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Oregon Public Water Systems

Groundwater Resource Guide

For Drinking Water Source Protection

DEQ

OREGON HEALTH AUTHORITY

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NOTE: The internet web addresses listed in this document were included as a convenience for the users of this document. All web addresses were functional at the time this publication was last updated (March 2025). This document will be updated as new information becomes available. Please feel free to make suggestions for improvements so that we can make the document more valuable to the public water systems in Oregon.

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Executive summary

Groundwater is an essential Oregon resource. As Oregon's population grows, the importance of high-quality drinking water sources to meet the demands of that population will increase. Ensuring high quality sources of water is essential for providing clean drinking water to rural homeowners, agricultural growers, ranchers, businesses, and urban communities of all sizes.

The Oregon Department of Environmental Quality Source Water Protection Program collects and shares information, provides financial and technical assistance, and implements other activities and water quality programs to prevent pollution. DEQ developed the resource guides in this report to support local government and community needs for more information about the various authorities, tools and assistance programs available to help protect drinking water.

Oregon Health Authority records for public water systems show more than 70% of Oregon residents rely solely or partially on groundwater for their drinking water. 90% of the state's public water systems get their drinking water from groundwater. Many federally regulated public water systems in Oregon have received a source water assessment and updated source water assessment developed by the Oregon Department of Environmental Quality and the Oregon Health Authority drinking water source protection programs. The source water assessments provide the water systems and communities detailed information on the watershed or recharge area that supplies their well, spring or intake (the "drinking water source area"). Public water systems and local communities can use the information in the assessments to voluntarily develop and implement drinking water protection strategies.

Requirements for water quality monitoring of public water systems in Oregon provide some degree of assurance of safe drinking water. However, all systems are vulnerable to potential contamination. One of the best ways to ensure safe drinking water and minimize future treatment costs is to develop local strategies designed to protect against potential contamination. Not only will this make drinking water safer, it will also raise awareness of drinking water contamination risks and provide information about how communities and local landowners can protect their drinking water sources. Community place-based planning for drinking water source protection allows community members to take an active role and work together to protect public health and reduce the costs of providing clean drinking water.

The drinking water source area for most communities lies partially, if not entirely, outside of their jurisdiction. It may include several different governing agencies as well as a diverse mix of landowners, businesses and residents. When developing protection strategies, DEQ and OHA highly recommend that the water system and community involve potentially affected parties early in the process to foster awareness and trust in the resulting strategies. Oregon adopted an "Integrated Water Resources Strategy" in 2012 that provides recommendations for how to do a place-based and integrated approach to water resources planning. This approach helps communities coordinate and collaborate to address local water quality and water quantity challenges. The planning guidelines describe elements to consider for building a collaborative process, characterizing water related issues, quantifying existing and future water needs, developing a suite of solutions, and adopting and implementing the plan.

This Groundwater Resource Guide incorporates Integrated Water Resources Strategy principles and provides detailed information on potential partner organizations, resources available, and funding sources to implement protection strategies. It is a "toolbox" for using the source water assessment information on public water system groundwater source areas and supports local efforts to protect drinking water sources. This Groundwater Resource Guide covers the following topics:

Section 1 provides a drinking water regulatory overview and summarizes the regulatory context of water quality as it relates to drinking water source protection. It also includes information on the contents of source water assessment reports that DEQ and OHA provide for all federally regulated public water systems in Oregon.

Section 2 introduces legal and hydrologic concepts related to groundwater resources in Oregon with an overview of what makes groundwater susceptible to contamination. It highlights important and unique groundwater issues in Oregon.

Section 3 includes information water systems can use to form partnerships, find technical assistance, and apply for funding for projects to protect their sources of drinking water.

Section 4 describes a planning process, inspired by Oregon's Integrated Water Resource Strategy, that brings together interested parties to plan for and implement actions that protect the quality of drinking water sources.

Section 5 covers pollutant reduction tools and provides summaries and examples of tools that public water systems may find useful for implementing pollutant reduction within drinking water source areas for groundwater wells.

Section 6 discusses land use activities that potentially impact water quality and the state agencies and rules that regulate these activities. This section highlights the importance of public water systems and community members understanding which agencies have authority for regulation of human land use activities, the structure of those regulations, and the individual agency responsibilities.

Section 7 covers related water quality issues/projects. The issues highlighted include climate change, nitrates in drinking water, and water corrosivity, with important impacts to the quality of drinking water sources. This includes the DEQ's Groundwater Management Areas and Total Maximum Daily Loads programs, and EPA's Sole Source Aquifer Protection Program which protect and improve water quality in Oregon.

Section 8 on next steps and Oregon's recognition program, provides resources for developing drinking water source protection strategies and information on Oregon's drinking water source protection award program.

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Glossary of acronyms

AgWQM	Agricultural Water Quality Management
ALE	Agricultural Land Easements
AOI	Area Of Interest
BLM	Bureau of Land Management
C	Community Public Water System
CAFO	Confined Animal Feeding Operation
CDL	Cropland Data Layers
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSP	Conservation Stewardship Program
cv	coefficient of variation
CWSRF	Clean Water State Revolving Fund
DEQ	Department of Environmental Quality
DMA	Designated Management Agencies
DOGAMI	Department of Geological and Mineral Industries
DWP	Drinking Water Protection
DWSP	Domestic Well Safety Program
DWSPF	Drinking Water Source Protection Fund
ECP	Emergency Conservation Program
ECSI	Environmental Cleanup Site Information
EFC	Environmental Finance Center
EJ TCTAC	Environmental Justice Thriving Communities Technical Assistance Centers
EPA / USEPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FERNS	Forest Activity Electronic Reporting and Notification System
GIS	Geographic Information Systems
GWAVA-S	Ground-Water Vulnerability Assessment for Shallow aquifers
GWMA	Groundwater Management Areas
GWUDI	Groundwater Under the Direct Influence of Surface Water
HHBP	Human Health Benchmarks for Pesticides
HMEP	Hazardous Materials Emergency Preparedness
IARC	International Agency for Research on Cancer
IMV	Interactive Map Viewer
IWRS	Integrated Water Resources Strategy

LCR	EPA's Lead and Copper Rule
LSI	Langeliuer Saturation Index
MCL	Maximum Contaminant Levels
MOA	Memorandum of Agreement
NASIS	National Soil Information System
NASS	National Agricultural Statistics Service
NAWQA	National Water-Quality Assessment
NIMS	National Incident Management System
NLCD	National Land-Cover Database
NPDES	National Pollution Discharge Elimination System
NPIC	National Pesticide Information Center
NRCS	Natural Resources Conservation Service
NTNC	Non-Transient Non-Community Public Water System
NTT	Nutrient Tracking Tool
NWQI	National Water Quality Initiative
OAR	Oregon Administrative Rule
OAWU	Oregon Association of Water Utilities
OCCRI	Oregon Climate Change Research Institute
ODA	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
OHA	Oregon Health Authority
ORS	Oregon Revised Statute
ORWARN	Oregon Water/ Wastewater Agency Response Network
OSFM	Oregon State Fire Marshall
OSU	Oregon State University
OWQDA	Oregon Water Quality Decision Aid
OWRD / WRD	Oregon Water Resources Department
PARC	Pesticide Analytical and Response Center
PCS	Potential Contaminant Source
PFAS	per- and polyfluoroalkyl substances
PPRC	Pollution Prevention Resource Center
PSP	Pesticide Stewardship Partnership
PWS	Public Water Systems
RCAC	Rural Community Assistance Corporation
RCPP	Regional Conservation Partnership Program
RET	Real Estate Transaction
RFP	Requests For Proposals
SDWA	Safe Drinking Water Act
SDWIS	Safe Drinking Water Information System

SEP	Supplemental Environmental Projects
SIPP	Sustainable Infrastructure Planning Projects
SRF	State Revolving Fund
SSA	Sole Source Aquifer
SWA	Source Water Assessments
SWCD	Soil and Water Conservation Districts
SWV GWMA	Southern Willamette Valley Groundwater Management Area
TA	Technical Assistance
TCF	The Conservation Fund
TMDL	Total Maximum Daily Loads and the related implementation plans
TNC	The Nature Conservancy
UCMR	Unregulated Contaminant Monitoring Rule
UIC	Underground Injection Control
USDA	United States Department of Agriculture
USDHHS	United States Department of Health and Human Services
USFS	United States Forest Service
USGS	US Geological Survey
USNRC	US National Research Council
UST	Underground Storage Tanks
USWA	Updated Source Water Assessments
WPCF	Water Pollution Control Facility
WQMP	Water Quality Management Plans
WRE	Wetland Reserve Easements
WSU	Washington State University

Project justification

Why is there a need for a "Groundwater Resource Guide"?

Oregon faces many challenges with water quantity, water quality, and ecosystem needs. Oregon's people rely upon water to drink, to irrigate and grow food, to supply livestock, to build products, to move goods, to recreate, and to produce energy. Clean water is essential to Oregon's environmental health—for the trees, native plants, wetlands, aquatic life, and human health. Oregon's economy is highly dependent upon a healthy environment and clean, reliable sources of water.

Groundwater is vulnerable to contamination from activities taking place on land as well as from discharges of wastes and pollutants at or below ground surface. All water beneath the land surface is groundwater, and it sometimes occurs at very shallow depths. Once groundwater becomes contaminated, it is very difficult, and often costly, to clean up. Because groundwater moves slowly, contamination may persist for tens, hundreds or even thousands of years. Likewise, groundwater currently being contaminated may not impact beneficial uses until sometime far into the future (when clean drinking water sources may be difficult to find). This contamination may impair groundwater for use as drinking water and may affect the quality of surface waters where it comes to the surface. Groundwater contamination from nitrates, bacteria, pesticides, volatile organic compounds, and other constituents can present potential human health risks in drinking water, both in public water systems and private domestic wells in rural areas.

When groundwater sources of drinking water become contaminated, communities must build expensive water treatment plants to provide safe drinking water, and this increases utility costs. In some cases, temporary emergency supplies of drinking water must be secured, and the costs to community members and Oregon businesses can be significant. Avoiding the need for expensive treatment technology or alternative water supplies by protecting the quality of raw water is cost-effective.

As Oregon's population grows, the importance of high-quality drinking water sources to meet the demands of that population will increase. Ensuring high quality sources of water is essential for providing clean drinking water to agricultural growers/ranchers, rural homeowners, businesses, and urban communities of all sizes.

Today, and historically, **the public is concerned about the safety of its drinking water.** This project—developing a "Resource Guide" for public water systems---was initiated after several multi-agency meetings during 2013-14 regarding how to address community concerns about

drinking water quality. During the meetings is became clear that local government and community members needed more information about the various authorities associated with water quality in their source area. In addition, communities needed more information about the tools and assistance available to them to help voluntarily reduce the risk of contamination of their drinking water. Oregon DEQ developed these Resource Guides in response to this need.

While the risk of intentional contamination is small, drinking water sources can become contaminated by a variety of land uses and everyday activities. Most water resource work to date has focused on identifying pollutant impacts, then reducing the levels of pollutants and restoring impaired or polluted waters. While we will continue to do this as resources allow, it is also important to prevent problems from occurring. Pollution prevention does not depend on data showing there is an existing problem, but an understanding of factors that pose a risk of pollution. If there is already a pollution problem, it is too late to prevent it.

Pollution prevention is fundamentally different from pollutant removal or treatment. Many studies have shown that **it is more cost-effective to prevent pollution in the environment than to remove it through treatment or implement restoration**. Reducing or eliminating off-site releases of pollutants through protection and prevention activities can effectively lower treatment and maintenance costs for public water providers and improve long-term viability of groundwater drinking water sources (Freeman et al 2008). Reducing or preventing pollutant loading to source water can reduce the need for equipment replacement or upgrades, as well as reduce risks associated with contaminants for which regulatory standards and/or monitoring requirements may be lacking. Long-term assurances of a safe and adequate drinking water supply also help to protect property values and preserve the local and regional economic growth potential for the area.

This Resource Guide provides the information necessary for Oregon's public water system officials and community partners to implement local place-based planning to prevent pollutant impacts that could affect their drinking water quality. **Pollution prevention can help protect public health, enhance public confidence in their drinking water, and reduce the need for expensive treatment in both surface water and groundwater sources.**

1.0 Drinking water regulatory overview

It is important to understand the regulatory context of water quality as it relates to drinking water source protection. We all depend on clean water. This section will highlight the state and federal regulations related directly to public drinking water. Many agencies administer different aspects of water quality regulations that are intended to protect public health and water resources in Oregon. An Interagency Agreement between the Oregon Health Authority and the Department of Environmental Quality provides a framework to ensure the responsibilities and tasks for DEQ associated with the drinking water source protection aspects of public water systems are clearly articulated.

1.1 Safe Drinking Water Act and Oregon's Drinking Water Quality Act

The Oregon Health Authority is the state agency responsible for the implementation of the federal Safe Drinking Water Act in Oregon. OHA administers and enforces drinking water quality standards through its Drinking Water Services program. Oregon Administrative Rules include requirements for systems to meet the Safe Drinking Water Act maximum contaminant levels, which are legal threshold limits on the amount of a substance that is allowed in drinking water which is delivered to the consumer. Water systems are also required to submit to periodic inspections and meet enforcement requirements as administered by OHA (reference Oregon Administrative Rules 333.061, 338.277, and 448.131 for more information). As the primacy agency responsible for implementing the Safe Drinking Water Act, OHA also approves drinking water treatment plans, sets construction and operator certification standards, and enforces rules to ensure safe drinking water. OHA assists systems in complying with standards by providing technical assistance and provides grants and loans to aid public water system operations.

In Oregon, public water systems with 4 or more connections or serving more than 10 people for at least 60 days of the year are regulated. There are approximately 3300 public water systems in Oregon. The majority of these (almost 90%) use groundwater wells or springs.

Oregon Health Authority's Drinking Water Services website has extensive information on all drinking water regulatory requirements and the various resources available to public water systems.

1.1.1 Ground Water Rule

The Safe Drinking Water Act's "Ground Water Rule" intended to increase protection of groundwater sources of public drinking water supplies from disease-causing viruses and bacteria. The Ground Water Rule is a risk-based approach that increases requirements for systems that either have identified deficiencies (that is, not meeting all public drinking water standards), or whose groundwater source is considered susceptible to fecal contamination (for such reasons as proximity of fecal sources, aquifer sensitivity, etc.). The rule requires public water systems to take corrective action when contamination is confirmed through testing. Corrective actions may include reconstruction or abandonment of wells contributing to viral contamination. For more information on the Groundwater Rule, see **OHA's Groundwater Source Monitoring website.**

1.1.2 Groundwater under the direct influence of surface water

The Safe Drinking Water Act regulates drinking water sources that include groundwater, surface water, and springs. However, there is a category of groundwater wells with unique characteristics. The Safe Drinking Water Act defines "Groundwater Under the Direct Influence of Surface Water" as: "any water beneath the surface of the ground with significant occurrence of insects or other macro organisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium,* or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions" (40 CFR 141 definition).

GWUDI basically means the groundwater source is located close enough to nearby surface water, such as a river or lake, to receive unfiltered surface water recharge. Since a portion of the groundwater source's recharge is from surface water, the groundwater source is considered at risk of contamination from pathogens such as *Giardia lamblia, Cryptosporidium,* and viruses, which are not normally found in true groundwater. This means that GWUDI systems have additional regulatory requirements beyond the groundwater wells that do not have surface water contributions.

Oregon Administrative Rule (OAR) 333-061-0032 (8) requires that all public water systems using groundwater as a source of drinking water must evaluate their source(s) for the potential to be under the influence of surface water. To learn about the criteria for determining if a groundwater source (wells, springs, and infiltration galleries) is susceptible to direct surface water influence and the regulatory requirements, please refer to the **OHA Groundwater Under the Direct Influence of Surface Water web page.**

1.1.3 Chemicals of concern in drinking water

The federal Safe Drinking Water Act currently regulates over 90 of the most commonly occurring pollutants in drinking water in the United States (USEPA, 2025). In April 2024, the United States Environmental Protection Agency announced proposed new Primary Drinking Water Regulations for six per- and polyfluoroalkyl substances (PFAS). Oregon has two years to adopt the regulations. This is the first new Maximum Contaminant Level established in over 10 years.

There are many pollutants used in Oregon that are not regulated in treated drinking water — including pharmaceuticals, personal care products, and some pesticides. Community public water systems (places where people live) and non-transient non-community public water systems (places where people work or attend school) test for regulated synthetic organic contaminants every three years in treated drinking water but there is no required monitoring for unregulated compounds. The testing requirements for Transient Non-community public water systems (places that don't serve the same people every day) are limited to bacteria and nitrate, which are pollutants that can have an acute risk of illness.

Through extensive sampling and analysis done by the U.S. Geological Survey, EPA, and others, we know that many pollutants found in drinking water sources cannot be fully removed through standard drinking water treatment technologies (Glassmeyer et al 2017; Stackelberg et al 2007). The inability to remove certain pollutants from source water highlights the importance of taking actions that *reduce or prevent pollutants in source waters*.

1.1.4 Source water assessments

Amendments to the federal Safe Drinking Water Act in 1996 required that Oregon delineate the individual drinking water source areas for public water systems and develop source water assessments that identify potential sources of pollutants (USEPA 1996).

Between 1999 and 2005, the OHA and DEQ teamed up to completed source water assessments for 2,656 public water systems (the total number of federally regulated community and non-transient non community water systems in Oregon at that time). Oregon's source water assessment procedures, including the development of the list of potential contaminant risks, were established by a statewide advisory committee (Feb 1998-June 1999) and approved by the United States Environmental Protection Agency in July 1999.

The advisory committee focused primarily on potential sources of contaminants regulated under the federal Safe Drinking Water Act, including contaminants with a maximum contaminant level, contaminants regulated under the Surface Water Treatment Rule, and microorganisms. DEQ defined significant sources of contamination as any facility or activity that stores, uses, or

produces the contaminants of concern and has a sufficient likelihood of releasing those contaminants to the environment at levels that could contribute significantly to the presence of these contaminants in the source waters of the public water supply.

In response to more advanced data and analyses becoming available, the Oregon Health Authority and the Department of Environmental Quality began completing Updated Source Water Assessments for public water systems in 2016. Updated Source Water Assessments for water systems using groundwater provide updated information on potential sources of contamination and recommendations for protection strategies. Additional information on Source Water Assessments is provided in Section 2.2.1.

1.2 Clean Water Act and Oregon groundwater quality protection rules

The Safe Drinking Water Act does not provide regulatory authority to prevent pollution in source waters such as aquifers, rivers, lakes, and streams. *Protecting water quality in source waters for public water systems requires implementation of federal Clean Water Act authorities and state law.* DEQ is responsible for implementation and enforcement of the federal Clean Water Act and state water quality law in Oregon. Because of this authority, DEQ is responsible for addressing pollutants from point and nonpoint sources of pollution that affect the water quality throughout the state.

The federal Clean Water Act authorities apply to all surface waters in the United States. Oregon state statutes (ORS 468B.005(10)) expand upon the federal Clean Water Act to afford protection for all waters of the state, including groundwater. Oregon statues authorize DEQ to implement and enforce the federal Clean Water Act within Oregon. Pertinent Oregon statutes that provide the basis for prevention of contamination include:

> *ORS 468B.005 Definitions for water pollution control laws.*
>
> *…(5) "Pollution" or "water pollution" means such alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state, which will or tends to, either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational or other legitimate beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof.*

…(10) "Water" or "the waters of the state" include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters which do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction.

ORS 468B.015 Policy.

Whereas pollution of the waters of the state constitutes a menace to public health and welfare, creates public nuisances, is harmful to wildlife, fish and aquatic life and impairs domestic, agricultural, industrial, recreational and other legitimate beneficial uses of water… it is hereby declared to be the public policy of the state:

*… (2**)** To protect, maintain and improve the quality of the waters of the state for public water supplies, for the propagation of wildlife, fish and aquatic life and for domestic, agricultural, industrial, municipal, recreational and other legitimate beneficial uses;*

… (5) To cooperate with other agencies of the state, agencies of other states and the federal government in carrying out these objectives.

Under Oregon statute, groundwater (or underground waters) is clearly considered part of "waters of the state" that are protected for beneficial uses that include public water supplies.

In addition to ORS citations above, the Oregon Groundwater Quality Protection Act of 1989 (ORS 468B.150-190) sets a broad goal for the state of Oregon – to prevent contamination of Oregon's groundwater resource, to conserve and restore this resource, and to maintain the high quality of this resource for present and future uses. The act established a policy that all state agencies' rules and programs are to be consistent with the goal of protecting drinking water resources and public health.

DEQ has primary responsibility for implementing groundwater quality protection in Oregon. DEQ coordinates groundwater quality protection with other state agencies which have overlapping responsibilities for regulation, involvement, or oversight. DEQ implements groundwater quality protection through a variety of programs and responsibilities that are designed to prevent groundwater contamination from point and non-point sources of pollution, to clean up pollution sources, and to monitor and assess groundwater quality (ODEQ 2025). As part of its strategic plan, DEQ places high emphasis on protecting human health. Within the water quality program, this is achieved through work on watershed health, basin assessments, discharge permitting, nonpoint source controls, water quality standards and protecting beneficial uses. As surface water resources are used to capacity across the state, Oregon

communities and businesses are becoming more dependent on groundwater resources, and they expect those resources to remain clean, available, and usable.

There is a high level of coordination to integrate the drinking water source area information and priorities into other agency programs, including toxics reduction, pesticide stewardship partnership implementation, emergency/spill response, hazardous waste cleanup, water quality permitting, and other programs that impact groundwater resources. Many DEQ programs prioritize public drinking water source areas in their statewide strategic planning for implementation. For example, the DEQ underground storage tank cleanup program prioritized and addressed 99 leaking tanks in the source areas adjacent to public water system wells based on the 2005 Source Water Assessment data.

2.0 Groundwater characterization and risks

This section provides an introduction to the groundwater resources in Oregon, an overview of what makes groundwater susceptible to contamination, and highlights of important and/or unique groundwater issues in Oregon.

Groundwater is an essential Oregon resource. By law, all surface and groundwater in Oregon belongs to the public. To protect this valuable resource, the Oregon legislature passed laws to prevent groundwater contamination, conserve and restore groundwater, and maintain the high quality of Oregon's groundwater resource for present and future uses. DEQ implements Oregon's groundwater protection program to monitor, assess, protect, and restore the quality of Oregon's groundwater resources. Because the sources of groundwater contamination and consumers of groundwater cross all boundaries, DEQ also engages with other state agencies, federal agencies, private and public organizations and individuals to improve and protect groundwater quality. The Oregon Water Resources Department has significant groundwater authorities related to issuing and regulating water rights, oversight of the demands on the state's water resources, providing water resource data, and facilitating water supply solutions (especially necessary in drought conditions).

Groundwater in Oregon has many valuable uses and functions:

- Groundwater makes up about 95 percent of available freshwater resources.
- Groundwater is the primary source of drinking water, and its use is increasing.
    - Of Oregonians receiving drinking water from a public water supply, an estimated 22% of Oregon residents rely on public water systems that solely depend on groundwater.
    - Many public water systems use both groundwater and surface water sources. Around 80% of Oregon residents rely on groundwater for at least a portion of their drinking water sourced from public water supplies.
    - An estimated 350,000 private drinking water wells exist in Oregon today providing 23% of Oregon's residents with potable water.
- Oregon's businesses require clean groundwater for industries such as food processing, breweries, dairies, manufacturing, and computer chip production.
- Groundwater provides irrigation water for Oregon agriculture and water for livestock.

- Groundwater supplies base flow for most of the state's rivers, lakes, streams and wetlands. In many streams, the inflow of cool groundwater may be essential to reduce stream temperatures to the range required by sensitive fish species.

2.1 Groundwater susceptibility

An understanding of the fundamentals of groundwater hydrology is essential for effective protection of groundwater used for public water supply. All water below the land surface, filling even the smallest voids in rocks, is referred to as groundwater. Groundwater occurs in several zones and may be confined or semi-confined by geologic layers underground. The groundwater immediately below ground surface is considered the water table (or shallow) aquifer and this groundwater is generally more susceptible to contamination from the surface. Recharge to the water table aquifer occurs as water percolates from the surface through the soils and rocks until it reaches the saturated zone of water. This water table aquifer is technically an "unconfined aquifer" as there are no rock layers that prevent the downward movement of water percolating from the surface. Where groundwater is overlain by an impermeable layer or "confining bed", the water is said to be a "confined aquifer". In general, the confined aquifers are less susceptible to contamination from the surface. It is important to recognize that no confining layer is completely impermeable, so even confined aquifers can become contaminated.

Drinking water wells in Oregon tap into both unconfined and confined aquifers. As part of OHA and DEQ's drinking water source protection work, the "drinking water source area" for each public water system well was calculated/modeled and mapped. The source areas are the 10- to 15-year water supply for each well. **Figure 1** provides a statewide view of the drinking water source areas for Oregon's approximately 2150 public water systems. Figure 1 includes the source areas for 3400 wells that are part of those 2150 groundwater public water systems in Oregon. Many public water systems have more than one well to serve their water supply needs. The wells labeled as "Groundwater Under the Direct Influence" are those that receive a direct contribution from a surface water body, such as a nearby river. Consequently, these public water systems have both groundwater and surface water (watershed) source areas. An interactive Individual maps can be accessed for each Oregon public water system on **DEQ's Drinking Water Source Protection website.** As discussed in Section 1.1.4 and below in Section 2.2.1 each public water system has also received a source water assessment provided by DEQ and OHA. One component of the source water assessment is the individual water system map of the drinking water source area. See section 2.2.1 for more information.

As part of the U.S. Geological Survey National Water-Quality Assessment Program, a study was published in 2013 on factors that affect the vulnerability of water from public-supply wells to

contamination (Eberts et al 2013). In general, the vulnerability of the water from public-supply wells to contamination is a function of contaminant input within the area that contributes water to a well, the mobility and persistence of a contaminant once released to the groundwater, and the ease of groundwater and contaminant movement from the point of recharge to the open interval of a well. Preferential flow pathways—pathways that provide little resistance to flow—can influence how all other factors affect public-supply-well vulnerability to contamination. This kind of information can enable resource managers to prioritize actions for sustaining a high-quality groundwater source of drinking water.

In the USGS NAWQA study, each of the drinking water source areas were also assessed for characteristics that determine the well's susceptibility. The susceptibility of a drinking water well to contamination depends on both the well characteristics and the land uses and activities in the vicinity of the well(s). Well characteristics that are contributing factors for susceptibility include the depth to the aquifer, the well's construction, and the presence/absence of other nearby wells. Natural conditions that may contribute to higher contamination risks include the presence/absence of confining layers, amount of local precipitation and irrigation, and other related factors (USNRC 1993).

Anthropogenic activities and pollution sources can be a risk to a drinking water well that serves as a private or public water system source. Groundwater is susceptible to contamination from many different land uses and activities. Common potential sources of pollution within drinking water source areas include gravel quarries and other mining sites, animal management areas (including permitted confined animal feeding operations), onsite wastewater systems (domestic or industrial), fuel and hazardous material storage/use locations, irrigated agricultural areas, and solid waste handling sites (landfills or transfer stations). As described in more detail below, the Source Water Assessment reports identified a broad range of these "potential contaminant sources" for each drinking water source area.

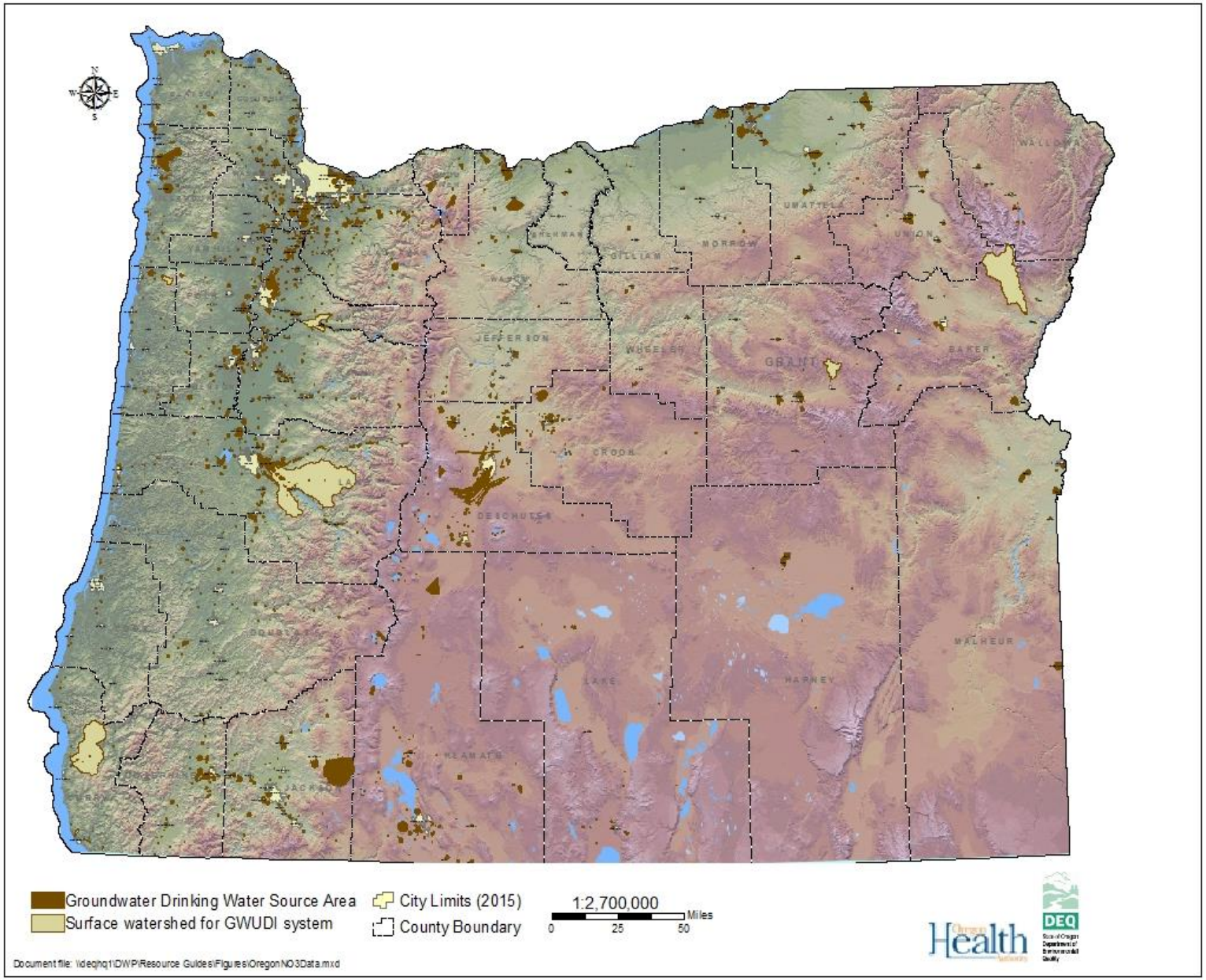

Figure 1. Drinking Water Source Areas for Public Water Systems Using Groundwater

2.2 Oregon public water systems

Public water systems in Oregon are regulated by the Oregon Health Authority -- Drinking Water Services. In Oregon, public water systems with 4 or more connections or serving more than 10 people for at least 60 days of the year are regulated. There are approximately 3,300 actively listed public water systems in Oregon as of January 2025 and most of these (almost 90%) use groundwater wells or springs.

2.2.1 Source water assessments

Amendments to the federal Safe Drinking Water Act in 1996 required that Oregon delineate the individual drinking water source areas for public water systems and develop source water assessments that identify potential sources of pollutants (USEPA 1996). Accurate source area mapping and visual resources to share with community residents and officials is one of the most important and valuable assets a public water system can have. Understanding the source water assessment is the first step in developing protection strategies to address potential risks. The source water assessments provide a broad view of information that is intended to be supplemented and refined with local knowledge from the water system, community, and other interested parties. This resource guide offers resources to help water systems and communities enhance assessment(s), build partnerships, and to develop meaningful strategies to reduce risk and improve resilience.

The assessment reports for each public water system provide community officials with detailed information on the watershed or recharge area that supplies their well, spring, or surface water intake and identify potential risks within the source area and identify potential risks within the source area, including both point and nonpoint sources of contamination.

- Point sources come from a single, identifiable origin, such as a wastewater treatment plant outfall.
- Nonpoint sources are more diffuse, with no single origin, such as runoff from agricultural land.

These potential risks were identified through a review of nine agency databases (DEQ, US EPA, State Fire Marshall, etc.), interviews with public water system officials, a windshield survey and other data sources. Each assessment also includes descriptions of land uses or activities considered potential risks along with individual maps showing locational data.

Based on the type of facility and nature of potential contaminants used, different contaminant sources can represent a low, moderate or high risk to the water system. The advisory committee

that developed the state's Source Water Assessment Plan also developed the risk ratings for potential contaminant sources. The advisory committee's goal was to assess potential impact, or risk, from various land uses and activities using worst-case assumptions. For example, worst case scenario could mean the facility or activity is not employing good management practices or using pollution prevention techniques or technologies. One of the most important aspects of the source water assessment process was determining the "susceptibility" of each system to contamination. Susceptibility in the assessment was defined as the potential for contamination in the source area to reach the public water system well(s). Whether or not a particular drinking water source becomes contaminated depends on three major factors: 1) the occurrence of a land use/activity that releases contamination, 2) the location of the release, and 3) the hydrologic and/or soil characteristics in the source area that allow the transport of the contaminants to the well. (It should be noted here that if the well is constructed properly, the risk of well contamination can be significantly reduced.) The assessments contained basic maps of susceptible areas within the source area for public water wells.

The 2000-2005 assessment reports are still available for public water systems from DEQ and OHA. Reports for groundwater sources are available by contacting OHA (541-726-2587).

Maps and downloadable statewide GIS shapefiles of drinking water source area data are available on **DEQ's drinking water source protection website**.

