department (OWRD) administers the Place-Based Integrated Planning Program. The Department of Land Conservation and Development (DLCD) administers numerous planning-focused grants including the General Fund Grant Program to support local governments with local comprehensive planning and plan updates, the Oregon Coast Management Program Coastal Grants to support coastal resiliency, and the Community Green Infrastructure Grant Program to fund planning and development of community green infrastructure projects.

Feasibility Studies

Local communities find it most difficult to secure feasibility study funding as part of their project development. Such studies help determine the viability of a project as well as the environmental, engineering, economic, and social implications of proposed water projects.

One way Oregon can help with costs is to bridge the existing funding gap for feasibility studies. In 2008, the OWRD began providing funding for Feasibility Study Grants for water conservation, reuse, and storage projects. Since then, approximately $9.9 million has been awarded to support 120 feasibility studies.

Business Oregon (BizOR) and Oregon Health Authority (OHA) provide funding for feasibility studies through the Sustainable Infrastructure Planning Projects forgivable loan program. The BizOR also funds feasibility studies through other programs, including the Safe Drinking Water Revolving Loan Fund and Water/Wastewater Financing Program.

The Oregon Watershed Enhancement Board (OWEB) can also fund feasibility studies through their Technical Assistance Grants, if the applicant can demonstrate it is necessary for an acquisition or restoration project. The DLCD offers Technical Assistance Grants for public facilities feasibility studies in support of housing production.

In 2024, the Oregon Department of Environmental Quality (ODEQ) offered forgivable loans up to $100,000 for planning and feasibility studies with Bipartisan Infrastructure Law funds through their Clean Water State Revolving Fund.

Instream and Out-of-Stream Project Implementation

The Strategy identifies many actions needed to meet instream and out-of-stream water demands. Many of these actions point to types of projects that are needed, such as ecological restoration (Actions 10A-10E), modernizing irrigation infrastructure (Actions 12B and 13A), or upgrading many types of water infrastructure to be more resilient to climate change and natural hazards (Actions 6A-6C, 13A-13C). Fortunately, many existing state agency programs can help fund a wide range of water projects. The OWEB has grant programs that can fund many aspects of a habitat restoration project including community engagement, technical assistance, construction, and monitoring. The OWEB also funds voluntary instream water transactions with water right holders to benefit fish and wildlife habitat and water quality. The BizOR has numerous grant and loan programs that fund site assessment, remediation, and water infrastructure planning, design, and implementation. The types of water infrastructure projects that receive funding include drinking water supply, stormwater conveyance, wastewater treatment, water storage, and levees.

The OWRD's Water Projects Grants and Loans Program funds evaluation, planning, and the development of instream and out-of-stream water projects that have an economic, environmental, and social or cultural benefit. The Irrigation Modernization Funding Program is also led by the OWRD, providing grants for projects that improve water use efficiency on currently irrigated agricultural lands.

"Coordinated and new investments will ensure communities – including Oregon's federally recognized tribes and those people living in disproportionately impacted and rural communities - can afford and access adequate clean water, and return it to our rivers for downstream users, fish, and wildlife."

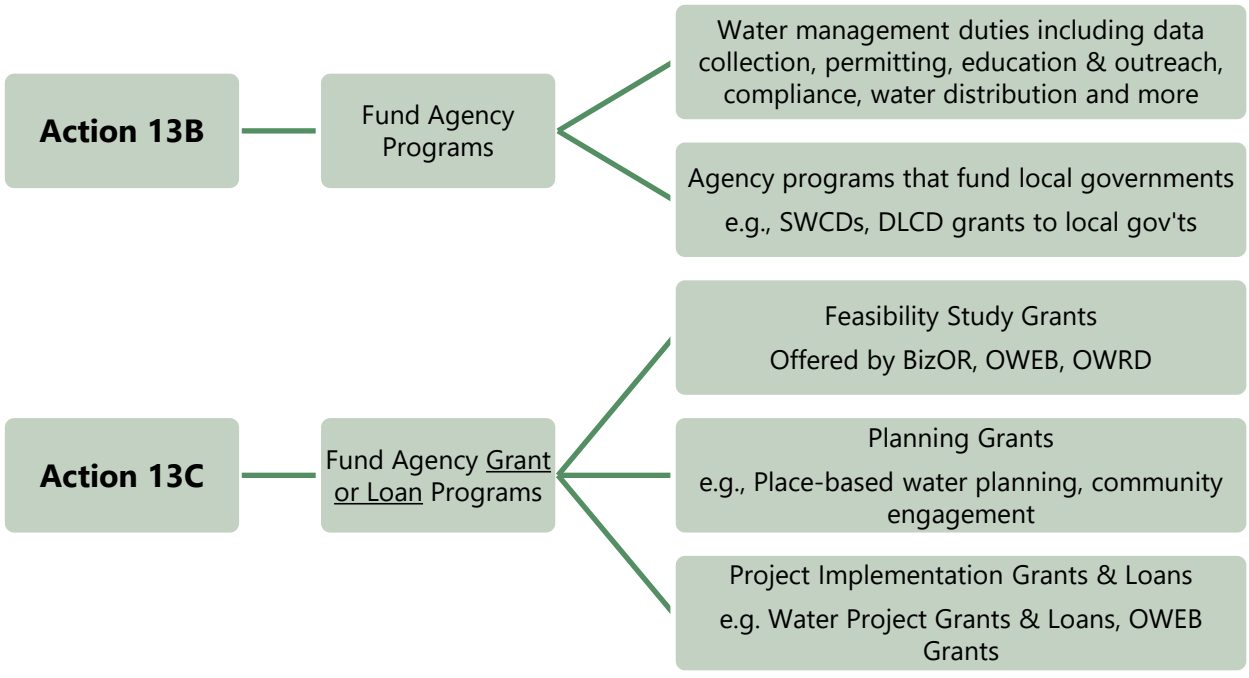
.-100-Year Water Vision (2020)

