Oregon Coastal Drinking Water Protection Planning

A Resource Guide

Oregon Department of Environmental Quality
Environmental Solutions Division
Watershed Management

Oregon Health Authority
Center for Health Protection
Drinking Water Services

July 2015 Final Draft

A Call to Action -
A Recommitment to Assessing and Protecting Sources of Drinking Water

"Our vision…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…"

(**Appendix 1,** Source Water Collaborative, 2014)

This report prepared by:
Oregon Department of Environmental Quality
Environmental Solutions Division
Watershed Management Section
811 SW 6th Avenue
Portland, OR 97204
1-800-452-4011
www.oregon.gov/deq

Contact: Sheree Stewart
Drinking Water Protection Coordinator
(503) 229-5413

Oregon Coastal Drinking Water Protection Planning
A Resource Guide

TABLE OF CONTENTS

FIGURES

APPENDICES

EXECUTIVE SUMMARY

Section 1453 of the federal 1996 *Safe Drinking Water Act* Amendments (PL 104-182) required states to develop "Source Water Assessments" for all public water supplies within their state. Source Water Assessments identify watershed or aquifer conditions and potential sources of pollutants, and also prioritize areas for future protection. The Oregon Health Authority (OHA) and the Oregon Department of Environmental Quality (DEQ) completed Oregon's assessment reports in 2005. More advanced data and GIS capabilities now allow the agencies to upgrade or update the original assessments. This resource guide will provide the foundation for updated Source Water Assessments for each public water system. This is the first in a series of focused guidance for protecting sources of Oregon's drinking water.

Drinking water sources, whether from a watershed or aquifer recharge area, are subject to a variety of potential point and nonpoint sources of pollution. Improving or maintaining the source water quality is a vital component of providing safe and clean drinking water to the public. This document will also provide guidance for overcoming barriers to protection, as well as a consistent framework for developing and implementing effective drinking water source protection projects.

There are 50 small- to moderate-sized watersheds on Oregon's Coast that currently serve as community drinking water sources. This is a subset of watersheds and aquifers serving as sources for the approximately 2500 public drinking water systems throughout Oregon. All public water systems would benefit from detailed GIS mapping and identification of risks and sensitive areas. *Coastal community water systems experience unique issues due to their geographic setting, climatic and geological vulnerabilities, and seasonal tourist demands that other parts of the state do not necessarily experience.*

The main reason for prioritizing coastal watersheds for guidance is climate change. An increase in weather extremes – intense storms and droughts – is affecting coastal water systems. Based on evaluation of drinking water data, it is clear that the most significant direct impact of intense storms to coastal watersheds is an increase in turbidity levels – that is, an increase in materials in the water that decreases water clarity. Elevated turbidity often results in increased maintenance for drinking water treatment and costs to coastal residents. Pollutants such as pesticides or fuels absorbed to the surface of entrained particles in turbid water can also increase public health risks. High turbidity due to organic matter in streams often requires more chemicals to treat water, and can increase the levels of disinfection byproducts, a category of carcinogenic compounds. Other impacts of climate change include an increase in temperatures of streams and lakes during the warmer summers, contributing to an increase in harmful algal blooms driven by higher levels of nitrates and phosphorus in stormwater and groundwater.

In recent years, many citizens from Oregon Coast communities have expressed concerns with their surface water sources for drinking water that may be related to land use and other human activities. Their concerns fall into these general categories:

- Pesticides and turbidity due to land management activities;
- Turbidity and fuels from quarries;
- Disinfection byproducts as a result of excessive organics/nutrients/turbidity.

- One goal of this guidance document is to provide information and references to foster better communication and collaboration to address these concerns at the local and state level.

Like all states, Oregon faces significant challenges in addressing water quality degradation in municipal drinking water watersheds. The federal Safe Drinking Water Act provides for OHA regulation of treated drinking water but provides no authorities to prevent pollution upstream. It is the federal Clean Water Act (CWA) authorities that apply to all waters serving as drinking water sources for Oregon communities. However, many of the CWA's important regulatory tools can only be applied after there is significant data and documentation to show individual sources of pollutants. CWA implementation funds are fully committed toward compliance and enforcement; therefore state agency programs are not always able to achieve proactive pollution prevention such as implementing ecosystem services markets, steep slope protection/stabilization, purchase of riparian easements, and a variety of other techniques.

For Oregon communities to provide safe and clean drinking water, many must secure loans to build more sophisticated water treatment plants. Upstream restoration projects and pollution prevention can reduce the need for expensive treatment, but most public water system entities do not have the capacity to build those collaborative partnerships with upstream landowners. This is where local citizen groups and non-profit organizations may be more effective in developing successful partnerships between municipal water providers and upstream landowners and managers. DEQ and OHA strongly support the work of non-profit organizations or citizen groups to work on projects to improve water quality. In fact, *we believe many water quality initiatives are far more effective when implemented on a voluntary basis*. With their collaborative approaches, we believe organizations not associated with local government are uniquely positioned to offer expertise and support to implement strategic restoration and stabilization techniques that will lead to better source water for Oregon public water systems. For this reason, we will provide in-depth information in this guidance document to assist public water systems to reach out to citizen groups and non-profit organizations.

DEQ and OHA recognize the need to stabilize and create ecological and social resilience in municipal watersheds; this need will continue to increase as climate change brings more intense storms. It is clear that weather patterns are shifting, and coastal communities are feeling more impacts of severe storms and intense rainfall events. We acknowledge that significant benefits could come from more data and analysis. More extensive water quality monitoring could put all of us in a better position to identify the specific root causes of water quality degradation *within each watershed*. But we also believe preventative steps can be taken now instead of waiting for extensive data collection efforts to be funded and implemented.

This guidance document *provides data and information to encourage action in the near future on priority areas*. DEQ and OHA's experience working with small communities indicates there are not enough local-level resources to perform an effective analysis to identify priority areas in their drinking water watersheds. This document provides the basis for updated assessments of individual watersheds, mapping of natural features, susceptibility analysis, and identifying potential sources of pollutants; links to non-profit organizations that may be able to assist; and information for how to improve collaboration with upstream partners and landowners to protect and improve source water quality.

CLIMATE CHANGE AND WATER QUALITY

The entire Pacific Northwest is a dynamic natural environment. Understanding the geographic setting improves identification of risks and vulnerabilities to a drinking water source. Watershed protection in this geographic setting requires understanding the unique influences of geology, topography, climate and ecology.

The Cascade Mountains are primarily of volcanic origin and are tectonically active with volcanoes and earthquakes as major forces that can drastically alter the landscape. Plate tectonics, a subducting ocean plate and uplift have created (and continue to create) diverse geological conditions in the Oregon Coast Range. The Coast Range is primarily interlayered oceanic sediment deposits and lava flows, pushed upward as a result of plate tectonics. This means there are large areas of highly erodible sedimentary rocks, including some of oceanic origin, with sections of harder igneous (volcanic) rocks. The landscape is shaped by the erosion and sediment movement processes that vary locally due to site-specific rock types and degree of consolidation. Topographically, the terrain is mountainous with valleys, large and small. Steep slopes are prone to shallow, rapidly-moving landslides, and there are numerous large, deep-seated landslides as well. There are large sea floor faults off the coast of Oregon that are active and can cause both earthquakes and tsunamis. Tsunamis present a risk to coastal drinking water supplies due to the possibility of saltwater surges upstream and physical damage to the infrastructure of community water supplies.

The topography of the mountains and proximity of the ocean also makes for a diverse climate. The climate on the west side of the Cascade Mountains is characterized by a dry summer season with high amounts of precipitation between October and April. In Oregon's Coast Range, the maritime Mediterranean climate's wet winters include frequent large storms. Yearly average precipitation can regularly exceed 100 inches in many mountainous locations. Coupled with the steep, fertile landscape, the westside wet climate makes the entire Pacific Northwest's coastal zone a very biologically productive region with the potential for large and small erosion events. Forests and deep soils covering much of the westside landscape store and filter the abundant rainfall, producing high-quality, reliable water for drinking, fisheries, agriculture and other beneficial uses.