Drinking water source areas, land use/activities, etc. are shown on **DEQ's Interactive Map Viewer.**

The Interactive Map Viewer is a location-based system showing DEQ and OHA data and information. The groundwater source areas are also mapped on the Oregon State University-Institute for Natural Resources website and are also available from the Oregon Geospatial Data Clearinghouse. The information provided within the original assessment reports served as a basis for communities to develop strategies to reduce the risks of pollution in their drinking water sources.

2.2.2 Updated source water assessments

As better data became available, the OHA and DEQ began updating Source Water Assessments for public water systems in 2016. These updates for groundwater systems include new information on potential contamination sources and protection recommendations and also include new wells for new or existing public water systems since 2005.

Since the first source water assessments, DEQ has improved its GIS capabilities and expanded data for identifying potential pollution sources. New datasets, such as hazardous material

storage, pollution links to water quality, roadway and river networks, outfall locations, underground injection wells, land use from imagery, and more, have enhanced understanding. The program now uses over 40 GIS datasets to help public water systems identify potential threats.

Updated assessment reports provide public water systems with precise GPS locations of wells and potential contamination sources. Maps include regional views, aerial base maps, human-caused land uses, pollutant sources, and historic landslides. Summary tables outline potential risks, and system susceptibility is assessed based on both natural recharge conditions and land use activities.

The updated assessment reports also include a variety of resources so that effective pollution prevention plans can be developed to prevent or reduce any groundwater contamination. Appendices provide information for moving forward to develop and implement source water protection, lists of websites and resources available to public water systems and community members seeking technical assistance for work on watershed protection, and descriptions and contact information for grants and loans to fund both drinking water infrastructure and source protection projects. Many of those same materials have been expanded with more information and detail in this Resource Guide in Section 3 on Partners, Resources and Funds.

More information on the groundwater USWA reports can be found on the **Oregon Health Authority's Drinking Water Source Protection website** and reports for groundwater sources are available by contacting OHA (541-726-2587).

2.3 Using Oregon data to identify priorities

Groundwater contamination is a serious issue in some areas of Oregon. Many state and federal agencies have studied the quantity and quality of groundwater in specific areas, but there are still significant gaps and data needs to fully characterize Oregon's groundwater resource. This section will summarize some of the best sources of data that help DEQ to determine the priorities for groundwater contaminant reduction work in the drinking water source areas.

Public water systems in Oregon are subject to Safe Drinking Water Act regulations, which includes requirements for water systems to test their finished (or treated) water for substances with established Maximum Contaminant Levels before delivery to consumers. The detection data results for public water systems are publicly available information and can be accessed online through the Oregon Health Authority's Drinking Water Data Online website. The Drinking Water Data Online website also contains information about basic water system information, public notices, enforcements, violations, and chemical testing schedules. Go to the Oregon

Health Authority's **Drinking Water Data Online website** to look up information for public drinking water systems.

The results of routine water testing can be evaluated to determine drinking water priorities for a particular water system. Detections of contaminants in regulatory monitoring are a clear indication that there is an existing pathway of contamination from the landscape to the waterbody and intake. Public water systems that have contaminant detections can develop targeted protection strategies to reduce or eliminate the source(s) of contamination in their drinking water source.

Figure 1 (above) provides a statewide view of the drinking water source areas for Oregon's approximately 2150 public water systems using groundwater. In terms of total land area, the drinking water source areas for groundwater public wells are not a significant portion of the state. However, these relatively small areas are critical for Oregon's communities. Groundwater is susceptible to contamination from many different land uses and activities within those source areas. Groundwater may be susceptible to organic, inorganic, and pathogen pollutants from both historical and existing land uses.

For purposes of providing statewide guidance to public water systems, drinking water source protection priorities could be determined by either:

A) Compile the predominant land uses, evaluate overall risk to water quality, then develop and prioritize strategies to address the highest risks, or
B) compiling monitoring data to determine the most significant contaminant or chemical in groundwater at or near public water systems.

As previously discussed, the source water assessment reports identified the geographical areas of groundwater source areas supplying the public water system wells (for the next 10-15 years). Each assessment provided an inventory of the potential contaminant risks identified at the time of assessment completion. A review of all statewide source water assessment 2005 data within drinking water source areas found over 15,750 potential contaminant risks (in a total of 134 categories). Based on statewide occurrence in source areas for the public water systems served by groundwater, the following were identified as the top 5 categories for potential contaminant sources based on the source water assessment results:

1. **High Density Housing** (more than 1 home per half acre): Improper use, storage, and disposal of household chemicals including cleaners, vehicle maintenance products, pool chemicals, pesticides and fertilizers may impact the drinking water supply. Stormwater run-off or infiltration may carry contaminants to drinking water supply.
2. **Transportation Corridors** – Highways (plus high use roads): High vehicle usage increases the risks for leaks or spills of fuels and other hazardous materials that may

impact drinking water. Over-application or improper handling of pesticides or fertilizers in the right-of-way may impact the drinking water supply.

3. **Above Ground Tanks**: Spills, leaks, or improper handling of stored materials may impact the drinking water supply.
4. **Crops – Irrigated**: Over-application or improper handling of pesticides or fertilizers may impact drinking water. Excessive irrigation may cause transport of contaminants or sediments to groundwater/surface water through runoff. NOTE: Drip-irrigated crops such as vineyards and some vegetables, as well as computer-based advanced management systems, are considered to be a lower risk.
5. **Underground Storage Tanks**: Spills, leaks, or improper handling of stored materials may impact the drinking water supply.

The assessment inventory results were an important summary of *potential* risks to Oregon public water systems. DEQ used this list as a first step in prioritizing drinking water source protection planning and implementation after delivery of the original source water assessments. **Figure 2** is a graphic showing the approximate percentage of the land uses within drinking water source areas for public water systems using groundwater. The data on land uses can only be considered approximate due to limitations within the GIS layers. Not all counties have data that is accurate for all types of land uses under statewide planning.

Public water systems in Oregon are subject to Safe Drinking Water Act regulations. OHA implements the SDWA regulations that require public water systems to test their finished or treated drinking water before delivery to customers. Regulatory data can be evaluated to determine drinking water priorities using the detections found in groundwater systems. OHA does not routinely collect samples of source water prior to treatment. There are some data on well water quality prior to treatment, but it is limited. The Safe Drinking Water Information System data for treated groundwater is still useful for prioritizing the contaminants since the public water systems must address these in the raw source water. Using Oregon SDWIS data from 1981 to 2012, the *highest number of contaminant detections in drinking water after treatment include nitrates, arsenic, pesticides, fuel constituents, phthalates, and volatile organic compounds such as tetrachloroethylene*. Detections of contaminants in regulatory monitoring are a clear indication that there is an existing pathway of contamination from the ground surface to the intake of a well, even when the individual contaminant levels do not exceed a regulatory threshold.

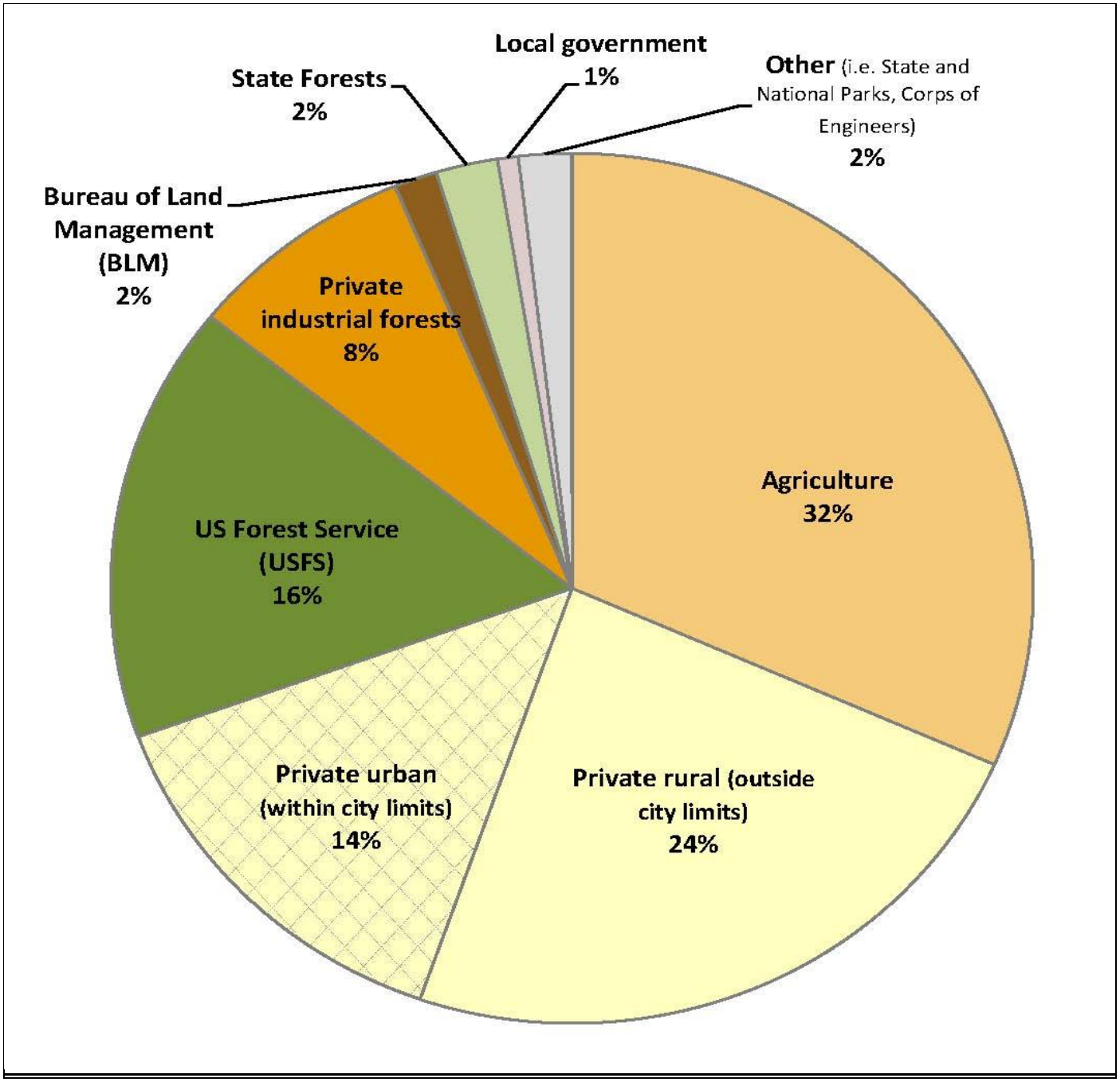

Figure 2. Approximate Percentage of Land Uses within Drinking Water Source Areas for Groundwater

2.3.1 DEQ groundwater monitoring

DEQ's Laboratory collects data as part of the statewide monitoring and assessment program for groundwater. Between 1980 and 2024, DEQ conducted multiple groundwater quality assessments. Based on that ambient statewide groundwater monitoring, the *most commonly detected contaminant in Oregon is nitrate, followed by pesticides, volatile organic compounds, and bacteria*. Data collected between 1980 and 2000 show that 24% of 1156 wells sampled statewide exceed the drinking water standard for arsenic. Sixteen percent of 2187 wells sampled exceed the drinking water standard for nitrate. Thirty-three percent of Willamette Valley rural wells contain at least one pesticide (some of these are "legacy" or historic uses, not currently used). Most pesticide detections were below their associated MCLs or screening levels, however, additive or synergistic toxicity has not been performed, thus not incorporated into the MCLs or screening levels. The DEQ Laboratory ambient groundwater quality studies found a majority of study areas show some impairment or reason for concern. More information on ambient monitoring programs can be found at **DEQ's website on Groundwater Protection in Oregon.**

The DEQ Laboratory staff also collects over 500 private domestic well water samples each year from the groundwater management areas in Oregon. Over 90 wells, including many private domestic wells, are sampled on a routine basis. DEQ staff monitor wells in the Northern Malheur County, Lower Umatilla Basin and Southern Willamette Valley GWMAs several times each year to gather nitrate and other water quality information. This data provides a characterization of the aquifers supplying the domestic wells in GWMAs. *Area-wide contamination in these areas is associated with nitrates and pesticides* from nonpoint sources such as agricultural practices and rural residential septic systems (more about the GWMAs in next section).

In its 2013-2015 budget, DEQ received funding from the legislature to conduct new statewide groundwater monitoring. The Statewide Groundwater Monitoring Program began collecting water quality data in 2015 to further assess ambient groundwater conditions, identify emerging groundwater quality problems, and inform groundwater users of potential risks from contamination. To implement this work, one to two regional groundwater studies are conducted annually with the goal of monitoring Oregon's vulnerable aquifers over a 10-year period. Regional study areas are selected based on previously identified groundwater vulnerabilities, nitrate data collected during real estate transactions as required by statute (ORS 448.271), time elapsed since water quality data were collected, analysis of potential contamination sources, and community interest to help with recruitment of volunteer participants. All studies include analysis of nitrate, arsenic, bacteria, pesticides, and common ions in 60 to 100 wells. Additional analyses are added based on local risk factors and program capacity. Recent study areas have included the Mid-Rogue Valley Basin in 2015, the North Coast Basin in 2015 and 2016, the Walla Walla Basin in 2016, the Mid-Willamette Basin in 2017, Harney County in 2018, the Klamath

Basin from 2019 to 2022, and the Southern Deschutes County study in 2023 and 2024. Completed study reports are available on **DEQ's Groundwater Protection page.**

As one example, The Mid-Rogue groundwater study area spanned Jackson and Josephine counties, including the communities of Grants Pass, Shady Cove, Central Point, Medford and Ashland. DEQ staff sampled 107 private domestic wells for nitrate, arsenic, bacteria, pesticides, metals, and common ions over two sampling events in February and October 2015. These domestic wells serve as sources of drinking water, along with other household uses such as for farm animals, outdoor garden and lawn irrigation, etc.

Key findings from the Mid-Rogue Statewide Groundwater Monitoring data include:

- 21% had **nitrate** levels above what is considered natural [3 milligrams per liter (mg/L) or higher] in the area. Where well logs were available, the data shows that elevated nitrate concentrations were found only in wells with shallow water bearing zones. Four wells had nitrate concentrations above the Safe Drinking Water Act Maximum Contaminant Level of 10 mg/L, set by the US EPA for public water systems.
- 22% had **arsenic** detections; 6 wells had arsenic levels above the SDWA MCL of 10 micrograms per liter (µg/L); most arsenic sources are natural in Oregon.
- **Coliform bacteria** were detected in 43% of wells tested.
- 21% of the wells tested had **pesticides or pesticide breakdown products**. All pesticide detections were below their associated screening levels; however, additive or synergistic toxicity has not been performed, thus not incorporated into the MCLs or screening levels. Pesticide detections and concentrations were slightly higher in the winter than the fall. Many of these are legacy pesticides, no longer used.
- 53% of the study wells had detections of **manganese**, 15 were above the SDWA MCL, with two of the wells above the Lifetime Health Advisory level of 300 µg/L; manganese is predominantly from natural sources.

The results of each of the Statewide Groundwater Monitoring studies are used to focus outreach and education activities that encourage private well owners to routinely test wells for nitrate, bacteria and arsenic and encourage well protection and maintenance best practices to protect the aquifer. The data will also serve to provide regional information on Oregon aquifers and ambient groundwater conditions and can assist public water systems by identifying regional issues that may impact public water supplies.

2.3.2 Drinking water source monitoring project

In a collaborative project with the Oregon Health Authority initiated in 2008, DEQ implemented a Drinking Water Source Monitoring project that conducted water quality testing for chemicals

in the *source water for public water wells*. During the period of 2008 through 2014, Oregon DEQ tested the source waters prior to treatment at 48 groundwater wells. Sample locations were selected based on their proximity to water systems that were either at risk due to nearby sources of contamination or had already shown signs of contamination (primarily nitrate). This provided a characterization of the aquifers supplying public water wells, as well as information on the influence from the drinking water source areas. The samples were analyzed at the DEQ Laboratory for over 250 Oregon-specific herbicides, insecticides, pharmaceuticals, VOCs (including cleaners), fire retardants, PAHs, personal care products, and plasticizers. The results showed very low levels of detections---- water quality impacts from various land uses and activities in typical groundwater aquifers. *Of all groundwater sources, 85% had wastewater constituents and 39% of the samples had pesticide detections.* With the exception of one detection (arsenic), the levels of all parameters detected were very low and met health standards where available on an individual basis.

As part of the Drinking Water Source Monitoring project's susceptibility analysis, DEQ also evaluated land uses/activities for source areas of each of the intakes and wells. Project staff conducted further evaluation of potential sources of contaminants on a site-by-site basis for each contaminant detected. These sources are likely from multiple land uses and activities in the watershed or source area for the wells. Since the levels were very low in this initial sampling project, OHA and DEQ will use the data analysis to determine potential associations with sources and to provide technical assistance to public water systems to reduce concentrations of source water contaminants.

Key findings of the data analysis from the Source Monitoring project:

<u>Potential Sources of Contaminants Identified in the Drinking Water Source Monitoring Project</u>

- **Microbes (E. coli)** are waste byproducts and are potentially from upgradient wastewater discharge, high-density onsite septic systems discharging to groundwater, heavy recreational uses, filtered surface water, and underground injection control wells.
- **Phthalates** are contaminants from plastics, perfumes, car care products, cosmetics and flooring. Phthalates in groundwater can come from wastewater discharges and onsite septic systems since the compounds are found in so many household products---for example, the breakdown of plastics or flooring materials. Phthalates can also come from submersible pumps, wiring, and electrical tape used in well equipment materials.
- **Pesticides** can enter groundwater from agricultural fields, forests, urban lawns, gardens, and roadside spraying. Results from this drinking water source monitoring suggest the primary sources are irrigated crops, orchards, and high-density housing. Household lawn applications of pesticides can contribute urban use pesticides to local groundwater resources (and can occur at higher concentrations in those areas).

- **Pharmaceuticals** are commonly detected in groundwater that is surrounded by high-density housing using onsite wastewater disposal. It is well documented that drugs are primarily found in human urine and can also come from improper disposal of unused drugs in toilets. Some antibiotics can come from livestock wastes.
- **Steroids and hormones** are very likely linked to human waste byproducts in wastewater released through onsite septic systems into groundwater. The most common marker of these byproducts is coprostanol, found in human feces. Some hormones can also come from livestock wastes.
- **Metals** are very common in Oregon's groundwater resources from natural geologic formations but are also found in stormwater runoff/infiltration from urban areas and agricultural fertilizer applications. Arsenic is commonly found in Oregon groundwater, especially in areas of volcanic rocks.

Many of the low-level detections from the Drinking Water Source Monitoring are chemicals in drinking water sources that are not currently regulated. Many volatile organic compounds are regulated, so this is an example of chemicals not tested in this project. Sampling and analyzing for low levels of a broad range of chemicals in waters of the state is important for several reasons:

- the detections become important priorities for prevention because we lack health standards for many of them,
- the detections are priorities for prevention because many of the pollutants cannot be removed through standard treatment technologies (Glassmeyer et al 2017)
- additive or synergistic toxicity has not been included in developing MCLs or screening levels for chemicals that are present in finished drinking water,
- the data is used to prioritize future water quality monitoring,
- the detections provide DEQ and others the ability to prioritize pollutant reduction efforts on activities and land uses that potentially impact groundwater.

Based on the sets of data presented in this section, DEQ will provide general groundwater quality protection recommendations for all potential contaminants but will *focus the more detailed recommendations and prevention tools in this Groundwater Resource Guide on nitrates and pesticides*.

*In Oregon, **most groundwater systems do not have any treatment**, and those that do have some type of treatment utilize chlorine as treatment. Chlorine is not considered an effective treatment for pesticides or nitrates. This places even more emphasis in reducing or preventing pollutants in source waters.*

2.4 Nitrate data and susceptibility

Nitrogen is considered a macro-nutrient and one of the most important nutrients necessary to support plant growth and the food system we depend on. Nearly 80% of all nitrogen is contained in the earth's atmosphere and therefore it surrounds us wherever we go. Despite the abundance of nitrogen in the air, only a comparatively small portion of nitrogen—fixed nitrogen—is biologically available to plants, and thereby to human beings. Nitrogen is made available to agricultural crops through the form of ammonium nitrogen (NH_4^+) or nitrate nitrogen (NO_3^-). Ammonium is positively charged and binds well to negatively charged soils and organic matter. Nitrate binds poorly to most soils and therefore is more susceptible to leach below the root zone and on into aquifers. Alternatively, nitrate can be mobilized as runoff during peak rain events and consequently pollute our lakes and rivers.

It is important to note that in addition to the unintended off-site movement of nitrogen through fertilizer application, septic system effluent and animal wastes are also significant sources of excess nitrogen in the natural environment. Considerable advancements in agricultural conservation practices such as precision agriculture have demonstrated the potential to reduce off-target movement of fertilizers and pesticides.

Nitrate levels of up to three parts per million in well water may be naturally occurring or possibly indicate some low level of contamination but are considered to be safe for consumption. EPA has set a maximum contaminant level of 10 ppm for nitrate (NO3-N) for drinking water. Nitrate levels above 10 ppm may present a serious health concern for infants and pregnant or nursing people. Adults receive more nitrate exposure from food than from water. Infants, however, receive the greatest exposure from drinking water because most of their food is in liquid form. This is especially true for bottle-fed infants whose formula is reconstituted with drinking water with high nitrate concentrations. Nitrate can interfere with the ability of the blood to carry oxygen to vital tissues of the body in infants of six months old or younger. The resulting illness is called methemoglobinemia, or "blue baby syndrome". Little is known about the long-term effects of drinking water with elevated nitrate levels. Some research has suggested that nitrate may play a role in spontaneous miscarriages, thyroid disorders, birth defects, and in the development of some cancers in adults (Ward et al 2005). Recent human epidemiologic studies have shown that nitrate ingestion may also be linked to gastric or bladder cancer (USDHHS 2010).

For more information on nitrate in drinking water, see OHA's fact sheets on **Nitrate in Drinking Water from Public Water Systems** and **Nitrate in well water** for domestic wells.

While every community should ensure they reduce nitrate contamination of drinking water, small and rural communities may need to pay heightened attention due to the higher prevalence of agricultural activities and associated fertilizer applications, septic systems, and animal wastes.

Nitrate that leaches into groundwater can sometimes discharge into streams and rivers, thereby causing elevated nitrate levels in surface waters. There are several sectors of development that contribute to the transport of nitrate to groundwater. These sectors include agriculture (e.g. fertilizer application, fertilizer manufacturing, composting operations, animal waste from livestock, nitrogen fixing crops), residential (e.g. septic systems, lawn and garden fertilizer, stormwater), and also some industrial sources. By applying nitrogen fertilizers, burning fossil fuels, and replacing natural vegetation with nitrogen-fixing crops, humans have doubled the rate of nitrogen deposition onto and into the land over the past 50 years (Vitousek et al 1997).

The Domestic Well Water Testing and the Real Estate Transaction program requires sellers of a property in Oregon with a domestic private well to have the water tested for arsenic, nitrate and total coliform bacteria. Laboratory results must be sent to the buyer of the property and OHA. The nitrate data has a statewide distribution, so the data serves as an important characterization of the groundwater quality in rural areas. For more information on the program and the data generated by the program, see **OHA's Well Testing and Regulations website**.

In 2011, the DEQ assessed nitrate risk at 70 Oregon Public Water Systems that either exceeded or were at risk of exceeding the nitrate MCL. The goal was to identify the best strategies for contamination prevention and drinking water source protection. The full report on Factors Influencing Nitrate Risks at Oregon Public Water Systems can be found on **DEQ's Publications and Technical Assistance web page**. The analysis found several key risk factors:

- Aquifer Characteristics: Confined or isolated aquifers are less susceptible to contamination.
- Well Construction: Poorly built, unsealed, or aging wells can allow contaminants to enter from the surface or shallow aquifers.
- Soil Sensitivity and Nitrate Leaching: Soil conditions can help predict nitrate contamination risk.
- Other Contributing Factors: Irrigation and fertilizer use, manure or wastewater application, crop type, tillage practices, organic matter content, and septic system density all influence nitrate levels.
- Regional Impacts: Even if a water system has few local contamination sources, larger regional factors can still affect water quality.

Water samples collected from both private and public wells in Oregon over the past twenty years show that nitrate levels in some wells may approach or even exceed the level considered

safe for drinking water. US Geological Survey studies indicate that about 20 percent of the wells in agricultural areas of the U.S. exceed the Safe Drinking Water MCL set by the US EPA of 10 mg/L. The state of Oregon has not set aside resources to determine the extent of groundwater nitrate levels throughout the state. Based on limited monitoring, Oregon has designated three Groundwater Management Areas because of elevated nitrate concentrations in groundwater. These include the Lower Umatilla Basin GWMA, the Northern Malheur County GWMA, and the Southern Willamette Valley GWMA. Each one has developed a voluntary action plan to reduce nitrate concentrations in groundwater (see Section 7.0).

Figure 3 illustrates a compilation of Oregon nitrate data showing potential areas of groundwater quality concern for nitrates. This figure includes data from public water systems (SDWIS), the Real Estate Transaction data, and DEQ Laboratory's LASAR database. For public water systems, DEQ consulted a variety of sources of information and technical data to find tools that identify areas that may be susceptible to nitrate infiltration into groundwater. Determining the relative susceptibility to nitrates within a drinking water source area will allow a public water system to focus technical assistance and resources on the highest priority sections of the drinking water source area.

Figure 4 illustrates the predicted values in Oregon. The values are not a measurement of actual conditions, but a predicted value based on existing data and conditions. For a full discussion of methods and limitations, see References, Section 8 (Nolan et al 2006).

The USDA Natural Resources Conservation Service provides soil data and information produced by the National Cooperative Soil Survey. NRCS's "Web Soil Survey" provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information. Soil surveys can be used for local (ex: family farm) or regional (ex: drinking water source area) planning. Onsite investigation is needed in some cases, such as soil quality assessments and certain conservation and engineering applications.

The Web Soil Survey data was used to produce the map shown in **Figure 5**. The data used to produce this map is an evaluation of the potential for soils to allow nitrate-nitrogen to be transmitted below the root zone by percolating water under non-irrigated conditions. The nitrogen leaching potential ratings are based upon inherent soil and climate properties and do not account for management practices such as nitrogen fertilizer application rates and timing, or crop selection/rotation.

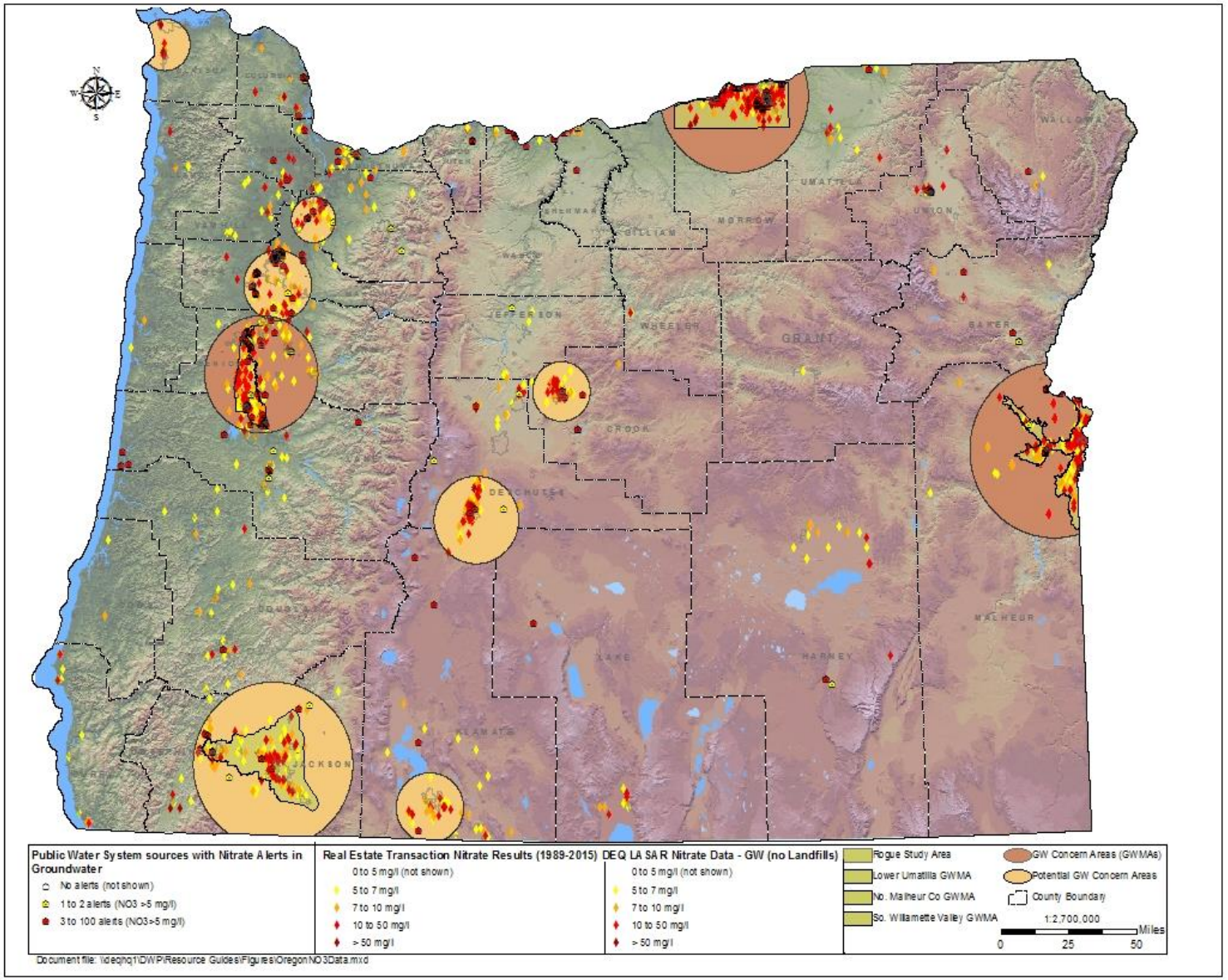

Figure 3. Compilation of Oregon Data for Nitrates in Groundwater

The map shown in Figure 5 is an overview of statewide soil nitrate leaching potential. For site-specific work, such as for a drinking water source area, an "Area of Interest" can be set, and then printed or downloaded for a localized map from the USDA Web Soil Survey website. The instructions to produce a site-specific area of interest for nitrogen leaching potential is provided in Section 5.0.

Nitrate pollutants can come from a number of potential sources. The development and implementation of strategic actions to reduce nitrate pollution will likely require research and mapping of the site-specific susceptibility within each drinking water source area.

When using these site-specific soil maps, it is important to keep in mind that interpretations and planning of conservation practices based upon these maps should be done through the involvement of a partner organization that specializes in natural resource conservation. The organizations that can most likely assist with creating and using site-specific nitrate susceptibility maps include the local Soil and Water Conservation Districts, Watershed Councils, NRCS district, the OSU Extension Service, or others. For a list of local county-level resources, see Partner Organizations in Section 3.0.