The Department of Fish and Wildlife administers the Private Forest Accord Grant Program and the Oregon Recreation and Conservation Fund. The Private Forest Accord Grant Program can support watershed-scale investments in projects like stream habitat restoration, removal of barriers to fish passage, cold water and flow protection, beaver-modified habitat creation, and other statewide benefits for the species covered by the Private Forest Accord Habitat Conservation Plan. The Oregon Recreation and Conservation Fund supports projects that help implement the State Wildlife Action Plan, protecting and enhancing species and habitats, and providing opportunities for wildlife-associated recreation and education.

The ODEQ leads the Clean Water State Revolving Fund, which provides below-market rate loans for water infrastructure projects. The BizOR and the OHA partner on the Drinking Water State Revolving Fund which provides low-cost loans to community and non-community water systems for planning, design, and construction of drinking water facility improvements.

Throughout Oregon, municipalities, organizations, businesses, and individuals apply for state funding. Projects often require multiple funding sources to be viable, increasing the impact of grant application and award timing. Project applicants can benefit from agency communication, coordination, and technical assistance to piece together various funding sources.

Figure 4-15: Guidance for using Action 13B or Action 13C



Action 13C

Invest in Planning, Feasibility Studies, and Water Resource Project Implementation

Examples of how to implement this action:

- Continue to authorize and fund public and private investments in efforts such as Place-Based Integrated Water Resources Planning, including plan implementation
- Provide funding to assist small water systems to develop and implement water management and conservation plans
- Provide funding to support hazard mitigation planning (e.g. droughts, floods) at the local level
- Support river basin-planning updates
- Authorize bonds to finance investments in water resource-related projects
- Ensure that basic water infrastructure maintenance needs continue to be eligible for grant and loan funding
- Advocate for continued state and federal funding for water and wastewater-related infrastructure
- Develop funding and technical support for low-income, small communities, and districts to maintain, upgrade, and operate water and wastewater-related infrastructure
- Continue funding and support for watershed restoration and OWEB Focused Investment Partnerships
- Continue to fund OWRD Feasibility Study Grants, Water Project Grants and Loans, and Water Well Abandonment, Repair, and Replacement funding opportunities
- Continue to provide BIZOR and OWEB administered grants that cover feasibility studies
- Support water project community engagement, including participation by representatives of disproportionately impacted communities (See HB 3293 (2021) that applies to BIZOR, ODEQ, ODFW, OHA, OWEB, and OWRD)
- Target investments so that benefits are distributed to frontline communities equitably
- Look for ways to support the federal Justice40 Initiative, a goal that 40 percent of benefits of specific federal investments are directed toward those marginalized, underserved, and overburdened by pollution
- Develop a centralized funding platform to help link people with project-appropriate funding programs

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CONCLUSION

Implementation and Looking Forward

Water is a finite resource with growing demands; water scarcity is a reality in Oregon. Water-related decisions should rest on a thorough analysis of supply, the demand / need for water, the potential for increasing efficiencies and conservation, and alternative ways to meet these demands."