In 2007, the Oregon State Legislature charged the Oregon Climate Change Research Institute with assessing the likely effects of climate change on the state, including specific biological, physical and social science aspects that relate to Oregon. An assessment report was developed in 2010 to act as a compendium of the relevant research on climate change and its impacts on Oregon (Dello 2010). The report stated that human activities are primarily responsible for the observed 1.5° F (0.83°C) increase in the 20th century temperatures in the Pacific Northwest.
Future predicted regional climate changes in Oregon include:

- Increases in temperature around 0.2-1°F (0.11-0.56°C) per decade
- Warmer and drier summers with a likely 14 percent decrease for summer precipitation by the 2080s
- Extreme precipitation events will likely increase in frequency and severity
- Sea levels will rise, possibly by two to four feet (0.6 to 1.2 meters) by 2100

Key findings from the report include:

• Summer water supply will decrease due to reduced snowpack and summer precipitation;
• Availability, quality and cost of water will likely be the most limiting factor for agricultural production under a warmer climate
• Wildfire is projected to increase in all Oregon forest types in the coming decades
• Frequency and magnitude of coastal flooding events may continue to increase
• Many plant and animal species on land, in freshwater and in the sea have and will shift their distribution and become less or more abundant – invasive species and harmful algal blooms may become more abundant
• Changes to the marine environment including increasing water temperatures
• Oregon's economy, like many other states, is likely to be affected by a changing climate and by policies addressing projected changes
• The important drivers of greenhouse gas emissions are population, consumption and the emission intensity of the economy.

Climate change is already affecting the Pacific Northwest, and alterations to our regional as well as global climate are expected to continue for decades. Effects of climate change include more frequent and larger major storms, drier summers and wetter winters, increased wildfire severity in some places, increases in stream temperature, and reductions to summer and early autumn streamflow. Larger storms increase erosion and are more likely to trigger landslides (Robison et al 1999, Turner et al 2010). In areas dependent on groundwater discharge into streams, there may be lower streamflows during the dry seasons that could create problems for fish and water supplies. Increases in stream temperatures can encourage algal blooms and impair fish and other aquatic life. Incidences of algal blooms can also be increased by storm runoff of nitrate- or phosphorus-rich waters. Climate change effects do not occur in isolation but will interact with the effects of human activities and other natural processes.

Along with the geographic setting, the qualities of surface water and groundwater are controlled by vegetation and biological communities. A diverse and resilient ecosystem can endure disturbances with reduced water quality impacts and faster recovery times. A simplified, disturbed or stressed ecosystem will have more sensitivity to water quality impacts and be slower to recover from disruptions. Different ages and structures for forest stands, for example, may have differing characteristics for water flows and occurrence of shallow landslides and debris flows. Because land management is primarily about ecosystem management, it is especially important to understand the ecological state of the drinking water watershed and how ecology is affected by current and potential management activities.

Water quality in the Coast Range of Oregon can vary due to natural and/or human influences. Fires periodically burn through forests and rangelands (see Coast Range history: Long et al 1998). In steep areas, landslides occur and can move large amounts of soil, rock and debris. Windstorms can blow over trees, and flooding periodically affects streamside areas and beyond. Erosion of streambanks and falling vegetation can add sediments and organic matter (biomass) to surface waters. These disturbances, large and small, can sometimes interfere with beneficial uses of surface waters and are also important ecological processes, rejuvenating and reorganizing ecosystems.

Likewise, human activities can disturb watersheds and streamside areas with the potential to alter water quality and aquatic habitat. Farming, forest management, urban and residential development, roads, recreation and other activities can cause erosion, trigger landslides, add organic matter and pollutants, change flows and stream temperature, and alter stream structure. For example, clearcut timber

harvesting is known to increase landslide rates on steep slopes and increase streamflows and erosion (Montgomery et al 2000). Narrow riparian buffers are subject to frequent windthrow (toppling of trees by wind), a fraction of which will become a source of fine sediment to the stream (Rashin et al 2006). Roads are a well-known source of fine sediment, petroleum products and other pollutants (Trombulak & Frissell 2000). Bank disturbance by development, agricultural practices and grazing animals, and forest harvest can also contribute sediment and organic matter to stream systems, such as slash from forest harvests adjacent to unbuffered headwaters streams (Jackson et al 2001, Kibler et al 2013). Effects may be apparent immediately or over years and may be local and/or cumulative across the landscape.

Causes of water quality impacts and risks can be roughly divided into natural and human (or anthropogenic) factors.
Natural factors that can affect water quality include:

- Locations of steep slopes prone to shallow, rapidly-moving landslides (>70-85%), depending on geology and landform)
- Locations of earthflows and other deep-seated earth movements
- Eroding streambanks, inner gorges and cliffs, and other erosion-prone, stream-adjacent features
- Recently disturbed uplands and riparian areas (for example, fire or windstorm in the past 10 to 30 years)

Human factors affecting water quality include:

- Human activities and facilities within riparian areas
- Road locations and conditions, especially stream crossings, roads near streams, roads on steep slopes, and roads with drainage systems connected to the stream network
- Actively used pastures and/or cropland that have flowing water adjacent
- Stormwater runoff from vulnerable areas (areas, with high phosphorus or nitrates, for example)
- Recently managed forestland that has been harvested, replanted, treated with herbicides, etc.
- Quarries and associated infrastructure
- Construction sites
- Residential land (rural, suburban, urban) and infrastructure (for example, onsite/septic systems and stormwater discharge pipes)
- Hazardous material sites
- Industrial sites
- Solid waste landfill sites

Some locations on the landscape are more sensitive to disturbances, including:

- Riparian areas
- Springs, seeps and wetlands
- Steep slopes (>70-85%)
- Floodplains
- Areas with highly-erodible soil

The costs associated with treating surface water sources can be directly related to raw water quality conditions. The natural processes and human and natural disturbances listed above can affect water quality in ways that become problematic for drinking water treatment processes. Increased turbidity (cloudiness) and suspended sediment in source water can clog filters, require more water treatment

chemical use, and carry pollutants and pathogenic microorganisms. Elevated amounts of organic matter are precursors to potentially carcinogenic disinfection byproducts, which are formed when commonly used disinfectants react with organic matter. All of these constituents can raise the cost of drinking water treatment, require treatment plant shutdowns or result in finished drinking water that does not meet Safe Drinking Water Act maximum contaminant levels (MCL) or treatment technique standards. Providing reliable clean and safe drinking water to the public requires both water treatment technology and prevention of pollutants in source water. *Reducing the pollutant loading in source waters can avoid additional treatment costs and improve the reliability of treatment.* Reducing pollutant levels in source water can also reduce the production of harmful disinfection byproducts, which are a result of factors such as high chlorine demand, high turbidity, or high organic matter content in source waters.

DRINKING WATER REGULATORY OVERVIEW

It is important to understand the context of water quality and drinking water regulatory authorities as it relates to drinking water source protection. The Oregon Health Authority (OHA) is the primacy agency for the implementation of the federal Safe Drinking Water Act (SWDA) in Oregon. 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. Standard under OAR 333-061 outlines requirements for systems to meet MCLs, 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. In order to assist systems in complying with standards, OHA also provides technical assistance and oversight of grants and loans for public water system operation and improvements.

The OHA website has extensive information on drinking water treatment requirements: http://healthoregon.org/dwp

The Safe Drinking Water Act does not provide authorities to prevent pollution in source waters.
Protecting water quality in source waters for public water systems requires implementation of federal Clean Water Act (CWA) authorities and state law. DEQ is responsible for implementation of the federal CWA 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 upstream of drinking water intakes in the Coast Range watersheds and throughout the state. CWA authorities apply to all state waters in Oregon, and DEQ works to achieve CWA goals by implementing a variety of programs. OHA works with DEQ to implement drinking water source protection work. An Interagency Agreement signed by both agencies provides a framework to ensure the responsibilities and tasks for DEQ associated with drinking water are clearly articulated.

State statutes authorize DEQ to implement and enforce the federal Clean Water Act within Oregon. Oregon statutes that provide the basis for prevention of contamination include:

> *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.*
> *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.

