CHAPTER 4

MEET OREGON'S INSTREAM AND OUT-OF-STREAM NEEDS

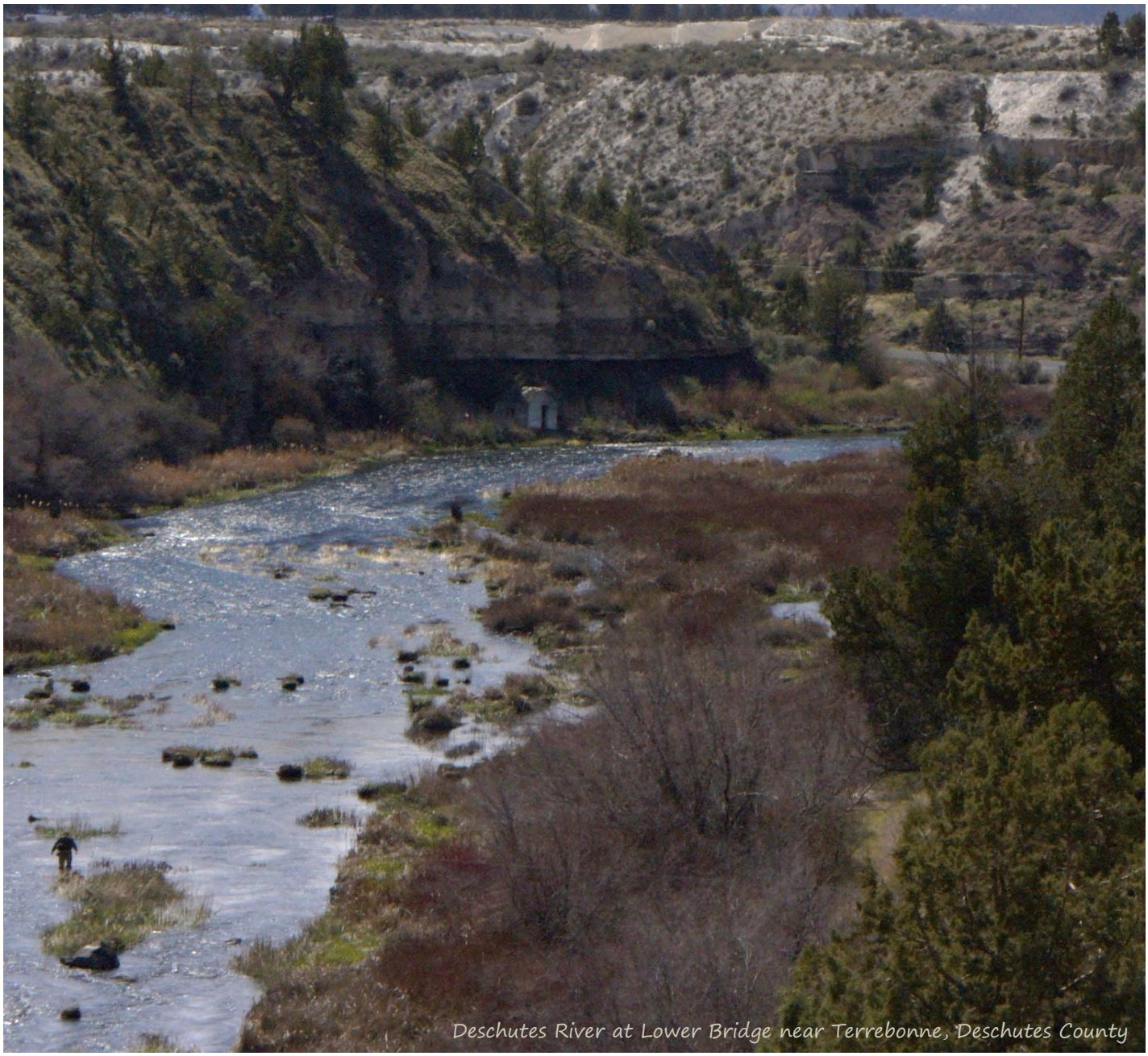

Photo: Kyle Gorman, OWRD

Deschutes River at Lower Bridge near Terrebonne, Deschutes County

Place-Based Efforts

Water Management & Development

Healthy Ecosystems

Public Health

Funding

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 resource and economic development agencies, at all levels of government. Key factors to consider include state-level and place-based water planning, water management and development, and the protection of ecosystems and public health. The Strategy's objectives of better understanding and meeting our water needs will be meaningless without adequate funding.

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CRITICAL ISSUE: PLACE-BASED EFFORTS

Brownlee Reservoir near Richland, Baker County

North Umpqua River, Douglas County

Nehalem Bay State Park, Tillamook County

Photos: Gary Halvorson, Oregon State Archives

Although everything we do in the natural resources community has a sense of "place," the concepts in this section specifically focus on three topics: place-based water resources planning, coordinating existing natural resource plans, and strengthening our communication and partnerships with tribes, federal agencies, and neighboring states with which we share water resources.

Because every river basin in Oregon is unique with widely varying ecological issues, community values, and economic dynamics, place-based integrated water resources planning is vital to meeting Oregon's water management challenges. Such planning enables communities to engage in a collaborative process to determine how best to meet their unique instream and out-of-stream water needs. Place-based efforts provide a venue for water managers to interact with the people who live, work, and play in a watershed and care deeply about it.

Place-based planning allows these conversations to take place at a scale that a statewide strategy may not be able to achieve. Voluntary place-based plans can "roll up" and inform the statewide Strategy. Place-based plans can leverage technical and funding resources available through the Strategy to make more meaningful local impacts. This approach is meant to empower communities to conduct voluntary, place-based integrated water resources planning in consultation with the State.

Bev Bridgewater, West Extension Irrigation District
& Brad Bogus, Tetra Tech Inc.

Municipal – Agricultural Partnership – Example

The City of Hermiston and West Extension Irrigation District have partnered with state and federal agencies to reclaim highly treated municipal wastewater, mix it with river water, and deliver it to agricultural customers, including ranchettes, gardens, orchards, and fields of potatoes, corn, and alfalfa.

At full capacity, the City expects to supply about 3.5 cubic feet per second (CFS) of water, from late spring until the end of the irrigation season each year. This will save the District about $22,000 annually in pumping costs from the Umatilla River. In turn, the City saves money by not having to chill its discharge.

This project will utilize wastewater discharge from the City, treated to levels that meet food quality standards (Class A water). The District will not jeopardize an existing agricultural exemption for its own discharge, under the federal Clean Water Act; and the City must have a fail-safe process in place so that no untreated water will go to the District.

Designing a Template for Place-Based Efforts

In order to successfully take a place-based approach to water resources management, the State must develop a template of guidelines to ensure that plans are integrated, addressing instream and out-of-stream needs, including water quantity, water quality, and ecosystem needs. Plans should account for the interaction between groundwater and surface water. Plans should also delineate and describe local population centers, key industries, and listed fish species, among many other factors that influence the use and management of water.

Recommended Action 9.A
Undertake Place-Based Integrated, Water Resources Planning

How to implement this action:

- Develop a template for place-based integrated water resources strategies
- Provide technical assistance and other incentives to communities undertaking place-based IWRS
- Compile relevant and readily-available water-related information to support place-based IWRS

At a minimum, the State and the template it designs must ensure that any place-based plan seeking state funding and/or state approval under the Strategy must recognize the public interest in water, and have a meaningful process for public involvement, with public meetings, and a balanced representation of all interests.

Inherent in any place-based plan is the recognition and commitment to the State's authority and responsibility for management of water resources. A place-based planning effort will need to comply with existing state laws and requirements. Having full participation by state and federal agencies, tribes, and non-governmental organizations will be important for achieving this; their expertise will help guide stakeholders through the planning process.

The State, working primarily through the four agencies involved with development of the Strategy, will develop the template and seek further grant funding and other incentives to assist with local planning efforts. Basic components of the template should include the following concepts:

- A description—quantity and quality—of current water resources (surface water, groundwater, storage, wastewater, stormwater), as well as a description of current and future water needs, both instream (ecological and biological needs, recreation, navigation) and out-of-stream (agricultural, municipal, industrial, including energy). Plans should note any specific data gaps, and any difficulties meeting instream and out-of-stream needs.

- A description of areas served by irrigation districts, and drinking water, wastewater, and stormwater utilities (include service area, status of infrastructure, status of contracts). This description should also note any difficulties meeting needs.

- Provisions for drought management and climate change adaptation and analysis of potential effects on quantity and quality of surface water and groundwater, as well as potential effects on demand/need.

- A discussion of other water plans (TMDLs, recovery plans, forestry plan, etc.) to the extent that data are available and provide direction for decision-making.

- Potential options to match future demands with supplies; the status of and opportunities related to water management and development tools in the basin, particularly water right transfers, water storage (both built storage and natural storage), water-use efficiency and conservation, water reuse, and restoration. This approach is meant to develop and evaluate water-resource scenarios.

The State should consider formally establishing the template, specifying the details of basin or sub-basin integrated water resources strategies, and ensuring ample public notice and comment prior to the approval process. The State already provides templates for other planning efforts, such as water management and conservation planning (described later in this chapter), which could be used as a model or example for place-based efforts. To build planning capacity and test the place-based planning concept, the establishment of pilot projects should be considered. This work will depend greatly on the availability of agency field staff.

Potential incentives to encourage place-based planning could include access to state and federal technical assistance, including hydrologic modeling; bundling state and federal water-resources funds to facilitate implementation of plans; a long-term commitment by the State to coordinate/implement other plans; recognition of place-based water resources plans by multiple state agencies; and facilitated permitting.

One area of need that communities have identified is a tool that models or evaluates the impact of policy and program options. Many communities do not have the tools to ask and answer "what if" questions when they are conducting water resources planning. An example of one such tool could arise through the Willamette Water 2100 project, an effort spearheaded by Oregon State University, University of Oregon, and Portland State University. The National Science Foundation is funding this three-year project that will attempt to incorporate local hydrologic, meteorological, ecological, economic, legal, and other factors into a Willamette basin model.

Mark Anderson and Michelle Girts,
CH2M Hill

Place-Based Partnerships – Examples

Urban Water Planning: Local Watershed

The City of Damascus, a 12,000-acre area in the Clackamas and Willamette Basins, is expected to grow to 50,000 residents by 2060. This semi-rural community at the eastern edge of the Portland metropolitan area was recently incorporated. To serve expected growth, the City developed an integrated water resources management plan for water, wastewater, and stormwater infrastructure. In cooperation with several regional service providers, this first-of-its-kind plan capitalizes on a unique opportunity to consider all the aspects of urban water management from a local watershed perspective.

Agencies Share Resources, Consensus for Long Range Plans

As primary drinking water supplier in Washington County, the Joint Water Commission prepared what may be the state's most comprehensive Water Management and Conservation Plan. It addresses the unique supply and conservation collective needs of all the associated water utilities using shared resources and consensus for long range planning. The Commission's four key players are the cities of Hillsboro, Forest Grove, and Beaverton, and Tualatin Valley Water District, each with existing water responsibilities and facilities.

A Public-Private Cooperative

The Talking Water Gardens project is a unique public-private partnership that enabled two cities (Albany and Millersburg) and a high-tech company (ATI Wah-Chang) to address their water needs as a cooperative. They pooled financial resources to plan and build a new kind of water reclamation system: an engineered wetland that mimics the cleansing and cooling characteristics that occur in nature. This award-winning project garnered federal financial support and was constructed for a fraction of the cost of conventional facilities, while improving Willamette River water quality for fish habitat and downstream uses, and providing recreational space to the community.

Coordinating Existing 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 non-profit organizations with an interest in water management and resource issues.

Recommended Action 9.B
Coordinate Implementation of Existing Natural Resource Plans

How to implement this action:

- Coordinate and reconcile existing ecological planning and restoration efforts
- Dedicate resources for state and local implementation

Within a basin or sub-basin, multiple planning documents that involve water management, directly or indirectly, may exist. Water management and conservation plans (by a municipal water provider, or irrigation district); fish conservation and recovery plans, BiOp implementation plans; basin plans for water allocation; Total Maximum Daily Load (TMDL) plans for improving water quality; and many local implementation plans are just a few examples. 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 a welter of agencies and entities at every level.

Each plan has its own goals and objectives, with varying expectations and outcomes, making it challenging for a group of basin stakeholders to conduct their own planning and to implement projects strategically that meet multiple water quantity, water quality, and ecosystem needs.

In envisioning a place-based approach to meet local needs, these existing plans and programs do not go away, but instead provide a baseline of information, history, and rules that must be considered, coordinated, and built upon. A place-based approach could help reconcile and implement the state's programs and plans more effectively.

Partnerships with Federal Agencies, Tribal Governments, and Neighboring States

Partnerships with federal agencies, tribes, and neighboring states have played an important and necessary role in Oregon history. A large percentage of Oregon's landscape is managed by federal agencies, and Oregon shares three major waterways with California, Washington, and Idaho. Oregon is also home to nine federally recognized tribes, all of which have responsibilities for protecting and managing water resources. The Strategy presents an opportunity to strengthen these government-to-government relationships. Place-based planning, data collection and sharing are just a few areas where new partnerships can emerge.

Federal Agencies

The federal government manages 53 percent of the land in Oregon, and 60 percent of forestlands. The Bureau of Land Management, for example, administers 15.7 million acres of federal lands in Oregon, more than one-quarter of the state's land base. The role of the federal government in natural resource management, and water resources management in particular, is significant. Groundwater basin investigations are one example, cited earlier.