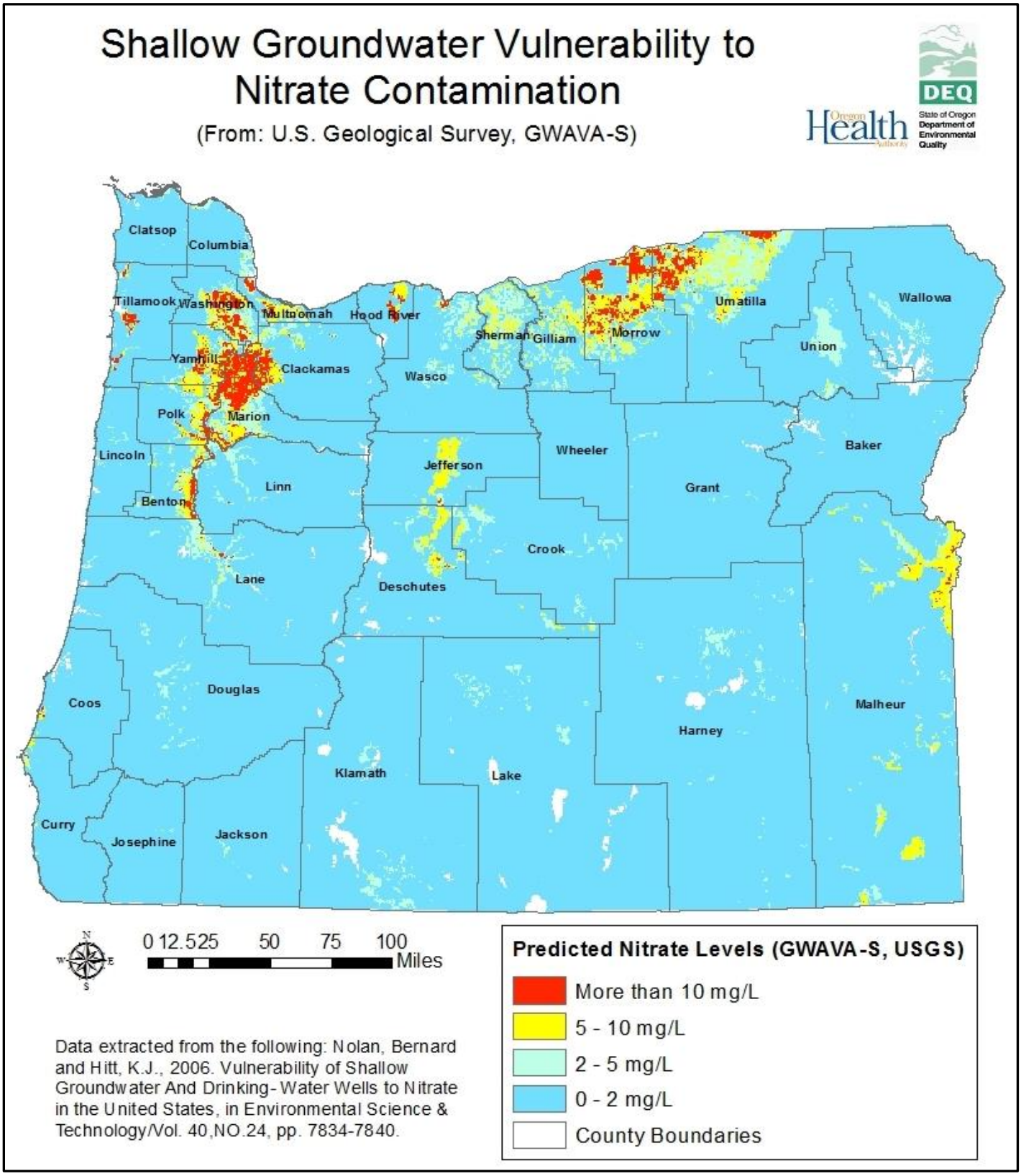

Figure 4. Statewide predicted groundwater vulnerability to nitrate contamination

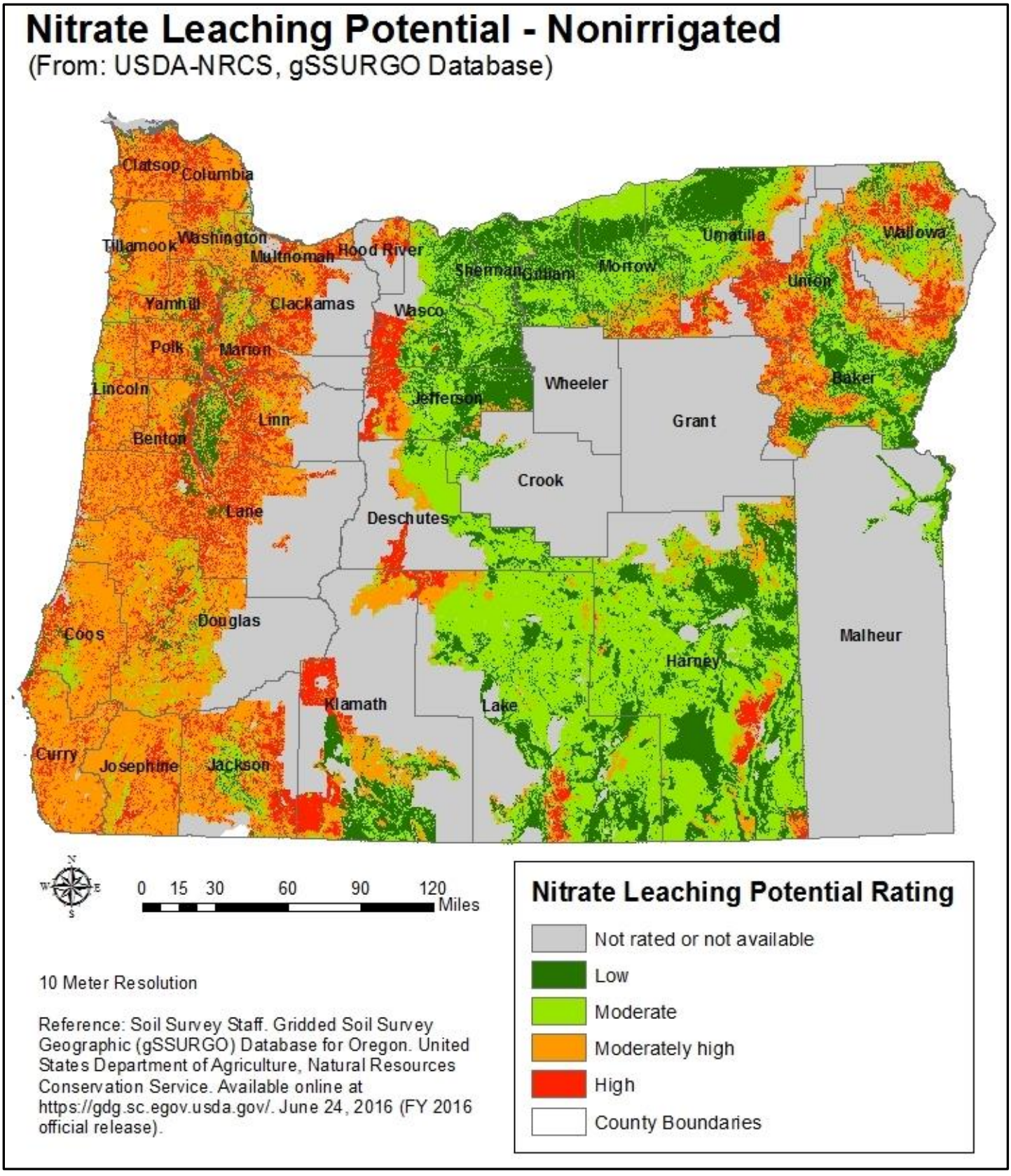

Figure 5. Statewide nitrate leaching potential – non-irrigated

2.5 Pesticide data and susceptibility

Pesticide contamination of groundwater is a subject of national importance because groundwater is used for drinking water by about 50 percent of the U.S. population. This especially concerns people living in the agricultural areas where pesticides are most often used, as about 95 percent of that population relies upon groundwater for drinking water. Before the mid-1970s, it was thought that soil acted as a protective filter that stopped pesticides from reaching groundwater. Studies have now shown that this is not the case. Pesticides can reach aquifers below ground from applications to crops, seepage of contaminated surface water, accidental spills and leaks, improper disposal, and even through injection of waste material into wells. The **website for the National Water-Quality Assessment Program of the US Geological Survey** provides the most comprehensive national-scale analysis to date of pesticide occurrence and concentrations in streams and groundwater.

In Oregon and Washington, while pesticide detections do occur, most detections are either localized or at levels far below any regulatory or screening levels. In USGS testing at the national scale, fewer than two percent of the wells focused on agricultural areas had concentrations that exceeded MCLs. Although this suggests that the problem is small at the national scale, our current ability to assess the significance of pesticides in groundwater is limited by several factors. USGS points out that, first, MCLs or other water-quality criteria have not been established for many pesticides and for most transformation products, and existing criteria may be revised as more is learned about the toxicity of these compounds. Second, MCLs and other criteria are currently based on individual pesticides and do not account for possible cumulative effects if several different pesticides are present in the same well. Finally, many pesticides and most transformation products have not been widely sampled for in groundwater and very little sampling has been done in urban and suburban areas, where pesticide use is often high.

Only a limited number of pesticides have a Safe Drinking Water Act "maximum contaminant level" for drinking water set by the U.S. EPA. Additive or synergistic toxicity has not been included in the development of these drinking water standards. There are currently a number of studies examining whether (or how) low levels of chemical mixtures in the environment may be combining to contribute to environmental carcinogenesis; that is, the cumulative effects of individual chemicals may act on cancer pathways to synergistically produce carcinogenic effects at low exposure levels (Goodson et al 2015; Alavanja et al 2005). This is the basis for why environmental health professionals tend to be cautious about the presence of pesticides in drinking water.

The use of pesticides is prevalent in agricultural activities but also exists in municipalities, rural and urban properties, transportation right-of-ways, parks, forestlands, powerline corridors, golf

courses, and others. Pesticides can sometimes be transported by water and air from the area of application to off-site locations, where they may impact beneficial uses such as drinking water.

The Oregon Department of Agriculture has an extensive program that works to prevent off-site movement of pesticides applied to agricultural operations (see Section 6.0 on Land Uses and Regulatory Authorities). Oregon is the national agricultural leader in the production of hazelnuts, blackberries, Christmas trees, peppermint, orchard grass seed, and other seeds. Oregon exports $2.6 billion in raw agriculture products internationally (USDA Economic Research Service- 2013 data). Oregon's success as a leading agricultural producer is partly due to the use of modern chemicals (pesticides) to control the insects, weeds, and other organisms that attack food crops. Of the multiple land uses/activities that use pesticides in Oregon, agriculture ranks at the top of all of those for pesticide use. **Figure 6** provides pesticide use reporting data for Oregon by land use/activity. While these data are almost seventeen years old, we would expect that the breakdown would be similar today if the data were collected and made available.

The effects of past and present land-use practices and pesticide applications may take decades to become apparent in groundwater. When weighing pollutant reduction strategies for protection of groundwater quality, it is important to consider the time lag between application of pesticides (and any other chemicals) to the land and arrival of the chemicals at a well. This time lag generally decreases with increasing aquifer permeability and with decreasing depth to water. In response to reductions in chemical applications to the land, the quality of shallow groundwater will improve before the quality of deep groundwater, which could take decades.

Natural land conditions and land-management practices can affect pesticide distribution, particularly in groundwater. Pesticide concentrations in surface water also vary by season, with lengthy periods of low concentrations punctuated by seasonal pulses of much higher concentrations. Groundwater is most vulnerable to contamination in areas with highly permeable soil and aquifer materials. The entire hydrologic system and its complexities need to be considered in evaluating the potential for pesticide contamination of groundwater. In addition, seasonal patterns in pesticide concentrations are important to consider in managing the quality of drinking water withdrawn from groundwater in agricultural and urban settings.

Understanding the correlations of pesticide occurrence with the amounts and characteristics of pesticides used can help land managers to anticipate and prioritize the pesticides most likely to affect water quality in different land-use settings. **Table 1** lists some of the pesticide transport factors and groundwater vulnerability factors that make portions of the drinking water source area susceptible to pesticide impacts. Section 5.0 will provide several tools that may be useful for reducing off-site migration of pesticides, with the goal of reducing any potential impact to drinking water supply wells. More information on the drinking water standards/benchmarks, and how Oregon regulates pesticides can be found in Section 6.7 on Pesticide Regulations

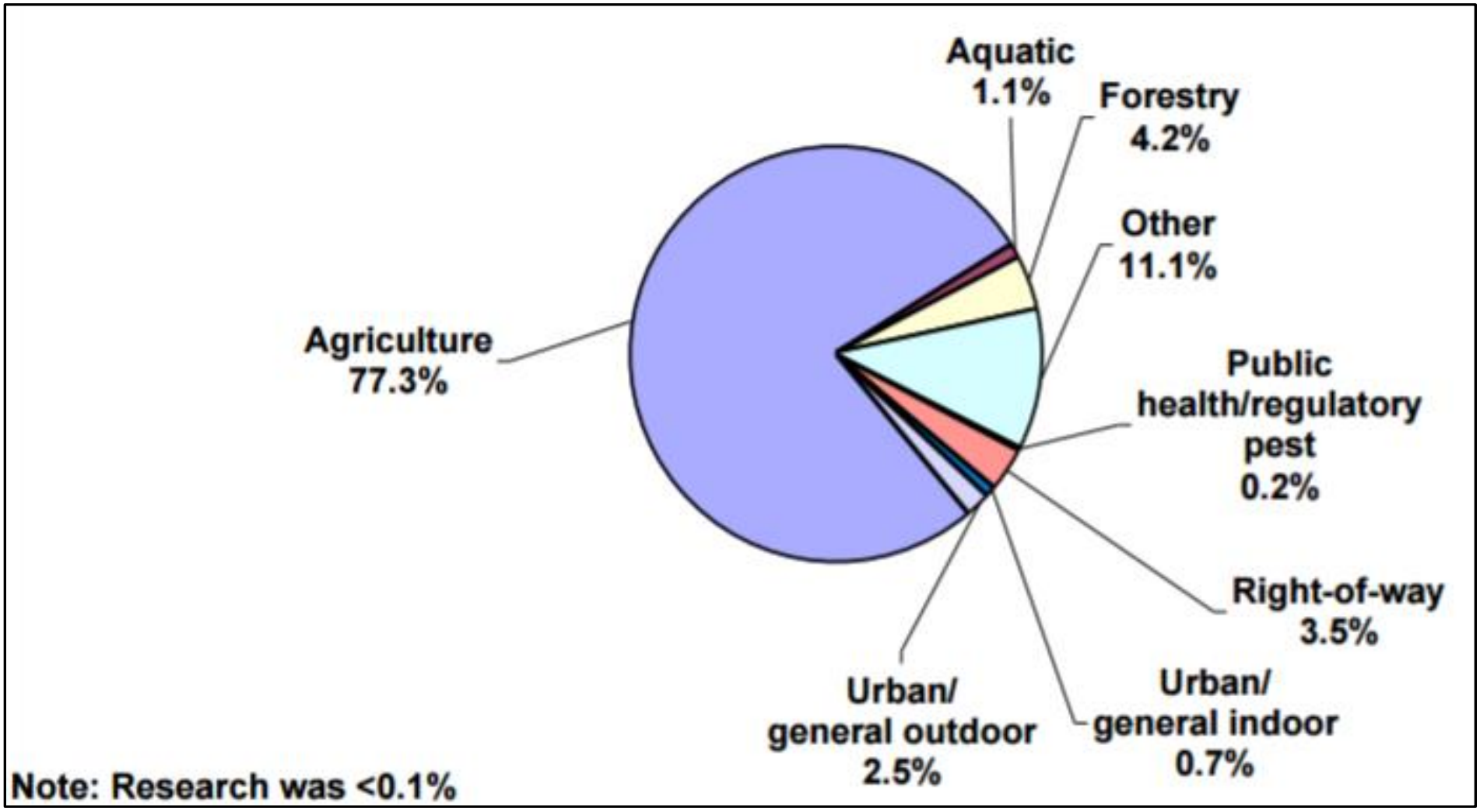

Figure 6. Percentage of Pesticide Active Ingredient by Land Use/Activity in Oregon

Source: Pesticide Use Reporting System: 2008 Annual Report. Oregon Department of Agriculture. June 2009. (**http://www.oregon.gov/ODA/programs/Pesticides/Pages/AboutPesticides.aspx**, December 2016)

Table 1. Factors Influencing Pesticide Transport and Groundwater Vulnerability

Pesticide Transport Factors					Groundwater Vulnerability Factors	
Pesticide Parameters	**Soil Parameters**	**Crop Parameters**	**Climatological Parameters**	**Management Parameters**	**Hydrogeologic Framework**	**Groundwater Flow System**
Organic carbon-normalized sorption coefficient (K_{oc})	Dispersion coefficient	Root density distribution	Rainfall or irrigation rates	Pesticide application rate and timing	Unsaturated Zone	Recharge Rate
Distribution coefficient (K_d)	Saturated water content	Maximum rooting depth	Pan evaporation rates	Pesticide application method and formulation	Confining Unit	Location within flow system (proximity to recharge area)
Aqueous solubility	Field-capacity water content (θ_{FC})	Pesticide uptake rates	Daily maximum and minimum temperature	Crop production-system variables	Aquifer Properties	
Henry's constant	Wilting-point water content		Snow melt	Soil-management variables		
Saturated vapor density	Hydraulic properties		Hours of sunlight			
Gas phase diffusion coefficient	Bulk density (ρ_b)					
Biological half-life	Organic carbon content (f_{oc})					
Hydrolysis half-life	pH					
Oxidation half-life	Cation exchange capacity					
Foliar decay rate	Heat flow parameters					

Source: Adapted from the US National Research Council - Committee on Techniques for Assessing Ground Water Vulnerability. (USNRC 1993).

2.6 Per- and poly-fluoroalkyl substances - PFAS

PFAS compounds are widely detected in the environment due to use across economic sectors since the 1930s and have been used in industry and consumer products because they are resistant to heat, water, oil, grease, and stains. PFAS are used in many different commercial products such as non-stick and protective coatings, stain- and water-resistant products, personal healthcare products, architectural resins, firefighting foams, electronics and paper products, and agricultural pesticides. Substances in the PFAS family are very stable and persistent in the environment (or transform to different PFAS that are persistent), meaning that once released, they do not break down and can build up in the environment, wildlife, and humans.

Oregon legislation defines PFAS broadly as a class of organic chemicals containing at least one fully fluorinated carbon atom (**ORS 459.465 to ORS 459.477**; OR SB543, 2023), which encompasses over 15,000 individual PFAS chemicals. Over the past 20 years, PFAS have been considered an important class of emerging contaminants that, due to their widespread use in consumer and industrial applications, are being detected in drinking water supplies, groundwater, surface waters, landfill leachate, soil, sediment, fish, and air. As a result, thousands of reports on PFAS environmental occurrence and human and animal toxicity have been published. In light of new scientific information on the human health and environmental impacts of PFAS chemicals, the U.S. Environmental Protection Agency declared PFAS an urgent public health and environmental issue facing communities across the country in 2016 and has taken several actions since. The toxicity, persistence, and bio accumulative nature of many of the chemicals in the PFAS class exceed those of many of our regulated chemicals. New Maximum Contaminant Levels for drinking water were introduced in April 2024. EPA and Oregon have only begun to regulate these compounds.

For more information on the new PFAS drinking water rule, see **EPA's Final PFAS National Primary Drinking Water Regulation web page**. For more information on adoption of the new PFAS rule in Oregon, see the **OHA-DWS PFAS Rule web page.** EPA's rule includes routine monitoring of all Community and Non-Transient Non-Community public water systems that must be completed by 2027. EPA's rule would also allow OHA to require action by 2029 at Oregon public water systems where PFAS exceed an MCL.

DEQ, OHA and other state agencies initiated a workgroup in 2019-20 to address and share information related to PFAS as part of a broader effort to evaluate emerging chemicals of concern in Oregon. Between 2020 and 2024, OHA and DEQ collected available GIS mapping data to evaluate potential sources of PFAS in the environment then used this data to select 143 public water systems for sampling and analysis to make sure customers of the public water

systems are not being exposed to potentially harmful PFAS chemicals in their drinking water. DEQ's laboratory, under contract to OHA, developed analytical methods for testing 24 PFAS in drinking water and collected and analyzed water samples from the public water systems. Additional monitoring for PFAS at some public water systems is also occurring under EPA's fifth unregulated contaminant monitoring rule or voluntarily by individual public water systems.

As of December 2024, approximately 23% of public water systems subject to the new MCLs have been sampled with measurable PFAS detections at 31 public water systems using groundwater sources (representing roughly 52 groundwater wells) and one water system using surface water. 23 of the tested water systems with PFAS and subject to the new PFAS regulation exceed EPA's new MCLs. There is very limited sampling of domestic/private drinking water wells in Oregon. DEQ has initiated rulemaking to designate two PFAS as hazardous substances. Rulemaking is needed for DEQ to have the regulatory authority to require investigation and remediation of PFAS environmental contamination to protect human health and the environment.

Although there is funding for water systems to install PFAS treatment, this is a very expensive undertaking for most water utilities requiring significant investments. Understanding the sensitivity of your groundwater source and identifying potential sources of PFAS in the environment can help water systems prioritize actions that may reduce PFAS at the source.

Section 5.0, Pollutant Reduction Tools, will provide several tools that may be useful for source water protection regarding PFAS.

3.0 Partners, resources, and funds

Communities of sufficient size, resources, and other means may be able to develop drinking water source protection plans or implement protective strategies for their groundwater resources without the use of the tools provided in this Resource Guide. Many communities that fit this description have already taken steps to develop and utilize screening tools, resources, and strategies for reducing potential risks to their drinking water. For smaller communities, partner organizations may be able to assist with drinking water source protection efforts that cannot be performed with existing staff and resources. Many smaller water systems depend on partners to help with project development, funding resource identification, grant writing, grant administration and project management. Most water systems rely on external funding assistance to complete drinking water source protection planning and/or implementation of protection strategies.

This section will provide an overview of potential partners and funding resources that public water systems can use to protect their drinking water source(s).

NOTE: The internet web addresses listed in this section were included as a convenience for the users of this document. All web addresses were functional at the time this publication was last updated (February 2025).

3.1 Technical assistance partner organizations

Cultivating relationships with partners is an important component of developing and implementing protection strategies within any source water area. Early involvement of partner organizations is critical to successful plan or project development and implementation.

The process of identifying the right partners to help public water systems with source water protection involves finding organizations that operate within the same geographic area as a water system's source water area and/or service area and that have goals that overlap with drinking water source protection. Examples of overlapping goals include promoting water quality or effective water use strategies, engaging with rural landowners or businesses to implement best management practices, community economic development and resiliency, and/or community outreach and education.

Identifying partner organizations is locality and geography specific, but the most common partners for public water systems in Oregon are soil and water conservation districts, watershed councils, local land trusts, Oregon State University Extension Services staff, regional government

councils, and not for profit organizations focused on economic development, community outreach, or the environment.

Other common partners include state agency staff and/or federal agency representatives (where federal ownership overlaps with drinking water source areas). See section 3.2 for a list of potential state or federal agency partners.

Department of Environmental Quality and Oregon Health Authority's Drinking Water Source Protection Program

Oregon's drinking water source protection program is implemented through a partnership between the Department of Environmental Quality and the Oregon Health Authority. The Drinking Water Source Protection Program is here to help water systems and communities identify and cultivate partnerships, develop projects, locate potential funding sources, and access technical assistance resources. Both DEQ and OHA maintain robust web pages with extensive resources for Source Water Protection. Go to **DEQ's Drinking Water Source Protection website** and **OHA's Drinking Water Source Protection Program website** to access these resources and find direct contact information.

Contact the Department of Environmental Quality Drinking Water Source Protection Program by sending an email to: **DrinkingWater.Protection@deq.oregon.gov**

Oregon Health Authority Drinking Water Services can be reached at **Info.drinkingwater@odhsoha.oregon.gov**

Soil and Water Conservation Districts

Oregon's Soil and Water Conservation Districts are special districts that support conservation of renewable resources, including water quality, through technical assistance and voluntary collaborative conservation partnerships that can include local landowners and residents, natural resource organizations, natural resource users, and local, state, and the federal government.

Go to the **Oregon Department of Agriculture's About Soil and Water Conservation Districts' website** to learn more about SWCDs and to locate the local SWCD active in your area.

Soil and Water Conservation Districts often work closely with the US Department of Agriculture Natural Resource Conservation Service to assist communities and individuals carry out voluntary conservation projects on private lands. NRCS is further discussed in Section 3.2.

Watershed councils

Watershed Councils are locally organized, voluntary, and non-regulatory groups established to improve the condition of natural resources in watersheds. They assess and monitor environmental conditions and lead voluntary conservation and restoration projects that bring together local, state, and federal land management agencies with local property owners and private land managers.

Go to the **Network of Oregon Watershed Council's website** to learn more about Oregon's watershed councils and to locate the watershed council(s) active in your area.

Land trusts

Land trusts are not for profit organizations that work cooperatively with landowners and partners to conserve land. The most common models of land conservation are the purchase or donation of land and conservation easements from willing landowners. In supporting communities in protecting their drinking water sources, land trusts can assist with land transactions or own land or hold conservation easements. Land transaction assistance could include tax lot research and prioritization, mapping, landowner outreach, and due diligence. Land trusts can also act as bridge buyers to purchase properties and hold them until the permanent holder – which may be the water provider, another land trust, or state, federal, or Tribal government – can purchase the property from the bridge buyer. National land trust organizations are common bridge buyer partners because they can often leverage funding and move quickly to close property transactions. National land trust organizations that have served as partners in Oregon to conserve land in drinking water source areas include The Conservation Fund and The Nature Conservancy. The role of the land trust will depend on the land trust's priorities and capacity in addition to the needs of communities and partners.

Local land trust organizations in Oregon operate within specific geographic localities and have organization-specific missions that guide their conservation mission. Local land trust organizations are important partners for water systems and communities interested in conserving land in their drinking water source area.

Go to the Coalition for Oregon Land Trusts Clean Water for All website to **locate the local land trust** operating in your drinking water source area, **learn about how land conservation can protect drinking water source areas**, and to download their Guide for Protecting Oregon's Drinking Water.

DEQ's drinking water source protection program has highlighted land conservation in several workshops and the presentations and a link to a video playlist of recordings are available on the

DEQ Source Water Protection Workshop website. For more information on working with a land trust partner, watch Margaret Treadwell's presentation entitled 'Tips and Tricks for Working with Land Trusts' on the **Economic Development Alliance of Lincoln County's Source Water Protection YouTube page.** Margaret works with the local land trust McKenzie River Trust.

Oregon State University extension services

The Oregon State University Extension Service provides Oregon communities with research-based knowledge and education that can assist in assessing, prioritizing, and planning projects that address risks to source water. Extension services are focused on healthy communities and economies, resilient and productive forests and natural ecosystems, sustainable agriculture, and thriving communities.

For information about the OSU Extension Service county offices and to locate staff visit the **OSU Extension Service website.**

Oregon State University Sea Grant Extension

The Sea Grant Extension program strives to engage, listen to, and assist coastal communities to address important social, economic, and environmental issues. The Oregon State University Sea Grant program has four focus areas:

1) Environmental literacy and workforce development
2) Healthy coastal ecosystems
3) Sustainable fisheries and aquaculture
4) Resilient communities and economies

For more information about OSU Sea Grant Extension and to locate staff **visit the Extension and Engagement website.**

Regional government councils

The Oregon Regional Councils Association promotes cooperation among different levels of government. The councils are multi-jurisdictional and voluntary associations that cooperate on issues and problems that cross city, county, and in some cases, state boundaries. Regional government councils can provide a forum for discussing issues, and often have technical assistance resources available to entities in their geographic region.

Go to the **Oregon Secretary of State's 'Regional Governments' web page** to identify if a regional government council is operating in your area.

Non-profit organizations

Non-profit organizations can be valuable partners when their organizational mission overlaps with source water protection goals. In particular, local economic development organizations, local philanthropic organizations, and/or organizations focused on community engagement, education, and outreach are common partners for public water systems.

Different organizations operate in different areas, so it is not possible to provide one link or resource for how to identify and build relationships with these entities.

Other public water systems in your area

There is value in identifying other public water systems located nearby – other water systems can be partners in activities ranging from shared resources and mutual aid to emergency preparedness and response for source water protection. Sources of contamination can be regional in scope (for example, nitrate contamination in groundwater), drinking water source areas can overlap, and projects initiated by water system partnerships can access more funding and can be more competitive for funding applications.

There are several examples of regional public water systems working together in Oregon to achieve drinking water source protection goals, including the Clackamas River Water Providers and the Rogue Drinking Water Partnership.

Go to the **Clackamas River Water Providers homepage.**

Go to the **Rogue Drinking Water Partnership homepage.**

There are a number of groundwater systems that have worked together to develop and implement a regional drinking water source protection strategies. If you would like more information, contact DEQ's Drinking Water Source Protection Program at **DrinkingWater.Protection@deq.oregon.gov.**

3.2 Agency resources and funding sources

This section provides information about the agencies and funding resources available to public water systems in Oregon to complete source water protection planning and implementation projects.

Source water protection projects include a wide variety of actions and activities aimed at safeguarding, maintaining, and improving the quality or quantity of drinking water sources and their contributing areas. **Source water protection projects are focused on the source of drinking water before it enters a well or spring box (for groundwater) or an intake (for surface water).**

The Department of Environmental Quality's Drinking Water Source Protection program maintains resources for public water systems to reference when locating potential funding sources for projects, including a comprehensive source water protection funding guide.

Go to the **DEQ Drinking Water Source Protection Funding for Public Water Systems website** to access these online resources.

Source water protection projects do not include projects related to the purchase or maintenance of intake, treatment, or distribution infrastructure or facilities, the operations and maintenance of the system, routine or required monitoring activities, regulatory requirements, fencing or other protective measures in routine set back areas, or security measures to prevent theft and vandalism of facilities. **If your water system needs assistance with infrastructure projects, please contact Oregon Health Authority Drinking Water Services or Business Oregon:**

For infrastructure financing opportunities, go to the **Oregon Health Authority Drinking Water State Revolving Fund Website** or contact them via phone 971-673-0405 or email: **dws.srf@odhsoha.oregon.gov**. Water systems can also go to the **Business Oregon 'Contact Us' page** to submit an online request for assistance or to look up the Regional Development Officer in your region.

3.2.1 State agencies

Oregon Health Authority Drinking Water Services

Go to the **Oregon Health Authority's Drinking Water Services web page.**

The Oregon Health Authority is the primacy agency for the implementation of the federal Safe Drinking Water Act in Oregon and administers and enforces drinking water quality standards through its Drinking Water Services program. ORS 338.277 authorizes the OHA to administer the federal Safe Drinking Water Act in Oregon as the Primacy Agency in agreement with the federal government. ORS 448.131 further authorizes the adoption of standards necessary to protect public health through insuring safe drinking water within a water system. Standards in OAR 333-061 outlines requirements for systems to meet maximum contaminant levels, submit to periodic

inspections, and meet enforcement requirements as administered by OHA. As the primacy agency, OHA also approves drinking water treatment plans and sets construction standards, operator certification standards, and enforces rules to ensure safe drinking water. The OHA website above has extensive information on drinking water treatment requirements.

In order to assist water systems in complying with standards, OHA also provides technical assistance and oversight of grants and loans from the Safe Drinking Water Act for public water system operation and improvements. For those Safe Drinking Water Act loans and grant funds, the Oregon Health Authority partners with Business Oregon to provide the financial services.

One key funding opportunity focused on surface water and groundwater source protection is the Drinking Water Source Protection Fund.

Drinking Water Source Protection Fund
This funding source is designed for the protection of drinking water sources. Drinking water sources include watersheds above a public water supply surface water intake and/or the delineated portion of the aquifer suppling water to public water supply wells or springs. The DWSPF provides grants of $50,000 (or more depending on project type) and low-interest loans (up to $100,000 per project) for source water protection projects in the following categories: refined or enhanced delineation, updated or enhanced assessment, source protection planning, implementation, and select security projects. Eligible activities include those that lead to risk reduction within the delineated source water area or would contribute to a reduction in contaminant concentration within the drinking water source. Public and privately-owned Community water systems and Non-profit Non-Community water systems with a completed Source Water Assessment are eligible to apply but can work with local partners to complete the work.

Go to the **Oregon Health Authority Drinking Water Source Protection Fund website** for up-to-date program information including application deadlines, grant and loan funding amounts, information on eligible projects, and project rating criteria. DEQ and OHA Drinking Water Source Protection staff are available for questions and can assist public water systems (and their partners) with the application process. **OHA Drinking Water Source Protection website** also has other resources.

Business Oregon

Phone: (503) 986-0123

Go to the Business Oregon web page.

As the state's community and economic development agency, Business Oregon manages several state and federal infrastructure funding programs. Business Oregon is not a regulatory agency but collaborates and supports state and federal partners with financing programs and technical assistance. To learn more about Business Oregon's programs and how to apply, contact a **Regional Development Officer**.

The funding program most applicable for surface water and groundwater source protection is the Drinking Water Source Protection Fund, which is discussed above in the Oregon Health Authority section.

Business Oregon funding programs

Business Oregon administers several other finance programs for communities that support the design and construction of public infrastructure and economic and community development. Use this link for a summary of **Business Oregon's Infrastructure Programs.** Many of these funding programs can be used to address potential sources of contamination within a drinking water source area. These include but are not limited to the following:

- Brownfields Revitalization Fund – for assessment and cleanup of a hazardous substance, pollutant, or contaminant that is complicating expansion, redevelopment, or reuse of a property.
- Community Development Block Grants - funding to develop livable urban communities for persons of low and moderate incomes by expanding economic opportunities and providing housing and suitable living environments.
- Special Public Works Fund – funding for planning, design, purchasing, improving and constructing publicly owned facilities; replacing publicly owned essential community facilities; emergency projects as a result of a disaster, and for planning.
- Port Planning and Marketing Fund – funding to assist Oregon ports in the planning and construction of facilities and infrastructure. Could be used to address issues at industrial parks, airports and commercial or industrial developments.
- Safe Drinking Water Revolving Loan Fund –loan funding to support drinking water system infrastructure improvements needed to maintain compliance with the Federal Safe Drinking Water Act.
- Sustainable Infrastructure Planning Projects – a sub-program of the Safe Drinking Water Revolving Loan Fund that provides 100% forgivable loans up to $20,000 or $50,000 (depending on project type) to support water system planning efforts.
- Water/Wastewater Financing Program –technical assistance, design and construction funding that supports public infrastructure projects for drinking water, wastewater, or stormwater systems working to achieve or maintain compliance with drinking water or water quality regulations.

More information, including eligible applicants and allowable funded project activities, are available on Business Oregon's website

Oregon Department of Environmental Quality

The Oregon Department of Environmental Quality is responsible for protecting and improving the quality of Oregon's land, air, and water. Key responsibilities include enforcing state environmental laws and ensuring compliance with federal laws like the Clean Air Act and the Clean Water Act and ensuring Oregon's waters are safe for drinking, recreation, agriculture, and fish populations. DEQ also has programs to manage the proper disposal of hazardous and solid wastes, assist with the cleanup of contaminated properties, reduce greenhouse gas emissions and prevent toxic chemical releases, develop and implement air pollution control strategies, supporting product stewardship to reduce environmental impacts throughout a product's life cycle, and improve working relationships with Oregon's nine federally recognized tribes.

DEQ is responsible for the implementation and enforcement of the federal Clean Water Act and state water quality laws in Oregon. The federal Clean Water Act authorities apply to Waters of the United States. Oregon state statutes (ORS 468B.005(10)) expand upon the federal Clean Water Act to afford protection for all waters of the state, which includes groundwater.

DEQ is responsible for addressing pollutants from point and nonpoint sources of pollution that affect water quality throughout the state. Point sources of pollution are from contaminants that enter the environment from a single, identifiable source (such as from the outfall pipe of a wastewater treatment plant) whereas nonpoint sources of pollution refer to contamination that does not originate from a single discrete source (such as contaminated water entering streams as stormwater runoff).

Go to the **DEQ's Water Quality home page** and learn more about Oregon's water quality programs.

Drinking Water Source Protection Program

The Department of Environmental Quality's drinking water source protection program assists public water systems and communities with protecting their sources of drinking water from contamination. Drinking water protection is implemented through a partnership between DEQ and the Oregon Health Authority. The program offers a range of free technical assistance services and resources to public water systems and communities.

Visit the **DEQ Drinking Water Source Protection website** and **OHA's Drinking Water Source Protection Website**. to learn more about source water protection in Oregon and resources available to public water systems.