Drinking water in Oregon is an important beneficial use. Through Clean Water Act implementation, DEQ works to minimize pollutant loadings to the source water before it reaches the surface water intake for a public water system. ***The fundamental goal of source water protection is this: if the CWA standards are met in source waters, a drinking water treatment plant using standard treatment technology should be able to generate water meeting the safe drinking water standards.***

The SDWA currently regulates the 91 most commonly occurring pollutants in drinking water. There are many pollutants not regulated in treated drinking water —including pharmaceuticals, personal care products (referred as "emerging contaminants") and some pesticides used in Oregon. Community public water systems and Non-transient Non-community public water systems test for regulated pesticides every three years in treated drinking water, but there are many pesticides used in Oregon that are not regulated under the current requirements. Transient non-community public water systems are not required to test for pesticides. Through extensive sampling and analysis by the U.S. Geological Survey and others, we know that many pollutants found in Oregon streams cannot be fully removed through standard drinking water treatment technology commonly used by public water systems (Kolpin et al 2002; Blomquist/USGS 2001). This places even more emphasis in reducing or preventing pollutants in source waters.

As part of its strategic plan, DEQ places high emphasis on protecting human health and, 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 (see "Regulatory Authorities" section below). Within other programs at DEQ, there is a high level of coordination to integrate the drinking water source area information and priorities into agency toxics reduction, pesticide stewardship partnership implementation, emergency/spill response, hazardous waste cleanup, etc.

WATERSHED CHARACTERISTICS

Much information already exists that describes the general topographical form and characteristics of the coastal watersheds (Kelsey et al 1994). In terms of overview, the land use coverages were summarized in the Oregon State of the Environment Report (Oregon Progress Board 2000). The primary change from historical land use cover over time has been an increase in urban and agriculture acreages as the coastal communities were developed. The report also provided a summary of the coast range region's current land ownership: 60% is under private ownership, 27% is federally-owned, and 12% is publicly-owned (Oregon Progress Board 2000). In this section, we will summarize what can be learned about each of the drinking water watersheds from existing GIS database files.

With respect to public drinking water sources, the coastal watersheds were mapped as required in the 1996 amendments to the Federal Safe Drinking Water Act (SDWA). These amendments required states to develop "source water assessments" for all public water supply systems. The work was funded through the SDWA----OHA and DEQ teamed up to complete the assessments for 2,656 Oregon public water systems by 2005. The assessment reports done for each public water system provide community officials detailed information on the watershed or recharge area that supplies their well, spring, or surface water intake (the "drinking water source area") and identify potential risks within the source area. The potential sources of contamination were defined by EPA and included both point sources and nonpoint sources. Using a statewide advisory committee, procedures were developed so that Oregon met the SDWA requirements.

The individual assessment reports are available for the public from DEQ and OHA. For surface water sources, summary reports are available on this website: (http://www.deq.state.or.us/wq/dwp/swrpts.asp), and citizens can contact DEQ to request a full copy of the report. Maps and downloadable statewide GIS shapefiles of drinking water source area data are available on DEQ's drinking water source protection website and drinking water source areas are shown on DEQ's Facility Profiler (a location based system showing DEQ permit holders and cleanup sites), DEQ's LASAR (Laboratory Analytical Storage and Recovery for air and water quality monitoring data), Oregon State University- Institute for Natural Resources website, and 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.

***There is universal agreement that the source water assessments for each public water system need to be updated*.** The level of information in databases and GIS mapping has significantly improved since Oregon's assessments were completed between 2000 and 2005. DEQ and OHA are now able to generate "Updated Source Water Assessments". *The information and mapping performed for this report will enable DEQ and OHA to provide Updated Source Water Assessments for the 50 coastal public water systems.* In order to ensure the site-specific data is the most current available, individual reports and maps will be issued for each public water system as soon as the community or citizen's group is ready to use them. The individual assessments can be printed or sent electronically upon request. Other public water systems across the state will have access to updated assessments very shortly.

One of the most important and valuable assets a public water system can have is accurate watershed mapping and visual resources to share with the community citizens and officials. Since the first source water assessments were completed, DEQ has expanded its GIS capabilities and, more importantly, the

range of available data for analyzing potential pollutant sources. Our understanding of potential pollutant sources has been improved by development or acquisition of new datasets (such as the hazardous material storage locations, linking water quality assessment results to pollution sources, better roadway and river networks, outfall locations for permitted pollution sources, land use based on photo imagery, permitted sources front door locations, historic landslide data, harmful algae blooms, confined animal feeding operations, mining activities, and many more). Currently the program has more than 40 GIS datasets to explore new or previously unknown potential pollutant sources. Modeling techniques allow for detailed evaluation using a combination of data sets rather than a single layer. This allows for using geospatial information of varied types (such as erosion potential, rainfall, soil types, and geology) to understand the interactions that can result in water quality impacts.

The susceptibility of the public drinking water system source depends on both the natural conditions in the watershed as well as the land uses and activities in the watershed. A summary of Updated Source Water Assessment information for the coastal public water systems is provided in **Appendix 2**. The *Coastal Watershed Land Use and Susceptibility Analysis* in **Appendix 2** includes 3 tables of information on land use, susceptibility to anthropogenic and natural conditions, and other factors such as previous chemical detections and drinking water treatment methods to help determine the most susceptible areas within each drinking water watershed. The susceptibility analysis provides us with information on where the greatest risk occurs for each system as well as a way to identify PWSs that have common risks and concerns.

There are a total of 50 community public water systems using surface water in the north, mid and south coast sub-basins. These are shown in **Figures 1-4**. Over 75% of these water systems are considered small (serving less than 3,300 people) and about a third of the PWSs serve less than 500 people. Because some water systems have more than one intake, there are a total of 76 intakes included in the susceptibility analysis. Many coastal water sources (82%) draw from a watershed that is less than 10 square miles in area.

Land use in each source area is a key factor for evaluating potential risk to the drinking water supply as very few public water systems have legal jurisdiction or other control over their source areas. **Figure 1** provides a map view of the land uses. The data for drinking water source areas is provided in a graph format in *Coastal Watershed Land Use/Ownership Summary Data* in **Appendix 3**. This illustrates the percent of land for each source area that is owned and managed by various governments or private parties. Overall, 20% of public water systems have a majority (>50%) federal ownership within their source area. Most of these with high federal ownership are located in the Mid-Coast area with the exception of Powers in the South Coast and Tierra Del Mar in the North Coast. Private industrial forest land ownership is common especially in the north and mid-coast public water system source areas. 40% of public water system sources areas contain more than half of their watershed in private industrial forest land ownership. Agricultural land use is less common in the coastal zone. Only 5 drinking water source areas contain a significant portion of agricultural land (>5% total). Most of the agricultural land is in the South Coast (Coquille, Myrtle Point, Weiss Estates, and Bandon) with the exception of Beaver Water District near Tillamook. Several water systems own all or a large portion of their drinking water source area including Astoria, Coquille (Rink Creek only), Coos Bay/North Bend, Nehalem (90% of Bobs Creek watershed), Bay Hills, Tillamook (38%), and Newport (25% of the Big Creek watershed). Fourteen other coastal public water systems own some acreage in the watershed, typically a relatively small parcel close to the intake. Five public water systems, all on the North Coast, have more than 10% of the

land within their source area owned and managed as Oregon state forest. Land uses included in the "other" category are primarily private non-industrial land (residential) with limited commercial/urban land, tribal land and the "water" classification.

The Coastal Watershed Land Use and Susceptibility Analysis (**Appendix 2**) also identifies susceptibility factors within each drinking water watershed based on the soils, slopes and geology. *The sensitive areas are those where potential pollutant sources or land use activities, if present, have a greater potential to impact the water supply.* One indicator of sensitive areas is the number of stream miles that have high erosion potential soils located within 300' of the stream. Coastal water systems appear to have a high percentage of stream miles in high erosion soils. Eighteen of the 50 coastal public water systems have more than 80% of the stream miles with high erosion soils. Half of the public water systems (26/50) have more than 50% of stream miles with high erosion soils. Another susceptibility factor is the percent of the watershed with high to moderate shallow landslide potential as evaluated based on modeling of slope stability using LiDAR data (Light Detection and Ranging technology---see DOGAMI website—**Appendix 5**). For coastal water systems, the percent of the land area with high to moderate shallow landslide potential ranged from 0.2% to 23% of the total drinking water source area. Ten of the 45 source areas with LiDAR data had a relatively higher risk (≥15%) and 11 public water systems have a moderate shallow landslide potential. Note that other factors (such as proximity to the intake or potential for downstream sediment transport) may impact risk levels for individual intakes. Individual maps detailing landslide potential are available for each coastal public water system upon request. An example of the individual map that can be produced for each is provided in **Figure 5**. An example combination of maps for a larger watershed is provided in **Figures 6A-6B**.