Another example is the use of federal Biological Opinions (BiOps). Watersheds throughout Oregon are host to a number of threatened, endangered, and sensitive species. Federal BiOps set objectives for species protection by laying out actions to protect, enhance, or restore conditions for these species and their habitat.

A third example is storage infrastructure. Two federal agencies, the U.S. Army Corps of Engineers and U.S. Bureau of Reclamation, are key partners in the operation and contract management of critical pieces of water infrastructure, among them, federal reservoirs that store water for patrons of several irrigation districts located throughout Oregon. The Bonneville Power Administration also has a role in water management, as it markets wholesale electric power from several hydropower projects in the Northwest.

Tribal Government Relations

All of Oregon's natural resource and economic development agencies have built relationships with the state's federally recognized tribes on a government-to-government basis. Oregon was the first state to adopt a formal legal government-to-government relationship with tribes through both executive action and legislation.

With regard to water, these relationships often revolve around environmental justice issues, water needs and water rights, water quality monitoring, or watershed management and restoration. Tribal members sit on state policy boards and advisory committees in order to provide perspective and guidance. These discussions range from awarding grants for restoration projects, to facility siting, to long-term water policy. As mentioned in Chapter 2, there is an ongoing need to resolve pre-1909 water right claims, including unresolved tribal claims.

Management of fisheries 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 works with the Columbia River Treaty Tribes (Nez Perce, Umatilla, Warm Springs, and Yakama), 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.* The Agreement was developed and is being implemented under the ongoing supervision of the U.S. District Court in Portland, Oregon. Species managed under the Agreement include white sturgeon, Chinook, Coho and sockeye salmon, walleye, lamprey, shad, and steelhead.

Partnerships with Neighboring States

Oregon shares surface water resources—the Snake River, the Columbia River, and the Klamath River, for example—with its neighboring states. It also shares significant groundwater aquifers with its neighbors, and coordinates data collection and sharing so that water managers on both sides of our borders can manage the resource effectively.

Oregon has been engaged in discussions with the State of Washington to pursue opportunities to release water from existing water storage facilities in Washington to offset additional water use in Oregon. These opportunities could also include potential long-term investment partnerships between the two states to construct new above-and below-ground storage facilities. Proposed appropriation of new water sources would be limited to times when water is available under existing state and federal requirements.

United States, Canada, and Tribes: Columbia River Treaty

The Columbia River Treaty between the United States and Canada was established in 1964, bringing significant flood control and power generation benefits to both countries. The year 2024 marks the end of 60 years of pre-paid flood control space from Canada. Either Canada or the United States can terminate most of the provisions of the Treaty any time on or after Sep. 16, 2024, with a minimum of 10 years written advance notice, making 2014 another important benchmark for this Treaty.

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, are conducting a multi-year effort to study these post-2024 Treaty issues. This effort is called the 2014/2024 Columbia River Treaty Review. Stakeholders have embarked on a campaign to elevate the subjects of water supply and ecosystem needs into the top tier of discussion items.

Oregon, California, and Tribes: Restoration Agreements

Representatives from Oregon and California, including several federal agencies, tribal governments, counties, irrigators and conservation and fishing groups signed the Klamath Basin Restoration Agreement and Klamath Hydroelectric Settlement Agreement in February 2010. These agreements set signatories on a path to comprehensive solutions for the Klamath Basin.

> **Recommended Action 9.C**
> **Partner with Federal Agencies, Tribes, and Neighboring States in Long-Term Water Resources Management**
>
> How to implement this action:
> - Protect Oregon's interests in shared surface water and groundwater basins
> - Partner to improve access to additional stored water

The Restoration Agreement is intended to: 1) restore and sustain natural fish production and provide for full participation in ocean and river harvest opportunities of fish species throughout the Klamath Basin; 2) establish reliable water and power supplies which sustain agricultural uses, communities, and National Wildlife Refuges; and 3) contribute to the public welfare and the sustainability of all Klamath Basin communities. The Hydroelectric Settlement 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.

CRITICAL ISSUE: WATER MANAGEMENT AND DEVELOPMENT

Irrigation near Dufur, Oregon

New Plantings along Newton Creek, Benton County

Recycled Water Project in Newberg, Oregon

Photos: B. Wood, OWRD; D. Schmitz, Benton SWCD; P. Chiu, City of Newberg

To meet its water needs, Oregon has developed several helpful management tools. The techniques and tools discussed in the Strategy should be considered and evaluated as part of any place-based planning effort in order to address Oregon's instream and out-of-stream water needs as effectively as possible.

Several such tools are highlighted in this section for further development: water right transfers, field-based expertise, water-use efficiency and conservation, built storage, water reuse, non-traditional techniques, and water supply development.

Water Right Transfers

There is growing interest in the use of the water right transfer process as a tool to move water to support new 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, which means the chances of securing additional water through a new water use permit are slim. This is especially true for obtaining water during the summer, when demands are high and supplies are scarce.

The Water Resources Department receives about 250 transfer applications for out-of-stream uses and about half a dozen applications for transfers to instream uses annually. 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, discussed here shortly, is an innovative conservation tool available in the water right transfer program.

Field-Based Expertise

A number of natural resource agencies have personnel in the field. The ability to partner with the community and work on the ground is one area that sets Oregon apart from other states who have written policies, but limited capacity to implement or enforce them out in the field. The State's ability to identify and correct problems in water management is dependent on the number of skilled personnel in the field, the technical training they receive, the equipment (measurement, communications, and transportation) available to them, and their ability to educate and inform customers.

Field personnel collect data and protect public and environmental health through inspections and enforcement actions. They are well positioned to work with federal and local 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 and they have a breadth and depth of policy, technical, and legal knowledge in their disciplines.

In recent years, however, the number of personnel in the field has dwindled. For example, staff at the Water Resources Department peaked in the 1990s when the agency had more than 160 staff members. This was supplemented by 37 county-funded assistant watermasters. In recent years, state-funded staff has declined to 144 and counties now support only 15 field-related positions. This reduction in the State's field presence is significant, given the large responsibilities involved. In southeast Oregon, for example, the District 9 watermaster is responsible for regulating and distributing water in an area covering 11,000 square miles. In northwest Oregon, the District 16 watermaster oversees several hundred dams of various sizes and configurations that need routine inspection and site visits.

There is a strong need to increase and maintain field presence among the state's water-related agencies. These staff members include watermasters, inspectors, scientists and technicians. Field personnel distribute available water to water rights; ensure compliance with permit conditions; guard against waste, contamination, and loss of artesian pressure; inspect for hazards; and collect critical data. Strengthening Oregon's field-based work will require financial investments and a look at more efficient ways to coordinate and partner with other agencies to carry out our shared responsibilities.

Water-Use Efficiency and Water Conservation

One of the more widely recognized approaches to managing water supplies is water conservation. Water conservation, as defined in state law, 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 a number of recommendations for improving access to information and program participation.

Water Conservation within the Home

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. Replacing certain appliances, such as toilets, dishwashers, and washing machines with more water efficient models, or adding faucet aerators to bathroom and kitchen sinks, or installing low flow showerheads to use less water are fairly common activities today. Land management techniques, such as maintaining healthy soils, planting drought-tolerant or native plants, and watering landscapes and plants when temperatures are cooler are also actions that can help conserve and make the best use of water resources.

WaterSense labeled faucets and accessories can conserve water by 30 percent or more.

WaterSense, a partnership program started by the U.S. Environmental Protection Agency 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 be at least 20 percent more efficient. Since the program's inception, it has helped consumers save a cumulative 125 billion gallons of water and $2 billion in water and energy bills.

Water Conservation within Agriculture

Agriculture is the largest user of water in Oregon, diverting an estimated 85 percent of the total water diverted in the state. Statewide efforts should focus on increasing voluntary conservation and efficiency efforts in the agriculture sector. This could result in significant water savings statewide.

Agricultural operations have options available to use more efficient irrigation systems, including weather-based irrigation systems, moisture sensor controls, evapotranspiration-based water models, drip irrigation, lining canals or piping, or variable speed pumping. Several irrigation districts, particularly in Central Oregon, have improved their water delivery systems through lining and piping projects to better manage water supplies. See accompanying essay, following page.

Piping and Lining as a Water Conservation Technique

Open canals and ditches, traditionally used to convey water throughout much of the state, face a distinct disadvantage in locations such as Central Oregon, where porous volcanic rock has caused significant leakage and water loss from open and unlined irrigation canals. Open canals also pose public safety issues and their maintenance can be costly and time-consuming, making it even more attractive to consider piping and lining for its multiple benefits.

Between 1992 and 2002, the U.S. Bureau of Reclamation engaged in a formal study to evaluate which piping and lining techniques and technologies fared favorably in Central Oregon's harsh weather conditions and rocky terrain. The cost-benefit analysis concluded that for all lining alternatives, every $1 spent on maintenance returns $10 in conserved water by increasing effectiveness and design life. Reclamation calculated these savings by assuming $50 per acre-foot for the value of the conserved irrigation water.

Reclamation cautioned that water leaking from unlined canals may be providing value for environmental, domestic, and irrigation uses, requiring thorough assessments before undertaking any changes. For example, seepage from canals may contribute to groundwater, rivers, and wetlands and these impacts should be assessed prior to canal lining. This type of assessment may be mandated for projects seeking federal funding.

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Piping and Lining Open Canals in Central Oregon

During the past 15 years, there has been a greater emphasis on water conservation and river flow enhancement projects, especially in the arid Central Oregon region. Irrigation districts have been actively pursuing piping and lining projects to eliminate losses into the porous rock along many of Central Oregon's open canals. Piping and lining projects are key conservation measures of many irrigation districts' Water Management and Conservation Plans.

Recent conservation projects include the following:

- North Unit Irrigation District piped and lined more than 22 miles of canals, returning conserved water to the Crooked River and helping prevent fine sediments from discharging to sensitive habitats.
- Three Sisters Irrigation District piped a large portion of its district, conserving water and enhancing anadromous fish flows in Whychus Creek, a tributary of the Deschutes River.
- Central Oregon Irrigation District has installed a 2.5 mile pipeline that serves multiple benefits, including the conservation of 20 cfs, and the placement of water back into the Deschutes River.
- Tumalo Irrigation District enclosed four miles of its Bend Feed Canal, conserving approximately 20 cfs of water, with more than 17 cfs of the conserved water protected instream in Tumalo Creek.
- Swalley Irrigation District piped 5 miles of canal, conserving 30 cfs of water to benefit the Deschutes River.

Although some barriers to water conservation exist, there are several water conservation and efficiency technologies already in use that are particularly helpful to agriculture. The 2008 farm and ranch irrigation survey shows Oregon growers irrigated an estimated 1.65 million acres of cropland, of which more than 525,000 acres (almost one-third) are under central pivot, computer controlled, low-medium pressure, with soil moisture monitoring—some of the most sophisticated and efficient water-to-plant irrigation systems in the world.

Other irrigation approaches in Oregon include:

Traveling Big Gun: Oregon irrigators are known for "traveling gun" systems that spray a huge stream of water across a field. While susceptible to wind and evaporation losses, these motor-driven carts are the method of choice for oblong or odd-shaped fields on small acreages such as berry fields, and for delivering effluent water from dairies, applied as nutrients on pasture and feed crops. More than 93,000 acres in Oregon are irrigated this way—more than any other state.

Drip or Micro Sprinklers: Oregon also ranks high in drip-irrigation, trickle or low-flow micro-sprinkler systems. Approximately 1,600 farms irrigate 81,000 acres by these methods.

Recycled Water: Oregon ranks fourth of all states in recycled and reclaimed water used for irrigation on more than 77,000 acres. Oregon ranks 5th of all states for the amount of food crops (square footage) grown in greenhouses, hoop houses, or other protected environments.

Flood Irrigation: Dominant on pasture, grazing lands, and some vegetable crops, 670,000 acres are irrigated with controlled or uncontrolled flood systems in Oregon.

The 2008 irrigation survey also shows Oregon producers applying, on average, 1.9 acre-feet of water per acre to grow their crops. This ranks very well compared to other surrounding states. Washington applies 2.3 acre-feet, Idaho applies 1.9 acre-feet, and California applies 3.1 acre-feet per acre, each year.

Challenges to further improving water conservation within agriculture can include the potential for increased energy-related costs, lack of funding or technical assistance, or a fear of forfeited water rights ("use it or lose it," as it's commonly called). The potential for reduced return flow or injury to other water users are also factors to consider when designing a water conservation project.

A number of resources exist to help water users make efficiency gains. The Bureau of Reclamation offers competitive grants to facilitate agricultural water planning. Other funding sources include the U.S. Department of Agriculture's Natural Resources Conservation Service, Oregon Water Resources Department feasibility grants, and the Oregon Department of Energy's tax credits for efficiency-upgrades.

Allocation of Conserved Water Program

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 leaky canals or ditches, or changing a less efficient water distribution system, such as flood irrigation, to sprinkler or drip irrigation.

Since the program began, fifty-two conservation projects have been approved under this program. This has resulted in almost 122 cfs of water permanently protected instream. Recent surveys show that very few irrigators and technical irrigation experts are even aware of this program, or the benefits to instream flows and agricultural production. The few irrigators who are aware of the Allocation of Conserved Water Program have realized huge benefits, placing more than 5,100 acres of previously arid land into cultivation. The Strategy should focus efforts on improving awareness of programs such as this. Increased participation in these programs could benefit both instream and out-of-stream needs.

Water Management and Conservation Planning – Agricultural and Municipal Uses

The water management and conservation planning process is an opportunity for municipal or agricultural water providers to estimate long-range water supply needs, and identify potential sources of supply, including water conservation programs, to meet those needs.