Go to the drinking water source protection program's **Funding for Public Water Systems website** to learn more about funding resources for source water protection and to access the comprehensive list of funding opportunities for source water protection guide.

Clean Water State Revolving Fund

The Department of Environmental Quality's Clean Water State Revolving Fund program provides below-market rate loans to eligible recipients for water infrastructure projects that prevent or mitigate water pollution. Eligible projects include those that are necessary to protect beneficial uses such as drinking water sources, irrigation, and recreation. Public entities, such as cities and counties, Indian tribal governments, sanitary districts, soil and water conservation districts, irrigation districts, various special districts and some intergovernmental entities are eligible to apply. Funding is available to support planning, design, and construction/ implementation project types that maintain or improve water quality standards.

Applications are accepted all year but the program only reviews applications three times per year in the spring, summer, and winter. The application requirements for CWSRF loans may take some lead-time to develop and may require out-of-pocket expense to prepare. Prospective CWSRF applicants should discuss any questions about the required content of these items with a regional DEQ CWSRF Project Officer at the earliest opportunity.

Specific project types that may be applicable to Drinking Water Source Protection include the following:

- **Nonpoint source:** Eligible project types include those that result in water quality improvements by reducing nonpoint sources of pollution from entering waters of the state. Examples of project types include establishing conservation easements, fee simple acquisition, animal waste management, agricultural conservation, protection or restoration of riparian habitat.
- **Point Source:** Eligible projects include those for the design and construction of public wastewater facilities, building or rehab of sewer systems, urban wet weather flow control, and more.
- **Local Community:** Encourages public agencies to use revolving fund financing to establish their own loan program that addresses a local water quality issue occurring within their jurisdiction. This project type allows the borrower to make loans to private entities, like homeowners and farmers to complete projects such as the repair/

replacement of failing septic systems or to implement best management practices for a variety of nonpoint source watershed improvement type projects.

- **Planning:** Eligible project types include those that develop a project such that an applicant could later apply for another loan type (nonpoint source, point source, or local community). Eligible projects include those involving data collection and measurement, evaluation, analysis, and any other activity leading to a written document.
- **Sponsorship Option:** Implement a non-planning nonpoint source project and a traditional point source wastewater treatment project through the same application to reduce your interest rate on the combined two projects to as low as 1%. This combined application is called a sponsorship option.

Go to the **Oregon DEQ Clean Water State Revolving Fund website** for up-to-date program information including application deadlines, information on eligible projects and loan types, and program contacts.

Go to the **Oregon DEQ Clean Water State Revolving Fund 'Program Contacts' website** to locate the correct contact for your region.

Section 319 grants and the Non-Point Source Program

Under Section 319 of the Clean Water Act, the EPA funds states, territories, and tribes to address nonpoint source pollution which comes from scattered sources, such as city streets, farms, and construction sites, and includes harmful substances like toxins, nutrients, pathogens, and sediments.

Each year, DEQ issues requests for proposals for projects aimed at controlling nonpoint source pollution in priority watersheds. These grants support activities such as watershed-based planning, pollution control, and water quality improvement. DEQ collaborates with municipalities, universities, nonprofits, and other organizations to implement these projects.

The program follows a five-year Nonpoint Source Management Plan, required by the Clean Water Act, to outline strategies for reducing nonpoint source pollution and enhancing water quality. Annual reports document progress, activities, and accomplishments, while a statewide water quality trends report supports ongoing efforts.
Go to the **Oregon DEQ's Nonpoint Source Program** and **319 Grant website** for up-to-date program information including application deadlines, information on eligible projects and loan types, and program contacts.

Supplemental Environmental Projects

Supplemental Environmental Projects are reviewed and approved on a case-by-case basis by the Department of Environmental Quality's Office of Compliance and Enforcement as part of

settlement of a formal enforcement action. When DEQ assesses civil penalties for environmental law violations, violators can offset up to 80% of their monetary penalty by agreeing to fund a Supplemental Environmental Project that improves Oregon's environment. SEPs can be for pollution prevention or reduction, public health protection, environmental restoration and protection as long as it is a project that the respondent is not already required to do by law or where the project would be financially self-serving for the respondent. The work can be completed by a third-party like a local government, watershed council, non-profit or private entity. Community organizations with proposed projects are also free to contact respondents on their own initiative. According to DEQ's SEP policy, DEQ prefers that the project is in the same locale (watershed/ county, etc.) where the violation occurred and in the same media (i.e. air/ water/ land) that were the subject of the enforcement action, however, those requirements are not absolute and DEQ may consider and approve good projects in other locations or media.

View a fact sheet about Supplemental Environmental Project Ideas and Contacts.

Go to **DEQ's Public Notices web page** to sign up for text or email notifications. When signing up, select "enforcement actions" under types of information and select the counties or subbasins of interest to you.

Go to **DEQ's Enforcement Actions website** to view current enforcement activity.

Oregon Water Resources Department

The Oregon Water Resources Department is the state agency charged with administration of the laws governing surface and groundwater resources. By law, (ORS 537.110) all surface and groundwater in Oregon belongs to the public, and with some exceptions, all water users must obtain a permit or license from OWRD to use water from any source. The OWRD's core functions are to protect existing water rights and process water rights transactions, facilitate voluntary streamflow restoration, increase the understanding of the demands on the state's water resources, provide accurate and accessible water resource data, and facilitate water supply solutions. OWRD carries out the water management policies and rules set by the Water Resources Commission and oversees enforcement of Oregon's water laws. The Water Resources Department completed a new groundwater allocation rulemaking in 2024 to update the rules for how OWRD determines if water is available to support new groundwater rights. The updated rules recognize the connection between groundwater and surface water sources and are meant to ensure that new groundwater rights do not negatively impact over-appropriated surface water sources.

Go to the **OWRD homepage** to learn more about water rights, groundwater and wells, streams and dams, and news from the agency. Go to the **OWRD Groundwater Allocation Rulemaking website** to learn more about the new rule and to access fact sheets and resources about the rulemaking process.

The Oregon Water Resources Department is responsible for developing and updating the Oregon Integrated Water Resources Strategy, which is a statewide inter-agency framework developed to better understand and meet the state's instream and out-of-stream water needs. The IWRS addresses water quantity, water quality, and ecosystem needs now and into the future. Oregon's Water Resources Commission adopted the first IWRS in 2012 and the second in 2017. Oregon is in the process of another IWRS update that is anticipated to be finalized in 2025. The IWRS is a helpful resource for understanding water governance in Oregon, in developing source water protection projects, and can help demonstrate the importance of projects that align with actions identified in the plan.

Go to the **Integrated Water Resources Strategy website** to learn more about the draft IWRS schedule, download the IWRS report, and to sign up for announcements about the IWRS.

Oregon Water Resources Department funding opportunities

The OWRD has several funding opportunities that allow the agency to strategically invest to achieve a secure and sustainable water future and to address instream and out-of-stream needs for Oregon's environment, economy, communities, and cultures. OWRD funding opportunities can be used to accomplish source water protection or water quantity related projects – consult with OWRD grant program contacts for more information. Funding opportunities available to public water systems include: (1) Planning Grants, (2) Feasibility Study Grants, (3) Water Project Grant and Loans.

Go to the **OWRD Funding Opportunities web page** to learn more about available funding opportunities, to find contact information for staff, and to sign up for funding opportunity announcements.

Watermasters and water rights

Watermasters respond to complaints from water users and determine in times of water shortage, which generally occur every year, who has the right to use water. Watermasters can also provide information on the potential risks and proper abandonment of unused wells. Watermaster offices across the state offer excellent local information.

Go to the **OWRD's Regional Offices and Watermasters Directory** to locate agency staff in your area.

Well Abandonment, Repair and Replacement Fund

The Water Resources Department's Well Abandonment, Repair, and Replacement Fund provides financial assistance to help Oregonians repair or replace and permanently abandon a household well that is dry or severely declining or that was damaged or destroyed by wildfire that is unable to supply water for household purposes.

This financial assistance is available to individual low to moderate income households or members of a federally recognized tribe in Oregon. The impacted well must have been used for household purposes and is no longer supplying enough water to sustain the household.

Go to OWRD's **Well Abandonment, Repair, and Replacement Fund** website for more information on eligibility and use.

Oregon Department of Forestry

The Oregon Department of Forestry manages and regulates activities on non-federal forestland in Oregon. There are three main divisions under ODF-- Fire Protection, Forest Resources, and State Forests. The Forest Resources Division administers the Forest Practices Act and various forestry incentive programs and employs the use of approximately 70 ODF Foresters who work closely with landowners and operators on privately owned timberlands. The State Forests Division is responsible for forest management to provide economic, environmental, and social benefits to Oregonians.

Go to the **Oregon Department of Forestry's website** to learn more about the agency and its programs.

ODF maintains the Forest Activity Electronic Reporting and Notification System – this is an online system for tracking activities on non-federal forested lands in Oregon. The Forest Practices Act requires that a notification of operation is submitted online in FERNS for any commercial forest operation at least 15 days before starting any work. Anyone can subscribe to receive copies of FERNS notifications or updates, request information about written plans for forestry work, or to submit official comments about the written plans. **Water systems that have timberlands in their drinking water source area are highly encouraged to sign up to receive notifications.**

Visit **ODF's FERNS website** to sign up for Forest Activity Electronic Reporting and Notification System notifications.

Visit ODF's Forest Practices Act website to learn more about the **Forest Practices Act** and the **Private Forest Accord**.

Visit **ODF's find a forester website** to find your local Oregon Department of Forestry Forester.

Financial incentive programs are aimed at encouraging and assisting landowners in managing their resources and meeting their objectives. Typical forestry projects can be aimed at protecting the landowner's resources/investment from fire or insect and disease infestation, and to increasing its monetary and environmental value in the future. Other grant programs, including the Community Forest Program and Forest Legacy Program, can help to conserve and protect lands through conservation easements or fee simple acquisition. The Forest Stewardship Program can provide cost-share incentives for developing a Forest Stewardship Plan for privately owned forestland.

Go to the **ODF Grants and Incentives website** to learn about all the available funding opportunities.

Oregon Department of Agriculture

The Oregon Department of Agriculture's mission is to "safeguard Oregon's agriculture, natural resources, working lands, economies, and communities through assistance, compliance, and market support."

Natural Resources Division
ODA's Natural Resources Division oversees many programs with the mission to protect water quality and habitat on agricultural lands. ODA is responsible for ensuring that farmers and ranchers achieve water quality standards. As part of this responsibility, ODA develops Agricultural Water Quality plans to prevent and control water pollution from agricultural activities and soil erosion on rural lands. ODA issues Confined Animal Feeding Operation permits to livestock owners to ensure that manure does not pollute ground and surface water. The Natural Resources Division also ensures the proper and legal sale, use, and distribution of pesticide and fertilizer products and assists local soil and water conservation districts in their efforts to provide technical assistance to landowners.

Go to **ODA's Natural Resources website** to learn more about agricultural water quality, confined animal feeding areas, soil and water conservation districts, and more.

Go to the **ODA Agricultural Water Quality website** for more information on the Agricultural Water Quality Plan Areas and Regulations and to find your area's ODA Water Quality Specialist.

DEQ participates in ODA's effort to review and revise Agricultural Water Quality Management Area Plans consistent with ORS568.930. During the biennial review process, DEQ provides status and trends reports, information on drinking water resources near agricultural practices and other water quality comments on ODA's area rules and plans.

To view this information for each agricultural area plan review, visit **DEQ's Area Plan Reviews and Comments** page and **DEQ's Water Quality Status and Trends Analysis** web pages

Go to the **ODA Confined Animal Feeding Operation Program website** for more information on the regulation of animal waste management.

Go to the **ODA Pesticide, Fertilizer, and PARC Programs website** for more information on the regulation and use of pesticides and fertilizers.

Pesticide Stewardship Partnership Program

The Pesticide Stewardship Partnership Program is a voluntary program that relies on local partnerships to monitor pesticide levels in waterways and to enact solutions to protect water quality while also managing pests and maintaining crop yields. ODA is the state lead for the PSP program and leads an interagency team called the Water Quality Pesticide Management Team.

The PSP Program uses water quality sampling data to evaluate pesticides of concern, conducts local outreach and technical assistance efforts designed and implemented based on water quality data findings, and evaluates the effectiveness of these education and collaboration projects annually. The PSP program also conducts free waste pesticide collection events for proper pesticide disposal from agricultural and commercial applicators.

Go to the **DEQ's Pesticide Stewardship Program website** and **ODA's Pesticide Stewardship Partnership website** to learn more about where the program currently operates in Oregon, learn about the pesticide waste collection program and to request a pesticide collection event in your area. In addition, **DEQ's PSP Data Viewer** provides access to water quality data collected by the Pesticide Stewardship Partnerships Program.

Pesticide Analytical and Response Center

The Pesticide Analytical and Response Center was created by executive order in 1978. The program was reauthorized under the Oregon Department of Agriculture in 1991 (ORS 634.550).

PARC is a multi-agency group that responds to pesticide-related incidents in Oregon with suspected health or environmental effects. It acts as a central location that receives Oregon-specific pesticide incident information. The main activity that PARC is mandated to perform is to **coordinate investigations into pesticide incidents in Oregon.** It also collects and analyzes information about reported incidents. PARC does not have regulatory authority – it relies on member agencies to conduct investigations and take necessary enforcement actions

To report a pesticide incident that has impacted people, animals, or the environment, you can:

- **Call: 503-986-6470 -** Your phone call will be routed to a specialist to take your information and PARC staffers will contact you within one business day.
- **Email: naturalresource-complaints@oda.oregon.gov**
- **Notify the Oregon Emergency Response System** by calling 911

Go to the **ODA PARC website** to learn more about PARC and access pesticide resources.

Oregon State Fire Marshall

The Oregon State Fire Marshall's mission is to protect people, property, and the environment from fire and hazardous materials. OSFM is the leading authority on fire safety and emergency response in Oregon.

Community Right to Know Program to track hazardous materials storage sites:
The Community Right to Know and Protection Act (ORS 453.307-414) requires Oregon employers to report hazardous substances to the Oregon State Fire Marshal, where they are stored, and the associated hazards. The OSFM's Community Right to Know program tracks and maintains these records.

Go to the **OSFM Community Right to Know website** to learn more about this program and to access additional hazardous materials information and resources.

OSFM's **Hazardous Materials Storage Sites interactive map** shows point locations and facility IDs of hazardous substance storage facilities across the state of Oregon.

Local Area Emergency Planning Committees:
Local Emergency Planning Committees help keep communities safe and prepared by improving emergency plans, raising awareness, and ensuring that dangerous materials are handled safely. The groups include a range of interested parties including local leaders, emergency responders, businesses, and community members. Water system representation on a Local Area Planning Committee can help ensure that the drinking water source is property protected by raising awareness about the source's location and potential sources of contamination within the source area.

Go to the **Oregon State Fire Marshall's Local Emergency Planning Committee website** to view a list of local emergency planning committees and to learn more about potential grant opportunities.

Hazardous Materials Emergency Preparedness Grant

The HMEP grant is a federal grant administered by OSFM which helps communities prepare for emergencies involving hazardous materials. It provides funding for training, planning, and exercises to improve local emergency response. This grant has been used successfully by public water systems to host emergency response trainings for critical local partners (water system employees, first responder personnel, local community representatives, other technical assistance providers, etc.) and to stage spill drills in source water areas. State, local, and tribal governments are eligible to apply. Eligible projects include those that help communities plan for and respond to hazardous materials incidents, including transportation accidents. Projects must have a HAZMAT transportation component to be considered for the grant. For more information contact OSFM at **osfm.hmep@osfm.oregon.gov**

Other state agencies

Many agencies work to protect water quality in Oregon through data sharing, monitoring, technical assistance, setting standards, or regulation. This section highlights the role of other Oregon agencies that can help address potential sources of point and nonpoint sources of pollution and natural resource issues. For help identifying the appropriate agency or contact, please reach out to **DEQ's Drinking Water Source Protection Program**. Other state agencies that may be of assistance include (but are not limited to) the following:

Department of Land Conservation and Development: DLCD works in partnership with local governments, and state and federal agencies, to address the land use needs of the public, communities, regions, and the state. Water systems may work with DLCD to address land use planning, resilience, natural hazards, coastal management, mitigating effects of climate change. DLCD's Statewide Planning Goal 5 requires local governments to address a variety of resources such as wetlands, fish and wildlife habitat, renewable energy sources, and water quality when making land use decisions. Go to **DLCD's Natural Resources Planning web page** for more information.

Department of Geology and Mineral Industries: DOGAMI helps increase understanding of Oregon's geologic resources and hazards through science and stewardship. The Mineral Land Regulation and Reclamation program oversees the state's mineral production including gravel and other mining operations. The Geological Survey and Services program develops maps, reports, and data to help Oregon manage natural resources and prepare for natural hazards.

Oregon Watershed Enhancement Board: OWEB provides grants to help Oregonians take care of local streams, rivers, wetlands, and natural areas. **DEQ's comprehensive funding guide** summarizes OWEBs grants that may be applicable to public water systems.

Oregon **Department of Transportation**: ODOT develops programs related to Oregon's system of highways, roads, bridges and railways among other programs. **ODOT's Environmental Programs** address water quality during stormwater management, road surface work, right-of-way maintenance, bridge maintenance, snow and ice removal, and during response to hazards such as slides and settlements.

Oregon State Marine Board: OSMB manages many programs serving boaters through education, enforcement, access, and environmental stewardship. OSMB's Environmental Programs address keeping sewage out of waterways, aquatic invasive species, and abandoned vessels. OSMB's Clean Marina and Clean Boater Programs are good resources for water systems with surface water sources.

Oregon Department of Fish and Wildlife: ODFW protects and enhances Oregon's fish and wildlife. ODFW can be a good partner where drinking water quality goals overlap with water quality and quantity goals for aquatic habitat for fish and other species.

3.2.2 Federal agencies

U.S. Environmental Protection Agency

Funding Integration Tool for Source Water
EPA's FITS is a one-stop-shop tool to help integrate various federal funding sources to support activities that protect sources of drinking water. The website has source water protection funding sources, planning and funding coordination information, and examples of funding sources in action. Go to EPA's **Funding Integration Tool for Source Water** for more information.

Clearinghouse for Environmental Finance
This is an online database that catalogues available funding sources (grants, loans, cost-sharing) and instructional resources to aid communities in improving environmental conditions for water, land, and air quality projects.

Go to the **EPA Clearinghouse for Environmental Finance website** for more information.

Environmental Finance Centers
Environmental Finance Centers deliver targeted technical assistance to local governments, states, Tribes, Territories, and non-governmental organizations to protect public health, safeguard the environment, and advance environmental justice. Through the EFC program, technical assistance providers help communities develop and submit project proposals, including for State Revolving Fund applications.

Go to the **EPA Environmental Finance Center website** for more information.

The Environmental Finance Center contracted by the EPA to serve Oregon is the Rural Community Assistance Corporation. RCAC focuses on environmental infrastructure (water, wastewater and solid waste facilities), economic and leadership development, and community development finance. RCAC can provide technical assistance to communities in the following areas:

- Wrap around services for submitting funding applications, including completing all tasks to meet requirements of awarded grants and loans.
- Hands on technical assistance to address technical, managerial, and financial operations of water and wastewater systems serving rural and Indigenous communities.
- Analyze utility rates and finances to recommend appropriate rate structures to meet community needs.
- Facilitate regional partnerships among utilities and communities.
- Host in-person and online training for utility staff, management, boards, and community members on a variety of topics.

Go to the **Rural Community Assistance Corporation website.**

Environmental Justice Thriving Communities Technical Assistance Centers Program
Environmental Justice Thriving Communities Technical Assistance Centers program funds technical assistance centers throughout the United States to provide technical assistance, training, and support to underserved and overburdened communities facing environmental and energy justice challenges.

Willamette Partnership's Northwest Environmental Justice Center and the University of Washington's Center for Environmental Health Equity were the technical assistance centers selected by the EPA to serve Oregon. These organizations receive funding from the EPA to provide free community engagement and technical assistance support to underserved and overburdened communities.

Go to Willamette Partnership's **Northwest Environmental Justice Center website** to learn more about their services or to fill out a technical assistance form to request help.

Go to the University of Washington's **Center for Environmental Health Equity website** to learn more about their services, request assistance, or access a myriad of resources.

Water Technical Assistance
WaterTA is EPA's free technical assistance program with services that may include identifying climate adaptation strategies, addressing stormwater challenges, complying with the Safe

Drinking Water Act and Clean Water Acts, and assistance with applying for federal funding opportunities. Eligible entities to receive WaterTA include local governments/communities and drinking water utilities/systems.

Go to the **EPA's Water Technical Assistance Information website** to learn more about eligibility, what technical assistance services are available, and access webinars and presentations about how communities can address water challenges.

Go to the **online Water Technical Assistance Request Form** to submit a request for assistance.

U.S. Department of Agriculture

USDA Farm Service Agency conservation programs

USDA Farm Service Agency oversees a number of voluntary conservation-related programs including the Conservation Reserve Program, Conservation Reserve Enhancement Program, and the Emergency Conservation Program. These programs work to address a number of farming and ranching related conservation issues including drinking water source protection, soil erosion, wildlife habitat preservation, preservation and restoration of forests and wetlands, and aiding farmers whose farms are damaged by natural disasters.

Eligibility: Farmers, ranchers, and agricultural producers are eligible to apply for the following conservation programs. Landowners must contact their local Farm Service Agency office to submit an offer and/or request for assistance.

Note: Implementing Farm Service Agency Conservation Programs within a drinking water source area will require partnering with technical assistance providers who specialize in working with private landowners (i.e. a Soil and Water Conservation District or USDA Natural Resource Conservation Service).

Go to the **Farm Service Agency's 'Find a Conservation Program' website** to find more information about conservation programs.

Conservation Reserve Program and Conservation Reserve Enhancement Program: In both the CRP and CREP programs, enrolled farmers receive a yearly rental payment for agreeing to remove sensitive land from agricultural production and convert it to vegetative cover such as native grasses, trees, and riparian buffers. These programs also offer financial incentives to landowners for implementing certain conservation practices. Contracts for land enrolled in the programs are 10-15 years in length. The long-term goal of the programs is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat.

Emergency Conservation Program: The ECP provides funding and technical assistance for farmers and ranchers to restore farmland damaged by natural disasters and for emergency water conservation measures in severe droughts

U.S. Department of Agriculture Natural Resources Conservation Service
The Natural Resources Conservation Service provides farmers, ranchers and forest managers with free technical assistance, or advice, for their land. NRCS also implements programs designed to provide technical and financial assistance to agricultural producers and forest landowners to address natural resource concerns. The goal of these programs is to improve water and air quality, conserve ground and surface water, and reduce soil erosion and sedimentation.

Eligibility: Agricultural producers and small forestland owners are eligible to apply for the following conservation programs. Landowners must contact their local NRCS office as the first step to accessing NRCS programs and resources.

Note: Implementing NRCS Programs within a drinking water source area often requires partnering with technical assistance providers who specialize in working with private landowners (i.e. a Soil and Water Conservation District).

NRCS programs commonly used to accomplish source water protection goals in Oregon include the following.

- National Water Quality Initiative (note that starting in 2019, NRCS included source water protection as a specific focus area for NWQI.)
- Environmental Quality Incentives Program
- Conservation Stewardship Program
- Agricultural Land Easements
- Wetland Reserve Easements
- Joint Chiefs' Landscape Restoration Partnership
- Regional Conservation Partnership Program

Go to **Oregon NRCS's Programs and Initiatives web page** to access additional information about each of these programs including eligibility and application dates and to see the full list of programs and initiatives that NRCS implements. In addition, you can find **local contacts**

For more information about NRCS, **visit their national home page**.

U.S. Department of Agriculture Rural Development – Emergency Community Water Assistance Grants

This program helps eligible communities prepare, or recover from, an emergency that threatens the availability of safe, reliable drinking water.

Rurally located public bodies (populations of 10,000 or less), nonprofit organizations, federally recognized tribes are eligible. The area to be served must have a median household income less than the state's median household income for non-metropolitan areas. Qualifying events include drought, flood, earthquake, tornado, hurricane, disease outbreak, chemical spill/ leak/ seepage, and other disasters.

Go to the **Emergency Community Water Assistance Grant website** for more information about the grant, how to apply, program contact information, and more.

3.2.3 Other organizations and resources

Source Water Collaborative

The Source Water Collaborative is a national organization formed in 2006 to protect drinking water sources across the nation by combining the strengths and tools of diverse member organizations. Member organizations include federal, state, and local partners.

Go to the Source Water Collaborative website to learn more about the organization, source water protection learning exchange resources, upcoming events, and to access the wealth of other resources and contacts they maintain.

Of note are the following:

How-to-Collaborate Toolkit

Guide for Using Clean Water Act Discharge Permits to Protect Drinking Water Sources

Guide For Land Use Planners

Guide for AG Leaders: Field to Faucet

Learning Exchange Webinars and Associated Resources Source water collaborative members also have resources for water systems. Many of these national members have already been discussed but here are a few additional resources of note:

Association of State Drinking Water Providers Source Water

- **American Water Works Association Source Water Protection Resources**: Assistance with metrics, justification, and working with agricultural partners. AWWA also recognizes drinking water systems drinking water systems that have developed and are implementing exemplary source water protection programs.

Oregon Association of Water Utilities

The Oregon Association of Water Utilities is a nonprofit, independent association of water and wastewater utilities. OAWU represents water utilities' interests in the state legislature, provides training opportunities, and offers onsite technical assistance (including maintaining a circuit rider program). OAWU's source water specialist deals specifically with drinking water source protection and can assist in the development of drinking water source protection plans.

Go to the **Oregon Association of Water Utilities homepage** to learn more about the organization, access their training and events calendar, and to contact an OAWU representative.

Oregon Water/ Wastewater Agency Response Network

ORWARN is a network of utilities helping other utilities to respond to emergencies. The organization's goal is to provide immediate relief for member utilities during emergencies by matching personnel with the necessary tools and equipment to assess and assist the impacted water system as quickly as possible until a permanent solution can be implemented. ORWARN aims to provide the following for its members:

- A mutual assistance agreement and process for sharing emergency resources among water and wastewater agencies statewide
- A mutual assistance program consistent with other statewide mutual aid and assistance programs and the National Incident Management System
- A legal means to secure the resources to respond and recover quickly from a natural or man-made disaster

Utilities can sign up for free to join ORWARN as a member. Non-utilities involved in emergency management can join as associate members.

Go to the **ORWARN homepage** to learn more about this network of utilities helping utilities and to sign up to become a member.

Rural Community Assistance Corporation

RCAC provides environmental technical assistance to small, rural, and indigenous drinking water systems, wastewater systems, and solid waste management programs in 13 western states including Oregon. RCAC provides a variety of technical assistance including source water and wellhead protection, asset management assistance, operations and maintenance manuals, rate studies, funding application assistance, and more. RCAC was selected by the Environmental Protection Agency as the regional Environmental Finance Center for Region 10, which includes Oregon. See Section 3.2.2 for more information on RCAC's services under the Environmental Finance Center.

For more information and to request assistance go to the **Rural Community Assistance Corporation website.**

Private charitable foundations

Private charitable foundations are a potential source of funding to support drinking water source protection projects when the foundation's mission and goals align with environmental protection, public health, economic development, or education and outreach. Each charitable foundation determines its own funding priorities, so it is important for water systems to ensure that their proposed drinking water source protection project fits well with the foundation's mission and goals before applying.

Foundations that fund projects and initiatives in Oregon include, but are not limited to:

The Oregon Community Foundation
This foundation seeks to help Oregonians through opportunities including the annual Community Grant Program. Details for this grant program are updated annually – go to the Oregon Community Foundation's **Grants website** to learn more about the Community Grants Program and other grant opportunities.

Bandon Dunes Charitable Foundation
This foundation supports communities along Oregon's southern coast whose projects focus on the triple-bottom-line of conservation, community, and economy. Small grants and large grants are available. Go to the **Bandon Dunes Charitable Foundation's website** to learn more.

Weyerhaeuser Family Foundation
This foundation's Sustainable Forest and Communities Initiative supports the development of environmentally, economically, and socially sustainable communities in forested regions of the United States. Foundation priorities are for projects that promote forest-based communities and address outcomes in the areas of environment, economy, and community. Go to the **Sustainable Forests and Communities Initiative website** to learn more about the program and how to apply.

4.0 Place-based planning approach for source water protection

Many public water systems in Oregon face challenges implementing drinking water source protection strategies because their drinking water source areas are located partially, if not entirely, outside of municipal jurisdiction or water system control. The jurisdiction of the source water area may also be complicated by several different and overlapping governing agencies. The land uses and potential contaminant sources within the source water area may correspond to a diverse mix of landowners, businesses and residents. One strategy for addressing this challenge is to adopt a 'place-based planning' approach to drinking water source protection.

This section will (1) discuss what a place-based planning is and why it can be an important tool for drinking water source protection, (2) provide an overview of a place-based approach to source water protection planning, (3) review common types of information that are available to support place-based planning efforts, (4) discuss specific considerations for working with private landowners, and (5) highlight land conservation as a tool for protecting critical lands within drinking water source areas.

4.1 What is a place-based approach for source water protection planning

A place-based approach for source water protection planning is voluntary, locally initiated and led, and involves a balanced representation of interested parties who work in partnership to understand local issues, coordinate action, and develop solutions that meet the unique circumstances of a specific place. This approach to planning can be used to achieve drinking water source protection goals by helping to identify the potential risks of contamination to source water quality, along with strategies to reduce that risk and improve water supply resilience within a drinking water source area.

There are several reasons why a place-based approach can be essential to the success of drinking water source protection planning. Perhaps most importantly, when the drinking water source area lies outside of a water system's control, the ability to implement protection activities relies on partnering with private landowners, businesses, and state or federal agencies. When developing protection strategies, the Department of Environmental Quality and the Oregon Health Authority highly recommend that the water system and community involve potentially

affected parties early in the process to foster their awareness and trust in the resulting strategies.

There is a greater likelihood of successful implementation of drinking water source protection strategies when protection efforts occur at the community level and involve key interested parties. Protection efforts could take the form of a focused strategy to address a specific issue or could be a broader "action plan" that address short- to long-term drinking water source protection challenges. Regardless of the approach, local engagement is a valuable investment in protecting the quality of life and economic vitality of the local community.

A place-based approach to drinking water source protection planning can also occur as a component of Oregon's Place-Based Integrated Water Resources Planning Program. Place-Based Integrated Water Resources Planning can help address drinking water source protection goals but is broader in scope than drinking water source protection alone.

Refer to section 4.2.1 in this resource guide if your water system or community is interested in engaging in a more comprehensive water planning effort with the state's Place-Based Integrated Water Resources Planning program.

Oregon's Integrated Water Resources Strategy provides helpful recommendations for how to follow a place-based and integrated approach to water resources planning. Additional, elements of Oregon's Place-Based Integrated Water Resources Planning program can be adapted by local groups to achieve goals related to drinking water source protection. Go to the **Oregon Water Resources Department's Place-Based Integrated Water Resources Planning web page** to access the Place-Based Planning Guidelines.

The essentials of a place-based approach to planning for drinking water source protection include:

- Voluntary process, driven by local partners
- Involves and integrates diverse and representative perspectives
- Potentially addresses a broad array of common source water challenges that include:
    - Water quality impairments and water supply limitations
    - Identifying data gaps and initiating projects to address these (e.g. groundwater monitoring studies to assess aquifer characteristics, recharge, utilization, etc.)
    - Identifying water resource needs and partners to develop solutions
    - Lack of jurisdiction over lands in watershed or recharge area
    - Assessing cumulative effects of regional demands on watersheds and aquifers, including existing uses and new development

- Increasing the visibility and awareness of source water as a priority water resource issue
- Connecting the quality of source water to conditions within the watershed or aquifer recharge area
- Raising awareness regarding the importance of drinking water source protection with decision makers and funders
- Surface impacts on source water, e.g. land use development and subsequent negative effects on recharge; vulnerability of source water to contamination

Collaborative partners help plan and implement place-based protection efforts. Reference section 3.0 on Partners, resources, and funds in this resource guide for more information on technical assistance providers and state or federal agencies (sections 3.1 and 3.2) that commonly serve as partners in drinking water source protection efforts. Other potential partners to consider are:

- Representative interested parties:
  - Local and Tribal governments
  - Special districts (i.e. irrigation districts, parks/recreation, ports)
  - Residential homeowners
  - Commercial, industrial landowners
  - Agricultural and forestry landowners

4.2 Planning process for protection

Many public water systems do not have the staff or resources necessary to develop comprehensive drinking water source protection plans or to maintain communication and coordination with landowners in their source area. For communities with limited resources, it is critical to streamline the process for developing and implementing strategies for drinking water source protection to ensure that protection efforts focus on the highest priority groundwater resources.

The first step for public water systems to take is to make sure that you have a copy of and thoroughly review both your original Source Water Assessment (typically prepared between 2000 and 2005) and your Source Water Assessment Update (produced between 2016 and present). As previously mentioned, each public water system in Oregon received a source water assessment report completed by the Oregon Department of Environmental Quality and Oregon Health Authority drinking water source protection programs. The assessment gives the water system and community information on the watershed or recharge area that supplies the well, spring or intake (the "drinking water source area") and identifies potential risks within the source area. For water systems using groundwater, the Source Water Assessment Update reports include a list of the "top three" higher priority potential contaminant sources of greatest concern

to the water system and suggested management practices to reduce risk. Public water systems and local communities can use the information in the assessments to voluntarily develop place-based plans and implement drinking water source protection strategies.

Figure 7 provides a visual map or process for moving through the various steps for developing a pollutant reduction or drinking water source protection plan once you have reviewed your Source Water Assessment(s).