Anthropogenic activities and pollution sources can also be a risk to the drinking water supply. Common potential sources of pollution within coastal drinking water source areas include gravel quarries and other mining sites, animal management areas (including permitted confined animal feeding operations), wastewater discharge permits (domestic or industrial), boat ramps and marinas, hazardous material storage/use locations as recorded on the State Fire Marshals list, and solid waste handling sites (landfills or transfer stations). Note that septic systems also present a risk but information on location and density is not readily available in GIS layers for analysis. A summary of the types of potential pollutant sources present in each drinking water source area is provided in **Appendix 2** and individual maps including this data are available for each coastal public water system upon request.

Water quality sampling is performed on a regular basis in many of the coastal watersheds---by state agencies, as well as federal partners such as the US Geological Survey. A majority (60%) of drinking water source areas within the coastal areas have at least one stream segment listed as impaired in DEQ's 2010 Water Quality Assessment for streams and lakes. These listed waterbodies are required to have Total Maximum Daily Loads (TMDLs) developed and then implemented through pollution reduction actions (see TMDL process in Current Projects section below).

Sampling has also been conducted above the intakes in source waters for 17 coastal public water systems by DEQ (see Drinking Water Source Monitoring in Current Projects section below). Low levels of pesticides or wastewater constituents were detected at all locations except one. The data is summarized in the table in **Appendix 2**. Note that the concentrations detected did not exceed health standards (where available) but indicate an opportunity for technical assistance to reduce their occurrence within the watershed. Coastal water systems are also addressing coliform detections in their finished water and

problems with disinfection byproducts. 64% of coastal public water systems have had more than 2 "alerts" for disinfection byproducts (see OHA website - **Appendix 5**).

WATER TREATMENT TECHNOLOGIES

In addition to the watershed and water quality characteristics, the types of drinking water treatment technologies employed can be summarized for the 50 coastal public water systems. Only one public water system –Reedsport-- has a regulatory filtration treatment exemption and does not filter the raw water (disinfection only). All other 49 systems employ treatment. Treatment systems used by the public water systems are varied and are summarized as follows:

29 PWSs	(58%)	Rapid Sand
5 PWSs	(10%)	Slow Sand
7 PWSs	(14%)	Membrane Filtration
8 PWSs	(16%)	Pressure Sand or Cartridge Filtration

Drinking water treatment is usually a combination of physical and chemical processes. Mechanical straining removes some particles in raw water by trapping them between the grains of the filter medium (such as sand). Coagulation (and flocculation) is a process by which suspended particles form a larger floc particle that allows for removal by sedimentation and/or filtration. Other types of filtration processes can be used without coagulation, and include membrane and cartridge filtration, as well as diatomaceous earth, while biological processes predominate in slow sand filters.

In rapid sand filtration, the water is filtered through a bed of graded sand. Filters are periodically cleaned by backwashing (reversing the flow of water through the filter). Anthracite coal or activated carbon may also be included in addition to sand to improve the filtration process, especially for the removal of organic contaminants and taste and odor problems.

Pressure filters are similar to rapid sand filters, except that the water enters the filter under pressure. Cartridge filtration uses a physical process—straining water through porous media. Cartridge filters are typically used for removing microbes and turbidity in small systems. The cartridge consists of ceramic or polypropylene filter elements fitted into pressurized housings. Cartridge filters cannot be cleaned by backwashing.

Slow sand filtration occurs at a much slower rate. Removal of particles and pathogens is predominantly dependent on biological processes. These filters form a filter skin or "schmutzdecke" containing microorganisms that trap and break down algae, bacteria, and other organic matter before the water reaches the filter medium itself, where contaminant removal includes biochemical and physical mechanisms. The filter consists of a bed of fine sand of approximately 3 to 4 feet deep supported by a 1-foot layer of gravel and an underdrain system.

Membrane systems utilize material capable of separating substances, depending upon the pore size of the material, when a driving force is applied across the membrane. Membrane filtration is effective for removal of microorganisms, particulate material, and some natural organic material that can impart taste and odor problems in drinking water. Membrane systems often employ coagulation to address disinfection by-product precursors like soluble total organic carbon that can more readily pass through micro and ultra-filtration systems.

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 Daily Maximum Loads (TMDLs) and the related implementation plans. TMDLs and their implementation plans are designed to control point source and nonpoint 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 standard treatment technology.

Nonpoint source pollution (pollution from a diffuse area rather than a discrete pipe, ditch, etc.) is addressed through the following programs implemented by DEQ: Water Quality Standards, Water Quality Assessment, Total Maximum Daily Loads, §319 Nonpoint Source Planning and Grants, Drinking Water Protection, Groundwater, 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 (DMAs). 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. The only significant limitation on DEQ's authority is that it 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 CWA or other federal law. The Oregon Department of Forestry (ODF) regulates commercial harvesting on private and state forest lands. The Oregon Department of Agriculture (ODA) regulates agricultural activities through Agricultural Water Quality Management Area rules.
The land uses within DWSAs in the coastal zone are the same types of land uses present throughout Oregon and the Pacific Northwest, although the geographic setting is substantially different from other parts of the state. Agriculture, residential (urban/suburban/rural), and forestry are the major land uses on private land. The major land use on state and federal land in the coastal zone is forestry. Land management regulation responsibilities vary by land use and ownership type (see below). Beyond which agencies are responsible for regulation of management activities, understanding the structure of those regulations and responsibilities is necessary. The landowner is ultimately responsible for management activities, so in addition to regulatory agencies, engagement with landowners can be helpful.

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 here: http://www.oregon.gov/ODF/Pages/lawsrules.aspx, and an illustrated guide to the rules from the Oregon Forest Resources Institute can be found here: http://oregonforests.org/sites/default/files/publications/pdf/OR_For_Protect_Laws_2011.pdf .

State-owned forestlands are referred to as "Board of Forestry lands". Management plans (rules) for state-owned forests can be found here: http://www.oregon.gov/odf/STATE_FORESTS/docs/management/nwfmp/NWFMP_Revised_April_2010.pdf . The overall goal of managing state-owned forestlands is stated as: "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 to ensure that management of the forest to maintain the quality and quantity of public water supplies for community water systems is 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.

Details of riparian rules for private and state forestlands in Oregon's coastal zone can be found in **Appendix 4**. The riparian and steep slope protections are common to all state forestlands.

AGRICULTURAL LANDS

Agricultural activities are regulated by Oregon Department of Agriculture under the Agricultural Water Quality Management Act (AgWQMA; Senate Bill 1010). The AgWQMA gave ODA authority to establish management plans and adopt rules regulating agricultural practices that contribute to water quality problems within planning areas. The areas include those where DEQ has determined that a TMDL is necessary for a water body, DEQ has established a groundwater management area, or an agricultural water quality management plan is otherwise required by state or federal law (ORS 568.909). ODA's agricultural area water quality management plans and implementing rules are the official TMDL implementation plans for agricultural nonpoint sectors (including non-permitted Confined Animal Feeding Operations (CAFOs) and other activities not covered under CAFO permits). The AgWQ Management Act provides ODA with the primary authority to address agricultural water quality issues in areas subject to water quality management plan requirements. ODA also administers permits for regulated CAFOs across the state.