The Water Resources Department provides a template for municipalities to follow as they develop these plans, and requires municipal water suppliers to prepare plans as conditions of their water use permits or permit extensions. A municipal Water Management and Conservation Plan, or "WMCP," provides a description of the water system, identifies the sources of water used by the community, and explains how the water supplier will manage and conserve supplies to meet future needs.

The Department coordinates a similar, voluntary program for agricultural planning, and provides a template for these plans as well. By using this process, irrigation districts and other suppliers can create a "water budget" for their current and future needs. 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 Water Resources Department are able to take advantage of 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.

Oregon should encourage greater participation by agricultural producers and providers in the State's water management and conservation planning program.

Water Conservation within Municipalities

One trend that has emerged in recent years has been decreased water demands across several of Oregon's urbanized communities. Water providers in the Portland Metro area indicate that water demands from some utilities have decreased by approximately 20 percent since 2008. It is difficult for the water providers to determine the exact cause of the demand decreases, but it is likely a combination of multiple factors, among them, recent wetter/shorter summers, loss of industry, and water conservation programs taking effect.

The Water Resources Department often requires water utilities to examine conservation-based rate structures. As a result, some utilities have modified their water rates, further driving down demands for water. In a 2009 survey conducted by the League of Oregon Cities, 37 percent of member cities reported the use of inclining block rates, the rate structure typically used to effect water conservation behavior.

Recommended Action 10.A
Improve Water-Use Efficiency and Water Conservation

How to implement this action:

- Establish and maintain an online water-use efficiency and conservation clearinghouse
- Prioritize agricultural water-use efficiency
- Expand outreach and participation in the State's water-use efficiency and conservation programs
- Conduct a state-wide water conservation potential assessment 🕮

Many water providers in Oregon offer rebates for the purchase and installation of water efficient appliances; some also provide shower timers, leak detection kits, and water conservation consultations free of charge to their customers. The State's water management and conservation planning program has been used by many of these water providers to successfully identify water conservation measures, such as those described here.

Identifying Additional Opportunities for Water Conservation and Efficiency

Oregon and its water providers have many programs and tools available to encourage water conservation and more efficient use of water resources. Establishing and maintaining a water-use efficiency and conservation clearinghouse that highlights best management practices, as well as state and federal funding sources, technical resources, and local conservation programs and tools, should be developed to help water providers design or improve their own 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 terms of determining whether investment in water efficiency and conservation programs make sense.

As for research needs, a statewide assessment that looks at the potential for water conservation would provide a quantitative basis for estimating how much water savings could be achieved with a variety of conservation best practices. A basin-by-basin hydrologic assessment of conservation's benefits and/or impacts on streamflows is another research need that could help the State and its conservation partners prioritize future efforts. This research would support previous agency work that identified stream reaches with the greatest need for streamflow restoration to benefit fish species.

Lastly, because water and energy are so closely tied, water conservation goals and efforts should be coordinated with energy efficiency programs.

Built Storage

The history of storing water in Oregon dates back 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. Most water rights are for small ponds or reservoirs storing less than 9.2 acre-feet, although there are more than 60 reservoirs with capacities exceeding 5,000 acre-feet each. The largest storage project is the U.S. Bureau of Reclamation's Owyhee Reservoir in southeastern Oregon with more than 1 million acre-feet (0.3 cubic miles) of storage.

In 1992, the Water Resources Commission adopted the state's water storage policy, identifying water storage options as an integral part of Oregon's strategy to enhance public and private benefits from use of the state's water resources. 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 of 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.

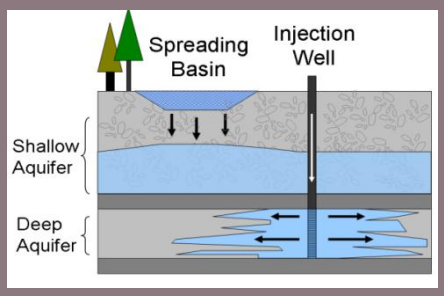
Below Ground Storage - Aquifer Storage and Recovery and Artificial Recharge

In 2008, the Water Resources Department evaluated 54 groundwater aquifers within Oregon and created a rating system to help assess the suitability of potential sites for underground storage.

The Department evaluated aquifers in terms of their physical ability to store water. The analysis did not include an economic or environmental feasibility analysis, only a hydrogeologic evaluation of how these areas accept and retain water. The most suitable locations are in the northern portion of Oregon, where geology, water availability, and cost-benefit circumstances create a favorable environment for this water management tool.

The use of Aquifer Storage and Recovery (ASR) and Artificial Recharge (AR) is gaining interest, particularly in the northwest and north central regions of Oregon, due to its smaller environmental footprint, cost, and associated benefits to water quality.

Authorizations for both of these processes are issued by the Oregon Water Resources Department in collaboration with the Department of Environmental Quality. DEQ's role is to ensure that a project meets standards for underground injection control systems, as well as underground water quality protection requirements. The Oregon Department of Fish and Wildlife is also involved when surface water is used as source water. ODFW consults with the Water Resources Department on permit conditions.



Methods of underground storage include infiltration into shallow aquifers through spreading basins or direct injection into deep aquifers using wells.

The Oregon Health Authority also plays a role in ASR/AR projects, ensuring that drinking water quality requirements are met. Water that is treated to standards safe enough for drinking water is the only source water allowed for direct injection into groundwater aquifers. Direct injection of water must be compatible with natural groundwater as well.

The following table describes both technologies in greater detail.

Category	Artificial Recharge	Aquifer Storage and Recovery
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	Permits required to appropriate source water and to pump recharged groundwater	Can use existing rights to store and recover the water
Governing Statutes /Rules	ORS 537.135 OAR 690-350-0120	ORS 537.531 to 537.534 OAR 690-350-0010 to 690-350-0030

The State has issued limited licenses to 18 entities for testing the use of Aquifer Storage and Recovery, including one ASR permit and five aquifer recharge permits. The reasons for aquifer storage range from municipalities that need to supplement their water supplies for their communities, as in the case of Baker City and the City of Beaverton, to farmers and ranchers, who can use the tool to supplement irrigation water during the summer months.

Oregon can improve access to built storage by encouraging the increased use of Aquifer Storage and Recovery and Artificial Recharge for water storage, where needed. Areas of the state designated as "groundwater limited" or "critical groundwater areas" should be evaluated for ASR and AR projects.

Forming partnerships between different user groups, for example, a municipality that treats water and an irrigation district needing an alternative source of water should be considered as a way to meet the water quality requirements for ASR injection.

Jeff Barry,
GSI Water Solutions, Inc.

Oregon Projects Use a Combination of Groundwater Storage Techniques

Umatilla Basin. The Umatilla Basin Aquifer Recovery Project uses artificial recharge techniques to clean the water to state water quality standards, and then injects the water into deep storage using aquifer storage and recovery techniques. Communities nationwide are following this project with interest, noting benefits to both irrigators and instream interests.

City of Beaverton. Since 1997, Beaverton has been implementing ASR to meet peak seasonal demands. The city has 6 million gallons per day of ASR capacity and has now drilled its fourth ASR well. During the past 14 years of operation, the ASR system has become an important element of Beaverton's overall supply (providing up to 25 percent of the peak supply) and has saved the City significant money by deferring a new water transmission line and eliminating the need to purchase water from Portland to meet peak demands.

Above-Ground Storage (Reservoirs)

Today, there is a mix of both publicly and privately owned above-ground storage reservoirs throughout Oregon. The largest of these are federal storage projects. There are some federal storage projects that are not fully allocated, representing key points of discussion between the State of Oregon and federal agencies. In the Crooked River Basin and the Willamette Basin, for instance, it can be difficult to secure long-term contracts, both instream and out-of-stream, for unallocated water.

Federal Reservoir Systems – In the Willamette Basin Reservoir System, the U.S. Army Corps of Engineers operates 13 dams and stores 1.6 million acre-feet of water in the reservoirs located on the Willamette River and its tributaries. Congress authorized the construction of these reservoirs for a variety of purposes, including flood control, navigation, generation of hydroelectric power, irrigation, potable water supply, and pollution reduction.

Recommended Action 10.B
Improve Access to Built Storage

How to implement this action:

- Develop additional below-ground storage sites
- Re-allocate water in federal reservoir systems that have not undertaken formal allocation processes in Oregon
- Develop additional above-ground, off-channel storage sites where needed
- Evaluate the status of storage infrastructure 🕮
- Authorize and fund the State to invest in and purchase water from stored water facilities

The U.S. Bureau of Reclamation currently holds water right certificates for 1.6 million acre-feet of storage for irrigation use, and is authorized to negotiate contracts with irrigators for that water. Other water interests in the basin, including municipal water providers and instream interests, would also like to have access to this stored water.

Similar conversations are occurring in the Crooked River Basin to manage uncontracted stored water in Prineville Reservoir to meet increasing demands for fish and wildlife, and other users. Prineville Reservoir, southeast of Prineville on the Crooked River, was built by the Bureau of Reclamation in 1960, and is currently authorized for irrigation and flood control only. A moratorium currently exists on long-term irrigation contracts out of Prineville Reservoir.

Reallocating water stored behind federal dams, such as in the Willamette Basin, could serve a full range of beneficial uses to meet agricultural, municipal, industrial, environmental, and recreational needs.

Developing contracting mechanisms that allow instream and out-of-stream water users access to such water, while protecting any contracts currently in place, would serve to make reallocation workable.

Identifying Storage Sites: The Water Resources Department maintains an inventory of potential water storage sites in Oregon. The purpose of developing the inventory was to create a clearinghouse of storage information. No attempt was made to assess the ecological or economic feasibility of these sites, however. The Department has provided this information so that communities can avoid "reinventing the wheel," in terms of site investigation.

To date, the Department has mapped the location of more than 1,200 potential above-ground storage sites. This information, collected over several decades, came from staff, other state, local, and federal agencies, private consultants, and the public. The Department has mapped each potential site and linked all available information to the project, including capacity curves, reservoir inundation areas, and site maps.

The State will continue to help water users identify potential above-ground storage sites, supporting the development of additional above-ground, off-channel storage opportunities, where needed, in locations where no known listed fish species exist.

Evaluating Storage Infrastructure: Oregon should evaluate the status of its existing storage capacity and infrastructure. Today, evaluation of storage infrastructure, including determining the maintenance and rehabilitation needs of dams, is done under Oregon's dam safety program. Continuing to support this program, and identifying ways to expand the capacity of existing above-ground storage projects (through raising a dam's height or sediment removal), is needed to improve access to stored water.

Water Reuse

Along with multi-purpose storage projects, the State of Oregon encourages the reuse of water, so long as the use protects public health and the environment. Interest in water reuse projects continues to grow in Oregon. The Oregon Association of Clean Water Agencies, for example, has identified recycled water use as a top priority for its members. Several agencies, including the Oregon Health Authority, Department of Environmental Quality, Oregon Water Resources Department, and the Oregon Department of Consumer and Business Services (Building Codes Division), are all involved in different aspects of water reuse projects and proposals.

The State of Oregon encourages three general categories of water reuse:

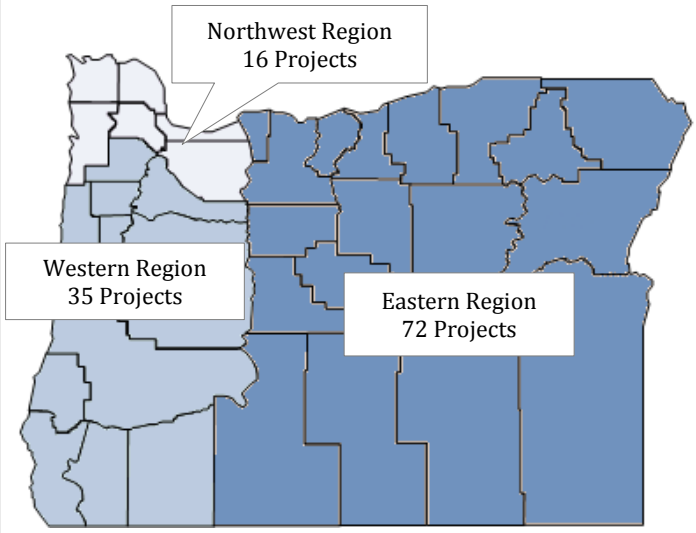
The Use of Graywater

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 DEQ.

The Use of Recycled Water

Recycled water refers to treated effluent from a municipal wastewater treatment facility. Oregon has approximately 340 domestic wastewater treatment facilities and there are more than 120 municipal facilities operating recycled water programs throughout the state (see map, following page).

Four classes of recycled water, based on various levels of treatment, can be reused for specific beneficial purposes. Communities are already taking advantage of State Revolving Fund loans for developing and upgrading recycled water systems, with seventeen such requests in 2009 alone.



~ Map courtesy of Oregon DEQ

The Use of Industrial Wastewater

Industrial wastewater refers to treated effluent from an industrial process, manufacturing 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.

Although water reuse activities are limited to non-drinking water purposes, a wide-range of activities can occur, including irrigation of crops and pastureland, irrigation of urban landscapes (e.g., golf courses, playing fields, and business parks), industrial cooling, dust control, street sweeping, and artificial groundwater recharge.

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

Recommended Action 10.C
Encourage Additional Water Reuse Projects

How to implement this action:

- Conduct a statewide assessment of the potential for additional water reuse 🕮
- Ensure that Oregon has the right policies and regulations in place to facilitate water reuse
- Provide incentives for increased water reuse

Reusing water can provide many benefits to both water quantity and quality. Water quality can be improved by the reduction of discharged treated effluent (e.g., a municipality recycles treated wastewater by using it to irrigate a park). It can also provide a benefit to water quantity by reducing the demand on drinking water sources (e.g., using non-potable water—instead of drinking water—for toilet flushing). In general, recycled water places fewer demands on freshwater, leaving more water instream or for other uses.