The degree of water system resources and the availability of information about a drinking water source will likely define the scope of the drinking water source protection efforts that are achievable. Initially, even a focused effort to address a few higher priority pollutants of concern is a concrete step towards protecting a drinking water source. Then, as resources allow, water systems can build on their initial efforts to pursue a broader approach that engages more local and/or regional partners and diverse community perspectives. With place-based planning, the goal of collaborators could be to develop an aquifer protection or a comprehensive watershed management plan that integrates groundwater and/or surface water drinking water source protection measures with other important water uses in the region. One example is the City of Florence, Oregon's Aquifer Protection plan: go to the **city's Drinking Water Protection web page** to see the plan.

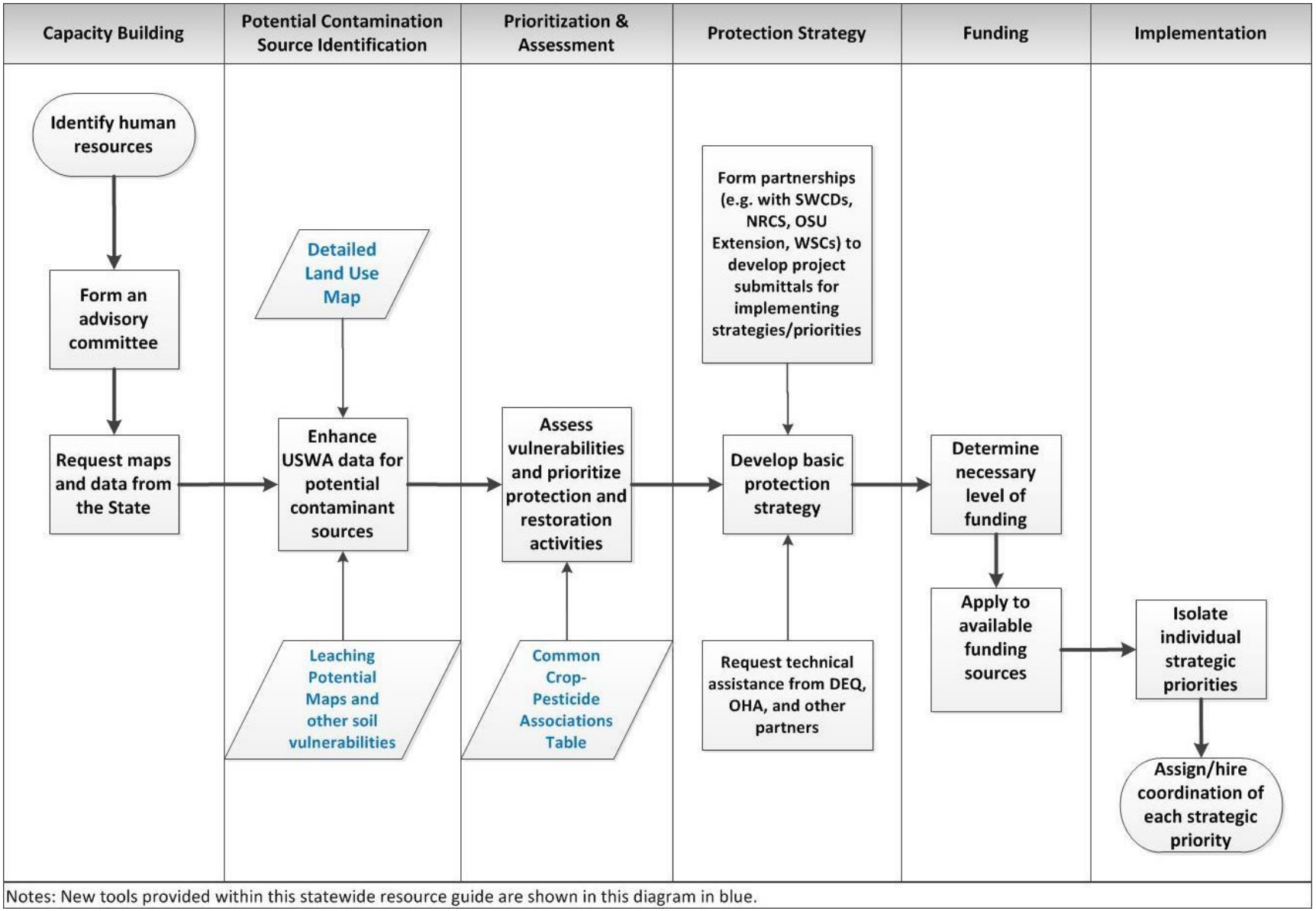

Figure 7. Process Diagram for Drinking Water Source Protection

The process diagram visualized in Figure 7 represents a streamlined approach for drinking water source protection planning. Protection planning includes the following important steps:

1. **Identify human resources** to work on protection/restoration planning.
2. **Solicit available technical experts, community members, and landowners to form an advisory committee:** Review Original and/or Updated Source Water Assessment(s) and identify potential interested parties and partners within drinking water source area. This includes the water system and any other entities that have jurisdiction and/or regulatory authority, such as cities, counties, state and federal agencies, Tribes, or special districts. This is particularly important for locations where priority sources occur. The Department of Environmental Quality Drinking Water Source Protection Program and/or Oregon Health Authority Drinking Water Services staff can provide technical assistance and/or participate on the committee.
3. **Request state agency assistance** to provide GIS and database information/maps, along with technical support, especially for broader place-based planning efforts.
4. **Develop an enhanced Potential Contaminant Source inventory** to identify and map any additional PCSs not already included in the Original or Updated Source Water Assessment(s) or to modify the relative risk rating of a PCS using local knowledge.
5. **Prioritize protection and restoration activities** using all available information and maps. The general criteria for prioritization include:
    a. Proximity to wells/springs
    b. Location within identified sensitive and/or susceptible areas in the Drinking Water Source Area
    c. Land uses/activities that pose significant threat to groundwater (e.g. use of toxic chemicals, application of pesticides, older septic systems, etc.)
6. **Use available resources to develop basic protection strategies for high priority Potential Contaminant Sources** with input from interested parties. If feasible, pursue larger efforts such as Oregon's Place-Based Integrated Water Resources Planning program (refer to section 4.2.1) or a Drinking Water Source Protection Plan (which can be a component of Place-based Planning.)
7. **Establish a timeline for implementing strategies** and identify individuals and/or organizations that will take the lead and/or assist (utilize technical assistance from the Department of Environmental Quality Drinking Water Source Protection program and Oregon Health Authority).
8. **Determine the level of funding necessary** to accomplish both short-term and longer-term implementation goals and identify potential funding sources.
9. **Isolate individual strategic priorities** and assign (or hire) a coordinator to implement each priority as resources and time permit.

10. **If resources are limited** for accomplishing proposed protection efforts**, apply for grants or loans** with assistance from partners who can implement the work.

Local and statewide technical, financial, and labor resources may be available to assist public water systems with the implementation of source water protection efforts. Community members and private landowners can volunteer to help with the implementation of protection strategies. There are grants and resources available from state and federal government agencies as well as from non-profits (see section 3.0). Local experts in water quality, conservation, restoration, forestry, and fisheries may be willing to contribute their knowledge and time. Service organizations, schools (including colleges/universities), OSU County Extension offices, Soil and Water Conservation Districts, and Watershed Councils can be a source of knowledge, labor, and sometimes funds. Local landowners and residents are often valuable resources with important insights and understanding of local ecosystems and land management strategies.

4.2.1 Oregon's place-based integrated water resources planning

Place-Based Integrated Water Resources Planning is a locally led, voluntary program that helps communities develop a holistic understanding of water resources, address complex water issues, and create a secure water future by identifying actions that promote and sustain a healthy economy, environment, and society. The process is collaborative, inclusive, and is designed to (a) gather information to develop a shared understanding of water resources and identify critical issues and knowledge gaps; (b) examine the existing and future in-stream and out-of-stream water needs for people, the economy and the environment; (c) identify and prioritize strategic, integrated solutions to understand and meet in-stream and out-of-stream water needs; and (d) develop, implement and update a place-based integrated water resources plan.

A place-based integrated water resources plan follows applicable state rules and guidance and:

- Is developed for a planning area associated with waters from sources within a shared hydrologic boundary
- Is developed in collaboration with a balanced representation of interests
- Addresses current and future in-stream and out-of-stream needs
- Includes the development of actions that are consistent with the state water resources policy and other state laws concerning the water resources of this state
- Is developed using an open, equitable and transparent process that fosters public participation and meaningful engagement with environmental justice communities
- Is developed in consultation with the Water Resources Department and other relevant state agencies

- Facilitates implementation of local water resources solutions and supports the knowledge and relationships needed to implement the solutions
- Assesses actions that are compatible with local comprehensive plans
- Strives to integrate solutions to cost-effectively achieve multiple benefits
- Is consistent with the guiding principles of Oregon's Integrated Water Resources Strategy.

The Oregon Water Resources Department and other state agencies provide guidance, funding, and technical assistance to place-based initiatives to bring interested parties together, assess and build collaborative capacity, develop and update plans, and coordinate plan implementation. Upon completion, state-recognized plans guide actions to meet current and future instream and out-of-stream water needs, help state agencies identify and consider regional priorities, and provide a platform for continued collaboration to solve complex water issues.

Public and domestic drinking water quality and quantity are an important existing and future water supply need that would be addressed as part of the OWRD Place-Based Integrated Water Resources Planning process. However, this process is inclusive of all other instream and out-of-stream water needs and is therefore more comprehensive in scope than just focusing on drinking water source protection.

Place-Based Water Planning grants may be available to help support initiatives interested in Place-Based Integrated Water Resources Planning. Go to the **OWRD Place-Based Integrated Water Resources Planning website** to learn more about the state supported planning process, find contact information for the program, and learn about planning grant availability.

4.3 Information available to support groundwater protection efforts

This section will discuss the numerous sources of information that are freely available to water systems and communities to help identify potential sources of contamination and risks to source water quality. However, it is important to note that most forms of available information can only provide insight into the natural risks for a source area (i.e. areas of highly erodible soils) or for regulated potential contamination sources (i.e. locations of hazardous waste or mining sites). Water systems, communities and local representatives continue to have the best knowledge about unregulated risks in their source water area (i.e. illegal dump sites).

The Department of Environmental Quality's Drinking Water Source Protection program staff are available to assist public water systems with accessing, understanding, and using data to protect their drinking water sources.

Contact the DEQ Drinking Water Program for free technical assistance by emailing: **DrinkingWater.Protection@deq.oregon.gov**

Sources of data on drinking water source area conditions and natural risks that could aid in developing plans and strategies for groundwater protection include, but are not limited to, the following:

1. Data available from the Original or Updated Source Water Assessment Reports completed by Oregon Health Authority and the Department of Environmental Quality.

    - Information on potential contaminant sources and susceptibility
    - Aquifer characteristics that show how easily the water supply could be affected or contaminated, e.g. permeability, infiltration capacity, confined vs. unconfined, etc.
    - Details about the well's construction that could reveal potential risks to the water supply

2. Department of Environmental Quality Drinking Water Source Area map data layers. This includes data that the Drinking Water Source Protection Program creates and maintains in addition to map data that the Drinking Water Source Protection Program hosts on its online Drinking Water Source Protection online map viewer. Contact the DEQ Drinking Water Source Protection program if you need assistance accessing or understanding these maps and data layers by sending an email to: **DrinkingWater.Protection@deq.oregon.gov**

    Go to the **DEQ Drinking Water Source Protection Program online map viewer** to view the following data layers:

    - Drinking Water Source Areas
    - Information on potential contaminant sources, including locations of hazardous materials and locations of roads, highways, and railways
    - Waterbody locations and flow paths from the United States Geological Survey (National Hydrography Dataset)
    - Impaired waterbodies from DEQ's water quality assessment process
    - Land ownership/use data
    - Satellite imagery

3. Land cover data available from the United States Department of Agriculture – National Agricultural Statistics Service. View the **USDA – NASS CroplandCROS web app** to view the Cropland Data Layer, geolocate farms, and assess landcover in map areas of interest.

4. Aerial photography (current and historic) from Google Earth. Go to the **Google Earth website** to explore available imagery and tools.

5. Oregon Department of Geology and Mineral Industries data layers:

   - Hazards data -- landslides, flood, tsunami, coastal erosion, earthquake shaking, fault, and volcano geohazards
   - Mining permit information
   - Geospatial data including Lidar and geologic information (rock types)

   Go to the **DOGAMI 'Interactive Maps and Geospatial Data' website** to access interactive maps, the mine site permit viewer, and the geospatial data.

6. Water quality and quantity data (groundwater levels, water use) from the United States Geologic Survey.

   - Go to **USGS's online National Water Dashboard** to access real-time water data.
   - Go to the **USGS Groundwater Data for Oregon website** to find information on current and historical groundwater data.

Additional data on land uses, management, or potential risks due to human activities:

1. Agricultural Water Quality Management Plan for your area. Agricultural Water Quality Management Area Rules and Plans completed by Oregon Department of Agriculture which are designed to prevent and control water pollution from agricultural activities and soil erosion on rural lands. Go to the **ODA Agricultural Water Quality website** for more information on the Agricultural Water Quality Plan Areas and Regulations. DEQ participates in ODA's effort to review and revise Agricultural Water Quality Management Area Plans and provides **status and trends reports**, information on drinking water resources near agricultural practices and other water quality comments on ODA's area rules and plans. To view this information for each agricultural area plan review, visit the **DEQ Area Plan Comments and Drinking Water Updates page.**

2. Confined Animal Feeding Operations (data from ODA). Various permits are required from Oregon Department of Agriculture depending on number of animals, length of time the animals are confined, and how manure and wastewater are managed.

Activities within the CAFO Program require public notice and participation opportunities and most facilities have an Animal Waste Management Plan. For more information see **Oregon Department of Agriculture's Frequently Asked Questions on the CAFO Program.**

3. Environmental cleanup site information about sites with known or suspected contamination from hazardous substances. Go to the **Oregon Department of Environmental Quality's Environmental Cleanup Information Database website** to learn about cleanup sites and access cleanup site information via the Your DEQ Online web portal.

4. Leaking underground storage tanks for information on releases of hazardous substances (primarily petroleum products) from regulated or unregulated leaking USTs. Go to the **Oregon Department of Environmental Quality's Leaking Tanks Database website.** DEQ also maintains information on Heating Oil tanks that have been decommissioned. See the **Heating Oil Tanks website** for more information.

5. Up to date information about locations of hazardous materials from the Oregon State Fire Marshall. Go to the **Hazardous Materials Storage Sites interactive map** to view current Hazardous Substance storage site information available from the OSFM Community Right to Know program**.** This program also tracks hazardous materials stored in aboveground storage tanks.

6. Water quality permits govern how wastewater and stormwater are managed. A DEQ water quality permit is required whenever there is a discharge of pollutants to waters of the state or to the ground. Waters of the state include surface waters (wetlands, pond, lakes, streams, rivers, etc.) and groundwater. Permits are required for discharges of wastewater (sewage, processing water, etc.), wash water, and even for wastewater that may be relatively clean, such as non-contact cooling water. Certain industries and activities may also be required to obtain permits for stormwater runoff from their properties. Go to **Oregon Department of Environmental Quality's Water Quality Permitting website** for more information. DEQ has a separate **Underground Injection Control website** for additional information on permitted systems that place fluids into the ground. Interested parties can subscribe to email notifications for all of DEQ's permitting topics by going to **DEQ's Public Notices** page.

7. Notifications for timber harvest, application of pesticides, road building activities, slash burning, etc. in forestlands. Visit the **Oregon Department of Forestry's FERNS**

website to sign up for Forest Activity Electronic Reporting and Notification System notifications.

8. The Total Maximum Daily Load, or clean water plan, is a science-based approach to cleaning up polluted water so that it meets state water quality standards. A TMDL is a numerical value that represents the highest amount of a pollutant a surface water body can receive and still meet the standards. TMDLs primarily address direct impacts to surface water but may also consider pollutant loading from groundwater discharges. **Oregon Department of Environmental Quality's Total Maximum Daily Load website** for basin specific information or to contact the appropriate DEQ Basin Coordinator.

If your groundwater well or spring is within approximately 500 feet of a surface water stream, river or lake, your source may be receiving some surface water recharge and therefore be susceptible to pathogens, viruses, and other contaminants contained in the surface water. **Oregon Health Authority's Drinking Water Services' Groundwater Under the Direct Influence of Surface Water website** provides more information on the formal determination process, however, some water systems may be hydraulically connected to surface water but not meet the GWUDI determination. **Oregon Department of Environmental Quality's Surface Water Resource Guide,** which is a companion document to this Groundwater Guide, has additional information on accessing potential contamination sources that may also impact groundwater sources including harmful algal blooms, boating access sites including marinas, and water quality limited surface water that may not be fully supporting beneficial uses, such as fish and aquatic life, drinking water or water contact recreation.

Appendix 2 is a compilation of information on the most common potential impacts to the groundwater drinking water sources in Oregon. Appendix 2 "Pollutant Reduction Strategies for Land Uses/Activities" lists the categories of land uses and activities that are identified in the Updated Source Water Assessments, then summarizes the potential impacts or risks from those activities. *Impacts generally will only occur when chemicals are improperly handled, or best management practices are not followed. The purpose of developing strategies to "protect" a drinking water source area is to reduce the risks of spills, pollutant release, or off-site movement of chemicals.* The Appendix 2 table provides key pollutant reduction ideas and resources for implementing drinking water source protection strategies.

4.4 Working with private landowners in drinking water source areas

Working with private landowners within delineated drinking water source areas must be a top priority for any water system or community interested in implementing protection measures. If all or part of the drinking water source area is owned by entities other than the public water supplier, then engagement and cooperation with those landowner(s) is a necessary condition for successful drinking water source protection. This engagement could take the form of permission to evaluate and remedy degraded sites on the landowner's property, a cost-share agreement where the landowner does the work and the water system assists with the necessary expenses and resources, or simply sharing information and encouraging the landowner to implement risk reduction practices on their own.

Regardless of what the specific protection strategies or goals are, working with private landowners will likely involve working with a technical assistance partner to assist with landowner engagement. Soil and water conservation districts or watershed councils are common partners for water systems to work with when engaging private landowners; see section 3.0 of this resource guide for more information on partnering with technical assistance organizations.

Working with private agricultural and rural residential landowners within groundwater drinking water source areas can be particularly important because nitrate, a common component in fertilizers and in human and animal wastes, does not attach to soil particles and is readily moved by water downward into groundwater sources. Common sources of nitrates found in groundwater include septic systems, agricultural fertilizer application, and animal waste storage. In addition, pesticides used to control insects, weeds, or other organisms can also contaminate groundwater sources. Agricultural landowners and rural residents rely on high quality groundwater sources for livestock watering and crop/lawn irrigation, in addition to its use as a drinking water source. The shared vision of protecting agricultural water quality is aided when tools are available to assess the potential impacts of different management practices on groundwater quality. See section 5.0 of this resource guide to learn more about pollution reduction tools that can be used in agricultural and rural settings.

Some landowners will be reluctant to allow access to their property for liability and other reasons. Therefore, developing a carefully negotiated agreement can address those concerns. An agreement may take the form of a "Memorandum of Agreement" often used between municipal entities and private or public landowners. The discussion and agreements with landowners in the drinking water source area regarding management practices (including potential

agreements with monetary compensation attached) are an important tool for the success of the place-based planning process and source water protection projects.

There are many examples in Oregon of water systems and their communities working with private landowners to accomplish drinking water source protection goals. For a comprehensive example that can be applied on a smaller scale where needed, go to the **Eugene Water and Electric Board's Pure Water Partners Program website** to learn more about how this water system engages landowners within its drinking water source area to complete property assessments and receive support to implement restoration work on their properties. In another example of a collaborative effort, several small water systems in the North Ashland area worked together with the support of a Drinking Water Source Protection Grant to form a drinking water protection team. The team worked with a consultant to develop a preliminary drinking water protection plan and provided public education and best management practice information to protect sources of drinking water in the area.

4.5 Place-based planning and critical lands protection

Public water providers rarely have ownership of all or even part of the drinking water source area for their public supply well(s), springs, or intake(s). This means that water systems and communities lack control over what activities happen on privately owned lands despite their responsibility to respond to any potential contamination resulting from those activities.

A potential outcome of drinking water source protection planning is the identification of critical land areas that may have a substantial impact on source water quality or quantity. One strategy for reducing risk from these land areas is to use conservation tools that provide long-term protection and increase local control and management of environmental resources. Land conservation can provide a mechanism for communities to ensure the management of land within their drinking water source area protects and improves the quality and/or quantity of their drinking water sources. The most common models of land conservation are (1) the purchase or donation of land, and (2) the establishment of conservation easements that define allowable land uses on specified portions of privately owned land. Both methods require the participation of willing landowners in Oregon.

Conserving land in drinking water source areas can provide many other benefits in addition to maintaining high source water quality or quantity. For example, land conservation can also protect the environment, increase the resiliency of the water system to the impacts from climate

change, provide recreation and open space opportunities for communities, support local economies, and result in healthier and more equitable communities.

Water systems and communities that are interested in learning more about land conservation as a strategy should reference the **Coalition of Oregon Land Trust's Guide for Using Land Conservation to Secure Clean and Reliable Drinking Water** (2022). This guide provides more information about common land conservation tools, how land conservation tools can protect drinking water sources, and lists funding resources for land conservation projects.

Land trusts are important partners for land conservation projects. **Reference section 3.1 in this resource guide** for more information about partnering with land trusts.

5.0 Pollutant reduction tools

This section provides summaries and examples of tools that public water systems may find useful for implementing pollutant reduction within drinking water source areas for groundwater wells.

For the purposes of this guide, a "tool" is defined broadly as an organized collection of data and/or information that may be used in informing technical assistance and implementation of drinking water source protection planning. A partial list of what can be considered a "tool" are maps, tables, diagrams, checklists, charts, online resources, and other formats. The land cover related tools provided and referenced within this guide range in complexity from simple tables to high-resolution geospatial information system maps. Several of the tools display statewide data that may not be directly transferrable for use at the local level due to the lack of resolution. The Department of Environmental Quality's Drinking Water Source Protection program staff are available to assist public water systems with accessing, understanding, and using data to protect their drinking water sources. In such cases where a local, site-specific, or tailored map/tool is needed, please make these requests directly to DEQ Drinking Water Source Protection (email **Drinkingwater.Protection@deq.oregon.gov** or see our **Drinking Water Source Protection Program Contacts web page**.

Communities of sufficient size, resources, and other means may be able to develop drinking water source protection plans for their groundwater resources without the use of the tools provided in this section. Many communities that fit this description have already taken steps to develop and utilize screening tools, resources, and strategies for reducing potential risks to their drinking water. Other communities may lack the information or data to engage landowners or managers within the drinking water source area. These discussions may be aided through the use of the tools provided in this section.

The tools provided in this section are intended to be used by public water system staff, managers, and community leaders with assistance received from their regional or county *partner organization*. A partner organization for community-led drinking water source protection efforts are most often the local Soil and Water Conservation District, watershed council, the university extension office, the USDA NRCS district, and/or possibly a contracted natural resources consultant. Early involvement of a partner organization is critical in order to ensure that screening tools are accessible, used properly, and are effective. Partner organizations may also be able to assist with follow-up efforts that may require grant writing and additional funding when in-depth investigation of natural resources may be deemed necessary. It is important that public water systems and community leaders involve their regional partner organization at the

outset when using screening tools provided in this section. The consolidated list of potential partner organizations for Oregon counties can be found in Section 3.0.

The authors of this resource guide would like to stress that ***none of the tools provided in this section are regulatory***. Instead, the use of the tools is highly encouraged. A community's decision to put the screening tools into use represents a community effort towards the broader, long-term goal of drinking water source protection planning. The tools provided in this section do not attempt to model a watershed, an aquifer, or the transport or fate of contaminants. Rather, they are viewed more as screening tools that provide preliminary information for informing community-led discussions aimed at drinking water source protection. Screening tools provide a cost-effective way to focus and prioritize limited resources where community planning efforts are expected to yield the greatest benefit to drinking water source protection. None of the tools in this section should be considered "definitive" analysis or a "risk analysis" for groundwater vulnerability, nitrate leaching, or pesticide leaching.

5.1 Data available from source water assessment reports

The Oregon Health Authority and the Department of Environmental Quality developed source water assessments for all community water systems. Source water assessments provide water systems and communities with detailed information on the water that is the source of their drinking water, whether it comes from a groundwater well, spring, or surface water intake. Source water assessments contain valuable information about potential contaminant sources and susceptibility within the drinking water source area, including information about soil erosion potential, landslide hazards, and land uses.

For more information on why source water assessments were developed refer to Section 1.1 of this resource guide.

5.2 Land cover maps

The Updated Source Water Assessments (sent to each public water system) include maps showing current land uses within the drinking water source areas. More detailed mapping is sometimes available, depending on data sources being updated on a regular basis. Public water systems can also request tax-lot data from local city or county agencies. At present, when a public water system requests a more detailed land use map from DEQ for their drinking water source area(s), the community will receive the most updated imagery available from the *USDA National Agricultural Statistics and the National Land-Cover Database* (USDA 2015).

Since the drinking water source areas (for 10-15 years of flow) for groundwater systems are generally very small, it is important to develop a detailed land use cover map in order to prioritize pollutant reduction strategies. For the groundwater public water systems in the Willamette Valley and Eastern Oregon, it is not unusual for the entire drinking water source area to be in productive agricultural lands. For those, it is much more useful to provide details of what the agricultural lands are currently producing.

Table 2 provides a list of example land covers that can be identified through imagery. The methodology for the USDA National Agricultural Statistics imagery is to identify one of over 240 unique agricultural land covers, referred as "Cropland Data Layers". The metadata for generating the source CDL imagery is referenced in Section 8.0 (USDA, 2015). After identifying the CDL covers, the tool then identifies each of the non-agricultural land covers as provided by National Land-Cover Database. The NLCD is a result of work by a federal agency consortium. The two sources of data are combined within this recommended Land Cover Map tool.

The land cover map is a starting point, or initial assessment of potential management practices or activities within the drinking water source area. An example of a map that displays the capabilities of the tool is provided in **Figure 8** below.

Figure 8 is an example of a land cover map for a small community with 2 wells serving as their public drinking water sources. The yellow arrow provides the general direction of groundwater flow from upgradient toward the public water supply well (white circle). The land cover imagery is only displayed for the area enclosed by the drinking water source area. The drinking water source area limits are calculated for 10-15 years of time-of-travel, depending on the data available for each particular well. More information on how the drinking water source areas were delineated can be found on **OHA's Delineation of a Drinking Water Source Protection Area website**.

For this example, using the USDA NASS imagery, the percentage of each land cover classification within the groundwater source areas is listed in the map legend. The accuracy of the cover identified, if available, is also listed in the legend in the following format: [PA = 80], where "PA" represents a producer accuracy in this example of "80%". When the land cover is determined to be non-agricultural, it adopts the National Land Cover Database identification categories (Homer et al 2015), for example, "Developed/Low Intensity," "Woody Wetlands," and others in order to account for all land covers (see Table 2). Only land covers that comprise at least two percent of the total groundwater source area are listed in the legend of Figure 8. *The land covers shown on the map should always be confirmed through field verification, or through verification with the landowner/producer.*

Table 2. Example Land Characteristics and Cover Identified through Imagery

National Land Cover Database Classifications (NLCD 2011)	Continental US Land Cover Classifications (CDL 2015)
Water/ Barren	**CDL Land Use Examples**
Open Water	**Alfalfa**
Perennial Ice/Snow	
Barren Land (Rock/Sand/Clay)	**Barley**
Developed	
Developed, Open Space- Impervious surfaces are 20%	**Cherries**
Developed, Low Intensity- Impervious surfaces are 20% to 49%	**Grapes**
Developed, Medium Intensity - Impervious surfaces are 50% to 79%	**Grassland/Pasture**
Developed High Intensity- Impervious surfaces are 80% to 100%	**Oats**
Forest	**Onions**
Deciduous Forest	
Evergreen Forest	**Pears**
Mixed Forest	
Shrubland	**Potatoes**
Shrub/Scrub	
Herbaceous	**Sod/Grass Seed**
Grassland/Herbaceous	
Wetlands	**Sweet corn**
Woody Wetlands	
Emergent Herbaceous Wetlands	**Winter wheat**
The classification system used by NLCD2011 is modified from the Anderson Land Cover Classification System*	The complete CDL Land Use listing can be retrieved at: https://www.nass.usda.gov/Research_and_Science/Cropland/sarsfaqs2.php#Section1_9.0

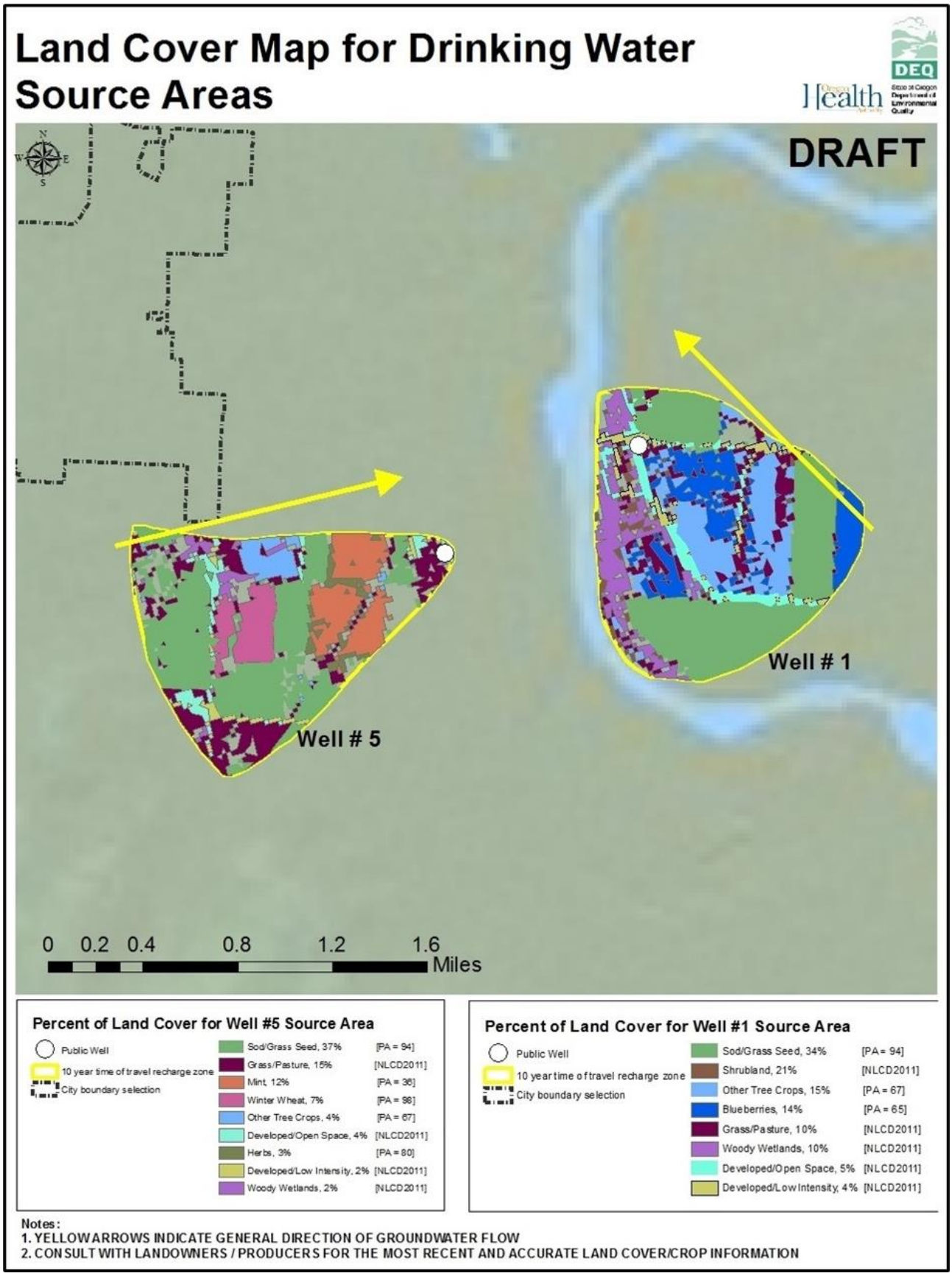

Figure 8. Land Cover Map – Example

5.3 Urban homeowners and pesticides

The use of pesticides in urban settings by residents is more patchy and unpredictable than agricultural pesticide applications. In high density housing areas, if a good portion of the homeowners are applying pesticides liberally, this could cause a regional problem in groundwater. For this reasons we have chosen to provide a resource that consolidates the a wide range of best use practices for homeowners when attempting to manage pests.

Urban homeowners tend to apply relatively high rates of general use pesticides on a per area basis for the maintenance of lawns, home gardens, and ornamentals plants. Most homeowners apply pesticides with minimal or no training, and they usually apply pesticides without a pesticide applicator license (as general use pesticides do not require an applicator license). For these reasons there is a reasonable likelihood that residential pesticide applications tend to result in off-target transport of pesticides. This means that residential pesticides that are applied near homes may end up traveling below the root zone of the targeted vegetation. These pesticides would be expected to travel on to contaminate the underlying aquifer or a nearby aquifer. Residential pesticide use is also likely to be washed off-site during storm events or through excessive watering, and thereby have the result of contaminating municipal stormwater (surface water pollution).

In recognition of this challenge several larger municipalities in the Pacific Northwest created an **online tool called Grow Smart, Grow Safe**. The tool is both a website (desktop) tool as well as a smartphone/mobile application. The guide provides homeowners with non-chemical options as well as comparative hazard ratings for different products depending on their intended use and application. This is a free resource to the public that is intended to assist homeowners in making informed decisions and thereby lead to a reduction of negative environmental impacts that are commonly associated with pesticide use. Grow Smart Grow Safe organizes its information and ratings by whether the intended user is managing for insects, weeds, plant diseases, and animal pests.

Additional information about less-toxic alternatives can be found at the National Pesticide Information Center's **Low Risk Pesticides website**.