Under the AgWQMA, there are 38 Agricultural Water Quality Management Areas, each with its own Area Rules and Area Plan. Rules constitute requirements under the law that must be met by agricultural producers. Common components of these include limits on how near to surface water agricultural activities are allowed and prohibitions on introducing sediment, bacteria, and other pollutants to waters of the state. Rules vary from Area to Area. Area Plans are additional voluntary measures intended to

restore riparian areas and improve water quality. Further information can be found here: http://www.oregon.gov/oda/programs/NaturalResources/Pages/AgWaterQuality.aspx

A summary of riparian rules for agricultural lands in Oregon's coastal zone can be found in **Appendix 4**.

RESIDENTIAL / STORMWATER, AND INDUSTRIAL LANDS

Residential land use is regulated by cities, counties, the Oregon Department of Land Conservation and Development, and, in some cases, regional governments like Metro. Construction stormwater, city stormwater in larger municipalities, and sewage treatment are regulated by DEQ through National Pollutant Discharge Elimination System (NPDES) permits. Onsite septic systems are regulated by county governments and DEQ (see next section). 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 ODA. Rules and ordinances vary among cities and counties, so restrictions on residential land activities will be different depending on the location of your drinking water source area.

DEQ regulates sewage treatment systems and industrial dischargers through the water quality permit program. 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 is a WPCF (Water Pollution Control Facility). Several of DEQ's general permits are administered by other agencies through Memoranda of Agreement or Understanding (MOA or MOU); these include the GEN800 for CAFOs (ODA), GEN1000 for gravel mining (Oregon Department of Geology and Mineral Industries; DOGAMI), NPDES 1200A for off-site discharge of storm and process water from gravel mining (DOGAMI). Other permits are administered directly by DEQ.

National Pollutant Discharge Elimination System (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. 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 TMDL. Small rural "farmsteads" are subject to regulation by Department of Agriculture (see above). 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 has clear legal authority to require local governments to address pollution that arises from proprietary-controlled activities.

ONSITE SYSTEMS

Approximately 30 percent of Oregon households rely on septic systems to treat their sewage. 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 borders, 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 web pages: http://www.deq.state.or.us/wq/onsite/onsite.htm
For lists of county agents and DEQ contacts for onsite system questions:
http://www.deq.state.or.us/wq/onsite/contacts.htm

AGGREGATE MINING

Development, use, and reclamation of rock pits or quarries for non-forest management uses are regulated by the Department of Geology and Mining Industry (DOGAMI). 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 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;
- DEQ NPDES 1200-A General Permit--- for stormwater from the mining operation and haul roads that drains to surface waters;
- Individual DEQ NPDES Permit--- for discharging process wastewater to surface waters.

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 is the Department of Forestry.

PESTICIDE STEWARDSHIP PARTNERSHIPS

Pesticide use is governed by the Federal Insecticide, Fungicide, and Rodenticide Act and corresponding state law (ORS634.005-.992). Agencies responsible for implementation in Oregon are the US Environmental Protection Agency and Oregon Departments of Agriculture, Environmental Quality, and Forestry (for non-federal forestlands). Since 1999, DEQ has been using a voluntary, collaborative approach called Pesticide Stewardship Partnerships (PSPs) to identify problems and improve water quality associated with pesticide use at the local level. The PSP approach uses local expertise in combination with the water quality sampling and toxicology expertise of DEQ to encourage and support voluntary changes that cause measurable environmental improvements. The key actions include: identifying local, pesticide-related water quality issues through targeted monitoring, sharing results early and often with local stakeholders, explaining data in relation to effects and water quality criteria, engaging the agricultural community for identifying and implementing solutions, and using ongoing effectiveness monitoring to measure success and provide feedback to support water quality management.

PSPs use both water quality and crop quality as measures of success. Pest management and water quality management must both be effective for long-term stewardship of natural resources. PSPs have focused on agricultural and some urban areas to date, but DEQ is working with the Department of

Forestry and urban stakeholders with the goal of increasing the PSPs reach into urban and forested landscapes. For more information on the PSP program, see:
http://www.deq.state.or.us/wq/pesticide/pesticide.htm

COMMUNITY FOREST AUTHORITIES

Municipalities (defined as cities or counties in this statute) have the ability under Oregon law to form "community forest authorities" to own and manage forestland for the municipalities' purposes (Oregon Revised Statutes 530.600 to 530.628). These community forest authorities have the ability to issue bonds to finance land purchase and management activities, either through the authority owning and managing forestland itself or by lending to nonprofit corporations to acquire and manage forestlands that can be "deemed betterments or additions to, or extensions of, the community forestlands, whether or not physically connected". The authority also decides how to manage the land and utilize assets and income. Assets and income of the community forest authorities are largely exempt from state taxes. There are some limits on forestland acquisition for community forest authorities: "A community forest authority may not finance the acquisition of community forestlands located outside the boundaries of the municipality that created the authority without the written consent of each municipality in which the community forest is located" (ORS 530.622(2)). This means that if a city or county wants to purchase forestland outside its borders, it needs the permission of any cities or counties in which that forestland resides. For example, a city-created community forest authority would need permission from the county government if they purchase community forestland outside of city limits. Within the limitations proscribed in the statute, the effect of this law is that cities and counties have the ability to form these authorities to own and manage forestland for public benefit, including production of wood productions and protecting drinking water sources.

FEDERAL LANDS

Federal lands in coastal drinking water source areas are primarily forestlands managed for multiple uses including watersheds and water quality, biodiversity and endangered species, recreation, and forest products (shown on **Figure 1**; **Appendix 3**). 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. The Northwest Forest Plan governs federal forestland in the coastal zone and has substantial protections for sensitive parts of the landscape including riparian areas, steep slopes, and older forests. 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. The BLM is currently revising its Resource Management Plans for Western Oregon. DEQ's drinking water protection staff is involved in evaluating the proposals to ensure that BLM lands will continue to provide high quality water for ecosystems and domestic use.

CURRENT WATER QUALITY PROJECTS

In addition to the *Safe Drinking Water Information System* database housing regulatory monitoring data for treated or finished drinking water, there are many other sources of water quality data in the waterbodies serving public water systems. As part of a comprehensive strategy for safe drinking water, testing the source water upstream of the treatment plant intakes is essential for understanding the watershed. The only raw water testing that is required by the SDWA is total organic carbon and alkalinity for some systems and, depending upon lead or copper action level exceedances in the distribution system, parameter related to controlling corrosion in the distribution system (e.g., pH, lead, asbestos, etc.). Systems also must monitor the levels of turbidity to ensure adequate reductions through treatment. Without thorough water quality monitoring in source waters, it is difficult to identify sources of pollutants and assess whether land management practices are successful in meeting water quality standards. As previously discussed, all source waters upstream of public water system intakes are required to meet Clean Water Act water quality standards.

DRINKING WATER SOURCE MONITORING

In a collaborative project with the Oregon Health Authority initiated in 2008, DEQ implemented water quality testing in over 80 drinking water source areas to analyze for a broad range of chemicals. The results showed very low levels of detections, but this data provides a good characterization of water quality impacts from various land uses and activities in typical watersheds and groundwater aquifers. During the period of 2008 through 2014, Oregon DEQ conducted a series of monitoring tests at the source waters at 35 surface water intakes and 48 groundwater wells. Raw water samples were collected upstream of intakes and at groundwater wells that serve as public water systems in 27 counties across the state. 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. Of all surface water intake sites sampled, 88% had typical wastewater constituents detected and 59% had pesticide detections. In the groundwater sources, 85% had wastewater constituents and 39% of the samples had pesticide detections. With the exception of one chemical (arsenic), the levels of all parameters detected thus far have been very low and have met health standards where available on an individual basis. When each of the analytical reports were received from the DEQ lab, the results were interpreted by OHA toxicologists, and a short report was sent to each of the public water systems. DEQ and OHA provided support to the public water systems in answering any questions from the public after the data was released. A summary report is available on DEQ's drinking water protection website.

Low-level detections of chemicals in drinking water sources are important priorities for prevention because we lack health standards for many individual chemicals and there is no toxicity data for synergistic effects when multiple chemicals are present in finished drinking water. Sampling and analyzing for low levels of a broad range of chemicals in streams provides DEQ and others the ability to prioritize pollutant reduction efforts on activities/land uses that impact those streams. DEQ also uses this data to prioritize future water quality monitoring, in conjunction with other toxics monitoring efforts.