- Policy Advisory Group (2016)

Chewaucan River near Paisley, Oregon. Credit: Garrett Steensland

Strategy Workplan and Implementation

The statute guiding the development and implementation of the Strategy was updated in 2023 to require a biennial workplan. Following the adoption of the 2025 Strategy by the Water Resources Commission, the Strategy Project Team will draft the first biennial workplan that reflects the Strategy Agency Priorities (Appendix E) and the legislatively adopted budget for the 2025-27 biennium. Future workplans will include engagement opportunities in advance of biennial agency budget processes and legislative concept development to adequately support forward-looking Strategy implementation. Workplan development provides an opportunity to coordinate work across many agencies and partners and must be done in a way that protects the public interest and balances instream and out-of-stream needs.

Agencies will continue to make progress on Strategy actions as resources allow. Each biennial budget cycle and legislative session provides a new opportunity to identify and secure necessary resources to implement the Strategy.

Closing Thoughts

Since 2012, the Strategy has provided Oregon with a roadmap to improve our understanding of our water resources and work towards meeting our instream and out-of-stream needs. Most years, steady progress has been made on the Strategy actions. The last four years of legislative investments have allowed for a significant increase in activity. Private landowners, communities, non-profits, businesses, local governments, utilities, Tribes, and state and federal agencies have come together to discuss difficult topics, develop creative solutions, find funding, and implement projects on the ground.

During public engagement for the 2025 Strategy, differences in opinion were shared about how to address our water challenges. But commonalities were also shared, across diverse communities throughout the state. Participants also shared a message of hope:

- Encouragement about the development of new devices and technology for both addressing water quantity (such as more efficient tools for agriculture or for households) and water quality
- Empathy and care for what people in other parts of the state might be facing with water in their communities. As one Marion County resident put it, “There are so many of us who care deeply about water, and there are not many ways to show that or ways to find each other if we are not already involved in water management as large-scale customers, professional experts, or administrators.”
- A desire to learn more
- Hope in future generations as water and land stewards
- Appreciation for opportunities to be part of the statewide conversation on water

More work is yet to be done. Let the Strategy be the springboard for conversations about both water problems and water solutions. We can’t live without water, and we can make choices now that make future conversations easier rather than harder. To quote many Strategy engagement participants, “water is life.”

The next edition of the Strategy is due in eight years.

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- Julie Smitherman, Vice-Chair
- Kathy Kihara
- Jan Lee-Weinberg
- Joe Moll
- Janet Neuman
- Woody Wolfe
- Meg Reeves (former Chair)

OREGON WATER RESOURCES COMMISSION

Resolution Adopting the State's Integrated Water Resources Strategy

Whereas, the Oregon Water Resources Commission adopted Oregon's first Integrated Water Resources Strategy in 2012, carrying out its vision of bringing various sectors and interests together to work toward the common purpose of maintaining healthy water resources to meet the needs of Oregonians and the environment for generations to come;

Whereas, extreme weather events in recent years including droughts, fires, winter storms, and floods continually remind us that water-related challenges are here and will only increase in the future;

Whereas, climate change and earthquakes may influence water availability, water use, and water infrastructure;

Whereas, the Water Resources Commission desires to continue, through updates to the Strategy, a strong tradition of scientific integrity, forward-looking public policy recommendations, and robust public participation in Oregon;

Whereas, this 2025 Strategy retained the original vision, goals, objectives, and guiding principles from the 2017 version, with the intent to update information, fill important gaps, and strengthen ideas by shoring up or adding new actions, where needed;

Whereas, partner state and federal agencies and Tribal Sovereign Nations have continued to lend their voices and knowledge;

Whereas, the citizens of Oregon continue to demonstrate awareness and knowledge of water issues, showing strong support for collaborative solutions and contributing to the conversation through numerous in-person meetings, almost 2,000 survey responses, and submitting public comments for two drafts;

Whereas, our fellow Boards and Commissions have continued to support this work, the process, and product—the Environmental Quality Commission, Fish and Wildlife Commission, and the Board of Agriculture;

Whereas, the 2025 Integrated Water Resources Strategy includes a suite of actions to improve our understanding of water resources, to define our collective instream and out-of-stream needs, including water quantity, water quality, and ecosystems needs, and to address the pressures that may affect these resources and needs;

Whereas, Oregon's update to the Integrated Water Resources Strategy has been completed according to the parameters set forth in ORS 536.220; Now, therefore,

Be It Resolved, we the undersigned members of Oregon's Water Resources Commission do hereby adopt Oregon's 2025 Integrated Water Resources Strategy on this Eleventh Day of September, 2025.

Janet Neuman
Westside at Large

Julie Smitherman
Southwest Region

Jan Lee
Northwest Region

Joe Moll
West Central Region

Not in attendance

Woody Wolfe
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