Finding More Reuse Opportunities

Oregon should continue to encourage water reuse activities throughout the state. This can be done, in part, by conducting a statewide assessment of the potential for additional water reuse, matching the water quality of reclaimed water to appropriate end uses. Such an assessment could determine the potential for water reuse to fulfill current and future water needs, while taking into consideration potential impacts on streamflow and water quality.

Water reuse could also be advanced by ensuring that Oregon has the right policies and regulations in place to facilitate water reuse, giving due consideration to the protection of instream flow, water quality, public health, and drinking water sources. Oregon should also consider providing financial or technical incentives for increased water reuse for municipal, industrial, and agricultural uses.

Non-Traditional Approaches to Meeting Water Needs

Storage and water conservation are a set of traditional tools for meeting water needs and water reuse is another tool that is growing in popularity. These traditional water supply tools are used in conjunction with state and federal regulatory tools that protect water resources for future generations. Today, however, we also need to consider less traditional approaches to meeting our collective and often competing demands for water. A number of public entities and non-profit organizations are already exploring and implementing non-traditional approaches to meeting water quality, water quantity, and ecosystem needs.

Clean Water Services, Tualatin River Watershed

Clean Water Services, a public utility serving Washington County, treats wastewater and releases it back into the Tualatin River. The utility is required to reduce the water temperature of its discharge to certain levels to protect fish in the river.

In 2004, the Oregon Department of Environmental Quality issued the Nation's first watershed-based, integrated NPDES permit to Clean Water Services, allowing the utility to invest in riparian shade restoration within the watershed to meet the temperature discharge requirements.

By planting trees to shade and prevent warming of the river's temperature, Clean Water Services completely avoided the traditional, yet more expensive option of purchasing refrigeration units at an estimated $60 million, plus an additional $2 million per year for operation and maintenance needs. More than 4 million native plants and shrubs have been planted along the river and its upper tributaries, equal to approximately 50 miles of river at an estimated cost of $4.5 million. Clean Water Services is able to invest a portion of its cost savings in strategies that lead to greater ecological benefits in the watershed while still achieving regulatory water quality requirements.

Recommended Action 10.D
Reach Environmental Outcomes with Non-Regulatory Alternatives

How to implement this action:

- Assist in the research and development of non-regulatory tools to meet environmental outcomes
- Develop protocols for translating water quality projects into credits 🕮
- Develop protocols for translating streamflow restoration into credits and accounting strategies 🕮
- Complete stream functional assessment

Next Steps

Public and private partners throughout Oregon are currently looking for ways to enhance tools that will help achieve desired environmental outcomes. Further assessment is needed to determine the potential for different types of ecosystem restoration projects for meeting various regulatory goals, including temperature and nutrients under the Clean Water Act as well as species habitat needs under the Endangered Species Act. This includes developing protocols to quantify and then translate the benefits of these restoration actions into some form of tradable currency. Organizations such as The Freshwater Trust, the Willamette Partnership, and the National Fish and Wildlife Foundation are actively working on developing protocols.

These protocols will help DEQ and point and non-point source dischargers make more informed choices about how to meet water quality requirements in more cost-effective ways (e.g., using riparian shade restoration to help achieve heat reduction requirements).

There are also tools and protocols for translating flow restoration actions into temperature, nutrient, and other types of credits. Water quality projects designed to meet temperature goals are currently occurring in several locations throughout Oregon. Oregon's state agencies will continue to provide technical

assistance to partners during the development of protocols to translate flow restoration into temperature credits.

Another way to reach desired environmental outcomes is to build upon the "stream functional assessment" under development by the Oregon Department of State Lands, the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and other partners to include streamflow in function-based accounting strategies.

David Pilz,
The Freshwater Trust

City of Medford, Rogue River Basin

Clean Water Services' work in the Tualatin Basin set the stage for developing a rigorous, statewide, and agency-adopted protocol for water quality trading to meet water quality goals. This protocol expanded the opportunity to invest in stream restoration projects as an alternative to traditional, engineered solutions, such as water refrigeration, to meet water quality goals across the entire state of Oregon. With this protocol in place, the Pacific Northwest is poised to make water improvements via stream and habitat restoration a viable, efficient way for towns and facilities to meet limits on temperature, nitrogen and phosphorus, while creating jobs and improving local watersheds.

The City of Medford and its partners evaluated the practicality of restoration offsets to meet the new temperature discharge requirement for the Rogue River. The Freshwater Trust proposed a water quality trading program in which the City could purchase temperature credits generated from privately-financed riparian restoration projects. Over time, trees planted within a regulator-defined area near the wastewater treatment facility would shade and prevent warming of the water, offsetting the impacts of the plant's clean but warm discharge.

The analysis included estimates of temperature credits required, analysis of available land for restoration, total cost, and implementation procedures. With this analysis in hand, Medford's managers could make a direct "apples-to-apples" comparison of their options, including restoration — a first for National Pollutant Discharge Elimination System (NPDES) permit evaluations anywhere in the country.

At the end of the analysis, the City selected the water quality trading alternative. The decision centered on four components: support for water quality trading from DEQ; temperature credits costing half of the best-engineered solution; associated ecological benefits, and lastly, responsibility for landowner recruitment, project management, and meeting regulatory standards on offsets would fall upon a restoration-focused organization. These efforts in the Rogue River basin have prompted a formal aligning process among all Clean Water Act management agencies in the Pacific Northwest (EPA, Oregon DEQ, Idaho Dept. of Environmental Quality, and Washington Department of Environmental Quality).

Water Supply Development

Other western states, particularly neighboring California and Washington, have long had authorities in place, allowing the state to take an active role in the development of water supply to benefit both instream and out-of-stream uses.

Through discussions with federal and other partners, the Water Resources Department has become aware of potential opportunities to purchase stored water, invest in, and develop new water resources projects. These opportunities may occur in the Columbia, Willamette, Rogue, and other basins, through

arrangements with the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and other partners. Today, the State of Oregon has neither the authority to enter into such arrangements, nor the funding to purchase, invest in, or develop such opportunities.

The establishment of a water supply development program would improve the state's ability to assess, plan, and develop new multi-purpose storage, including above and below-ground storage, to improve or expand operations of existing storage facilities, to implement conservation projects, or to facilitate other actions designed to provide access to new water supplies for instream and out-of-stream uses in Oregon. Such a program would necessarily work in tandem with a place-based planning approach, with state and local partners working together to determine needs, feasibility, funding, and implementation.

Recommended Action 10.E
Authorize and Fund a Water Supply Development Program

How to implement this action:

- Identify opportunities for the State to serve as a partner in water supply development projects
- Authorize the Water Resources Department to invest in projects, to purchase and/or contract for water supplies
- Authorize bonds to finance these investments

CRITICAL ISSUE: HEALTHY ECOSYSTEMS

East Fork Illinois River, Josephine County

Rogue River Gorge, Jackson County

John Day River, east of Kimberley, Grant County

Photos: Gary Halvorson, Oregon State Archives

Responsibility for managing, protecting, and restoring Oregon's ecosystems falls across a broad range of local, state, tribal, and federal agencies, as well as on private landowners and local organizations. Oregon has a rich history of work in this area, using myriad tools and institutions to help address and improve ecological conditions.

Healthy ecosystems provide a wide variety of benefits and services to our communities. Generally, the term "ecosystem" refers to a system of interdependent relationships between organisms and their surrounding environments. 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.

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

- 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 source of water;

- Flooding is far more frequent and costly when waters cannot be well absorbed by the physical environment;
- Crop production costs are higher when soil productivity is compromised; and
- Fish populations are more expensive to maintain through restoration actions and hatchery operations than through the maintenance and protection of natural habitat and watersheds.

The Relationship between Water and Resilient Ecosystems

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. This section describes the important role that natural storage systems play in Oregon's ecosystems and makes several recommendations for further improvements.

Freshwater Ecosystems

Freshwater ecosystems are essential for providing habitat to many at-risk species, including important spawning and rearing habitat for salmonids, breeding habitat for amphibians, and habitat for freshwater mussels and other invertebrates. However, most river systems in Oregon have been heavily modified in order to achieve various flood control, irrigation, navigation, hydropower, recreation, and other water supply benefits.

A riparian area is the zone of transition from an aquatic ecosystem to a terrestrial ecosystem. These areas are located adjacent to lakes, reservoirs, estuaries, wet meadows, and streams. Riparian areas represent about 15 percent of the total area in the state. They are dependent upon surface or subsurface water through the zone's soil-vegetation complex to support the overall health of the riparian ecosystem. Wetland habitats are highly diverse and include the following different types: alkaline wetlands, deciduous swamps and shrub lands, marshes (including emergent marshes), playas, seasonal ponds and vernal pools, wet meadows, and wet prairies. Floodplains, also diverse habitats, are the land areas 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.

Recommended Action 11.A
Improve Watershed Health, Resiliency, and Capacity for Natural Storage

How to implement this action:
- Improve riparian conditions
- Preserve wetlands
- Restore floodplain functions
- Maintain forested areas

Through their ability to hold and slowly release water, filter and biologically process nutrients, and to provide shade and habitat, upland wet meadows, riparian wetlands, and floodplain habitats directly affect water storage, hydrology, water quality, habitat quality, and water temperature.

Oregon has lost an estimated 38 percent of its original wetlands. In the Willamette Valley, a recent study shows an average loss of wetlands at the rate of 357 acres per year, between 1994 and 2005. In the Willamette River Basin, flood control modifications have largely disconnected the Willamette River from its braided channels, oxbows and sloughs—wetland types that characterized much of its historical floodplain. This fundamental change of the valley's hydrologic regime has changed the character of the valley's wetlands and greatly altered their functions.

The Strategy should continue to encourage efforts to improve riparian conditions through voluntary restoration, such as the efforts conducted under the Oregon Plan for Salmon and Watersheds and Oregon's Agriculture Water Quality Management Plans. The State already provides incentives for voluntary participation in these restoration-type projects, including funding and technical assistance.

Developing a statewide floodplain policy could set the framework for regulation and permitting of floodplain restoration. Oregon should also support other ways to restore floodplain function, including implementation of actions described in Oregon's Conservation Strategy, such as 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.

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. Numerous species can be found in Oregon's estuaries, such as salmon, herring, flounder, crabs, oysters, clams, birds, ducks, geese, shorebirds, and harbor seals.

There are 22 major estuaries in Oregon; the Columbia River estuary at Astoria is the largest in area at approximately 80,811 acres, although most estuaries along the coast are relatively small. Some of the issues affecting the health of Oregon's estuaries include increased sedimentation and nutrient loading, introduced nuisance species, recreational and development pressures, and low freshwater inflows.

Groundwater & Ecosystems

Groundwater dependent ecosystems support a large number of plants and animals and offer multiple benefits to humans, such as clean water and recreational opportunities including river rafting, and wildlife/bird watching. Many cold-water salmonids thrive in Oregon because of the high quality and quantity of water supplied by springs and groundwater, due to a large extent to the unique geology of Oregon.

Groundwater is susceptible to contamination from many different pollutants, including nitrates, especially where the water table is shallow and there are no confining units to reduce migration downward. If the contaminated groundwater flows into streams and rivers, it can cause elevated nitrate levels in downstream water bodies, posing problems for groundwater dependent ecosystems and water users. An assessment of groundwater dependent ecosystems was completed by The Nature Conservancy in 2011 (see brief description featured on page 43).

Forests

Oregon is comprised of 61 million acres of land. Nearly 50 percent of the state, or 30 million acres, is classified as forestland. Oregon's forests help filter drinking water, keep water cool, provide habitat for diverse animal and plant species, supply oxygen, moderate temperatures and rainfall, and store atmospheric carbon. Healthy forests promote soils that provide natural filtration to keep streams clean and water quality high.

Most of Oregon's municipal water systems use water that originates from forestlands, including those managed for wood production. The quality of this source water is among the best in the nation. At the state scale, data collected by DEQ between 1998 and 2007 indicates that more than 90 percent of the sampled sites on forestlands showed an Oregon Water Quality Index in good or excellent condition.

Forests are part of the essence of Oregon, and our waters benefit from their sound management. However, Oregon's forests are at risk. For example, many federal forestlands, particularly in drier regions, have massive ecological restoration needs. The density of homes in private forests has doubled in the last decade. Forests are being fragmented, converted to other uses, and encroached upon by development. The rising expense of owning forestland and the land's growing value as real estate create increasing pressure to sell private forestland for development.

There are solutions. Forest diversity can offer a range of benefits when land managers emphasize multiple values—wood production, nature emphasis, or mixed uses. Awareness is growing that keeping forests in productive forest use should be a primary goal. Keeping forests as forests requires public support and investment in forestry and resource protection policies that make continued forest ownership an economically viable alternative to conversion. The Forestry Program for Oregon emphasizes this, and the Strategy should continue supporting efforts to maintain healthy, resilient, and functional forested areas, in part, for the benefit of water resources.

Enhancing Streamflows

In many areas of Oregon, streamflows are very low or even non-existent during late summer months. Today, low streamflow conditions occur during periods of drought, intensive water use, and may be exacerbated by changes in precipitation patterns. Low streamflows often mean higher water temperatures and increased nutrient concentrations, contributing to poorer water quality. Changes in the hydrologic regime, improperly sized or misaligned culverts, and impassable dams have greatly reduced historically accessible habitat for many aquatic species. Oregon needs to enhance streamflows by developing additional instream protections and expanding the scope and scale of its tool box.