ALGAE BLOOMS

State officials in Oregon expect that with climate change, algae blooms in streams and lakes will increase in number and severity. Algae blooms are associated with warmer temperatures in streams and lakes, increased sunlight, and increased runoff of nutrients during high-intensity storms. The floodwater and stormwater runoff carries additional pollutants into the streams and lakes, including phosphorus and nitrates that increase the risks of algae blooms. Algae blooms can cause many complications for drinking water, including toxic exposures, taste and odor issues, algal mats blocking the intakes, and changes in pH.

As noted in the *Climate Change and Water Quality* section above, HABs would likely become more abundant in Oregon with climate change. Changing conditions, both warmer and drier climate and lower flows (based both on shifts in precipitation and demand for water), would result in warmer water and more standing water which is more favorable to cyanobacteria growth. Therefore, it is likely that blooms would occur longer, in more places and perhaps with greater magnitude (Paerl et al 2011).

DEQ and the Oregon Health Authority (OHA) work with a variety of federal, state and local partners to coordinate monitoring and response related to HABs. OHA provides public education regarding the risks to human and animal health that HABs pose as part of their overall program. OHA developed HABs sampling guidelines and has been working with a number of labs to better standardize identification and enumeration techniques. OHA -Drinking Water Services has several resources for HABs and drinking water are available on their website and it is important to note that these are updated as necessary: http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Operations/Treatment/Pages/algae.aspx OHA recreational HAB's program also has several resources on their website: http://public.health.oregon.gov/HealthyEnvironments/Recreation/HarmfulAlgaeBlooms/Pages/index.aspx
Oregon's current HAB strategy (Schaedel 2011) relies primarily on monitoring by management agencies, or groups such as watershed councils, that are:

- responsible for recreational sites, water access or water uses such as drinking water;
- operate dams;
- manage activities in the lake or reservoir and its watershed; or
- have water quality responsibilities

Partners include DEQ, USFS, USACE, USGS, ODFW and a number of local watershed groups, health departments, parks and recreation agencies and drinking water providers. Through this effort, a limited surveillance program has been established, with monitoring occurring primarily at or near recreational facilities maintained by the USFS or the USACE. If there is no clear Designated Management Agency that would be responsible for monitoring the HAB, DEQ provides monitoring staff to collect, preserve and ship samples. An Interagency Agreement between OHA and DEQ defines and partially funds this activity (Oregon DHS 2010).

While there is variation in monitoring protocols including the number, frequency and types of sample analysis (algal identification & enumeration or toxin analysis), it generally consists of the following:

- observation of conditions in the lake or reservoir--- this is usually done by a partner agency who has someone who is often at the waterbody and is familiar with its conditions
- when visible scums or blooms occur, samples are collected by the partner agency for algal identification and enumeration; secchi disk depths are often used to trigger the process
- an advisory is issued by OHA if combined cell counts for toxigenic cyanobacteria exceed

100,000 cells/ml, or less than 40,000 cells/ml of microcystis or planktothrix; typically advisories are posted on the OHA website, at the waterbody and are sent
to media outlets

- the advisory stays in effect and is lifted on the basis of no visible bloom and both cell counts and toxicity testing showing that both are below advisory values.

With regard to HAB monitoring, funding and resources may change from year-to-year, so public water providers and management agencies may depend more upon observation and inspection, and less upon active monitoring. DEQ and OHA are currently revising the HAB strategy to reflect ongoing funding changes and focused priorities.

DEQ's TMDLs are an effective approach for developing appropriate pollutant loads to address the causes of HABs. TMDLs are not only required under the Clean Water Act but they are a good tool for doing the necessary studies to determine factors that are causing HABs and setting appropriate goals for addressing HABs. TMDLs can address coastal lakes experiencing HABs but will not prevent other lakes from developing HABs. DEQ's TMDL approach is currently being applied on a lake-by-lake basis with TMDLs that set a target for each specific lake, but do not automatically address nearby lakes that may be declining or could be experiencing HABs. For example, the 2007 Umpqua TMDL addressed blooms in Diamond Lake and the South Umpqua River but, in 2010, four other listings for HABs were added in the Umpqua (Lemolo and Fish Lakes, Elk Creek and the Umpqua River).

TILLAMOOK ESTUARY PARTNERSHIP

As part of a regional water quality assessment, the Tillamook Estuary Partnership and DEQ completed an analysis in 2014 of water samples collected from surface water sources in 5 North Coast drinking water watersheds. The samples were analyzed for over 120 different pesticides using 4 different laboratory methods. DEQ summarized the results and coordinated with OHA toxicologist to compare to health standards, and letters were sent to all of the public water systems where sampling occurred. The public water systems sampled were the City of Vernonia, Beaver Water District, Rockaway Beach, Tillamook Water District, and Neskowin Regional Water District. Low levels of pesticides were detected, including atrazine and its breakdown products, sulfometuron-methyl, DEET, and Glyphosate and its breakdown product. Concentrations were near the detection level, and well below any available health standards. DEQ drinking water staff continues to provide technical assistance to public water systems in the North Coast as part of this larger effort, including addressing issues surrounding gravel quarries within their source area, pesticide spraying, and forest harvests on private lands. Additional project planning and scoping is currently underway.

BASIN ASSESSMENTS AND ASSISTANCE

DEQ works to develop drinking water-specific sections and data input for the Basin Assessment Reports and for Agricultural Water Quality Management Plans (AgWQMP), including identifying drinking water sources, drinking water quality issues, potential contaminant sources and recommendations for action. The AgWQMPs are developed to prevent and control water pollution from agricultural activities and soil erosion on rural lands and include pollution reduction strategies that protect sources of drinking water.

The basin (or watershed) assessments draw on the expertise of DEQ's 17 water quality sub-programs including recommendations for actions that DEQ (and others who are interested in these basins) can

take to improve water quality. To date, drinking water input for the watershed assessments has been developed for the North Coast, South Coast, Deschutes, Rogue, Umpqua, and Willamette basins.

DEQ is also working directly with multiple public water systems in basins or subbasins to encourage protection strategies on a watershed scale basis. This includes coordinating with surface water providers in the Rogue River, Umpqua, and Siletz subbasins. In the Umpqua project, DEQ staff has worked with the Winston-Dillard Water District, Oregon Department of Agriculture, Douglas Soil and Water Conservation District (SWCD), and Partnership for the Umpqua Rivers to address high *E. coli* bacteria counts in untreated drinking water detected during Safe Drinking Water Act testing. The partners are providing technical assistance to interested landowners, implementing on-the-ground restoration projects, and conducting effectiveness monitoring at project sites identified as high risk for bacteria contribution. In the Siletz watershed, Lincoln SWCD worked with the Cities of Toledo and Newport to conduct a bank erosion assessment in portions of the upper watershed, as well as a sediment delivery analysis for county roads within the drinking water source area. The work products identify priority areas for restoration/best management practices within the Siletz, setting the stage for on-the-ground implementation. In addition, the work serves as a model to employ within other basins and subbasins dealing with the impacts of bank erosion and sediment at drinking water treatment plants. Lincoln SWCD's work was funded through the OHA drinking water protection grant program (described in the *Funds and Resources* section below).

TMDLs - GENERAL

DEQ prepares Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) 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 (wasteload 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.

TURBIDITY AND TMDLs

DEQ drinking water staff recently worked directly with 15 public water systems to research/document water quality problems with turbidity. Several systems are impacted so severely that the intake must be shut down regularly due to water with extremely high turbidity. Disinfection by-products are also problematic for many communities, and the organic matter precursors may be related to land management and nonpoint source pollution. Research and assessment included collection of raw water data, interviews with operators, GIS research on land uses, and field inspections. The report documenting data and findings (Seeds, 2010) can be accessed on DEQ's drinking water protection website. DEQ continues to use the data from the report to promote more active protection and awareness of potential violations to the turbidity standards in the public water supply watersheds. This includes conversations with citizens, city governments, watershed councils, and water utility boards to

share information and source water protection strategies. In addition, data and analysis from the above-mentioned turbidity report were used to list three waterbodies on DEQ 2010 List of Impaired Waters (303(d) list).