Go to the National Pesticide Information Center's **Pesticide Ingredients Used in Organic Agriculture website** to learn about organic or naturally derived pesticides permittable for use in certified organic agriculture.

5.4 Nitrate leaching potential rating

There is a reasonable likelihood that pesticides and nitrates may occur together in monitoring data or public water system tests. Laboratory results that reveal nitrate detections in groundwater may also be interpreted as a "conservative tracer" for pesticide contamination. This is because nitrates tend to move through a soil, geological layers, and leach into groundwater more readily than do pesticides. When nitrate is detected in groundwater, additional follow-up testing is sometimes warranted to confirm whether pesticides are also present, and if so, whether the level of pesticide contamination represents a public health concern. As the number and types of pesticides available for use are constantly changing over time, developing a list of pesticide use practices within a drinking water source area and keeping this list updated is valuable for ensuring the safety of public drinking water. In an effort to proactively anticipate those soils that may lead to nitrate leaching, this section provides a tool to interpret nitrate leaching potential in advance of actual detections.

Figure 9 illustrates an example of a nitrate leaching potential rating map for a community's drinking water source areas using the USDA-NRCS Gridded SSURGO Database through the Web Soil Survey portal (USDA 2016). This tool is designed to evaluate the potential for nitrate-nitrogen to be transmitted through the soil profile below the root zone by percolating water under non-irrigated conditions. An irrigated nitrate leaching potential map is also available. The ratings are based on inherent soil and climate properties, and *do not account for management practices* such as nitrogen fertilizer application rates and timing, or crop rotation.

The NRCS Web Soil Survey provides a large number of soil map data layers and information, including the Nitrogen Leaching Potential rating. It is important to note that high nitrate potential leaching ratings do not confirm that groundwater vulnerability in fact exists. Rather, a high rating for soils within groundwater delineation zone means that more information and investigation is needed. In most cases there are multiple nitrate leaching potential ratings that exist within a given groundwater delineation zone (low to high). In all cases, the involvement of a partner organization with technical knowledge when using the tools in this section is strongly encouraged. It may be that landowners within the drinking water source area may have already implemented a number of conservation practices that have reduced the potential for groundwater contamination.

Additional information important to public water system staff and landowners about each soil type can be obtained on the Web Soil Survey site. Note that this example is for *non-irrigated agriculture*. The *irrigated* leaching potential ratings for nitrates in Oregon generally are moderately-high to high for most soil types. This is primarily because of the way water serves as the vehicle for transporting nitrates and pesticides, as well as other contaminants.

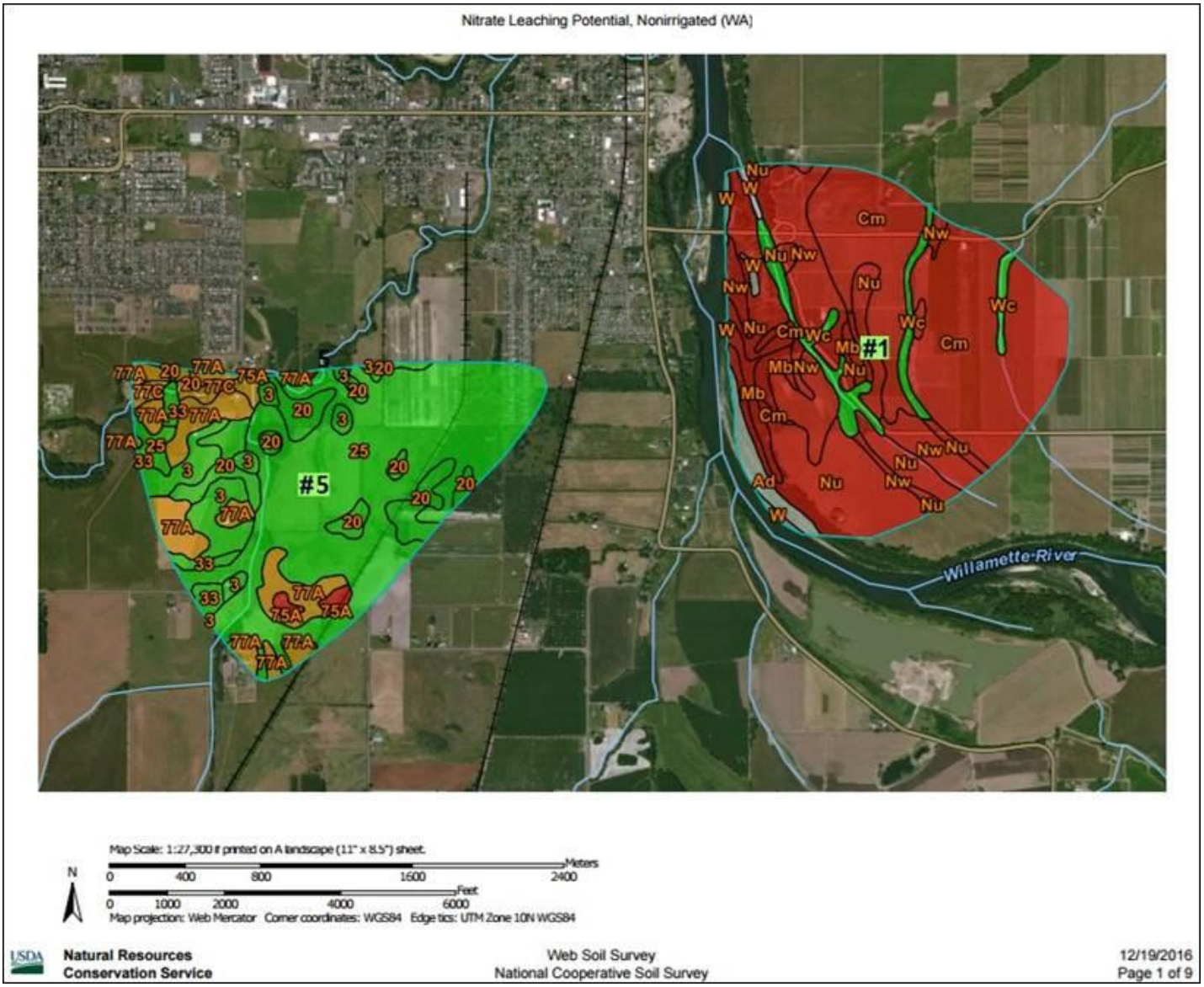

Figure 9. Nitrate Leaching Potential Map – Example

Another tool for rating or predicting potential nitrate leaching is a system originally developed for a project in Washington, however it is equally available and relevant for use in Oregon through selecting an area of interest in Oregon. **Table 3** provides the information on the soil type and the percentage of each soil type to correlate with the Figure 9 mapped units.

Table 3. Example Nitrate Leaching Potential Data Summary (Page 1 of 5)

Nitrate Leaching Potential, Nonirrigated (WA)—Marion County Area, Oregon, and Polk County, Oregon
(CDL_Monmouth_2015Poly_cropDescJoin)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- High
- Moderately high
- Moderate
- Low
- Not rated or not available

Soil Rating Lines
- High
- Moderately high
- Moderate
- Low
- Not rated or not available

Soil Rating Points
- High
- Moderately high
- Moderate
- Low
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marion County Area, Oregon
Survey Area Data: Version 13, Sep 16, 2016

Soil Survey Area: Polk County, Oregon
Survey Area Data: Version 14, Sep 19, 2016

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 5, 2011—Jul 6, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

USDA Natural Resources Conservation Service | Web Soil Survey, National Cooperative Soil Survey | 12/19/2016 Page 2 of 9

Table 3. Example Nitrate Leaching Potential Data Summary (Page 2 of 5)

Nitrate Leaching Potential, Nonirrigated (WA)

Nitrate Leaching Potential, Nonirrigated (WA)— Summary by Map Unit — #1, Marion County Area, Oregon (OR643)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
Ad	Alluvial land	Not rated	Alluvial land (100%)		17.6	1.4%
Cm	Cloquato silt loam	High	Cloquato (85%)	Water quantity available for leaching (1.00) Water travel time (0.90)	294.1	23.4%
Mb	McBee silty clay loam	High	McBee (85%)	Water quantity available for leaching (1.00) Water travel time (0.82)	18.5	1.5%
Nu	Newberg fine sandy loam	High	Newberg (85%)	Water quantity available for leaching (1.00) Water travel time (1.00) Water holding capacity (0.40)	169.6	13.5%
Nw	Newberg silt loam	High	Newberg (100%)	Water quantity available for leaching (1.00) Water travel time (1.00) Water holding capacity (0.20)	127.2	10.1%
W	Water	Not rated	Water (100%)		9.2	0.7%
Wc	Wapato silty clay loam	Low	Wapato (90%)	Water quantity available for leaching (1.00) Denitrification due to saturation (0.50) Water travel time (0.22)	42.8	3.4%
Subtotals for #1					**678.9**	**54.1%**
Totals for Area of Interest					**1,255.8**	**100.0%**

Table 3. Example Nitrate Leaching Potential Data Summary (Page 3 of 5)

Nitrate Leaching Potential, Nonirrigated (WA)— Summary by Map Unit — #2, Polk County, Oregon (OR053)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
3	Amity silt loam	Low	Amity (85%)	Water quantity available for leaching (1.00)	52.5	4.2%
				Denitrification due to saturation (0.50)		
				Water travel time (0.35)		
			Concord (4%)	Water quantity available for leaching (1.00)		
				Denitrification due to saturation (0.50)		
			Dayton (3%)	Water quantity available for leaching (1.00)		
				Water holding capacity (0.78)		
				Denitrification due to saturation (0.50)		
20	Concord silt loam	Low	Concord (90%)	Water quantity available for leaching (1.00)	69.8	5.6%
				Denitrification due to saturation (0.50)		
			Dayton (5%)	Water quantity available for leaching (1.00)		
				Water holding capacity (0.78)		
				Denitrification due to saturation (0.50)		
25	Dayton silt loam	Low	Dayton (95%)	Water quantity available for leaching (1.00)	329.7	26.3%
				Water holding capacity (0.78)		
				Denitrification due to saturation (0.50)		

Table 3. Example Nitrate Leaching Potential Data Summary (Page 4 of 5)

Nitrate Leaching Potential, Nonirrigated (WA)— Summary by Map Unit — #2, Polk County, Oregon (OR053)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
			Concord (2%)	Water quantity available for leaching (1.00)		
				Denitrification due to saturation (0.50)		
33	Holcomb silt loam	Low	Holcomb (90%)	Water quantity available for leaching (1.00)	15.7	1.3%
				Water holding capacity (0.79)		
				Denitrification due to saturation (0.50)		
			Concord (2%)	Water quantity available for leaching (1.00)		
				Denitrification due to saturation (0.50)		
			Dayton (2%)	Water quantity available for leaching (1.00)		
				Water holding capacity (0.78)		
				Denitrification due to saturation (0.50)		
75A	Willamette silt loam, 0 to 3 percent slopes	High	Willamette (85%)	Water quantity available for leaching (1.00)	8.1	0.6%
				Water travel time (0.82)		
77A	Woodburn silt loam, 0 to 3 percent slopes	Moderately high	Woodburn (85%)	Water quantity available for leaching (1.00)	86.8	6.9%
77C	Woodburn silt loam, 3 to 12 percent slopes	Moderately high	Woodburn (85%)	Water quantity available for leaching (1.00)	14.3	1.1%
Subtotals for #2					**576.8**	**45.9%**
Totals for Area of Interest					**1,255.8**	**100.0%**

Table 3. Example Nitrate Leaching Potential Data Summary (Page 5 of 5)

Nitrate Leaching Potential, Nonirrigated (WA)— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
High	617.4	49.2%
Low	510.4	40.6%
Moderately high	101.1	8.1%
Null or Not Rated	26.8	2.1%
Totals for Area of Interest	**1,255.8**	**100.0%**

Using the USDA-NRCS Web Soil Survey (online) map tool to generate a nitrate leaching potential rating map for your community's drinking water source area does not require use of ArcGIS software, nor does it require GIS expertise. By following these steps, anyone with basic computer skills and access to the internet should be able to produce a Web Soil Survey map for their local area of interest. The step-by-step process to produce the map can be carried out through the use of an internet browser. If you have more than one source area, the shapefile will be bundled with multiple areas, and the shapefiles will be attached in an email as a single .zip file.

Steps for creating a soil Nitrate Leaching Potential Map:

1. Request the GIS shapefile of your community's drinking water source area(s) from DEQ (GIS Coordinator 503-229-6798). The shapefile will be provided to you by email.
2. Save the .zip file that was attached to the email on your computer.
3. Navigate to the **Web Soil Survey website**.
4. In the "Area of Interest" box on the left margin of the screen, select the double chevron that is downward pointing.
5. Click on "Create AOI from Zipped Shapefile."
6. The box will expand, and a button will appear, "browse." Click the browse button.
7. A window will appear prompting you to locate the .zip shapefile that you saved from the email. Select the zipped shapefile, then click the Open button.
8. Click the smaller box below the Browse button that reads "Set AOI."
9. **note** If a blue-colored information box opens, read it, but then click the Close button.
10. After a few seconds, you should see the delineation zones with an outline and hash marks.
11. **Note: at this point you may use this Area of Interest with any other additional Web Soil Survey map data. The following steps will take you to the nitrate leaching rating map layer. **
12. In the menu tabs that run across the top of the page, click the "Soil Data Explorer" tab.
13. In the left-hand margin of the page, select the "Land Management" drop down button (double chevron bubble).
14. Select the "Nitrate Leaching Potential, Nonirrigated (WA)" (or irrigated) from the list (or the irrigated version if desired). Note, "WA" does not mean this tool is limited to Washington, it simply was originally developed for Washington.
15. **Note: If the soil ratings without mapped colors is desired, skip to step 18 at this point**
16. Also in the same area of the left margin, below the "View Options, and below the "Advanced Options," you will find two buttons. Of the two, click the "View Rating" button.
17. After a few seconds, the color ratings the nitrate leaching potential map will appear.
18. At the very top right corner above the map is a "Printable Version" button. Click this button.
19. A small window will pop-up. Click the "View" button at the bottom, right-hand side of the window.

20. **Note: If you have not added Web Soil Viewer as a trusted site for your browser, the printable map may be blocked, and you may get a notice. Check with your IT staff/department for help in such cases**
21. After a few seconds, you will see a full nitrate leaching potential map with ratings and a summary data that you can print or save.

For more background on the topic of understanding soil sensitivity to the effects of leaching in Oregon, please see the *Determination of Soil Sensitivity Ratings for the Oregon Water Quality Decision Aid* (Huddleston et al, 1998). While this tool is in the process of being updated, this publication is still useful in understanding the sensitivity of soils to the effects of leaching in Oregon.

Assessing site-specific groundwater vulnerability is a relatively in-depth analysis that in most cases involves obtaining grants and funding in order to do the work. In such cases where nitrate leaching potential ratings for a particular soil are high, and mitigating management practices are few or insufficiently understood, it is recommended to apply for a grant or funding in order to assess groundwater vulnerability (See Funds and Resources in Section 3.0).

5.5 Common crop-pesticide associations

Gaining a better understanding of land use activities within a drinking water source area for public supply wells is an important step towards developing strategies for drinking water source protection. It is advisable to use every available source of information about potential risks to a drinking water supply to help inform risk reduction priorities (refer to sections 2.0 and 5.0 for more information about available sources of information). After identifying the land uses and activities in the drinking water source area, the next step is to prioritize the reduction work based on the particular chemicals or pesticides that may impact the drinking water system. In this section, tools are provided that enable the public water system staff to identify priority areas regarding potential risks from pesticides.

The association of pesticides with specific land uses can vary over time based upon several factors. Today's producers must continually adapt to many factors when considering what to grow year to year. Some of these factors include: changing commodity prices, climate change, available labor, cost of crop inputs (pesticides and fertilizers), and encroaching urbanization in some areas (for more information on the most produced crops see **Oregon Agricultural Statistics**)

However, county level statistics suggest that crop selections and their yield tend to be relatively stable over the past two decades. The stability in land use decisions is further supported by the consistency of USDA satellite crop imagery data (as shown in Figure 8). Proven pest

management strategies tend to be carried forward from the previous year into the next. Where a crop-rotation plan is practiced, these operations typically rotate back through set grouping of crops as well as a corresponding set of pest management strategies. The possible variability in crops and pesticides can be addressed through precise mapping and working closely with the local agricultural partners.

Several resources or tools are described here that may be useful in identifying pesticides that are most commonly associated with specific land uses or crops.

Washington State University's Extension Service maintains an extensive online resource with information on crops and pesticides. Go to the WSU **Pest Management Resource Service website** to access information and resources targeted at commercial, agricultural, and home uses of pesticides.

WSU Extension Service also maintains the Pesticide Information Center Online **PICOL Database** that provides electronic copies of most Oregon registered pesticide labels. Users can search by pesticide name, by ingredient, or by crop type. This tool is most effectively utilized after drinking water providers and communities have already investigated which crop types or agricultural activities are present in their drinking water source area.

Appendix 3 provides a starting point for determining which pesticides are most commonly associated with specific land uses. Appendix 3 provides common crop application patterns for the pesticides that are typically applied to more common Oregon crops. The patterns or associations between land uses and pesticides in appendix 3 are a result of multiple producer/landowner survey data, pesticide registration information, and published regional strategies for managing pests. Visit the **Pacific Northwest Pest Management Handbooks website** for more information. While most of the land uses are specific crops, nursery operations, Christmas trees, and other non-crop land uses are included in these tools as they are available. Please note that the table in appendix 3 is simplistic and may not be representative of crop pesticides in your drinking water source area. The table in appendix 3 is included for educational purposes only. Local partners (reference in Section 3.0) will be able to assist in identifying the actual crops and pesticides. in use locally, and site-specific pesticide use practices should be confirmed through communication with producers and landowners directly.

The data in **appendix 3** provides a preliminary list for discussing pest management practices that are used within the drinking water source area. As indicated in the notes, there are limitations associated with the data. For example, the USDA surveys of Washington wine grape and potato producers were used since Oregon data of this type was not available at the time this table was compiled. The data on the percentage of total acreage treated are for the first (predominant) pesticide listed by the survey, and the data is not always available. It does not include common "organic-approved pesticides" that may be used in both organic and

conventional agricultural systems. The PICOL Pesticide Database was accessed and cross-referenced for Oregon-registered products. Site-specific pesticide use practices should be confirmed through discussions with producers and landowners. These discussions benefit from guidance and assistance provided by the agricultural service partner organizations (see Section 3.0).

The US Geological Survey has done extensive research on pesticides in surface water and groundwater across the country. USGS data on pesticides in US waters can be found at the **USGS website on Pesticides in the Nation's Streams and Ground Water**.

As part of the USGS research, their National Water-Quality Assessment Program not only does research in pesticide occurrence, but also how that data relates to land use and pesticide use. The NAWQA program is currently working to publish reports on new statistical models that can be used to estimate the concentrations or occurrence of some pesticides in streams and groundwater where they have not yet been measured. The national NAWQA data are sufficiently extensive to support these statistical models. The spatial extrapolation allows NAWQA's data on detections, sources and factors that affect pesticide occurrence —such as pesticide use and land use, climate, and soil characteristics—to be used as a more comprehensive national assessment that includes unmonitored areas.

USGS has developed pesticide-use maps that show the geographic distribution of estimated use on agricultural land in the conterminous United States for numerous pesticides. Maps were created by allocating county-level use estimates to agricultural land within each county. Graphs at the county level are available that show annual use by major crop for the mapped pesticides (Thelin et al 2013). These pesticide use estimates are suitable for evaluating national and regional patterns and trends of annual pesticide use (Baker et al 2015). USGS notes that the reliability of estimates generally decrease with scale and these maps are not intended for detailed evaluations, such as within or between specific individual counties. Details for how the pesticide-use maps are made, including data sources and methodologies, are available at the **USGS Pesticide National Synthesis Project website**.

For purposes of providing additional tools to be used within drinking water source areas, DEQ used the data from USGS and Oregon-specific data for pesticides in statewide water quality monitoring to create a "Categorical Crop to Pesticide Table". The table is attached as **Appendix 4.** It provides a broad association between common Oregon crops and pesticide use, potentially useful as another starting point in working to develop drinking water source protection strategies.

Additional information on pesticides and for crop-pesticide association is available at the **National Pesticide Information Center website**. The NPIC is a cooperative agreement

between Oregon State University and the U.S. EPA (#X8-83560101). This site is an important reference for pesticide related information, providing science-based information about pesticides and pesticide-related topics, including information on health/environmental impacts, pest identification, pesticide label and MSDS databases, manufacturers, statistics, and records of exposures, etc.

It is important to state again that pesticide use practices may have variability with respect to geography, time/season, and landowner decisions. The site-specific data for chemical and pesticide usage should be verified at the field level. The specific land uses, cropping patterns, and associated pesticides chosen by landowners/producers can change from one year to the next. Agricultural producers may need to adapt new strategies to manage pests. The particular pest pressures will vary from year to year, and chemical companies formulate new pesticides for review and potential registered usage in Oregon. Agricultural service partners (Section 3.0) may be able to assist with the outreach necessary to work with the landowners and operators so that there is an understanding of their practices and product usage.

5.6 Agricultural best management practices

Drawing upon the extensive research available nationwide from USDA, universities, and other organizations, it is well known that some agricultural conservation practices are universally beneficial to reducing the potential for pesticides or nitrates to leach to groundwater. To provide background information on potential technical approaches, here are summaries of some of the leading conservation practices:

- Irrigation practices - restricting irrigation based on plant needs and soil water content can reduce the potential for pesticides to be moved off-target to contaminate groundwater (as well as surface water). A selection of free-for-use irrigation scheduler applications for multiple irrigation methods are available at the **Washington State University Extension Irrigation Calculator website**.
- Timing of pesticide applications – observing weather patterns and avoiding the application of pesticides preceding rain events considerably reduces the potential for off-target pesticide movement.
- Quantity of pesticide application—precision agriculture techniques are allowing producers to better utilize pesticides and their efficacy as a win-win for producers' profits and a way to reduce the potential for groundwater contamination.
- Nutrient management – calculating the necessary nutrients using soil characteristics can maximize yields and protect water quality.
- Integrated Pest Management --developing non-chemical solutions (e.g. crop rotations, trap crops, beneficial insects, etc.)

- Conservation tillage — integrating crop residual through tillage and reduced tillage practices can provide increased returns in crop yield, enhanced soil health (increased nutrients and organic matter, better water infiltration and storage), and reduced erosion and water pollution (USDA 2016).

The above points are a few of the key strategies that can lead to increased profits while at the same time reduce costs and risks of off-site movement of potential contaminants. A sampling of current innovations in Integrated Pest Management can be accessed through the **OSU Integrated Plant Protection Center website**.

Additional strategies for Integrated Pest Management can be found from local partner organizations in your county (see Section 3.0). *These same resources should also be consulted for technical assistance when attempting to use or implement the tools provided in this section of the guide.*

5.7 Nutrient management

Municipal stormwater contributes a considerable amount of nitrogen from fertilizers used on private urban and commercial properties. On a per area basis, a relatively high amount of nitrogen and other macronutrients are applied to lawns, gardens, and ornamental plants throughout cities. The high rate of application, when combined with large amounts of impervious surfaces in urban settings, presents a considerable challenge to manage nitrogen and other nutrients for city planners. Urban zoning laws and building codes are increasingly considering the influence of impervious surface effect and the corresponding need to construct bioswales, buffers, and constructed wetlands to mitigate these effects. In most cases these requirements are only placed upon new and larger-sized development projects, and they do not apply to existing or previously completed projects. In 2014, DEQ issued **"Oregon's Nutrient Management Program"** guidance that discusses sources and source control for nutrients in Oregon

Many tools for urban nutrient management can be found on EPA's **Help Prevent Nutrient Pollution website**.

In agricultural areas, the Oregon Department of Agriculture addresses excessive nutrient runoff through implementation of Agricultural Water Quality Management Area plans and rules. Numerous financial incentives are available to encourage agricultural landowners to reduce nutrient runoff and off-site movement, including programs through the state Soil and Water Conservation Districts, Oregon Watershed Enhancement Board, DEQ's Section 319 nonpoint grants, and federal grant programs. The Oregon Department of Forestry also addresses nutrients in its fertilizer application management program.

Cover crops and no till operations have the benefit of reducing or even eliminating the need for fertilizer application, they reduce the leaching of nutrients, and they are protective of our shared drinking water resources. ODA assists farmers and ranchers in Oregon to prevent and control nutrient pollution from agricultural activities on rural lands. More information on agricultural water quality plans and programs can be found on the **Oregon Department of Agriculture's Agricultural Water Quality Plans and TMDL Implementation Plans website**.

Nutrient management within the agricultural sector is extremely important for maximizing yields and protecting water quality. Obtaining soil test data can allow producers to fine-tune fertilizer application with each consecutive crop cycle. An additional benefit of obtaining soil sample results is that they may influence a producer's decision for which cover crop to use. Soil sampling for nutrients is best done in the spring before planting and in the fall after harvest. The spring samples are useful for knowing the concentration of nutrients already present, so the fertilization rates can be adjusted. The fall sample is an effective measure of how much of the nutrient addition was not used by the crop, so the fertilization amount can be adjusted in the next season. One solution for minimizing fertilizer inputs to agricultural fields is for agricultural producers to incorporate cover crops into their crop cycle. Oregon State University hosts a free online cover crop calculator that allows producers to compare the nutrient value and cost of cover crops, organic and synthetic fertilizers, and compost in acre and 1,000 square foot units. The leftover nutrients after harvest can be carried over to the next seasons and the leaching of these nutrients during heavy winter rainfall events can be minimized through the use of winter cover crops. The OSU Extension cover crop calculator for regions both east and west of the Cascades Mountain can be found at **OSU's Organic Fertilizer and Cover Crop Calculators website**.

When excessive nitrogen remains in the soil, a grass cover crop will effectively take up nitrogen and conserve it for spring planting as a "green manure." Legume cover crops fix additional nitrogen from the atmosphere and are best used when soils are deficient for nitrogen. Legume cover crops are capable of fixing up to 150 pounds of nitrogen per acre—enough nitrogen for some of the heaviest nitrogen feeding crops (Hoorman et al 2009). The organic matter produced during the winter months provide a "soil building" benefit to the soil, effectively increasing tilth for present and future production. The use of cover crops has also been found to "jump start" the increase yields obtained from no-till or conservation tillage practices (Hoorman et al 2009). Where conversion to no-till operations have taken as many as nine years to observe increased yields, combining cover crops with no-till practices have reduced or even eliminated this lag time to see increased yields more quickly.

5.8 Addressing per- and polyfluoroalkyl substances - PFAS

In April 2024, EPA announced the final National Primary Drinking Water Regulation for PFAS, establishing legally enforceable levels for six compounds and mixtures containing PFAS. While funding is available to help water systems install treatment, removing PFAS is expensive and requires major investments. One way to reduce PFAS contamination is to understand where it comes from and how vulnerable your water source is.

Key Steps to Assess and Protect Your Water Source:

1. **Check Your Water Source's Vulnerability**
   - Review your Source Water Assessment to understand your aquifer's geology, water flow, and well construction.
   - Identify if your well is shallow or has weak barriers, making it more susceptible to contamination.
2. **Review Your Drinking Water Source Area**
   - If your water protection area was mapped using a Calculated Fixed Radius method. update it to reflect current pumping rates. The CFR method was used for water systems that serve 500 or less people Also consider additional modeling to include groundwater flow direction and aquifer characteristics.
   - Expand the area of concern beyond the standard 10-15 years of travel time since PFAS are persistent and highly soluble and can spread farther.
3. **Identify Possible PFAS Sources**
   - Facilities that have Emergency Response/Fire control capability such as: Airports, military bases, fire training centers, fuel storage areas, railyards.
   - Waste treatment facilities: Sewage plants, landfill sites, areas where biosolids are spread.
   - Industries using PFAS: Factories, cleanup sites, and businesses with a history of PFAS use.
   - Consider both existing and future industrial developments that could pose a risk.
   - More information on potential PFAS sources can be found on the **Interstate Technology Regulatory Council PFAS uses and products website**
4. **Reducing PFAS Risk at Businesses and Industrial Sites**
   - Review **DEQ's Drinking Water Source Protection Strategies for Commercial and Industrial Land Uses** and consider other general or business sector specific strategies for pollution risk reduction**.**

- Inform facility owners if they are in a drinking water source area.
- Share information with business owners about pollution prevention.
- Ask if they have used PFAS and encourage safe handling practices.
- Provide guidance on reducing toxic chemical use (resources available from **DEQ's non-regulatory Toxics Use/Waste Reduction Technical Assistance Program**).
- Ensure businesses follow best management practices for wastewater and stormwater.

5. **Reducing Risk at Landfills and Wastewater Treatment Plants**
   - Inform facility owners if they are in a drinking water source area.
   - Check for past or current PFAS testing and encourage better waste management.
   - Work with regulators to ensure proper compliance and risk reduction.
6. **Addressing Contaminated Sites**
   - Check **DEQ's Environmental Cleanup Site Information database** for known contamination risks.
   - Contact **DEQ Cleanup program** or Drinking Water Source Protection staff for guidance and support in reducing water contamination.

An additional resource for water systems is the **Pollution Prevention Resource Center's Preventing PFAS Pollution: Drinking Water Source Protections document**.

By taking these steps, water providers can better protect their sources and reduce PFAS contamination before it becomes a bigger issue.

5.9 Potential goals and outcomes for using tools

The tools in this section are provided to assist public water system officials in understanding some of the primary tools and best management practices to reduce off-site migration of pollutants such as nitrates or pesticides. The tools may be useful in the following practical ways:

- for prioritizing technical assistance and outreach efforts
- to inform the creation and composition of an inclusive community-led drinking water source protection planning committee
- as a technical basis for submitting grant requests for drinking water source protection projects
- as a basis for needing comprehensive modeling of local contaminant sources (e.g. follow-on grants, studies, and/or modeling efforts)
- as justification for new/renewed water quality monitoring/sampling activities

The use of these tools is best done through collaborative place-based planning approaches. *In practice, keep in mind that most of the coordination and collaboration of the agricultural community will be done through your local partners from soil and water conservation districts and National Resource Conservation Service.*

6.0 Land uses and regulatory authorities

DEQ, along with the State Departments of Forestry, Agriculture, State Lands, Geology and Mineral Industries, Fish and Wildlife, Parks and Recreation, Land Conservation and Development, and Marine Board have regulatory authority or advisory roles associated with land use activities that potentially impact water quality. Two of the primary mechanisms for DEQ to regulate pollution is through the adoption of water quality standards and Total Maximum Daily Loads and the related implementation plans. TMDLs and their implementation plans are designed to control source pollution to bring water bodies into attainment with the water quality standards adopted by the state for water bodies in Oregon. Water bodies meeting water quality standards should be readily useable as drinking water sources with use of standard treatment technology.

In DEQ's rules, a "source" is defined as any process, practice, activity or resulting condition that causes or may cause pollution or the introduction of pollutants to a waterbody (OAR 340-42-0025). Sources of pollutants can be point sources or nonpoint sources. Under ORS 468B.110 (1), DEQ has the specific authority to take the actions necessary to attain and maintain water quality standards and to implement load allocations established under a TMDL. Management strategies to achieve waste load and load allocations in a TMDL are implemented through water quality permits for those sources subject to permit requirements in ORS 468B.050 and through source-specific Water Quality Management Plans for other sources.

Nonpoint source pollution is pollution from a diffuse area as opposed to point sources from a discrete pipe, ditch, etc. At DEQ, nonpoint sources are addressed through the following programs: Water Quality Standards, Water Quality Assessment, Groundwater, TMDLs, §319 Nonpoint Source Planning and Grants, Drinking Water Source Protection, Clean Water State Revolving Fund, Pesticide Stewardship Partnerships, and Water Quality Monitoring. DEQ also coordinates with federal and state agencies that are responsible for nonpoint source issues and identifies them as Designated Management Agencies. The Water Quality Management Plans identify the source-specific implementation requirements and the persons, including DMAs, responsible for developing and revising those plans.

There are two areas where DEQ's authority is limited under OAR 340-42-0080 for nonpoint source controls in forested and agriculture land uses. Nonpoint source discharges of pollutants from forest operations on state or private lands are subject to best management practices and other control measures established by the Oregon Department of Forestry under the ORS 527.610 to 527.992. DEQ may not impose or enforce effluent limits on nonpoint source

discharges from forest operations subject to the State's Forest Practice Act, unless such limits are required by the Clean Water Act or other federal law.

The Oregon Department of Agriculture regulates agricultural activities through Agricultural Water Quality Management Area rules. In areas subject to the Agricultural Water Quality Management Act under ORS 568.900, the Oregon Department of Agriculture develops and implements agricultural water quality management area plans and rules to prevent and control water pollution from agricultural activities and soil erosion on agricultural and rural lands.

Regulatory responsibilities vary by land use and ownership type. It is important that public water systems and community members understand which agencies have authority for regulation of human activities and land uses, the structure of those regulations, and the individual agency responsibilities. *The landowner is ultimately responsible for management activities and potential off-site impacts, so in addition to regulatory agencies, community engagement with landowners in a drinking water source area can be a critical component to implement strategies for improving water quality.*

6.1 Aggregate and mineral mining / extraction wells

Development, use, and reclamation of rock pits or quarries are regulated by the Department of Geology and Mining Industry. DOGAMI acts as DEQ's agent for water quality permitting (under a *Memorandum of Understanding*) and adds permit conditions to the Operating Permit for each facility to ensure compliance with state regulations. Many quarries contain process water and stormwater runoff on-site which minimizes the risks of groundwater or surface water pollution. Landowners are required to obtain the following Water Pollution Control Facility or National Pollution Discharge Elimination System permits if they discharge process water or otherwise discharge water from their site:

- DEQ WPCF) 1000 General Permit--- for disposing of process water by evaporation or seepage in ponds or by irrigation (issued through DOGAMI);
- DEQ NPDES) 1200-A General Permit--- for stormwater from the mining operation and haul roads that drains to surface waters (issued through DOGAMI);
- Individual DEQ NPDES or WPCF Permit--- for discharging process wastewater to surface water or groundwater (issued by DEQ).