Instream Water Rights

Oregon should help meet instream needs by establishing additional instream water rights, where needed, to protect both base and elevated flows, and continue to work on resolving protested instream water right applications. Coordination of these new instream water right applications is needed to meet multiple water quality and flow needs. For example, when the Oregon Department of Fish and Wildlife is preparing to apply for an instream water right, it can coordinate with the Oregon Department of Environmental Quality and the Oregon Parks and Recreation Department to submit a joint application (if warranted) to address multiple instream needs and run simultaneous public processes.

At the completion of a TMDL, the Department of Environmental Quality has the opportunity to prepare and submit to the Water Resources Department an instream water right application for the flow amount used to calculate the TMDL.

Recommended Action 11.B
Develop Additional Instream Protections

How to implement this action:

- Establish additional instream water rights where needed to protect flows
- Designate scenic waterways where needed to protect recreation, fish, and wildlife uses
- Expand the use of voluntary programs to restore streamflow
- Expand the geographic range of flow restoration efforts

The Oregon Parks and Recreation Department has the authority to recommend the designation of additional rivers or segments of rivers as scenic waterways, or file for instream water rights, where needed, to protect recreation, fish, and wildlife uses. Oregon has one of the most extensive scenic waterway systems in the country, with more than 1,100 river miles protected for the beneficial uses of recreation, fish and wildlife. The designation of scenic waterways is a well-established tool that brings benefits to a local economy through tourism and recreation, while at the same time protecting water quality and quantity and other ecological values. The last state-designated scenic waterway was established in 1989.

Instream Transfers & Leases

Not only can state agencies apply for water rights to protect water instream, water users with existing water rights can transfer water instream using several tools and programs administered by the Oregon

Water Resources Department. Water users can voluntarily transfer their out-of-stream use, such as irrigation for agricultural crops, to instream use, on a temporary or permanent basis. The water user has the option of transferring an entire water right instream, or a portion thereof.

Oregon is a leader in flow restoration. More than 300 current instream leases, instream transfers, and conserved water projects have resulted in the restoration of nearly 1,700 cubic feet per second of water instream for the benefit of fish, wildlife, recreation, and water quality.

More than 70 percent of the water that is transferred instream by water users on a permanent basis is senior in priority, with some certificates pre-dating Oregon's 1909 water code. One of the basic tenets of instream transfers is ensuring that other water users are not injured as a result of the changes to the use.

The instream program benefits greatly from active partnerships with Oregon's conservation organizations, including The Freshwater Trust, the Deschutes River Conservancy, and the Klamath Basin Rangeland Trust. Incentives offered by these organizations and others can help landowners remain productive and profitable, while also benefitting freshwater ecosystems. Instream flow restoration activities have predominantly occurred in a handful of basins, although streamflow restoration needs have been identified in every basin throughout the state. Developing and implementing strategies that target watersheds with the highest instream flow needs is needed to expand voluntary streamflow restoration beyond current efforts, on both public and private lands.

Preventing the Spread of Invasive Species

According to the Oregon Invasive Species Council, an invasive species is 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 biological 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's rivers, lakes, and streams are greatly affected by their presence.

Zebra Mussel; photo: Randy Westbrooks

In 2011, the Oregon State Marine Board and the Oregon Department of Fish and Wildlife implemented the second year of the Aquatic Invasive Species permit program, which included watercraft inspection stations and decontamination washes in locations throughout Oregon. Inspection teams conducted 3,600 inspections and intercepted six boats with zebra/quagga mussels; three were from Lake Michigan, one was from Lake Mead, one was from Lake Havasu, and one was a sailboat from the East Coast.

Built systems are also negatively affected by invasive species. Invasive species can interfere with water use by reducing flow in irrigation canals and drainage ditches, which can result in flooding and damage to canal banks, structures and pumps. Water treatment and power plants are also affected by invasive species, which can cause problems in water intake pipes, filtration equipment, and generation plants.

Certain species of cyanobacteria, commonly referred to as blue-green algae, can be both invasive and toxic. It can form thick foam or scum on the water's surface and produces toxins or poisons that can cause serious illness or death in pets, livestock, wildlife and humans. Some of Oregon's lakes and reservoirs are experiencing annual blue-green algae outbreaks.

Invasive species are already very costly to Oregon's economy. A 2009 report on the economics of invasive species estimates the impacts from 21 noxious weed species in Oregon at $125 million per year, and the control costs of the current sudden oak death outbreak to be $7 million annually.

Oregon's state agencies and partners should support implementation of the Oregon Conservation Strategy's six statewide actions aimed at preventing new introductions of invasive species, and slowing the scale and spread of infestations. This can be achieved by coordinating the efforts of public agencies and private citizens, including the use of boat inspection stations.

In addition, implementing and enforcing ballast water management regulations is needed to reduce the risk of introducing new aquatic invasive species. The discharge of ballast water, used to provide vessel stability, may introduce aquatic non-indigenous species into Oregon waterways, potentially resulting in ecological damage, economic costs, and/or human health concerns.

Recommended Action 11.C
Prevent and Eradicate Invasive Species

How to implement this action:

- Support the Oregon Conservation Strategy's six state-wide actions to prevent new introductions, and decrease the scale and spread of infestations
- Implement and enforce ballast water management regulations

Since 2002, the Department of Environmental Quality has had authority under the Oregon Legislature to implement and enforce ballast water management regulations in an effort to reduce the risk of introducing new aquatic invasive species.

Enhancing Watershed Restoration & Fish Protections

Oregonians can be proud of the work that has been done to protect and restore watersheds throughout the state. Tens of thousands of stream miles have been restored through riparian habitat projects, removal of fish passage barriers, and restoring streamflows. All of these efforts have helped improve the ecological and economic health of Oregon's communities. Oregon's cooperative, community-level approach to watershed restoration, through the Oregon Plan for Salmon and Watersheds and the creation of locally-formed watershed councils, has significantly improved water quality and fish habitat. Oregon should build upon this good work to further enhance watershed restoration and fish protection efforts.

Fish Passage and Screening

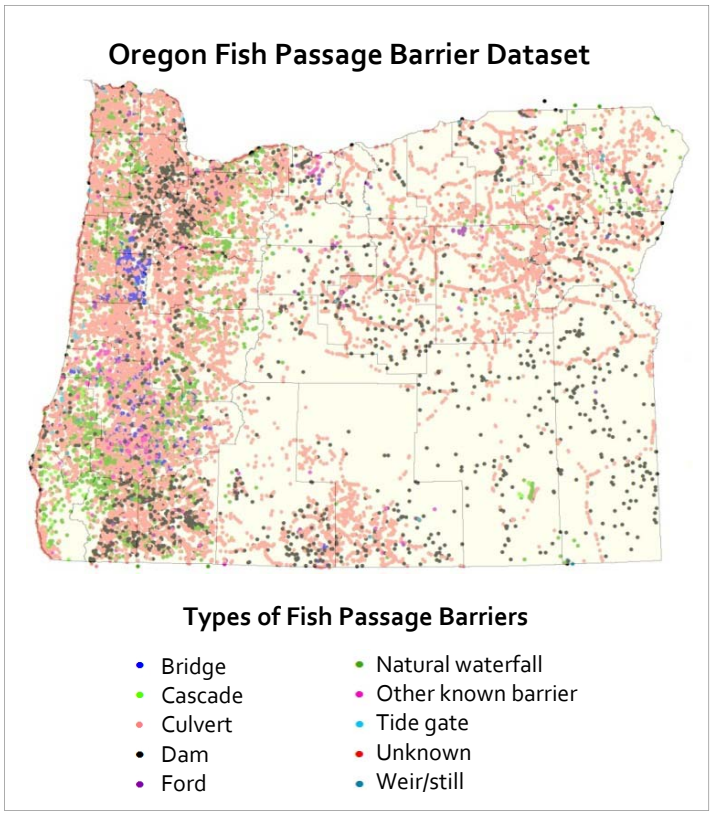
Before Oregon was officially recognized as a state, natural resource managers were concerned with providing stream passage for migratory fish. Barriers such as dams, dikes, road fill, and culverts change hydrological conditions and alter natural flow regimes. Many of these artificial obstructions create a drastic change in water surface elevation from one side of the structure to the other. Misaligned or improperly sized culverts can prevent fish passage, alter transport of sediment and wood, and create an uneven distribution of habitat.

The Oregon Department of Fish and Wildlife works with owners or operators in several ways to address barriers to fish passage. Recognizing the unique nature of migratory fish in the Pacific Northwest, many other agencies and organizations are also working on addressing fish passage barriers. Just recently, the Oregon Department of Fish and Wildlife worked with several partners at the local, state and federal level to compile data on fish passage barriers throughout the state.

Compiling this data is a first step in a long-term process to fill existing data gaps related to fish passage and fish habitat distribution, with the hope of integrating the two datasets to further fish passage restoration opportunities.

This initial effort resulted in the identification of more than 30,700 barriers to fish passage, which includes both natural (waterfalls, steep gradients, etc.) and artificial obstructions (dams, bridges, culverts, etc.). More than 75 percent of the barriers that were compiled are culverts.

Some of the barriers identified are passable, others are partially blocking or completely blocking passage, and for a large percentage—43 percent—it is unknown whether these barriers are passable or not.



Although significant progress has been made to compile data on fish passage barriers and fish habitat distribution, more work is needed. Data gaps in the coverage still exist, and several local, county, and federal agency inventories still need to be incorporated into the compilation.

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 can significantly reduce juvenile fish mortality at water diversions by preventing fish from entering diversion ditches, machinery, or irrigated fields. The Oregon Department of Fish and Wildlife operates the state's fish screening program and has helped install more than 1,400 fish screens through its cost-share program. Since the early 1990's, the State has required fish passage, bypass devices, or fish screening as a condition of approval for surface water permits and transfers.

The State should continue to support fish passage and screening efforts. This can be done through using funds from Oregon's Fish Screening and Passage Cost Sharing Program, and working with other state and federal funding partners. Replacing culverts with bridges, installing larger culverts, constructing fishways, stabilizing road fill material, and retiring obsolete and push-up dams are all techniques employed in Oregon today and should continue to be encouraged.

The Oregon Plan for Salmon and Watersheds

The Oregon Plan for Salmon and Watersheds (the "Oregon Plan"), mentioned earlier, 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 organizes specific actions—called "measures"—around factors that contribute to the decline in fish populations and watershed health. Many of these measures focus on voluntary actions to improve water quality and quantity and restore habitat. The voluntary actions and willingness of private citizens to implement restoration projects has been and will continue to be fundamental to the success of the Oregon Plan for Salmon and Watersheds.

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 councils and soil and water conservation districts (SWCD's) assist landowners with projects and lead restoration efforts in many watersheds throughout the state. The Oregon Plan has bolstered interagency and state-federal coordination and collaboration. In 2002, for example, the Oregon Water Resources Department and the Oregon Department of Fish and Wildlife completed a joint project that identifies priority areas for streamflow restoration in basins throughout the state. These priority

areas represent watersheds in which there is a combination of need and opportunity for flow restoration to support fish recovery efforts under the Oregon Plan for Salmon and Watersheds.

Along with the Oregon Watershed Enhancement Board, several state agencies, federal agencies and non-profit organizations provide financial assistance for these restoration projects. The USDA Natural Resources Conservation Service, National Fish and Wildlife Foundation, the Oregon Departments of Fish and Wildlife and Environmental Quality, the U.S. Environmental Protection Agency, the U.S. Forest Service, and the U.S. Fish and Wildlife Service are actively funding watershed restoration projects throughout the state. 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.

Les Perkins,
Farmers Conservation Alliance

The Farmers Screen

There are an estimated 76,000 surface water diversions in Oregon, supplying water for irrigation, municipal water supplies, power generation, and other uses. Fish screens are devices placed at diversions to prevent the fish, organic debris, and sediment that are naturally carried along in a river system from entering the diversion. When a diversion is unscreened or improperly screened, it can cause problems for fish populations and the water user alike. With the great diversity of terrain and hydraulic conditions at all of Oregon's water diversions, a full portfolio of screening technologies is needed to ensure an optimal match for each site.

15 cfs modular Farmers Screen near Parkdale, OR

160 cfs dual Farmers Screen near Sisters, OR

In an effort to reduce their operation and maintenance costs, protect fish, and keep their canals free of debris, Farmers Irrigation District (FID) in Hood River spent ten years developing a new kind of horizontal, flat-plate fish screen now known as the Farmers Screen. FID licensed the Farmers Screen technology to the non-profit social enterprise Farmers Conservation Alliance (FCA), also based in Hood River, so that revenue from sales of the technology could be invested into other solutions that benefit both fish and farms.

The Farmers Screen is unique in that it has no moving parts and no power requirement and is substantially self-cleaning. After years of biological testing proving the technology is safe for fish at all life stages, and several demonstration projects proving cost-saving benefits to farmers throughout Oregon, the Farmers Screen received federal approval in 2011 from the National Marine Fisheries Service.

As of June 2012, Farmers Screen installations in Oregon, Idaho, Wyoming, and Montana have converted a total of 484.2 cubic feet per second of diverted water to fish-friendly status, opening 167.7 river miles for safe fish passage while saving landowners a total of $493,700 annually in avoided operation and maintenance costs.