One of those waterbodies (the Siletz River upstream of the intake for the City of Siletz) has a TMDL for turbidity/sediment under development. DEQ is currently working on that TMDL as well as other sediment-based TMDLs, evaluating natural and human sources of sediment pollution to the listed waterbodies in the Oregon Mid-Coast Basin. The TMDLs will document known and potential sediment sources, set allowable limits of sediment inputs to the waterbodies, and detail management measures and monitoring needed. Information from the TMDLs may be used to inform changes to riparian and steep slope protections on forest- and agricultural lands.

STRATEGIC RESTORATION and PROTECTION

Since all streams are at risk of water quality degradation from both natural and man-made disturbances, it is important to take action to **protect the integrity of the watershed**. There is, of course, a close connection between the condition of a watershed and the water quality in that watershed. Degraded watersheds or individual sites are a source of nonpoint source pollutants such as fine sediment and organic matter which can interfere with drinking water treatment and quality. Managing a watershed for water quality and resiliency in the face of natural disturbances and climate change is an ecological challenge rather than an engineering challenge.

Many studies have shown that reducing and eliminating pollutants through protection and restoration activities can be effective in reducing treatment costs and the frequency of intake shutdowns (Freeman et al 2008). There are several ways to approach the development and implementation of drinking water protection strategies. Most public water system managers and/or departments do not have the resources necessary to put together comprehensive watershed protection plans; some do not have the resources to sustain communication and coordination with landowners in their source area. For communities with limited resources, it is critical to **create a streamlined "roadmap" for watershed protection** that ensures any protection efforts focus on the highest priorities in the watershed. Depending on the level of information and data available for your source area, it may be possible to focus very specifically on a limited number of pollutants or pollutant sources for reduction.

The roadmap for developing and implementing a drinking water protection plan might be simplified as such:

1. Identify human resources to work on protection/restoration planning;
2. Solicit available technical experts, citizens, and landowners to form advisory committee;
3. REQUEST STATE AGENCY ASSISTANCE to provide GIS and database information/maps (see **Appendix 5** for contacts);
4. Identify and map potential sources of contamination in the watershed;
5. PRIORITIZE protection and restoration activities using all available information/maps;
6. Use available resources to develop basic protection strategy;
7. Determine level of funding necessary to accomplish more advanced protection planning (and apply to those potential funding sources identified);
8. Isolate individual strategic priorities and assign (or hire) a coordinator to implement each priority as resources and time permit.

Identifying and mapping the risks and potential sources of contaminants requires appropriate data. One of the primary purposes of this report is to provide examples of the level of data available to assist with coastal watershed protection. Identification and mapping allows appropriate planning, preparation, and management of sensitive sites and risks to source water. In some cases, water quality data collected from the drinking water source may be of use to identify incidents or patterns in water quality problems which create difficulty for treatment and provision of adequately treated finished drinking water.

Sources of data on natural risks and watershed conditions include the following as examples (information on resources in **Appendix 5**):

- Digital elevation models (DEMs) from Oregon Geospatial Enterprise Office;
- Waterbody locations and flowpaths from USGS (National Hydrology Dataset);
- Forestry stream types from ODF;
- Locations of slopes prone to shallow, rapidly-moving landslides from DEQ;
- Historic & deep-seated landslide locations from DOGAMI ;
- Disturbance data from USFS;
- Wildfire susceptibility data from USFS;
- Aerial photography (current and past) from Google Earth;
- Highly erodible soils;
- Climate change predictions for precipitation and storms.

Sources of data on land use and "degraded sites" or potential risks due to human activities:

- Source Water Assessments completed by DEQ and OHA contain information on potential contaminant sources;
- National Land Cover Database (NLCD) for land use;
- Land ownership category data from ODF;
- Locations of hazardous material from Fire Marshall's office;
- Locations of highways, county roads, and other roads (including forest roads);
- Forest practice notifications for harvest and application of pesticides;
- Locations of quarries from DOGAMI.

Following the identification of degraded sites in a watershed, it is necessary to evaluate the characteristics and needs of different locations, prioritize based on those characteristics and available time and resources, and then plan/implement the restoration activities. The ecosystem's capacity to repair itself if left alone, known as passive restoration, may be all that is needed to allow a degraded site to return to a more robust and healthy condition. In other cases, human actions such as planting, species introductions, erosion control, addition of coarse woody debris, mulching, or excavation/re-contouring of roads (decommissioning), etc. are needed to accelerate or enhance the recovery of beneficial ecosystem functions and ecosystem resiliency. Following implementation, periodic monitoring should be conducted to verify that the restoration efforts are correctly implemented and effective for reducing pollutant loads.

Identifying degraded sites can be done through various means, some rigorous and some less so. For more rigorous evaluation, the Oregon Watershed Enhancement Board has a watershed assessment manual that provides detailed methods which could be employed by staff to evaluate watershed health and identify degraded sites (http://www.oregon.gov/oweb/Pages/docs/pubs/OR_wsassess_manuals.aspx). Ecological and geoengineering consultants can also be hired to do assessment work and document the results. Watershed councils have experienced staff and volunteers who can be engaged to assist municipalities with this and subsequent steps of restoration.

A less rigorous process of identifying degraded sites could be as simple as asking local residents, workers, and landowners if they know where areas may be contributing to water pollution, or field inspection of steep slopes and riparian areas to document the locations of degraded or potential at-risk sites. Aerial photos and satellite images, available through portals such as Google Earth, can be examined for locations bare of vegetation or with obvious sediment movement. This method may not

be most accurate as it is likely that some sites would be masked due to photograph resolution and degraded sites being disguised by overstory vegetation. Whatever methods are used, one should, at a minimum, document the location of the degraded site, the approximate size of the site, the severity of site degradation and other characteristics of the site (e.g. current vegetation), and whether there is clear evidence of sediment and other pollutants entering waterbodies.

Prioritizing sites for restoration or protection as resources allow is essential. While there is some subjectivity to prioritization, a defined prioritization process will achieve better results and be more consistent and efficient with limited resources. Prioritization should be based upon:

- Active or likely erosion and/or active introduction of pollutants into waterbodies (sites that are an active source of pollutants should be a higher priority);
- Location of site relative to the intake (sites closer to the intake are likely to have a greater impact);
- Ease of access and/or restorability (sites that are readily restored due to site conditions and/or access may be higher priority due to getting the most benefit for the expense);
- Need for human intervention (not wasting time and resources on sites that are likely to recover on their own).

Generally speaking, sites that currently have the biggest negative impact and are most readily improved should be restored first to maximize effective use of resources. Estimating effect of restoration (e.g. how much area that is actively eroding or likely to erode can be stabilized?) will assist in prioritization. DEQ suggests using active or likely erosion and addition of pollutants as the primary prioritization factor. However, the ability to restore a site, and the cost of restoration, needs to be considered. For example, if one badly eroding site can be restored OR several less impactful sites can be restored, prioritization should consider which option will have the greatest overall effect on watershed health and resiliency, which will vary from circumstance to circumstance. Finally, prioritization should consider how the high priority sites relate to each other to ensure that restoration benefits are additive across the watershed rather than a series of isolated “random acts of conservation.”

It will sometimes be necessary to collect additional data and information through surveys and evaluation of drinking water source areas and/or measuring water quality data. For example, information on the condition of road-stream crossings would need to be collected as no comprehensive data set exists. Likewise, conditions of riparian areas and inner gorges may be observable using resources such as Google Earth, but may require ground-based surveys to understand the true condition of your drinking water source area. Collecting and analyzing this information will enable better planning, management, and collaboration.