Rock pits or quarries located on forestland and used for forest management are exempt from needing a DOGAMI mine operating permit but under the Forest Practices Act (OAR 629-625-

0500), they "shall be conducted using practices which maintain stable slopes and protect water quality". On forestlands, the regulating agency for rock pits or quarries is the Department of Forestry.

DOGAMI is also the permitting agency for extraction wells, such as gas, oil, and geothermal wells. DOGAMI coordinates with DEQ to address NPDES or WPCF permitting to protect groundwater quality. More information on the permits for surface mining, wells, or chemical process mining in Oregon can be found at **Oregon's Department of Geology and Mineral Industries website**.

6.2 Agricultural Lands

Oregon regulates agricultural activities through programs administered by the Oregon Department of Agriculture. The Confined Animal Feeding Operation Program regulates animal facilities such as dairies and large chicken and hog operations. CAFOs are point sources of pollution under Oregon and federal law, and many must have a permit to operate. The permits provide for zero effluent discharge limits. For more information, please go to **ODA's Confined Animal Feeding Operations website**.

The Agricultural Water Quality Management Program regulates animal production activities not regulated by the CAFO Program and all other agricultural activities that may impact water quality. The Agricultural Water Quality Management Act, formerly referred to as Senate Bill 1010, gives ODA the authority to establish management plans and adopt rules to prevent and control water pollution from agricultural lands. These areas include those where an agricultural water quality management plan is required by state or federal law, such as DEQ TMDLs and Oregon Groundwater Management Areas (ORS 568.909). ODA's AgWQM area plans and rules are the official TMDL implementation plans for agricultural nonpoint sectors.

There are 38 management areas throughout the state with area plans and the rules that regulate agricultural activities to prevent and control water pollution. All 38 management areas have riparian rules requiring that agricultural activities allow the establishment and growth of stream-side vegetation to provide specific functions such as: moderation of solar heating (shade), filtration of overland flow, and stream bank stability. Further information can be found at **ODA's website on Agricultural Water Quality Plans and TMDL Implementation Plans**.

DEQ participates in ODA's effort to review and revise Agricultural Water Quality Management Area Plans consistent with ORS568.930. During the biennial review process, DEQ provides status and trends reports, information on drinking water resources near agricultural practices and other

water quality comments on ODA's area rules and plans. To view this information for each agricultural area plan review, visit **DEQ's Area Plan Reviews and Comments** page and **DEQ's Water Quality Status and Trends Analysis** web pages

ODA's Pesticide Program regulates the sale and use of pesticides in Oregon. Program staff conduct routine compliance monitoring, investigate complaints of alleged pesticide misuse, and administer enforcement actions when appropriate. Enforcement actions, including civil penalties, play a vital role in deterring unlawful use of pesticides. Additional responsibilities include communicating the laws and regulations to licensed pesticide applicators and the public. This is done through continuing education training resources, informational brochures, the ODA website, and one-on-one communication. For more information about ODA's regulatory authorities see **ODA's website on Laws and Rules**.

6.3 Commercial and industrial lands

Groundwater can be susceptible to contamination from many different commercial or industrial land uses. These facilities are generally the most highly regulated of any land uses. However, even facilities that are required to have permits for building, material storage or waste discharge may still pose a risk. Many regulations applicable to commercial and industrial facilities rely upon response to contamination events, rather than on preventing problems. In addition, some facilities are not regulated. Spills, leaks, or improper handling of chemicals and other materials during transportation, use, storage and disposal may impact drinking water supplies. There are many ways to raise awareness of the need for protection including facilitating changes in the day-to-day operations at the existing businesses in order to reduce the risks of surface water or groundwater contamination. See DEQ's **Drinking Water Source Protection Strategies for Commercial and Industrial Land Uses** for strategies designed to protect against potential contamination.

DEQ is responsible for waste reduction and management from commercial and industrial activities, air quality monitoring, spill preparedness and response, environmental assessment and cleanup, and underground storage tank compliance and cleanup. Oregon's Toxics Use Reduction and Hazardous Waste Reduction Act of 1989 was one of the first laws in the nation to mandate pollution prevention planning. The Act outlines a comprehensive approach to reduce or eliminate toxic chemical use and hazardous waste generation. In June 2005, the Oregon Legislature passed a law (ORS 465.003 to 465.037) that streamlined and made other significant changes to the Toxics Use and Hazardous Waste Reduction Program.

Large toxics users, large quantity generators and small quantity generators must prepare a Reduction Plan or an Environmental Management System. As part of the planning, a facility

must evaluate options to reduce its toxics and hazardous wastes. Materials that must be in the plan include any toxic substance reported to the U.S. Environmental Protection Agency under the Toxics Release Inventory program.

Since the Act's adoption, businesses throughout Oregon have reduced their toxic chemicals and hazardous wastes. DEQ publishes pollution prevention stories to explain how businesses are reducing their toxics and hazardous waste. In the program's 21 years, businesses have voluntarily reported: reducing more than 31.5 million pounds of hazardous waste with savings estimated at $5.25 million and reducing more than 56.25 million pounds of toxic chemicals with savings at over $15 million.

For more information on toxics reduction, see **DEQ's Toxics Reduction and Safer Alternatives website**.

When there are spills or releases that contaminate groundwater, DEQ's Site Assessment program investigates hazardous substance sites that may require further action to protect health and the environment, ranks sites based on threat to human health and the environment, overseeing limited removal and remedial actions, and maintains DEQ's Environmental Cleanup Site Information database. When extensive investigation and appropriate cleanup of hazardous substance site is necessary to protect public health and the environment, the Site Response program works to investigate and clean up contaminated hazardous waste sites throughout Oregon.

6.4 Federal lands

Federal lands in drinking water source areas are primarily forestlands managed for multiple uses including watersheds and water quality, biodiversity and endangered species, recreation, and forest products. The US Forest Service and the Bureau of Land Management manage these lands in National Forests and Districts, respectively. Each National Forest and BLM District has a unique management plan, but all have common features. In the past, the federal agencies have entered into agreements with municipalities and water districts to ensure protection of drinking water sources on federal lands.

In August 2016, BLM approved new Resource Management Plans for western Oregon. The approval marked the end of a four-year effort by the BLM to use new science, policies, and technology to protect natural resources and support local communities. DEQ's drinking water source protection staff evaluated the proposals to provide input to BLM so that those federal lands will continue to provide high quality water for ecosystems and domestic use.

These RMPs provide direction for the management of approximately 2.5 million acres of BLM-administered lands, and maintain strong protections for the northern spotted owl, endangered species listed fish species, and water resources while offering predictable and sustainable outcomes for local communities from tourism, recreation, and timber harvest. For more information on the BLM plan and implementation, see **BLM's website on Resource Management Plans for Western Oregon**.

6.5 Forest lands

Forestry activities on state-owned and private lands are regulated by the Oregon Department of Forestry. The rules, referred to as the "Forest Practices Act", are implemented by ODF and address the overall maintenance of the following resources: (a) air quality; (b) water resources, including but not limited to sources of domestic drinking water; (c) soil productivity; and (d) fish and wildlife (ORS 527.710(2)). The forest practice rules include water protection provisions governing activities in or adjacent to water bodies, wetlands, and riparian areas (OAR 629-635-0000 to 629-660-0060). The overall goal of the water protection rules is to provide resource protection during operations adjacent to and within streams, lakes, wetlands and riparian management areas so that, while continuing to grow and harvest trees, the protection goals for fish, wildlife, and water quality are met.

Forest practice rules related to water quality (as prescribed in ORS 527.765) must ensure that, to the maximum extent practicable, non-point source discharges of pollutants resulting from forest operations do not impair the achievement and maintenance of the water quality standards (OAR 629-035-0100(7)(a)-(c)). Forestry rules specify harvest protections for riparian areas and some steep slopes, chemical use (including pesticides), reforestation requirements, and road construction and maintenance.

Rules for private forests can be found at **ODF's Laws and rules website**.

See the **Oregon Forest Resources Institute website for an illustrated guide** to Oregon's Forest Protection Laws.

State-owned forestlands are referred to as "Board of Forestry lands". Management plans (rules) for state-owned forests as well as more information about conservation and restoration analyses and projects can be found on **ODF's State forests website**.

The overall goal of managing state-owned forestlands is stated as follows: "Oregon Revised Statutes direct that Board of Forestry Lands shall be managed by the State Forester to 'secure the greatest permanent value of such lands to the state'." The goals for state forestlands include

maintaining healthy watershed conditions to support the beneficial uses of the waters of the state both in water quality and water quantity. Public water systems with state forestlands within their source area may consider contacting the District or State Forester will ensure that management of the forest to maintain the quality and quantity of public water supplies for community water systems, and that the drinking water beneficial use is adequately considered when determining the greatest permanent value of these lands to the state. An economic analysis of the value of the land to provide long-term community drinking water may be helpful for demonstrating this.

6.6 Onsite septic systems

Approximately 30 percent of Oregon households rely on onsite septic systems to treat their sewage. Properly functioning septic systems treat sewage to minimize groundwater and surface water pollution. A malfunctioning system can be a health hazard and will harm natural resources.

Under state law, DEQ is responsible for ensuring that septic systems are sited, installed, and operated so that Oregon's land, water, and public health are protected. Improperly functioning septic systems can pollute streams and groundwater and be a public health hazard. Owners of onsite systems must operate and maintain their systems in compliance with all permit conditions and applicable requirements in this rule division and must not create a public health hazard or pollute public waters (*OAR 340-71-0130 General Standards, Prohibitions, and Requirements)*.

Many counties implement the onsite system regulations within their county on behalf of DEQ, and some counties have additional requirements beyond those in state rules. For more information on regulatory oversight and counties that administer state and local rules, please go to the **DEQ Onsite Wastewater Management Program website**.

A new program was initiated in 2016 between DEQ and a regional nonprofit lender "Craft3" to make repairs more affordable for Oregonians in need. The new partnership provides funds to help Oregonians get their septic systems fixed.

The Clean Water Loans will allow homeowners to pay for all costs associated with the project, including:

- Septic system design
- Relevant permits
- Installation of the new septic system
- Ongoing maintenance
- Essential safety measures, such as those to prevent children from falling into septic tanks

Special rates and deferred payment options may be available for homeowners with lower incomes. Homeowners, small businesses and onsite service providers can learn more about the Clean Water Loan program and apply for loans at **Craft3's Clean Water Loans website**. In addition, several public water systems have implemented cost-share programs for local homeowners conducting septic system inspections and repairs in areas that could impact drinking water quality if the septic system fails or is not functioning properly.

There are excellent resources available to assist homeowners with septic systems. EPA's **"Septic Smart"** program includes resources for septic system owners for the repair and maintenance of septic systems as this helps protect the quality of groundwater.

6.7 Pesticide regulations

Pesticide use is governed by the Federal Insecticide, Fungicide, and Rodenticide Act and corresponding state law (ORS634.005-.992). Nearly 1,400 pesticides are currently registered and approved by the US EPA for agricultural and non-agricultural use (USDHHS 2010). Agencies responsible for implementation in Oregon are the US EPA and ODA, DEQ, and ODF (for non-federal forestlands).

For a summary of Oregon pesticide regulations with regard to drinking water sources, please see **DEQ's fact sheet on Pesticide Use in Vicinity of Drinking Water Sources**.

Exposure to various pesticides has been linked to brain/central nervous system, breast, colon, lung, ovarian, pancreatic, kidney, testicular, and stomach cancers, as well as Hodgkin's and non-Hodgkin's lymphomas, multiple myeloma, and soft tissue sarcoma (Clapp 2007). Approximately 40 chemicals classified by the International Agency for Research on Cancer as known, probable, or possible human carcinogens, are used in EPA-registered pesticides now on the market (IARC 2009).

6.7.1 Oregon Department of Agriculture Pesticide and Fertilizer Program

ODA's Pesticide Program regulates the sale and use of pesticides. Program staff conduct routine compliance monitoring, investigate complaints of alleged pesticide misuse, and administer enforcement actions when appropriate. Enforcement actions, including civil penalties, play a vital role in deterring unlawful use of pesticides. Additional responsibilities include communicating the laws and regulations to licensed pesticide applicators and the public. This is done through continuing education training resources, informational brochures, the ODA website, and one-on-one communication.

Go to ODA's **Pesticide, Fertilizer, and PARC programs website** to learn more about how ODA's programs regulate the sale and use of pesticides and fertilizers in Oregon.

For a summary of Oregon pesticide regulations with regard to drinking water sources, please see **DEQ's fact sheet on Pesticide Use in Vicinity of Drinking Water Sources**.

6.7.2 Pesticide Stewardship Partnership Program

The Pesticide Stewardship Partnership Program is a voluntary program that relies on local partnerships to monitor pesticide levels in waterways and to enact solutions to protect water quality while also managing pests and maintaining crop yields. The Oregon Department of Agriculture is the state lead for the PSP program and leads an interagency team called the Water Quality Pesticide Management Team.

The PSP Program uses water quality sampling data to evaluate pesticides of concern, conducts local outreach and technical assistance efforts designed and implemented based on water quality data findings, and evaluates the effectiveness of these education and collaboration projects annually. The PSP program also conducts free waste pesticide collection events for proper pesticide disposal from agricultural and commercial applicators.

DEQ's drinking water source protection program provides information on public drinking water source areas and public water system partners to help prioritize areas for Pesticide Stewardship Partnership implementation. Several waste pesticide collection events benefiting drinking water source areas occurred in 2014, including a project in Milton-Freewater that collected more than 15,000 pounds of chemical product. The collection area for the Milton-Freewater pesticide waste collection event included the drinking water source area for Milton-Freewater's public supply wells, serving over 7,000 people.

Go to the **DEQ's Pesticide Stewardship Program website** and **ODA's Pesticide Stewardship Partnership website** to learn more about where the program currently operates in Oregon, learn about the pesticide waste collection program and to request a pesticide collection event in your area. In addition, **DEQ's PSP Data Viewer** provides access to water quality data collected by the Pesticide Stewardship Partnerships Program.

Go to the interagency **Pesticide Management Plan for Water Quality Protection** (2011).

6.7.3 Pesticide Analytical and Response Center

The Pesticide Analytical and Response Center was created by executive order in 1978. The program was reauthorized under the Oregon Department of Agriculture in 1991 (ORS 634.550).

PARC is a multi-agency group that responds to pesticide-related incidents in Oregon with suspected health or environmental effects. It acts as a central location that receives Oregon-specific pesticide incident information. The main activity that PARC is mandated to perform is to **coordinate investigations into pesticide incidents in Oregon.** It also collects and analyzes information about reported incidents. PARC does not have regulatory authority – it relies on member agencies to conduct investigations and take necessary enforcement actions

To report a pesticide incident that has impacted people, animals, or the environment, you can:

Call: 503-986-6470 - Your phone call will be routed to a specialist to take your information and PARC staffers will contact you within one business day.

Email: naturalresource-complaints@oda.oregon.gov

Notify the Oregon Emergency Response System by calling 911

Go to the **ODA PARC website** to learn more about PARC and access pesticide resources.

6.7.4 Other Pesticide Resources

Other pesticide resources available for free online include:

- For a summary of Oregon pesticide regulations with regard to drinking water sources, please see **DEQ's fact sheet on Pesticide Use in Vicinity of Drinking Water Sources**.

- Human Health Benchmarks for Pesticides in Drinking Water – the Environmental Protection Agency developed human health benchmarks for 430 pesticides to (1) help provide information about whether the detection level of a pesticide in a drinking water source or in finished water may indicate a potential health risk, and (2) to help prioritize water monitoring efforts. The HHBPs or benchmarks indicate levels in water, below which no adverse health effects are anticipated. The benchmarks include values for short term and lifetime exposure and cover both cancer and non-cancer risks. The benchmarks are based on studies and data that EPA receives through the pesticide registration process. The Human Health Benchmarks for Pesticides table includes pesticides for which EPA's Office of Pesticide Programs has toxicity data but for which EPA has not yet developed either enforceable Maximum Contaminant Levels or non-enforceable Health Advisories. Go to the EPA's **Human Health Benchmarks for Pesticides website**. Go to the **EPA Fact Sheet about the Human Health Benchmarks for Pesticides** update that was done in 2021 to learn more about how to interpret Human Health Benchmarks information

and how the information was developed.

- The United States Geological Survey developed health-based screening levels to supplement the Environmental Protection Agency's Maximum Contaminant Levels and Human Health Benchmarks for Pesticides information. USGS developed health-based screening levels for contaminants that lack either Maximum Contaminant Levels or Human Health Benchmarks. Go to USGS's **Health-Based Screening Levels for Evaluating Water-Quality Data website** to access the searchable table that includes 835 different contaminants.

- Go to the Environmental Protection Agency's **National Primary Drinking Water Regulations website** to learn about legally enforceable standards (i.e. maximum contaminant levels) that apply to public water systems (including some pesticides).

- Go to the Environmental Protection Agency's **Drinking Water Health Advisories website** to learn about contaminants (including pesticides) that are not subject to Maximum Contaminant Level regulations but that can cause adverse human health impacts at certain levels of exposure.

- The Pesticide Data Program is a national pesticide residue monitoring program that produces comprehensive pesticide residue databases for the United States. Go to the United States Department of Agriculture's **Pesticide Data Program website**.

- Oregon Department of Agriculture's **Pesticide Storage and Disposal program website** provides information about the waste pesticide collection program, pesticide storage resources, and pesticide spill reporting and clean up information.

- Oregon Health Authority's Pesticide Exposure, Safety and Tracking Program: This program tracks and investigates health effects reported by people exposed to pesticides. Go to OHA's **pesticide exposure website** to learn more about the program or to report a pesticide exposure incident.

6.8 Private domestic wells

Any source of household water that is a hole drilled, bored, or dug into the ground to reach water is called a "well". All types of wells can provide drinking water or can be used for non-potable uses such as irrigating and washing. A well is considered private domestic if it serves no more than three households. The federal Safe Drinking Water Act does not regulate private

wells. Individual well owners are entirely responsible for the testing and safety of the water drawn from their wells.

6.8.1 The Oregon Domestic Well Safety Program

In Oregon, there is a resource to assist private well owners with managing their well and promote safety. The *Oregon Domestic Well Safety Program* provides technical information and limited resources to assess and manage risks associated with private wells. Oregon DWSP partners with local health departments and water information providers to further promote private domestic well safety. See the **Oregon DWSP website** for information.

6.8.2 Oregon Water Resources Department and domestic wells

The Oregon Water Resources Department regulates well construction and abandonment for groundwater wells. For information on private well regulations and technical assistance with construction or modifications, see Oregon Water Resource Department's **Water Well Owner's Handbook**.

WRD is a strong partner in Oregon for protecting the groundwater resource, public health and safety by adopting policies and/or procedures to insure proper well construction and abandonment. Proper well abandonment procedures are outlined in OAR 690-Division 220. Contamination from improperly abandoned or used wells can threaten other wells over a large geographical area. As development overtakes lands on which wells are located, it is important to protect the groundwater resource through proper abandonment of unused water wells. Improperly abandoned wells can serve as a conduit for contamination or can cause loss of artesian pressure. Domestic uses and even municipal uses can be threatened by even one improperly abandoned well.

For developments on which the future use of existing wells is not anticipated, proper abandonment of wells (permanent or temporary) is very important to protect the groundwater resource. Any well that is not going to be used must be abandoned to standards established by the State of Oregon. Also, if there is a suspicion that there are contaminants in any well, DEQ should be contacted before any action is taken.

In addition to protecting the groundwater resource, proper abandonment protects the landowner and developer from civil liability and civil penalties. Proper abandonment before any damage occurs to the well and/or the aquifer is worth the cost in comparison to the cost of abandonment after the fact. The advantages to proper well abandonment are to:

- protect the groundwater resource,
- lower cost than "after the fact repairs", and
- avoid liability and potential civil penalties

Local jurisdictions may wish to consider the following criteria for determining their policies.

1) Unused water wells must be permanently abandoned if the well:

- will no longer meet well construction standards,
- poses a threat to health and safety (hand dug and shallow wells are of particular concern), or
- will no longer meet local set-back requirements.

2) Unused water wells with the following risk factors are of concern because of the increased risk of contamination:

- proximity to roads, large parking lots, sewer lines, certain industrial uses, feed lots, quarries, nursery and greenhouse operations, liquid fuel transmission lines and flood plains;
- wells that may provide the opportunity for cross connections of aquifers;
- any unsecured large diameter well (also a public safety concern); and/or
- the connection to another system not protected by a back-flow device.

For more information on maintenance and closure of private wells, see **WRD's Well Water Handbook**.

6.8.3 Domestic well water testing and the Real Estate Transaction Database

The Domestic Well Water Testing and the Real Estate Transaction Database requires sellers of a property with a private domestic well to have the water tested for arsenic, nitrate and total coliform bacteria. Results must be sent to the buyer and OHA. For more information on the program and the data generated by the program, see **OHA's Well Testing and Regulations website**.

6.9 Public drinking water wells

For Oregon public water system wells, there are state rules that include prohibitions for certain land uses, activities, and chemical storage in the vicinity of the well. Certain sanitary hazards are prohibited within 100 feet under Oregon Health Authority rules:

333-061-0050 Construction Standards

(1) General:

(a) These standards shall apply to the construction of new public water systems and to major additions or modifications to existing public water systems and are intended to assure that the system facilities, when constructed, will be free of public health hazards and will be capable of producing water which consistently complies with the maximum contaminant levels…

(2) Groundwater:

(a) Wells:

(A) For the purpose of this rule, wells are defined as holes or other excavations that are drilled, dug or otherwise constructed for the purpose of capturing groundwater or groundwater in hydraulic connection with surface water as a source of public drinking water…

(E) The following sanitary hazards are not allowed within 100 feet of a well which serves a public water system unless waived by the Authority: any existing or proposed pit privy, subsurface sewage disposal drain field; cesspool; solid waste disposal site; pressure sewer line; buried fuel storage tank; animal yard, feedlot or animal waste storage; untreated storm water or gray water disposal; chemical (including solvents, pesticides and fertilizers) storage, usage or application; fuel transfer or storage…

A link to the full text of the rules on **OAR 333-061-0050 Construction Standards**.

Under Oregon Water Resources Department's rules related to water supply well construction, ORS 537, OAR 690-210, and OAR 690-215, there are also restrictions for setbacks:

- 25' from residential underground or above ground petroleum storage tank
- 50' from commercial underground or above ground petroleum storage tank
- 50' setback for septic tanks
- 100' for sewage disposal or line
- 50' from Confined Animal Feeding Operations
- 50' from a closed sewage or storm drainage system
- 50' from any animal waste holding area such as a pond or lagoon
- 100' from sewage sludge disposal area
- 500' from hazardous waste storage, disposal, or treatment facility

6.10 Residential Lands

Residential land uses in urban and rural areas are regulated by cities, counties, the Oregon Department of Land Conservation and Development, and, in some cases, regional governments like Metro. The primary potential groundwater impacts from rural residential lands include private domestic wells, animal management, and onsite septic systems. Those issues are summarized separately above. Urban residential lands can also be sources of chemicals from garden and lawn care. Good resources are available to assist with outreach and reduction from those chemicals from DEQ and US EPA.

6.11 Small water systems

Small public water systems, defined by EPA as systems serving a population of 10,000 or less, can face unique financial and operational challenges in consistently providing drinking water that meets Safe Drinking Water Act standards and requirements. Small systems often lack the resources, personnel, or knowledge of funding opportunities to help protect their drinking water source areas. At the same time, these small systems, which in Oregon primarily use groundwater for drinking water, are exposed to a variety of potential contaminant sources. To learn more about how the Drinking Water Source Protection Program at DEQ is working to support Oregon's small public water systems with source water protection visit **DEQ's Small Water System Outreach Project website**.

6.12 Water quality permits

Point sources of pollution are from contaminants that enter the environment from a single, identifiable source. These identifiable, point sources of pollution are typically from facilities that receive a permit to discharge a specified amount of a pollutant into a receiving water body under certain conditions. In Oregon, construction stormwater, industrial facilities, municipal stormwater in cities over a certain size, and wastewater/sewage treatment facilities are all regulated by DEQ through the issuance of National Pollutant Discharge Elimination System permits.

NPDES-permitted facilities are those which discharge pollutants from any point source, such as a pipe, to state waters. If a facility discharges to the ground, it requires a Water Pollution Control Facility permit. NPDES permits from DEQ are required for stormwater and process discharges to surface waters from construction and industrial activities and larger municipalities if stormwater from rain or snow melt leaves a site through a "point source" and reaches surface waters either directly or through storm drainage. As a result, stormwater discharges from large and medium

sized municipal storm sewer systems are required to have NPDES permits. Similarly, NPDES stormwater permits are required for most industrial properties and for construction affecting one acre or more of land, including projects that are less than one acre that are part of a larger common plan of development that ultimately disturbs one acre or more.

Some water quality permits are administered directly by DEQ, but several of DEQ's general permits are actually administered by other agencies through Memoranda of Agreement or Understanding. Examples of permits administered through other agencies include:

GEN800 permit for Confined Animal Feeding Operations administered by the Oregon Department of Agriculture

GEN1000 permit for gravel mining administered by the Oregon Department of Geology and Mineral Industries

National Pollutant Discharge Elimination System 1200A for off-site discharge of storm and process water from gravel mining administered by the Oregon Department of Geology and Mineral Industries

1200C and 1200CN for stormwater runoff from construction activities administered by various local government agencies. Other permits are administered directly by DEQ.

In urban areas, city governments are primarily responsible for regulations. In rural areas, counties are primarily responsible. Rural residential activities related to livestock and farming activities are regulated by the Oregon Department of Agriculture. Rules and ordinances vary among cities and counties, so restrictions on residential land activities will be different depending on the location of a given drinking water source area.

Runoff from rural communities and rural residential areas remains largely unregulated, except to the extent that it may be covered by an implementation plan developed by a local government or special district as a designated management agency identified under a Total Maximum Daily Load plan. Small rural "farmsteads" are subject to regulation by the Oregon Department of Agriculture. Local governments operating as designated management agencies may develop TMDL implementation plans both for properties over which they have proprietary control (e.g. a street system or park) and for areas where they maintain regulatory authority (police power or land use planning) over private property.

DEQ regulates Underground Injection Control well discharges. Underground injection wells are used to place fluid underground into porous geologic formations. These injection systems include any discharges below the ground or subsurface including geothermal systems, large capacity septic systems, and aquifer storage and recovery systems. The most common UIC

systems in Oregon are stormwater drywells, which are usually found on large parking lot surfaces or streets. DEQ issues permits for UIC systems under the Safe Drinking Water Act to protect water quality. DEQ maintains a database of Class V wells. Go to DEQ's **Underground Injection Control website** to learn more about the permitting program, learn about the contaminants of concern associated with UICs, and find program contact information.

7.0 Related water quality issues/projects

7.1 Climate change impacts

The effects of climate change will likely be many-faceted and will affect groundwater as well as surface water systems. Oregon, like much of the pacific northwest is an ecologically diverse region that is reliant on snowpack, precipitation, groundwater, and surface water for its drinking water supply. Despite its reputation for having a surplus of water, Oregon has experienced multiple droughts including prolonged droughts in the Eastern portion of the state. Additionally, changes in our climate can lead to an increase in severe winter weather, changes in precipitation events, flooding and wildfires and many other impacts to our drinking water. Precipitation, temperature, coastal inundation, and ecosystem changes could all contribute to changes in drinking water supplies (Dalton et al 2013; Dello et al 2010).

Oregon Health Authority's Environmental Public Health program provides key points on the impacts as well as resources and tips for public water systems on their **Climate Change and Drinking Water website.**

Additional state resources can be found on **Oregon Water Resources Department Climate web page**. In addition OWRD has undertaken **Groundwater Allocation Rulemaking** to help address dry wells and water scarcity that impacts water suppliers, families, farmers, industry, and recreation.

The Oregon State Legislature established the ***Oregon Climate Change Research Institute*** within the Department of Higher Education in 2007. OCCRI is a network of over 150 researchers at Oregon State University, the University of Oregon, Portland State University, Southern Oregon University, and affiliated federal and state labs. OCCRI is tasked with serving as a clearinghouse for climate change information, developing strategies to prepare for and to mitigate the effects of climate change on natural and human systems, and providing technical assistance to local governments to assist them in developing climate change policies, practices, and programs.

OCCRI also develops periodic assessments of climate change science as it relates to Oregon, and the likely effects of climate change on the state (see **OCCRI's website** for more information). It is widely acknowledged that there will be changes in hydrologic patterns in some Oregon basins (Abatzoglou et al 2014). *These changes could affect supplies of water for all uses and will contribute to increased water quality problems. Reduced availability of water will affect junior*

irrigators, change water supply planning in many basins, and affect the quality and availability of water for some public drinking water systems. Proposals for surface water storage may increase. Water quality problems will likely increase the cost of domestic, commercial and industrial water supply and waste disposal. Public water systems may have to invest additional capital to assure adequate availability of source water (USEPA 2015).

Oregon produced its latest statewide **Climate Change Adaptation Framework in 2021**.

The Framework was developed in part to assess Oregon's capacity to adequately address conditions and issues resulting from climate variability and change. The Framework outlines climate risks, state agency responsibilities related to the risks, gaps in state capacity to address the risks, and actions needed to fill those gaps. The long-term significance of Oregon's Framework is that it outlines the climate-related risks that need to be addressed (in varying degrees) by governments, communities, and individuals across Oregon. The Framework clearly establishes what 'global climate change' means for Oregon.

The Climate Change Adaptation Framework discusses the potential economic impacts for climate change, acknowledging that irrigated agriculture is a primary economic driver in Oregon, so the state economy could suffer with changes in water availability and accessibility. Reduced access to surface water or groundwater could have the potential to significantly affect agricultural productivity until crops suited to new hydrologic conditions are developed. Reduced water availability can increase the cost to produce agricultural and manufactured goods. As surface water quantity is reduced, Oregon will depend more heavily on groundwater resources where available.

In the context of long-term drought conditions for Oregon, it makes sense to promote water conservation through public water systems. Reducing the water demands from source areas can be an important component of protecting the drinking water resource, and this will help ensure that the resource is available for future growth and expansion of residential and business needs. For more information on Oregon's comprehensive water resource planning, see the **Water Resources Department's Integrated Water Resources Strategy**.

7.2 Statewide groundwater protection

DEQ evaluates and protects groundwater through its work in groundwater management areas, biennial groundwater studies, technical assistance, and permitting. **Every two years, DEQ** prepare**s a** report to the legislature on the groundwater-related activities **addressing the following topics:**

- Status of groundwater quality.

- Groundwater management areas and regulatory programs.
- Grants and loans awarded.
- Emerging issues

For more information see the most recent report: **DEQ Groundwater Quality Protection in Oregon 2023-2024 Report**.

A number of public water systems are located within "Groundwater Management Areas. DEQ designates groundwater management areas when groundwater in an area has elevated contaminant concentrations resulting from nonpoint sources such as farming, onsite septic systems, timber harvesting, or other dispersed human activities. Oregon currently has three groundwater management areas: Northern Malheur County, Lower Umatilla Basin, and Southern Willamette Valley. In each area, DEQ monitors groundwater quality, provides technical assistance and engages communities to adopt best management practices to reduce groundwater contamination. Public water systems in these areas are encouraged to be part of the implementation activities.

For more information about the GWMA program and project updates, see **DEQ's Groundwater Management Areas website**. For specific information on the work in northern Morrow and Umatilla Counties including the Oregon Nitrate Reduction Plan, see **DEQ's Nitrate Contamination: Lower Umatilla Basin website**.

7.3 Total Maximum Daily Loads

DEQ prepares Total Maximum Daily Load and Water Quality Management Plan documents for waterbodies in Oregon designated as water quality limited and on DEQ's 303(d) list of impaired waters. A TMDL uses scientific data collection and analysis to determine the amount and source of each pollutant entering streams. A TMDL is the maximum amount of pollutant that can be present in a waterbody while meeting water quality standards. These maximum allowable pollutant loads are assigned to contributing sources, typically to point sources (waste load allocations) and land use authorities (load allocations). The WQMP provides the framework for management strategies to attain and maintain water quality standards. The framework is designed to work in conjunction with detailed plans and analyses provided in sector-specific or source-specific implementation plans. The plan designates organizations to prepare and carry out source-specific TMDL implementation plans including the U.S. Forest Service and Bureau of Land Management, the Oregon Departments of Agriculture and Forestry, counties, cities, and others. The implementation plans identify management measures that will be used to achieve and maintain water quality standards.

When TMDLs are developed, it is necessary to identify, assess and implement control measures that limit the known and potential sources of pollutants entering the surface water that did not meet water quality standards. *Any pollutants entering the surface water from groundwater discharge is considered a nonpoint source.* These are evaluated as part of the allocation process when the TMDL is developed. Groundwater is generally a transport mechanism for pollutants entering surface waters and should be considered as part of the load allocations for pollutants. For more information on the TMDL program and status see **DEQ's Total Maximum Daily Loads website**.

7.4 Statewide toxics monitoring and assessment

In a program referred to as "Statewide Toxics Monitoring", the DEQ laboratory staff collect samples on a rotating basin schedule during spring, summer and fall around the state. The DEQ laboratory analyzes seven major categories of toxics, including consumer product constituents, current-use pesticides, legacy pesticides, flame retardants, combustion products, metals, and industrial intermediates. Access, site appropriateness, species availability and hydrology all determine the types of samples collected. In 2012-13 sampling, DEQ tested for more than 500 unique chemicals using 21 different analytical methods and 128 unique chemicals were detected in that round of sampling. The most commonly detected groups were priority metals and sterols present at 100% of sites, followed by current-use pesticides, at just over 50% of sites sampled. In 2015, DEQ began its second round of monitoring for toxics around the state. In 2019, DEQ transitioned the Toxics Monitoring Program from the rotating basin basis used since 2008 to a network basis. The initial network consists of 60 sites statewide. This change allows the program to collect data from across the state more frequently, identify trends at selected sites, and apply the most current analytical methods in each basin. Past data, land use, assessment unit overlap, 303d listing status and spatial coverage all factored into the selection of network sites.