The Oregon Conservation Strategy

The Oregon Conservation Strategy, touched upon earlier in the invasive species discussion, was developed in 2006. It is broader in scope than the Oregon Plan and provides a blueprint and action plan for the long-term conservation of Oregon's native fish and wildlife and their habitats. It takes a non-regulatory, statewide approach to conservation. It also recognizes that conservation issues vary by region and requires conservation actions be tailored to the unique needs of the fish, wildlife and human communities that coexist throughout Oregon. The Oregon Conservation Strategy engages citizens in monitoring key species and attributes of ecosystems, and by measuring the effectiveness of conservation actions.

Future conservation efforts should be enhanced by continuing to implement and build upon the successful collaborative efforts of the Oregon Plan for Salmon and Watersheds, the Oregon Conservation Strategy, Northwest Power and Conservation Council's Strategy for Salmon, 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.

Recommended Action 11.D
Protect and Restore Instream Habitat and Habitat Access for Fish and Wildlife

How to implement this action:

- Remove fish passage barriers and support fish screening efforts by implementing actions in Oregon's Conservation Strategy
- Build upon existing ecological planning and restoration efforts

Chris Park and Trish Carroll, U.S. Forest Service

Restoration after Mining: Many Hands Reclaim Sucker Creek, Josephine County

In 2011, the Siskiyou National Forest and its partners completed Phase II of the Sucker Creek Channel and Floodplain Restoration project. The project focused on a half-mile section of Sucker Creek that had been heavily altered by previous gravel mining on both private and U.S. Forest Service managed lands in Josephine County. Past mining activities had affected habitat, introducing higher temperatures and sediment and affecting coho and Chinook salmon, steelhead, and other native fish.

Pre-Project: Road and mine tailing

Post-Project: Downstream view immediately after channel construction

A variety of partners (The Forest Service, Oregon Watershed Enhancement Board, Ecotrust/Whole Watershed Restoration Initiative, Oregon Department of Environmental Quality, landowner Carlon Gravel Pit, LLC, and Illinois Valley Watershed Council) pitched in with grants, technical expertise and other support.

Partners constructed a new mainstem channel through mine tailings to create the pattern, dimension, and profile appropriate to the stream and valley type. They also placed large wood complexes in the channel and added floodplain and spawning gravels and boulders; planted native trees and shrubs; restored floodplain connectivity; and constructed habitat features including pools, riffles, runs, and glides. The long-term anticipated outcome of this project includes increasing the quantity and quality of habitat.

Already, successes are evident (see photo insert). This project won awards for mining reclamation in 2011.

Wallowa Lake, Wallowa County

Willamette River near Buena Vista, Polk County

Bandon Beach, Coos County

Photos: Gary Halvorson, Oregon State Archives

Oregon has a collective responsibility for protecting and managing water resources to ensure the health of its citizens. Part of this responsibility is ensuring that every citizen is treated fairly—regardless of race, culture, or income during the development of environmental laws, regulations, and policies. Oregon's natural resource agencies are committed to the principles of environmental justice—where equal protection from environmental and health hazards exists, and there is meaningful public participation in decisions that affect the environment in which people live, work, learn, practice spirituality, and play. In Oregon, adhering to the principles of environmental justice means that all persons affected by the state's natural resource decisions have a voice in those decisions, particularly members of minority or low income communities, tribal communities, and those traditionally under-represented in public processes.

The tools we use to protect public health, within the context of water management, are shared among many entities. The Oregon Health Authority and water system operators throughout the state are instrumental in making sure the water that enters our homes is safe for consumption and use. Other agencies, such at the Department of Environmental Quality, are working with partners to reduce toxics in the environment, clean up contaminated or hazardous sites, and ensure that the fish we consume are safe for *all* Oregonians. The Oregon Health Authority and the Oregon Department of Agriculture issue advisories when it is unsafe for recreational water activities at Oregon's beaches and lakes, or when fish and shellfish consumed from various Oregon's waters should be limited. Both agencies work with several other state, federal, and municipal agencies to keep the public informed.

Drinking Water

On average, a person will consume more than a quart of water each day. Some drinking water contaminants, such as bacteria, can cause acute health effects that generally occur within a few hours or days. Prolonged exposure of chemical contaminants, such as lead or arsenic, can cause cancer or organ damage. Drinking water is vulnerable to contamination from many potential threats. The Safe Drinking Water Act and its provisions are critical for protecting public health and drinking water.

Oregon should increase efforts to consult with and educate public water suppliers on safe drinking water regulations, contaminant standards, source water treatment options, and best practices to help prevent drinking water contamination. In particular, efforts should be expanded to support Oregon's smaller public water systems.

Photo: F. Reed, Tualatin Valley Water District

Municipal water providers in Oregon deliver safe drinking water to approximately 88 percent of the state's population.

Source Water Assessments

From 1998 to 2006, the Oregon Health Authority and the Department of Environmental Quality completed source water assessments for more than 2,400 public water systems in Oregon. The assessments include a delineation of the geographic area that supplies the public water system and information on potential contamination risks, natural and human-caused. This information is a valuable tool for safeguarding drinking water protection areas.

Land Use Planning Goal 5 requires communities to protect these drinking water sources, once they have been identified as resources. State and local governments should further collaborate on drinking water source pollution prevention efforts. Protection efforts should be enhanced by providing federal Safe Drinking Water Act revolving loan funds for source water protection projects.

Contaminants of Emerging Concern

Some chemicals that previously had not been detected are now being detected. These are often generally 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 not be known. State and federal agencies are working to improve the understanding of a number of CECs, particularly pharmaceuticals, personal care products, and perfluorinated compounds, among others.

Oregon should consider increased monitoring of public drinking water for contaminants of emerging concern. Monitoring can determine occurrence/concentration of contaminants, and if or how such contaminants pose individual, cumulative, or synergistic health risks to the public. These data could be used in conjunction with U.S. EPA's Unregulated Contaminant Monitoring Rule data to evaluate connections among source sensitivity, potential contaminant sources in the area, and overall system vulnerability to contamination. Monitoring would also provide better information on the public health impacts of these contaminants in Oregon.

Drinking Water Emergencies

Oregon's statewide emergency response system should 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. Drinking water providers should also partner with other regional networks and organizations. The Regional Disaster Preparedness Organization (UASI Region), and the Regional Water Providers Consortium in the Portland Metro area are two such networks that can help with development of regional emergency preparedness, response and recovery, and coordination of resources.

Water Quality & Domestic Wells

The Safe Drinking Water Act covers public water systems; however, it does not regulate private wells providing water for fewer than 25 individuals. In rural areas, private wells are often used as a source for water. In fact, more than 90 percent of people living in rural areas rely on groundwater from such wells to meet their drinking water needs.

Recommended Action 12.A
Ensure the Safety of Oregon's Drinking Water

How to implement this action:

- Assist public water suppliers; support small public water systems
- Protect drinking water sources
- Monitor public drinking water for contaminants of emerging concern
- Encourage water providers to join the Oregon Water/Wastewater Agency Response Network
- Increase domestic well testing

In Oregon, the owner of a property with a private well must test for nitrate, coliform, and arsenic if the property is being sold or changing ownership. California, Colorado, Georgia, Idaho, Indiana, Oregon,

Pennsylvania, Washington, and Wisconsin have been identified as having the highest nitrate concentrations in shallow groundwater in the United States. Of these states, only Oregon has enacted legislation that requires private well testing at the point of a real estate transaction.

While Oregon's Domestic Well Testing Act requires collection of nitrate, coliform, and arsenic data during the sale of a property, there is currently no authority to enforce the requirement. Public health officials estimate a 10 to 20 percent compliance rate. Mechanisms to increase domestic well testing are needed, along with resources to help educate and train homeowners on water quality testing of private wells (see also Recommended Action 8.C., Promote Community Education and Training Opportunities).

Toxics and Other Pollutants

Protecting Oregonians from the impacts of toxic pollutants is one of the top priorities for the Oregon Department of Environmental Quality. Thousands of toxic chemicals are in products that individuals and businesses use daily. Old chemicals that may not be used today but are stored in homes, schools and businesses also pose risks. Whether used in their raw form or in products, these chemicals can be 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.

Toxics Reduction Strategy

The Oregon Department of Environmental Quality is developing a toxics reduction strategy that will identify reduction options that address a range of toxic pollutants that move among air, land, and water. DEQ's strategy will increase the efficiency of reduction efforts while ensuring Oregon addresses the problem comprehensively. It will place an emphasis on reducing toxic pollutants at the source, rather than managing them after they are released.

Oregon DEQ completed a draft of its Toxics Reduction Strategy in December 2011 and hopes to finalize it by Fall 2012. In addition, Executive Order No. 12-05 ("Environmentally Friendly Purchasing and Product Design") signed by Governor Kitzhaber in April of 2012 provides additional support for DEQ's Toxics Reduction Strategy by focusing the work of other state agencies on achieving toxics reduction goals. In addition, the Executive Order will result in Oregon's state agencies and universities having a set of guidelines for purchasing and using less toxic chemicals within building materials, electronics, cleaning products and other items. Making the implementation of DEQ's Toxics Reduction Strategy and the Executive Order a priority will also allow agencies, businesses and academic institutions to advance green chemistry efforts, and promote alternatives to priority toxic chemicals that reduce environmental and health impacts in addition to producing potential economic benefits.

Water Quality Pesticide Management Plan

An important task for managing toxics is to implement the statewide Water Quality Pesticide Management Plan. Led by the Oregon Department of Agriculture, a team composed of representatives from the Oregon Department of Forestry, Oregon Department of Environmental Quality, Oregon Health Authority, and Oregon State University implements this plan, which calls for coordination of agency and stakeholder activities to:

- select and prioritize pesticides of interest and pesticides of concern;
- establish water quality guidelines and reference points;
- 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.

Oregon should commit to implementing the Pesticide Management Plan to make water quality programs across the state more consistent and resource efficient.

Pesticide Stewardship Partnerships

Since 2000, Oregon DEQ has used a voluntary, collaborative approach called Pesticide Stewardship Partnerships (PSPs) to identify problems and improve water quality associated with pesticide use at the local level. DEQ partners with OSU Extension, soil and water conservation districts, watershed councils, grower groups, tribes, and the Oregon Departments of Agriculture and Forestry. The PSPs are funded largely through federal grants and use local expertise in combination with water quality sampling and toxicology expertise of DEQ to encourage and support voluntary changes that result in measurable environmental improvements. The Water Quality Pesticide Management Team helps guide these local partnerships and assists in the interpretation of the monitoring data.

Currently there are eight partnerships in seven watershed areas. The eight include Hood River; Mill Creek and Fifteenmile Creek (in Wasco County); the Walla Walla River; Clackamas River; Pudding River; Yamhill River (Yamhill Pesticide Stewardship Partnership for rural and urban areas, and South Yamhill River Pesticide Stewardship Partnership, for a forested area of the watershed); and the Amazon Creek watershed project in Eugene.

The first partnerships implemented (Hood River and Mill Creek Basins) have shown substantial improvements in water quality associated with changes in pesticide management practices in response to monitoring data. The Hood River and Mill Creek successes show the Pesticide Stewardship Partnership approach could be an effective, timely alternative to traditional regulatory approaches dealing with "non point" sources of chemicals in water. Oregon should continue supporting the collaborative efforts of Pesticide Stewardship Partnerships.

Photo: Marion County Soil & Water Conservation District

Spray equipment demonstration at pesticide drift reduction workshop, Pudding River Watershed.

Hazardous Waste Collection – Pesticides & Medications

Keeping pollutants out of the water, rather than treating it later, is certainly the easiest way to protect water quality. Proper disposal of unused or outdated chemicals can help prevent pollutants from entering Oregon's waterways. For example, pesticides that are stored in deteriorating containers may lead to spills or leaks with potentially significant impacts to surface water and groundwater.

Legacy pesticide collection events around Oregon provide an opportunity to bring pesticides that are no longer used to a central location to properly dispose of them for free or at a reduced charge. These collection events help to remove old or unusable pesticides that pose a direct threat to Oregon's water quality. Since 2006, nearly 209,500 pounds of pesticides have been collected from agriculture pesticide collection events, in coordination with Pesticide Stewardship Partnership projects and other collaborative water quality improvement programs. Three counties—Hood, Sherman, and Wasco County—operate permanent hazardous waste collection facilities, offering free agriculture pesticide collection for local farmers and ranchers.

Like pesticides, unused medications can pose problems for Oregon's water resources. Often times, unused or expired medications are disposed of by flushing down drains in homes, care facilities, medical clinics, doctors' offices, and hospitals. In one recent national study, scientists analyzed streams for 95 different organic wastewater contaminants, including pharmaceutical compounds. One or more of these wastewater contaminants appeared in 80 percent of the streams. Risks posed to aquatic organisms by long-term exposure to various pharmaceutical compounds are unknown.

Wastewater treatment plants and septic systems usually do not treat or only partially treat pharmaceuticals, allowing certain chemical compounds to reach surface water or groundwater resources. Drugs of concern include controlled and non-controlled prescription drugs, as well as over-the-counter medications. Proper management of these drugs reduces avoidable poisoning of both children and adults; prevents intentional misuse of unwanted prescription drugs, especially by teenagers; and protects water quality and fish.

Oregon should continue to establish and fund "take back programs" for unused and outdated chemicals. These include pharmaceutical take-back programs for communities, pesticide collection events for farmers, ranchers, and homeowners, and other hazardous waste collection events or facilities.

Contaminated or Hazardous Sites

Sites, facilities, or structures originating as industrial, military, transportation, energy or other uses may be in such condition that they pose a serious or imminent hazard of emitting or discharging substantial amounts of toxics or other pollutants to water resources. Oregon should continue identifying and addressing hazardous or contaminated sites and all immediate legal means and enforcement mechanisms should be employed to prevent such emissions or discharges before they occur. Continuing to provide technical and financial assistance to clean up existing contaminated sites that affect groundwater or surface water is also needed.

Addressing existing hazardous and contaminated sites is not only important for protecting environmental and public health, it can lead to future 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. With an estimated 450,000 brownfields in the United States today, there are many opportunities to make contaminated properties economically viable for a variety of purposes and uses.

In Oregon, brownfields have been cleaned up and revitalized into an urban community garden, additional facilities for a Portland-area college, and a food bank operations center and thrift store in a rural Oregon community. Although these are just a few examples, the economic opportunities are many for brownfields redevelopment. Assessing current exposures, preventing future exposures to contamination, and ensuring that environmental justice and community health concerns are integrated throughout the redevelopment and reuse planning process is an important component of brownfields redevelopment. Oregon should continue to focus efforts on addressing hazardous and contaminated sites, while looking at opportunities to further economic development.

Recommended Action 12.B
Reduce the Use of and Exposure to Toxics and Other Pollutants

How to implement this action:

- Finalize and implement DEQ's Toxics Reduction Strategy
- Implement green chemistry executive order, including revising purchasing practices related to toxic chemicals
- Implement Water Quality Pesticide Management Plan
- Support Pesticide Stewardship Partnerships
- Establish and fund "take back programs"
- Continue to identify and address hazardous or contaminated sites, including brownfields
- Prevent blue-green algae from forming beyond natural background levels
- Monitor recreational waters and inform the public when contaminants are present

Monitoring Recreational Waters and Informing the Public

When locally caught fish and shellfish accumulate toxic chemicals because of spills or toxic algae blooms they pose health risks to those who consume them. The Oregon Department of Environmental Quality establishes the level of protection needed to ensure public health, by setting water quality standards and

establishing fish consumption rates that are safe for humans. DEQ recently worked with tribes, agency partners, and other stakeholders to revise the fish consumption rate and Oregon's water quality standards. These standards represent the most stringent human health criteria in the nation.

With millions of people participating in recreational activities each year, whether to harvest shellfish, catch local fish, swim or boat at a favorite lake, or play along Oregon's coastline, it is important to notify the public with any health or safety concerns. State agencies use a variety of approaches and tools to protect people living, working and playing near Oregon's beaches, rivers, lakes, and other water bodies.

Issuing fish and shellfish consumption advisories is one such tool used by Oregon's natural resource agencies. The Oregon Health Authority issues fish consumption advisories, due primarily to moderate-to-high mercury levels or PCB's (polychlorinated biphenyls) found in locally caught fish. Today, there are 19 different water bodies where fish consumption advisories exist.

The Oregon Department of Agriculture and the Oregon Department of Fish and Wildlife jointly issue shellfish safety closures to protect recreational shellfish harvesters from consuming clams or mussels contaminated with harmful biotoxins. Shellfish can be contaminated by natural events such as harmful algae blooms or man-made events such as sewage spills. The presence of marine biotoxins is the most common reason for shellfish closures in Oregon's coastal waters. Biotoxins can cause mild to severe health problems for consumers. The Oregon Department of Agriculture also maintains an online site with biotoxin results, recent news releases, and encourages the public to call the shellfish safety hotline before harvesting.

Oregon Harmful Algae Bloom Surveillance Program: Public health and safety concerns associated with recreational use of lakes and other waters have been growing over the past several years. When toxic algae blooms are detected in the water, the Oregon Harmful Algae Bloom Surveillance program advises the public to avoid recreational contact with water, such as swimming, wading, or water-skiing.

Advisories are only issued for lakes, reservoirs, and rivers where a lab has verified the presence of a harmful algae bloom. Only a fraction of Oregon's many water bodies are monitored. In 2010, twenty-two algae-related health advisories were issued throughout Oregon, as compared to 6 in 2005. Advisories were in effect for 272 days compared to 193 days in 2009. The increase could indicate that cyanobacteria blooms are increasing in severity, but may also reflect enhanced surveillance efforts among local, state, and federal partners.

Key actions include preventing blue-green algae from forming in lakes, streams and ponds beyond natural background levels. Blue-green algae, or cyanobacteria, can irritate skin, cause liver malfunction, or affect the nervous system. They thrive in warm, stagnant waters that have significant concentrations of nutrients, particularly phosphorus. Steps should be taken to control phosphorous from entering the water body through fertilizer runoff, septic systems, and other sources. Additional prevention techniques include increasing water flow through the lake or reservoir, artificial circulation of water within the reservoir, and improved watershed management.

The Oregon Beach Monitoring Program: This program monitors recreational water quality at ocean beaches. Marine waters are tested for the bacterium enterococcus, which is an indicator of the presence of other illness-causing organisms. Enterococcus has been shown to have a greater correlation with swimming-associated illnesses than other bacterial 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, strengthening 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.

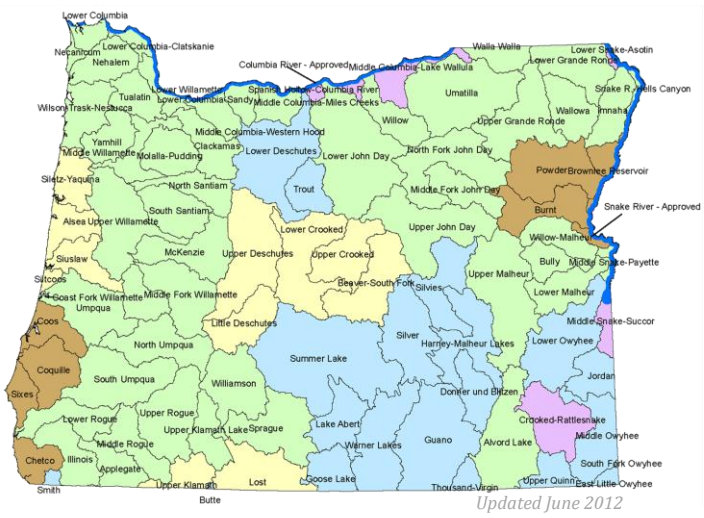
While the Beach Act currently provides funding from the U.S. Environmental Protection Agency to monitor ocean beaches for fecal contamination and the National Oceanic and Atmospheric Administration currently provides funding to monitor the coast and recreational shellfish for cyanobacteria, given the current federal budget environment, these and similar programs are at risk of being eliminated.

Additionally, there is no ongoing funding commitment at any level to monitor *freshwater* recreational areas and inform the public regarding exposures. Oregon needs to continue monitoring recreational waters at its beaches, and within its rivers and lakes, in order to be able to inform the public when contaminants are present.

Implementing Water Quality Pollution Control Plans

Oregon's long history of assessing and reporting on the conditions of Oregon's waters began in 1938 when the Oregon State Sanitory Authority (now the Oregon Department of Environmental Quality) was established as a result of a citizen initiative.

Today, Oregon's Total Maximum Daily Load (TMDL) Program is an important tool for managing water quality. A TMDL describes the maximum amount of pollutants allowed from municipal, industrial, commercial, and surface runoff sources, including natural background that can enter waterways without violating clean water standards. The Oregon Department of Environmental Quality recently completed 1,153 TMDLs in Oregon (see accompanying map).



It is important to continue developing and implementing Total Maximum Daily Load plans for water bodies that do not meet water quality standards. This includes developing TMDLs for remaining water bodies and pollutants on Oregon's 303(d) 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.

Nonpoint Sources of Pollution

A nonpoint source (NPS) of pollution is any pollution entering a waterbody that does not come directly from a pipe. Nonpoint source pollution, unlike end-of-pipe pollution from industrial and sewage treatment plants, comes from many diffuse sources, including runoff from agricultural, forest and ranching activities, construction sites, home landscaping and road surfaces.

Oregon's NPS Program is an important part of the state's water pollution control programs because for some pollutants, nonpoint sources of pollution are the major sources of pollution to a waterbody. In 2010, Oregon awarded more than $1.38 million in Section 319 grants to 33 projects to address nonpoint source pollution. Funding through 319 grants is used to implement best management practices, to support TMDL implementation plans and Pesticide Stewardship Partnerships throughout the state, and for educational or informational outreach efforts.

Oregon will need to continue assisting landowners with the management of non-point source pollution across all land uses (e.g., urban, agriculture, forestry) to ensure the protection of surface water and groundwater. This can be done by building upon the Forest Practices Act and local Agricultural Water Quality Management Plans to ensure compliance with water quality standards and TMDL load allocations. Oregon should increase monitoring to ensure the efficacy of forestry and agricultural best management practices.

Stormwater in Urban Areas

As discussed earlier, within the context of land use and low impact development techniques, stormwater runoff often contains pollutants that can adversely affect water quality. National Pollutant Discharge Elimination System (NPDES) permits are required for stormwater discharges to surface waters from construction for industrial activities and municipalities if stormwater from rain or snow melt leaves the site through a "point source" 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. Sources that need to obtain an NPDES MS4 permit are classified as either "Phase I" or "Phase II." Phase I NPDES MS4s are those with populations greater than 100,000, while regulated Phase II (or "small") MS4s serve populations less than 100,000 located within Census Bureau-defined Urbanized Areas. Federal regulations also provide EPA and the states the discretion to require other MS4s outside of urbanized areas to apply for a permit.

Recommended Action 12.C
Implement Water Quality Pollution Control Plans

How to implement 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; increase monitoring
- Ensure effective management and oversight of stormwater in urbanized areas
- Assist communities with septic system challenges

Oregon needs to ensure the effective management and oversight of stormwater in urbanized areas through the implementation of NPDES MS4 permits, TMDL Implementation Plans for Urban Designated Management Agencies, or through comparable voluntary plans.

Septic Systems in Rural Areas

State law provides the Oregon Department of Environmental Quality with regulatory authority over on-site sewage treatment and disposal. More than one million Oregonians, or about 35 percent of the state's population, use on-site 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. Businesses that install septic systems or provide pumping services are regulated through a statewide licensing program. DEQ provides direct service for on-site system permitting and installation in 14 counties around the state. These include

Clatsop, Coos, Douglas, Josephine, Baker, Grant, Gilliam, Harney, Lake, Morrow, Umatilla, Union, Wallowa, and Wheeler counties. The 22 remaining Oregon counties manage the program through local governments under contract and oversight from the state. Oregon should continue to provide technical and funding assistance to landowners who need to replace or repair failing septic systems. Similar assistance should be provided to communities needing to address public health or water quality problems associated with individual subsurface sewage disposal systems.

CRITICAL ISSUE: FUNDING FOR OREGON'S WATER

Trojan Park, Columbia County

Waldo Lake, Lane County

Sixes River, Curry County

Photos: Gary Halvorson, Oregon State Archives

The Strategy lays out an extensive blueprint of actions that the State and its partners can undertake to better understand and meet instream and out-of-stream needs now and into the future. Implementing every action in its entirety would be cost prohibitive in today's economy. It is instructive to learn about how other states have approached funding these types of actions and work in recent years. Many other western states have invested heavily in water-related planning, operations, and projects, even in dire economic times.

This section lays out funding needs in three fundamental categories: implementing Oregon's Integrated Water Resources Strategy at the state and local level, managing water resources at the state level, and assisting with local water projects.

Funding an Integrated Water Resources Strategy

Limited funding was available to develop the state's Integrated Water Resources Strategy in 2009-11 and again in 2011-13. Two limited duration positions were used to convene and manage the public process, oversee the scientific and technical work products, and develop and produce the content of the Strategy.

Recommended Action 13.A
Fund Development and Implementation of Oregon's Integrated Water Resources Strategy

How to implement this action:
- Fund implementation of 2012-2017 IWRS
- Fund required updates of state-level IWRS
- Fund development of place-based IWRS

The Water Resources Department is required to update the Strategy every five years. This allows the State to evaluate whether we are achieving our goals of improving our understanding of Oregon's water resources, and meeting our instream and out-of-stream water needs. Implementation also includes development of further project details for legislative action, fulfillment of scientific, outreach, and policy obligations, and documentation of lessons learned.

The goals, objectives, and recommended actions spelled out in the Integrated Water Resources Strategy will be meaningless without dedicated funding. Implementation begins in Fall 2012 and coordination among state, local, federal, and private partners will be needed.

In the coming years, an effective state-wide Strategy will require efforts at the local level as well, to develop place-based strategies that can guide not one, but a series of projects over time. Funding should be available to help communities conduct place-based planning and sustain the type of effort and expertise required to establish and implement the integrated strategies that emerge.

Investment in Planning Efforts - What Other States are Doing

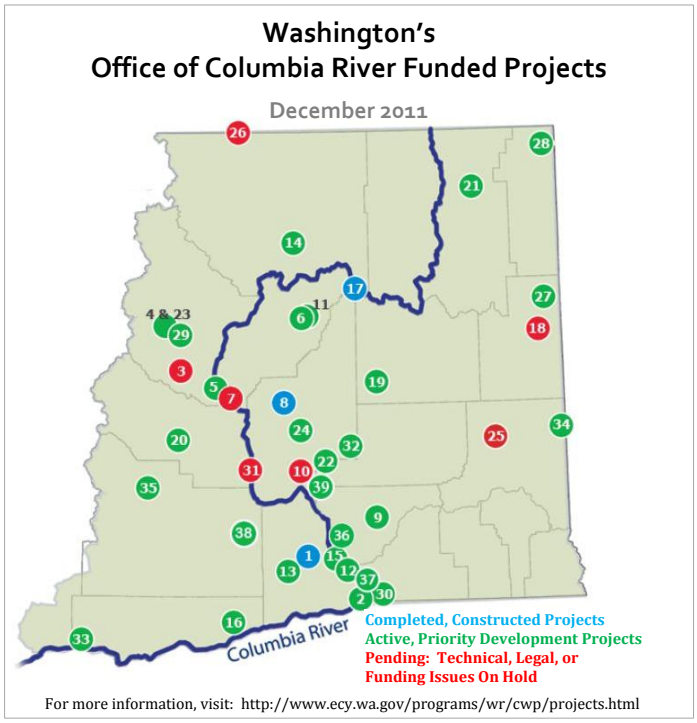
Several western states, including Washington, California, Colorado, New Mexico, Oklahoma, and Texas, have taken on a formal approach to locally-led planning, with direction and financial investments coming primarily through state resources. In each of these cases, regional or basin councils are formally delineated, with staff and budget assigned, formal stakeholder positions filled, and workplan and reporting requirements in place. These regional plans then roll up and inform state-level plans, which have traditionally been focused on water supply issues, but increasingly, plans are being broadened to encompass water quality, ecosystem needs, and the risks related to climate change.