For an update of the status of Statewide Toxics Monitoring, see **DEQ's Water Quality Toxics Monitoring website.**

DEQ uses the toxics monitoring data along with data and information from other agencies and organizations to develop a "Toxics Reduction Strategy" which is intended to reduce toxic pollutants at the source. The Toxics Reduction Strategy prioritizes DEQ's toxics reduction work and improves internal and external coordination to reduce toxics in Oregon's environment. It includes a toxics "focus list" of includes priority toxic chemicals to center the agency's strategic actions.

The most recent strategy, toxics focus list and recommended actions can be found on **DEQ's Toxics Reduction Strategy website**.

7.5 Sole Source Aquifer Protection Program

The Environmental Protection Agency defines a sole or principal source aquifer as one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. The Sole Source Aquifer Protection Program is authorized by Section 1424(e) of the Safe Drinking Water Act of 1974 (Public Law 93-523, 42 U.S.C. 300 et. seq). EPA guidelines also stipulate that these areas can have no alternative drinking water source(s) which could physically, legally, and economically supply all those who depend upon the aquifer for drinking water. For convenience, all designated sole or principal source aquifers are usually referred to simply as "sole source aquifers."

When an aquifer is the sole or principal drinking water source for the area, which, if contaminated, would create a significant hazard to public health, no commitment for federal financial assistance may be entered into for any project that may contaminate such aquifer.

In Oregon, there is currently only one aquifer designated ---the North Florence Dunal Aquifer. See EPA's website for more information on the **Sole Source Aquifer program**.

7.6 Collaborative projects in agriculture

DEQ and the Oregon Department of Agriculture fund groundwater projects through various grant and loan programs. For example, in 2013, DEQ awarded Clean Water Act "Section 319" grants to promote community involvement in groundwater protection in the Rogue Basin, northern Malheur County and southern Willamette Valley. ODA's Fertilizer Grants Program funds studies of the interaction of fertilizers, agricultural amendments or agricultural minerals with groundwater. In 2014, ODA granted $20,000 towards research on fertilizer management practices in the Southern Willamette Valley Groundwater Management Area and $50,000 for an independent review of the monitoring program for the Lower Umatilla Basin Groundwater Management Area.

7.7 Corrosivity and lead exposure

An issue regarding drinking water contamination that has received increased attention in recent years is the potential for it to become contaminated with heavy metals as it travels through the distribution system and the piping at the point of use. The City of Flint, Michigan and its drinking water lead contamination crisis—that occupied national headlines for many months—exemplifies the importance of managing for corrosion prevention in drinking water supplies. A recent USGS data analysis found that all 50 states and the District of Columbia have at least

some groundwater sites that are considered to be potentially corrosive to metal piping, lead solder, and other components.

Using data from USGS, a new map was developed to show the corrosivity and Langeliuer Saturation Index for 206 Oregon private wells, public wells, and springs (Belitz et al 2016). The LSI measures the potential for untreated source water to naturally deposit a corrosion-inhibiting mineral layer (scale) within distribution and residential piping. This map is provided as **Appendix 5.**

Lead has been found to cause damage to the kidneys, brain, nervous system, and other health consequences. According to the Center for Disease Control, there is not a safe level of lead exposure that has been found to exist for infants and children. Pregnant mothers are also considered a vulnerable population to the effects of lead poisoning. The EPA's Lead and Copper Rule consists of the following four components: a) corrosion control treatment (USEPA 2016), b) replacement of lead service lines, c) treatment of source water, and d) educating ratepayers and the public. An action level for 0.015 mg/L for lead and 1.3 mg/L for copper are set by the LCR. If 10% or more of the customer samples exceed the action level, then the PWS must take additional actions to control corrosion. EPA adopted revisions to the Lead and Copper Rule in 2021 that include a requirement for public water systems to conduct inventories of service lines and to identify service line material type. The intent of the service line inventory requirement is to identify those service lines made of lead so that they can be scheduled for removal and replacement. More information is available on **Oregon Health Authority's Lead and Copper Rule Revisions web page**.

The Oregon Health Authority's drinking water program provides the following *important tips for public water systems as lessons learned from the Flint, Michigan drinking water lead contamination crisis*:

1. Revisit your water system materials evaluation to include lead pigtail removal and ensure completion.
2. Review sample site selections and confirm that no lead pigtails remain.
3. Revisit sampling instructions for residents to ensure instructions meet US EPA guidelines—such as no "pre-stagnation flushing," etc.
4. Sample result invalidation by the state is limited only to lab error, bottle damage/tampering, or site did not meet sample site selection criteria.
5. Revisit your corrosion control treatment, especially when adding a new source or treatment.
6. Ensure consumer notification is timely following routine tap sampling.
7. Ensure required follow-up actions are taken on schedule after any lead action level exceedance, including timely and complete public education.

8. Be transparent to the public in all you do.

See **OHA's website on the Flint Michigan Crisis, Aftermath and Ramifications** for more information.

EPA provides technical guidance for corrosion control in their publication **Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems.**

The recent USGS groundwater sampling and analysis shows that some areas in Oregon have an overall potential for being corrosive to PWS distribution and customer piping without treatment. It is important that public water systems work with OHA to assess and reduce this risk of contamination posed by potentially corrosive water sources. More detailed analysis of potential corrosivity of untreated groundwater sources is provided at **USGS's Corrosivity website**.

7.8 Example groundwater projects

DEQ Statewide Groundwater Monitoring: DEQ's statewide groundwater monitoring program has conducted one to two regional groundwater studies since 2015 to further assess ambient groundwater conditions, identify emerging groundwater quality problems, and inform groundwater users of potential risks from contamination. Regional study areas are selected based on previously identified groundwater vulnerabilities, nitrate data collected during real estate transactions as required by statute (ORS 448.271), time elapsed since water quality data were collected, analysis of potential contamination sources, and community interest to help with recruitment of volunteer participants. All studies include analysis of nitrate, arsenic, bacteria, pesticides, and common ions in 60 to 100 wells. Additional analyses are added based on local risk factors and program capacity. Recent study areas have included the Mid-Rogue Valley Basin in 2015, the North Coast Basin in 2015 and 2016, the Walla Walla Basin in 2016, the Mid-Willamette Basin in 2017, Harney County in 2018, the Klamath Basin from 2019 to 2022, and the Southern Deschutes County study in 2023 and 2024. Completed study reports are available on DEQ's **Groundwater Protection page**.

Fifteenmile Creek: DEQ and the Oregon Water Resources Department conducted a joint sampling effort in the Fifteenmile Creek area south of The Dalles in 2013. Samples were collected from surface water locations and twenty groundwater wells. One well had nitrate concentrations above the federal drinking water standard of 10 mg/L. Another well had nitrate concentrations just below the federal standard. WRD is using the data reported by DEQ to evaluate the connection between surface water and groundwater in the area.

La Pine Area: DEQ sampled monitoring wells in the City of La Pine and surrounding area, now known as the South Deschutes / North Klamath Counties Groundwater Protection Area in 2014. Previous monitoring found that this area had nitrate levels that were elevated above background levels, but most samples were below the federal drinking water standard. The elevated nitrate levels are due to a shallow underlying aquifer and individual septic systems on small rural developed lots. In addition to testing for nitrate, samples were collected for pesticides, pharmaceuticals and personal care products, to determine if these compounds are contaminants of concern. These results will be used to work with the local entities to develop a pollutant reduction plan for the area.

Southern Willamette Valley: A joint inter-agency project began in 2013 in the Southern Willamette Valley Groundwater Management Area. EPA and the Benton Soil and Water Conservation Districts were awarded two grants to collaborate on a project measuring nitrate losses from fields in areas with improved fertilizer management. Soil water samples from existing and newly placed lysimeters in the GWMA are being collected once a month for 2 years and analyzed by the DEQ laboratory to determine levels of nitrate and phosphorus leaching below the crop rooting zones in fields using precision agriculture and other innovative fertilizer management practices. Ultimately, all these data will be used to validate a groundwater protection module of the Oregon-approved USDA-NRCS Nutrient Tracking Tool for nutrient trading. In addition, these lysimeter data will allow the SWV GWMA Committee to obtain real-time data that can be used in management of the GWMA, and to compare current and innovative best management practices and new agricultural technologies for their effectiveness in reducing nutrient release below the rooting zone.

City of Irrigon: Irrigon developed new public water system groundwater wells in 2007 to replace wells lost due to nitrate contamination. Water quality tests on the new wells immediately showed the presence of nitrate and further monitoring indicated an increasing nitrate concentration. The city requested help from the Governor's Office and state agencies tasked with preventing groundwater contamination. DEQ and OHA collaborated on a new Source Water Assessment document for the city in 2011. This served as a basis for understanding the risks of nitrate and other contaminants affecting the new wells. The City was awarded a Drinking Water Source Protection Fund grant in 2012 to develop strategies and implement protection within the groundwater source area. DEQ worked with City officials and a local task force with other partners (including the County, SWCD, and OSU Extension Service) to implement strategies for nitrate reduction. The County is taking the lead on potential initiatives to reduce the number of large animals on rural lands adjacent to the new supply wells. The city has developed and installed signs informing the public of the protection area. DEQ has provided customized educational materials about onsite systems and private wells to the city for

distribution, and continues to provide technical assistance to the City as it implements nitrate reduction activities.

Corvallis Schools: DEQ conducted a groundwater study in the surrounding area as a follow-up to a **2012 USDA study** which detected pesticides in groundwater wells supplying two Corvallis-area schools. Thirty domestic wells and three irrigation wells were sampled in October 2013 for nitrate, pesticides, and common ions. Nitrate was detected at 26 of the 30 domestic wells and was over 7 mg/L at 9 of those wells. Pesticides were detected at 26 domestic wells and 2 of the 3 irrigation wells and were often detected as mixtures. All the detected pesticides were well below the federal drinking water standards, where standards exist. DEQ shared the results with the homeowners by letter and public meeting in early 2014. The Southern Willamette Valley Groundwater Committee incorporated this data into their project.

8.0 Next steps and Oregon's recognition program

Drinking water source protection is already at work in Oregon. A number of Oregon communities are currently developing and implementing strategies to protect their drinking water source areas. Successful drinking water source protection plans developed in Oregon are available to communities as templates or examples. The Department of Environmental Quality's and Oregon Health Authority's Drinking Water Source Protection program staff are available to assist public water systems, local community groups or consultants as they develop drinking water source protection plans and strategies.

Detailed information about developing drinking water source protection strategies can be found on **DEQ's Drinking Water Source Protection Program website** and on **OHA's – Drinking Water Source Protection Program website.** Water systems or community members interested in the potential of developing drinking water source protection strategies should contact DEQ Drinking Water Program for free technical assistance by emailing: **DrinkingWater.Protection@deq.oregon.gov.**

To acknowledge excellence in drinking water source protection efforts, the state of Oregon awards a certificate of recognition to water systems that have made substantial progress in implementing measures to protect their drinking water sources from contamination. Receipt of the award is displayed on each system's Water System Information page on **Drinking Water Data Online**. The Drinking Water Source Protection Award may be used to promote consumer trust, positive customer relations, and public support in protecting drinking water sources. To be eligible for the award, the water system must show that strategies are in place to reduce the risk of contamination from one or more high- or moderate-risk land-use activities within the drinking water source area. The strategy also must be commonly considered an effective risk-reduction measure for the drinking water supply (either groundwater or surface water). Risk-reduction strategies can be implemented through actions taken by state agencies, regional management authorities, local government, and the water system.

If your water system has implemented drinking water source protection measures that protect your drinking water source from contamination and you are interested in receiving the Drinking Water Source Protection Award, find your water system on **OHA's Data Online web page** then please go here. To view your current status, go to Data Online, search for your system, and the click on the "Source Water Protection Status" link. From there, you may press the Source Protection Activities Survey button and complete the survey. Information provided in the survey

will be used to document drinking water source protection activities and to determine if your water system is eligible to receive the award. If you have questions or would like further information, please contact Drinking Water Services at 971-673-0405 or email the Department of Environmental Quality at Drinkingwater.Protection@deq.oregon.gov.

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Appendices

Appendix 1.

Source Water Collaborative - Call to action

A CALL TO ACTION –
A RECOMMITMENT TO ASSESSING AND PROTECTING SOURCES OF DRINKING WATER

WHY A CALL TO ACTION NOW?

As a nation we face a host of water quality and quantity challenges that are both pressing and ongoing. Persistent threats and challenges, and disastrous chemical spills highlight the importance of safe drinking water to public health and local economies. The public and private costs of inaction can be extensive. Together, we must consider lessons learned over the past decade and apply newly available resources to prioritize threats and protect drinking water sources, both surface and ground water. A realistic assessment of recent events demonstrates that additional action by federal, state, and local partners can and must be taken to effectively protect drinking water sources.

Our Vision for the Future: The Nation's Source Waters are Protected

Our vision includes the following elements:

- Federal, State, and Local Actions Reflect the High Value of Safe Drinking Water: The high value of drinking water is widely recognized at all levels of government and among the general public, by regular and systematic actions to help ensure sufficient quantities of high quality water into the future.
- Source Water Protection is Embedded into Our Processes: Source water protection is "hard-wired" into everyday practice at federal, state, and local levels.
- All Stakeholders Work to Help Protect Drinking Water Sources: Stakeholders across multiple fields and sectors are invested in source water protection. We can achieve mutual benefits through government agencies, non-governmental organizations, water utilities, communities, emergency response personnel, and businesses/corporations working collaboratively.

To accomplish this vision, we recommend the following key actions:

1. Update/improve source water assessments and protection plans to prioritize risks and actions, by leveraging new data and tools.
2. Take priority actions to protect sources of drinking water, working with key partners.
3. Coordinate, plan, and communicate in advance with key "upstream" partners as well as within water utilities to help ensure that, in an event, rapid emergency notification is provided to facilitate activation of mitigation measures.

Our Vision

All drinking water sources are adequately protected. As a result, the nation gains profound public health advantages as well as economic benefits.

1

KEY ACTIONS FOR SOURCE WATER PROTECTION LEADERS AND STAKEHOLDERS

DRINKING WATER UTILITIES

Source water protection is part of an effective multiple-barrier approach to ensure the safety and quality of drinking water.

- Leverage new contaminant information resources to update source water assessments, source water protection plans, and emergency response plans.
- Work with local/state partners on priority actions that prevent and/or mitigate the potential for source water contamination.
- Build relationships with emergency responders and staff at sites storing priority contaminants.
- Develop communication plans to obtain early, actionable information from local and state agencies and potential contaminant sources.
- Identify funding strategies for priority measures that protect source water.
- Develop and exercise response and recovery plans for potential contamination events.

LOCAL GOVERNMENTS

Local entities are well situated to address specific local source water concerns through land use planning and collaboration with key stakeholders.

- Address potential impacts on drinking water quality and public health through land use planning (from plan development and implementation through capital investment), zoning, development regulations, and code enforcement.
- Disseminate educational information to community members on water quality issues.
- Coordinate with states and water utilities in developing source water assessments and implementing protective measures.

STATE DRINKING WATER AND OTHER PROGRAMS

Collaboration between state water programs and other influential agencies (agriculture, parks, fish & game, forestry, conservation, and others) provides multiple opportunities to protect drinking water sources.

- Where source water assessments are no longer current or sufficient for supporting source water protection efforts, encourage and engage in targeted updating of source water assessments in collaboration with drinking water systems, and other state, federal, and local officials.
- Leverage the Clean Water Act and other programs and authorities to protect water supplies.
- Communicate key information from source water assessments to stakeholders to guide priority actions and advance protection.
- Factor source water protection needs into land acquisition and management strategies.
- Partner with communities and other watershed and ground water stakeholders to implement priority actions.
- Facilitate community and state-level all-hazards planning.

A CALL TO ACTION TO DEFEND DRINKING WATER

Source water protection ultimately takes place at the local level and, those on the front lines of drinking water protection – drinking water utilities and local governments, supported by state, federal, and community-sponsored programs – have unique opportunities to defend drinking water. Federal agencies can provide tools and data, and leverage programs and authorities to protect drinking water sources. Other source water partners, including Source Water Collaborative (SWC) members and their constituents, also play vital roles. All SWC members and other stakeholders can seize opportunities to establish, participate in or support state and local collaboratives to protect drinking water sources. Defending drinking water is truly a shared responsibility among all concerned stakeholders -- as responses to recent contamination episodes have made abundantly clear.

FEDERAL GOVERNMENT

Land management, environmental, agriculture, scientific, and public health agencies have a role in protecting drinking water sources.

- Encourage and support collaborative approaches to source water protection between programs at the federal, state, and local levels, including USDA conservation and forestry programs, EPA programs, and all federal programs that support the quality of water resources.
- Assist state agencies and local communities to improve source water assessments and protection plans by providing information on the nature and quantity of potential contaminant sources, as well as modeling and analytical tools to characterize contaminant transport in surface and ground waters.
- Continue to expand electronic data sharing among federal offices and agencies to bring the most current and complete datasets possible to bear on source water assessments and protection plans.
- Identify opportunities to incentivize collaboration between the chemical emergency response community and state and local source water assessment and protection activities.
- Encourage upstream entities to take on shared responsibility for protecting source water, including enhancing rapid notification of contaminant spills to downstream drinking water utilities.
- Promote use of Clean Water and Safe Drinking Water State Revolving Fund (SRF) programs to support preparedness and source water protection priorities.

OTHER SOURCE WATER PARTNERS

- Engage in public participation processes under state and federal programs and local land use planning processes to protect sources of drinking water. In particular, take advantage of opportunities to engage in various Clean Water Act actions and projects to protect sources of drinking water [e.g., water quality standards, Total Maximum Daily Loads, point source discharge National Pollutant Discharge Elimination System (NPDES) permits, nonpoint source project development].
- Promote grassroots place-based initiatives to advance source water protection.
- Share data and information to help target source water protection and citizen scientist monitoring.
- Continue to plan and install soil health best management practices to obtain the multiple benefits of soil health, including improved water quality and drinking water protection.
- Inform and influence land use decisions that adequately consider potential impacts to drinking water sources.
- Encourage land conservation practitioners to prioritize working with landowners, drinking water suppliers, and other interested parties to protect undeveloped land that is critically important for protecting drinking water source areas, such as headwater streams, riparian areas, wetlands and intact forests.
- Communicate the importance of source water protection to local, state, and federal decision-makers.
- Understand local communities' emergency response procedures for chemical spill events.
- Adapt positive examples in contingency planning from local source water collaborations.

FOR A COMPLETE COPY OF THE CALL TO ACTION TO DEFEND DRINKING WATER INCLUDING SUPPORTING RESOURCES PLEASE VISIT THE SOURCE WATER COLLABORATIVE WEBSITE AT SOURCEWATERCOLLABORATIVE.ORG

Appendix 2.
Pollutant reduction strategies for common land uses/activities within the drinking water source areas

View DEQ and OHA's table of Pollutant Reduction Strategies for Common Land Uses/Activities Within the Drinking Water Source Areas.

This link leads to a document with a compilation of information on the most common potential impacts to the groundwater drinking water sources in Oregon. "Pollutant Reduction Strategies for Land Uses/Activities" lists the categories of land uses and activities that are identified in the Updated Source Water Assessments, then summarizes the potential impacts or risks from those activities. Impacts generally will only occur when chemicals are improperly handled, or best management practices are not followed. The purpose of developing strategies to "protect" a drinking water source area is to reduce the risks of spills, pollutant release, or off-site movement of chemicals. This table provides key pollutant reduction ideas and resources for implementing drinking water source protection strategies.

Appendix 3. Common crop-pesticide associations in Oregon

DATA SOURCES: The majority of the data in this table are survey data provided by the USDA-NASS Agricultural Chemical Use Program, with the additional data sources listed at the bottom of the table. The NASS program is USDA's official source of statistics about on-farm pesticide use and pest management practices. NASS collects information directly from growers, who participate voluntarily and on a confidential basis. The NASS data are empirical and report actual pesticide use. Estimates were subject to sampling variability; sampling variability was measured by the coefficient of variation, expressed as a percent of the estimate.

Crop	Type of Pesticide	Predominant	Estimate of % Acres Treated	Additional commonly- used chemicals	Data Source	Year
Alfalfa	Herbicide	Metribuzin	--	Diuron	2	1992-2013
Apples	Fungicide	Triflumizole	55	Penthiopyrad, Myclobutanil, Mancozeb, Streptomycin sulfate, Trifloxystrobin	1	2015
Apples	Herbicide	Glyphosate	49	--	1	2015
Apples	Insecticide	Chlorantraniliprole	58	Carbaryl, Methoxyfenozide, Spinetoram	1	2015
Blackberries	Fungicide	Cyprodinil; Fludioxonil	52	Azoxystrobin, Pyraclostrobin, Captan	1	2015
Blackberries	Herbicide	Carfentrazone-ethyl	54	Simazine, Paraquat, Diuron	1	2015
Blackberries	Insecticide	Zeta-Cypermethrin	64	Bifenthrin	1	2015

Blueberries	Fungicide	Cyprodinil	54	Fludioxonil, Azoxystrobin, Captan, Fenhexamid, Boscalid, Pyraclostrobin, Fenbuconazole	1	2015
Blueberries	Herbicide	Simazine	35	Diuron, Flumioxazin	1	2015
Blueberries	Insecticide	Zeta-Cypermethrin	61	Malathion, Thiamethoxam, Bifenthrin	1	2015
Cherries, Sweet	Fungicide	Quinoxyfen	54	Triflumizole, Pyraclostrobin, Boscalid, Trifloxystrobin	1	2015
Cherries, Sweet	Herbicide	Glyphosate	25	--	1	2015
Cherries, Sweet	Insecticide	Imidacloprid	44	Fenpropathrin, Malathion, Lambda-Cyhalothrin	1	2015
Christmas Trees[1]	Fungicide	Chlorothalonil	--	--	1	2009
Christmas Trees[1]	Herbicide	Glyphosate Iso. Salt	--	--	1	2009
Christmas Trees[1]	Insecticide	Chlorpyrifos	--	--	1	2009
Corn, Sweet	Herbicide	Atrazine	95	Dimethenamid-P	1	2014
Grapes, Wine[2]	Fungicide	Quinoxyfen	70	Cyclufenamid, Boscalid, Pyraclostrobin, Fluopyram, Ebuconazole, Triflumizole	1	2015

Grapes, Wine[2]	Herbicide	Glyphosate Iso-Salt	67	Paraquat, Glyphosate Amm. Salt, Carfentrazone-Ethyl	1	2015
Grapes, Wine[2]	Insecticide	Bifenthrin	26	Abamectin	1	2015
Hazelnuts	Fungicide	Chlorothalonil	--	--	7	2006
Hazelnuts	Herbicide	Paraquat	--	2,4-D	7	2006
Hazelnuts	Insecticide	Esfenvalerate	80	Chlorpyrifos, Permethrin, Pyriproxyfen	7	2006
Hops	Fungicide	Quinoxyfen	--	Pyraclostrobin, Boscalid	5	2013
Hops	Herbicide	Carfentrazone ethyl	--	Paraquat, Clethodim, 2,4-D	5	2014
Hops	Insecticide	Imidacloprid	--	Bifenthrin, abamectin (mite), spiridoclofen (mite), hexythiazox (mite)	5	2010, 2013
Mint	Herbicide	Bromoxynil	--	Bentazon	3	2011
Mint	Insecticide	Chlorpyrifos, Acephate	--	Chloranthraniliprole	4	2015
Nursery Stock[1]	Fungicide	Chlorothalonil	--	--	1	2009
Nursery Stock[1]	Herbicide	Glyphosate Iso. Salt	--	--	1	2009

Nursery Stock[1]	Insecticide	Petroleum Distillate	--	--	1	2009
Onions	Fungicide	Mancozeb	48	Pyraclostrobin, Mefenoxam, Chlorothalonil	1	2014
Onions	Herbicide	Pendimethalin	88	Bromoxynil Octanoate, Oxyfluorfen, Clethodim, Dimethenamid-P, Glyphosate	1	2014
Onions	Insecticide	Methomyl	90	Spirotetramat, Azadirachtin, Chlorpyrifos	1	2014
Pasture and Hay	Herbicide	2,4-D	--	MCPA, Diuron	2	1992-2013
Pears	Fungicide	Mancozeb	84	Penthiopyrad, Triflumizole, Pyraclostrobin, Boscalid	1	2015
Pears	Herbicide	Glyphosate	42	2,4-D	1	2015
Pears	Insecticide	Spirotetramat	82	Pyridaben, Pyriproxyfen, Abamectin, Chlorantraniliprole, Etoxazole, Lambda-Cyhalothrin	1	2015
Potatoes [2]	Fungicide	Chlorothalonil	78	Mancozeb, Mefenoxam, Fluazinam, Azoxystrobin, Boscalid, Fludioxonil, Cymoxanil, Famoxadone, Difenoconazole	1	2014
Potatoes [2]	Herbicide	Rimsulfuron	37	--	1	2014

Potatoes [2]	Insecticide	Novaluron	29	Flonicamid	1	2014
Raspberries	Fungicide	Cyprodinil	58	Fludioxonil, Boscalid, Pyraclostrobin, Azoxystrobin	1	2015
Raspberries	Herbicide	Simazine	42	Paraquat	1	2015
Raspberries	Insecticide	Zeta-Cypermethrin	58	Bifenthrin	1	2015
Ryegrass seed	Insecticide	Chlorpyrifos	--	--	6	2002
Strawberries	Fungicide	Boscalid, Pyraclostrobin	67	--	1	2014
Strawberries	Herbicide	Flumioxazin	54	--	1	2014
Winter Wheat	Herbicide	2,4-D	49	Imazamox, Metsulfuron-Methyl, Thifensulfuron, Tribenuron-Methyl	1	2015

Notes

1 -Cut Christmas tree and nursery survey data from the USDA chemical use program include data from multiple program states, of which Oregon was one of the participating program states.

2 -USDA surveys of Washington wine grape and potato producers were used since Oregon data of this type was not available at the time this table was compiled.

Table 4. Common Crop-Pesticide Associations in Oregon

References/ Data Sources

1 -[USDA-NASS] U.S. Department of Agriculture–National Agricultural Statistics Service. 2016. Agricultural Chemical Use Program. Washington, D.C.: USDA National Agricultural Statistics Service, Accessed Online October 18, 2016: https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Chemical_Use/index.php

2 -Pesticide use estimates are based upon USGS NAWQA project data. Nancy T. Baker, U.S. Geological Survey, 2016, written communication.

3 -Sbatella G and Twelker S, "Weed Control Programs in Mint Based Upon Spring Applied Herbicides to Minimize Rotational Restrictions," Central Oregon Agricultural Research Center, Oregon State University. Accessed online February 2017: https://agsci.oregonstate.edu/sites/agscid7/files/coarec/attachments/weed_control_programs_in_mint_based_on_spring_applied_herbicides.pdf

4 -Butler M, Walenta D, Sullivan C, Anderson N, Berry R, "Electronic Mint Pest Alert Newsletter to Promote Optimal Application of Coragen (R) to Control Mint Root Borer, Cutworms, Armyworms and Loopers." Central Oregon Agricultural Research Center, Oregon State University. Accessed online February 2017: http://oregonstate.edu/dept/coarc/sites/default/files/publication/07_herbicide_tea_leaves.pdf

5 -O'Neal S, "Pest Management Strategic Plan for U.S. Hops," Washington State University Irrigated Agriculture Research and Extension Center. Accessed online February 2017: https://ipmdata.ipmcenters.org/documents/pmsps/US-hops-PMSP2015.pdf

6 -USDA Integrated Pest Management Center, [Report], "Crop Profile for Ryegrass Seed in Oregon." Accessed online February 2017: https://ipmdata.ipmcenters.org/documents/cropprofiles/ORryegrass.pdf

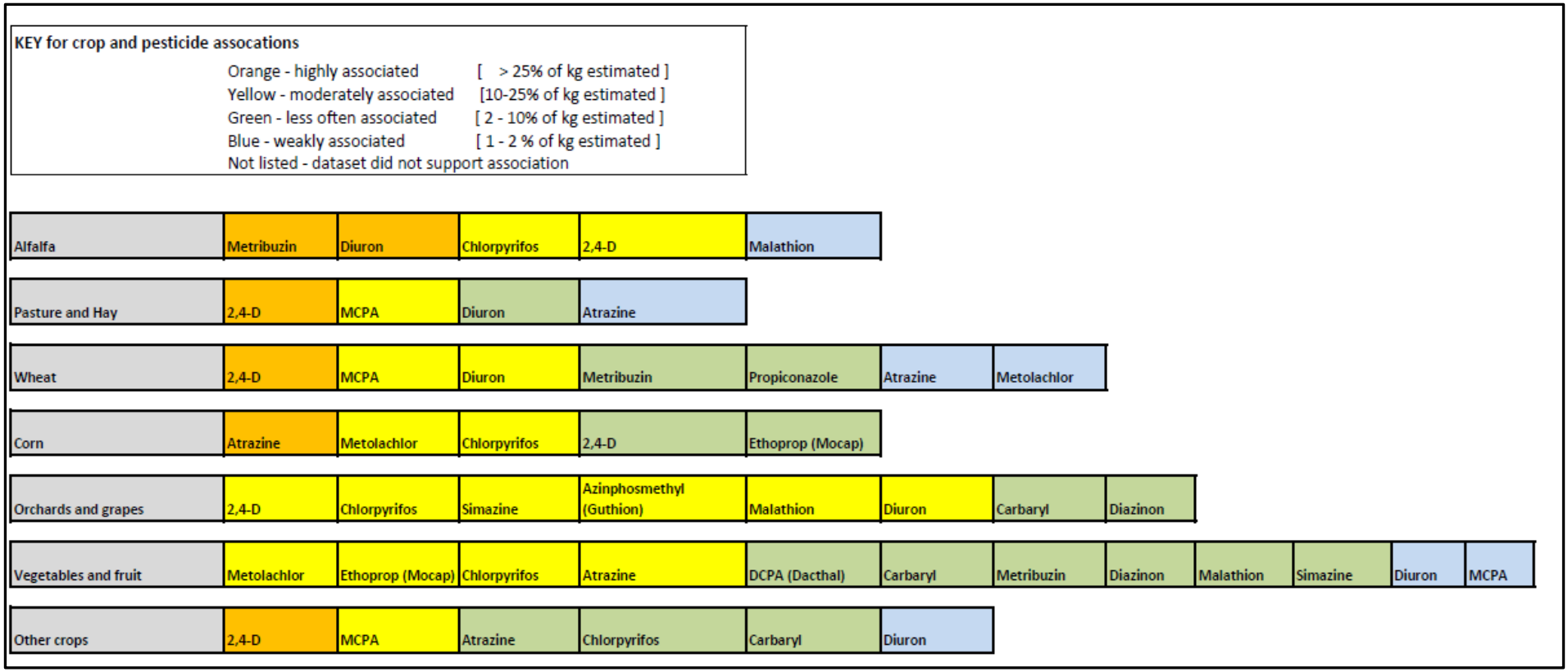
7 -DeFrancesco J, Oregon State University, Workshop Summary, "Pest Management Strategic Plan for Hazelnuts in Oregon and Washington." Accessed online February 2017: https://ipmdata.ipmcenters.org/documents/pmsps/ORWA_Hazelnut.pdf

Appendix 4. Categorical crop to pesticide table

Crop Application Table

Based upon USGS Pesticide Synthesis Project using EPest Low method, for years 1992-2013. The below table is based upon the estimated kilograms of pesticide applied in Oregon by crop/crop category.

1. This table is comprised of selected pesticides ingredients as per their designation as an Oregon Pesticide of Concern, Pesticides of Interest, or as per water quality monitoring results.
2. The research/scientific basis for color coding ratings for crop and pesticide application rates are explained below the table in the references and notes section.



References and Notes

- Orchard and grape crop group in Oregon principally include: hazelnuts, pears, wine grapes, cherries, apples, and other crops
- Vegetable and Fruit crops group in Oregon principally include: Potatoes, onions, blueberries, other berries, snap beans, strawberries, garlic, green peas, cranberries, and others
- Other crops groups in Oregon principally include: Field and grass seeds, hops, and others

Pesticides selected on the basis of water quality monitoring results: DCPA, diazinon, and MCPA. Source: DEQ December 2009 report for LASAR data: "Analysis of DEQ and DHS Pesticide Data in Oregon"

Pesticide use estimates are based on USGS NAWQA project data. Source data: Nancy T. Baker, U.S. Geological Survey, 2016, written communication

Limitations: EPest values form this study are suitable for making national, regional, and watershed assessments of annual pesticide use. Although estimates are provided by county to facilitate estimation of watershed pesticide for a variety of watersheds, there is a greater degree of uncertainty in individual county-level estimates when compared to Crop Reporting District or state-level estimates because (1) EPest crop-use rates were developed in the basis of pesticide use on harvested acres in multi-county areas (Crop Reporting Districts) and then allocated to county harvested cropland; (2) pesticide-by-crop use rates were not available for all Crop Reporting Districts in the conterminous Untied States, and extrapolation methods were used to estimate pesticide use for some counties; and (3) it is possible that surveyed pesticide-by-crop use rates do not reflect all agricultural use in all crops grown. The methods developed in this study also are applicable to other agricultural pesticides and years.

Note 1: One POI, Sulfometuron, was not included in the table above due to the lack of sufficient available data.

Note 2: Bromacil was also considered as part of the analysis on the basis of water quality monitoring results, however the data did not support an association with a crop/crop category. Note 3: Grass seed is included under "other crops" category.

Appendix 5. Corrosivity potential – Oregon monitoring data map