Other states that conduct statewide, long-term, water planning have invested considerably in staff and consultants to conduct this work as well. For example, Georgia had a one-time budget in 2009-11 of $36 million to conduct planning across 10 regions; Texas had a $3 million budget in 2009-11 for planning across 16 regions; and Wyoming has about $500,000 per year to conduct planning across seven basins.

Oregon's neighbors to the north and south have also made significant investments. The State of California began developing long-term water plans 50 years ago, and is statutorily mandated to update them every five years. Although California has set aside a budget for these purposes, it has dwindled over time from $4.5 million in 2000 to $2.5 million in 2008, and even less today. About 40 part-time staff members work throughout the state on data collection and water budgeting, 15 more are located in district offices conducting data processing, and an additional 30 to 40 experts provide in-kind technical work.

In 2006, the State of Washington secured $200 million in general obligation bonds consistent with its legislative mandate to "aggressively pursue development of water supplies to benefit both instream and out-of-stream water uses." The Washington Legislature directed the Washington Department of Ecology to allocate two-thirds of the money to out-of-stream uses and one-third to augment instream flows.

To date, Washington has used these monies primarily to study the feasibility of water supply projects. The accompanying map shows almost 40 projects under consideration in the Columbia River Basin, using these monies.



Funding Water Management at the State Level

Natural resources are critical to Oregon's economy. Natural resource activities such as agriculture, forestry, fisheries, and mining, as well as recreational activities and tourism including fishing, hunting, viewing wildlife, camping, and hiking are major economic drivers in Oregon's economy.

Oregon's natural resource agencies compiled the following facts for 2011:

- The total combined economic activity of Oregon's natural resource industries exceeds $55 billion in output—37 percent of the state's annual domestic product.
- Approximately 550,000 Oregonians work in natural resource-related fields, or jobs supported by those industries, comprising more than one-third of the state's employment.
- For every $1 in General Fund invested in natural resource agencies, $376 in economic activity is generated by Oregon's natural resource sector.

The General Fund

Because General Fund monies are used for a variety of public purposes and the amount of General Fund is limited, there is intense competition for these monies. The General Fund is used most often to pay for education, human services, and public safety.

Since the 1999-2001 biennium, the average General Fund investment across all state agencies has risen 31.33 percent; however, the investment in natural resource agencies has declined 2.5 percent. In 2009-11, Oregon's General Fund investment in natural resource agencies equated to less than one percent, or $145 million, of Oregon's $13 billion General Fund budget. In the most recent budget (2011-13), that share has fallen even further, to $129 million, with six natural resource agencies not receiving any portion of the General Fund. This includes the state's drinking water program, which is responsible for providing oversight and assistance to public water systems to ensure safe drinking water and protect public health for Oregonians.

2011-13 General Fund (GF) Budget for Natural Resources Agencies

	GF (millions)	GF as % of Total Funds
Forestry	$ 47.9	16%
Environmental Quality	$ 24.9	8%
Water Resources	$ 20.6	56%
Agriculture	$ 12.8	15%
Land Conservation & Development	$ 10.9	60%
Fish and Wildlife	$ 7.1	2%
Geology and Mineral Industries	$ 2.5	19%
Land Use Board of Appeals	$ 1.3	94%
Columbia River Gorge Commission	$ 0.8	99%
State Lands	$ 0.0	0%
Energy	$ 0.0	0%
OHA, Drinking Water Program	$ 0.0	0%
Parks and Recreation	$ 0.0	0%
Watershed Enhancement Board	$ 0.0	0%
State Marine Board	$ 0.0	0%

Over the years, natural resource agencies have become more 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 resource agencies also rely on "fees for service;" however, these funds do not completely cover the real cost of conducting transactions and have suffered with the recent economic recession as well. These funding sources are also expected to decrease significantly in the coming years. Loss of funds at the state level creates a domino effect, where dollars removed from state agency budgets results in lost matching dollars at the federal level.

The state's core responsibilities related to water, described in detail throughout this document, are underfunded and have been for years. The trend of declining General Fund investment must be reversed in order to ensure Oregon's natural resource legacy for future generations and to implement our shared vision for the future. Natural resource agencies in Oregon are developing a number of ideas to stabilize their budgets from the steep decline in General Fund, and are watching other western states with interest, as they do the same.

Alternatives to the General Fund – Models from Other States

The State of California has been working for several years to establish a funding mechanism that relies less on the General Fund in order to pay for its day-to-day operations. In 2003, the California Legislature passed Senate Bill No. 1049, directing the California Water Resources Control Board's Water Rights Division to charge annual user fees to fund its operations.

Water permit and license holders are charged a fee of $100 or $0.03 per acre-foot of water, whichever is higher. This fee was designed to cover a budget of approximately $7 million. Although challenged in the courts by water users, the water right fee program was found to be "facially constitutional" by unanimous decision of the California Supreme Court in 2011, and is operating today.

In Minnesota, $75 million in dedicated funds is available each year under Minnesota's 2008 Land, Water and Legacy constitutional amendment. The amendment increased the general sales and use tax rate by three-eighths of one percentage point to 6.875 percent. One-third of the proceeds are dedicated to water quality protection, one-third to restoration of wetlands and other wildlife habitat, and the remaining third to support parks, arts, and cultural heritage efforts.

Here in Oregon, the Water Resources Commission appointed a subcommittee to work with staff in the development of funding options. After meeting with more than thirty stakeholder organizations, the subcommittee and staff generated a list of dozens of potential funding options, "to ensure the Department can fulfill its mission and legally mandated responsibilities successfully, in service to Oregon's economy and environment." The group evaluated these funding options against the following principles: (1) "user pays," (2) fees should be equitably distributed, (3) fees should be used toward the purpose for which they are collected, and (4) fee collection must be logistically reasonable. The subcommittee and staff continue to work with the Governor's Office and Legislature to analyze and finalize options for legislative consideration.

> Recommended Action 13.B
> Fund Water Resources Management Activities at the State Level
>
> 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

Funding Investments in Local Projects

Oregon's state agencies, several of its federal counterparts, and both commercial and investment banks have a variety of funding mechanisms available to pay for water resource projects, ranging from infrastructure finance, to feasibility study grants for water supply, conservation, and reuse projects, and grants for watershed protection and restoration activities.

Infrastructure Financing

The U.S. Environmental Protection Agency estimates Oregon's infrastructure needs at approximately $3 billion for municipal drinking water systems, based on its 2007 needs survey. Costs can include capital

construction and maintenance, transmission, storage, treatment, and distribution. These costs involve routine construction and maintenance, and do not include the billions of dollars worth of seismic retrofits and emergency preparedness efforts that Oregon needs to undertake in the next 20 years.

As previously mentioned in the infrastructure financing discussion (p. 70), Oregon communities have a number of opportunities to access infrastructure funding, from revolving loan funds, to state and federal grants, and the bond market. As one example, USDA Rural Development provides loans, grants, and loan guarantees for drinking water, sanitary sewer, solid waste and storm drainage facilities in rural areas and cities and towns of 10,000 or less. The Rural Community Assistance Corporation has a Wastewater Funding and Resource Guide containing additional state and federal funding sources.

The League of Oregon Cities, Association of Oregon Counties, and Special Districts Association of Oregon each have funding mechanisms for their members, which are accessible through their respective associations. Private financial institutions also underwrite bond financing and loans.

Funding for Feasibility Studies

Local communities often find it difficult to secure feasibility study funding as part of their project development. Such studies help determine the environmental, engineering, economic, and social implications of proposed water supply projects.

Recommended Action 13.C
Fund Communities Needing Feasibility Studies for Water Conservation, Storage, and Reuse Projects

How to implement this action:

- Continue to provide SB 1069 grants to help evaluate the feasibility of water conservation, storage, and reuse projects

One way Oregon can help with costs is to bridge the existing funding gap for feasibility studies. In 2008, the Water Resources Department awarded approximately $1.3 million in feasibility study grants to 21 Oregon communities, plus funds for the Umatilla Basin Aquifer Recovery Project. In 2011, the Oregon Legislature provided another $1.2 million for this grant program, which funded feasibility studies in more than 20 Oregon communities.

Funding for Watershed Restoration

Since 1999, the Oregon Watershed Enhancement Board has awarded 5,500 grants totaling $434 million to partners in Oregon. OWEB grants are funded from the Oregon Lottery, federal dollars, and salmon license plate revenue. This has resulted in more than 5,100 miles of stream restoration, including improved stream habitat and removal of fish passage barriers. In addition, more than 5,400 miles of stream banks have received riparian forest restoration, benefiting salmon and steelhead. Oregon consistently reports about the same length of stream mile restoration as Alaska, California, Idaho, Washington, and Pacific Northwest Tribes, combined.

Ninety percent of OWEB investments stay in Oregon. Restoration project managers typically hire local consultants, contractors, and employees to design, implement, and maintain projects. Consultants and contractors hire field crews, rent or purchase equipment, and buy goods and services. Employees spend wages on goods and services to support their livelihoods in their local communities. The payoffs of habitat restoration projects yield immediate jobs at a level very similar to traditional infrastructure investments.

Oregon's watersheds also benefit from significant annual investments by the Bonneville Power Administration. In fiscal year 2011, BPA spent about $56 million on fish and wildlife programs in Oregon. Under the Willamette Wildlife Agreement, BPA will provide $144 million over the next 15 years for habitat protection in the Willamette River Basin. These investments translate into an improvement in ecosystem conditions and enhancement of local economies.

Pooling Funding Sources

Navigating through different funding sources and requirements, while continuing to meet the objectives of the local community, can be a significant challenge for instream and out-of-stream projects. The Whole Watershed Restoration Initiative, described in the accompanying essay, was created to help project proponents make sense of the funding maze.

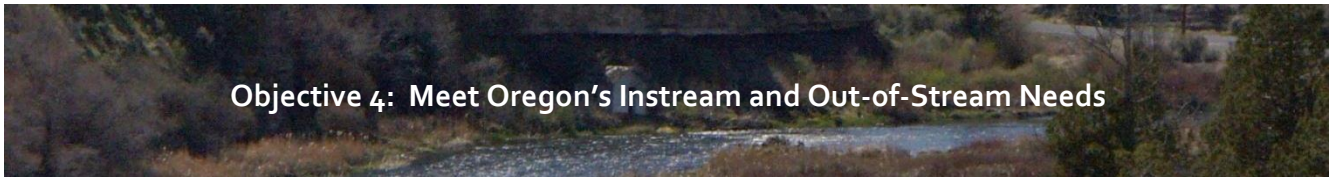
Cathy P. Kellon,
Ecotrust

Public and Private Organizations Working together to Fund Watershed Restoration

The Whole Watershed Restoration Initiative (WWRI) is a competitive salmon habitat restoration grant program in Oregon, Washington and Idaho. The WWRI is a public-private partnership whereby state and federal agencies contribute restoration dollars to the Initiative and Ecotrust, a nonprofit, then makes these pooled funds available as grants to local groups for on-the-ground restoration work. The goal is to restore natural ecosystem processes for the benefit of salmon and communities. The approach is to fund work where there is strong community support, effective collaboration, and high ecological value to salmon.

The WWRI partnership was formed in 2007 and is comprised of Ecotrust, the Oregon Watershed Enhancement Board, the Pacific Northwest Region of the USDA Forest Service, the U.S. Fish and Wildlife Service, the National Oceanic Atmospheric Administration's Restoration Center, the Bureau of Land Management, and USDA's Natural Resource Conservation Service.

Recommended Actions at a Glance



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

Place-Based Efforts	9.A. Undertake place-based integrated, water resources planning 9.B. Coordinate implementation of existing natural resource plans 9.C. Partner with federal agencies, tribes, and neighboring states in long-term water resources management
Water Management & Development	10.A. Improve water-use efficiency and water conservation 10.B. Improve access to built storage 10.C. Encourage additional water reuse projects 10.D. Reach environmental outcomes with non-regulatory alternatives 10.E. Authorize and fund a water supply development program
Healthy Ecosystems	11.A. Improve watershed health, resiliency, and capacity for natural storage 11.B. Develop additional instream protections 11.C. Prevent and eradicate invasive species 11.D. Protect and restore instream habitat and habitat access for fish and wildlife
Public Health	12.A. Ensure the safety of Oregon's drinking water 12.B. Reduce the use of and exposure to toxics and other pollutants 12.C. Implement water quality pollution control plans
Funding	13.A. Fund development and implementation of Oregon's IWRS 13.B. Fund water resources management at the state level 13.C. Fund communities needing feasibility studies for water conservation, storage & reuse projects