Once finished with assessment and prioritizing, documenting the results of that effort is necessary. Partners should not assume that city planning staff or water district operators or managers will remember all this information and how it interrelates in addition to everyday work tasks. Recording the assessment and prioritization results, documenting how those results are implemented, and observing whether and how implementation is successful will allow tracking of source water protection knowledge and activities and reduce the loss of important institutional knowledge when there is turnover in water system staff and management. To this end, a plan should be written and should include a means to track drinking water source area condition over time, as well as document priorities and allow them to change over time with new information and restoration accomplishments. In addition, documentation of

restoration activities done, how those activites were done, and how successful the restoration was will prove valuable as time passes. A useful plan and recording system will:

- Document the locations and characteristics of vulnerable sites (steep slopes, wetlands, etc.) and sites in need of restoration identified in your initial watershed assessment;
- Include other observations of watershed condition (including ages of stands of trees, species composition, sites with bare ground or rock outcrops, wildlife present, apparently diseased patches, etc.) and locations of roads, pipes, power lines, culverts and bridges, seasonal wetlands and channels, springs, year-round stream channels, and so on.
- Electronic forms for recording water quality parameters of finished (treated) water and raw (untreated) water. At a minimum, raw water should be sampled at the intake. Collecting regular water quality data at set monitoring points in the drinking water source area and periodic random sampling throughout the drinking water source area are additional options to track the quality of your drinking water sources over time. This additional sampling could occur weekly, monthly, or yearly, but more frequent sampling will give better resolution of any potential changes to water quality and give an opportunity to evaluate changes in water quality over time.
- Include a decision-making process to prioritize restoration and protection activities based on the information above. Documenting how restoration actions are prioritized will allow learning and adaptation as source water protection efforts move forward. It will also create opportunities to learn from missteps and inefficiencies, and allow priorities to shift over time as needed.
- Document planned projects and their goals, resource needs, and timelines. As projects are completed, record details about implementation (methods, sources of materials such as plants or pipes, how the work was done, seasonal timing of activities, weather during and immediately after restoration actions, etc). Photographs and standardized data collection sheets are easily used tools to record watershed and site conditions before, during, and after restoration/protection activities.
- Evaluate the success of each task and how human and environmental circumstances may have contributed to or detracted from success. This will ensure that necessary work is getting done and allow for continuous learning and adjustment of practices as necessary. Mistakes and failures do occur in environmental management, so an approach geared toward acknowledging and learning from failures will allow for adjustments and ultimately ensure resources are used more effectively over the long-term.

Local and statewide technical, financial, and labor resources may be available to assist in implementation of source water protection. For example, community involvement and volunteer labor can be utilized when available, and the expertise of state agencies can be an important source of knowledge and improvement. There are grants available from state and federal government agencies as well as foundations and non-profits. Local experts in water quality, restoration, forestry, fisheries, etc. may be willing to contribute their knowledge and time. Service organizations (Girl and Boy Scouts, Rotary Club, etc.) and watershed councils can be a source of knowledge, labor, and perhaps funds. Municipalities and water districts should view local landowners and residents as a potential resource for valuable insights and understanding of the ecosystem and land management.

Working with landowners within the source watershed must be a top priority for restoration or protection. If all or part of the drinking water source watershed is owned by entities other than the

public water supplier, then engagement and cooperation (or at least permission) of the landowner is necessary. This 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 municipality assists with the necessary expenses and resources, or simply encouraging the landowner to implement restoration on their own. Some landowners will be reluctant to allow access to their property for liability and other reasons. So, developing a carefully negotiated agreement can address those concerns. An agreement may take the form of a "Memorandum of Agreement" (MOA) often used between municipal entities and private or public landowners. As discussed above, discussion and agreements with landowners in the drinking water source area regarding management practices (including agreements with monetary compensation attached) are an important tool, and these agreements can and should address restoration of ecologically degraded sites in the watershed.

A final note with regard to managing and restoring a drinking water source area: good management and protection practices will promote a resilient ecosystem, but this is not the same thing as an invulnerable ecosystem. Natural disturbances are a fact of life, and disruptions to water quality and drinking water treatment are possible in the most pristine ecosystem. However, management, restoration, and protection choices can certainly reduce the frequency, extent, and duration of disruptions to source water quality. The goal of managing for a resilient ecosystem in your drinking water source area is not for a stable, unchanging ecosystem; rather, the goal is for an ecosystem that is not readily damaged and recovers quickly when disturbances do occur. This is best accomplished by understanding ecosystem functions and processes and crafting management to effectively work within those processes. A complex, dynamic, and resilient watershed will still have occasional problems, but these will be less frequent, shorter-lived, and more likely to resolve themselves than in simplified, degraded systems.

COLLABORATIVE APPROACHES FOR CLEAN SOURCE WATER

The values and goals of public water systems (PWSs) and landowners are often not the same, but this does not need to result in conflict, unresolved disagreements, or actions that benefit one party at the expense of another. Collaboration between PWS and municipalities, community members, and landowners offers a way to create better understanding of differing needs/points-of-view and to establish cooperative mechanisms to improve physical and social outcomes for all. Collaborative approaches can include short-term or informal agreements. (Long-term or formal (legal) agreements are discussed below.) Reaching out to landowners in a drinking water source area and to responsible regulatory agencies can allow PWSs and municipalities to share concerns, create opportunities for cooperation and compromise, and reduce misunderstandings and unintended negative consequences. Examples of potential informal actions include:

- Communication between PWSs and landowners about goals, needs, and concerns to increase understanding and create opportunities for mutually beneficial actions;
- Landowners, watershed councils, and water systems can cooperate on restoring degraded sites and restoring fish passage or natural hydrology to a stream system;
- Consultation with agencies responsible for regulating particular land uses (e.g. ODF for forest practices, ODA for agricultural activities) to inform them of drinking water needs and ask for prioritized inspection, education, and enforcement for landowners and operators in drinking water source areas;
- Asking landowners to take voluntary measures to reduce risk such as larger buffers or buffering areas around intakes, changes in pesticide use, etc;
- Engaging homeowners and community members on residential land management and restoration projects in the drinking water source area.
- Formal agreements can also be negotiated and implemented to create long-term, mutually beneficial arrangements. Options include (details given below):
    - Land acquisition by municipalities/PWSs;
    - Easement purchases;
    - Payments for Ecosystem Services;
    - Assistance from land trusts.

The approaches listed above can be combined to create a solution that is tailored for an individual situation to achieve source water protection goals. A combination of community and landowner engagement, negotiated deals, and purchases of land and/or easements within the drinking water source area can successfully reduce risk to drinking water sources, promote ecosystem resiliency, and engender relationships between communities, governments, and landowners that create benefits for all.

The most straightforward means for a public water system to have control over land management in their drinking water source area is acquisition of the land through purchase or donation. Ownership in fee title gives the PWS the ability to restrict land management practices to only those that restore watershed functions, increase ecosystem resiliency, and have risks which fall within acceptable limits. Restoration actions can be taken without needing to get permission from a different landowner. Careful planning and execution of watershed restoration and management activities is crucial (Gartner et al 2014). An additional benefit of land ownership lies in the potential for revenue derived from that land.

For example, timber harvest from forestland can provide some income for the public water system while also providing local employment. Some restoration actions, such as thinning overcrowded stands to promote a more resilient forest, also have the potential to generate usable (and saleable) material. It is potentially expensive to acquire a drinking water source area, however, and it may be years before the land is able to generate income to partly or fully defray the cost of acquisition. Nevertheless, the ability to manage primarily or solely for water quality and quantity coupled with the potential for revenue makes land acquisition a good option.

Easements are restrictions or allowances on property use entered into between the property owner and a non-owner, often involving an exchange of money for a specific use by the non-owner. Easements are a legally-binding agreement attached to a parcel of land's title. Easements can be used for a variety of purposes, such as allowing a road across a property to allow access to another property. In the case of source water protection, a municipality or PWS could negotiate the purchase of easements with a landowner to restrict high-risk activities on vulnerable locations in the drinking water source area. For example, a PWS might want a landowner to leave a 100 meter forested riparian buffer on all perennial streams in their drinking water source area. However, this would result in the landowner losing revenue from trees that could be harvested or for land that could be farmed or developed within those strips of land. One approach to working with a landowner in this instance is purchasing easements on those sections of land which the PWS would like to see managed with low-risk practices which go beyond regulatory minima or protected from management outright. Examples include:

- Avoiding or limiting timber harvest and other forestry activities within 50-100 meters of streams, reservoirs, or lakes used as drinking water sources;
- Avoiding or limiting ground disturbing agricultural activities within 50-100 meters of streams, reservoirs, or lakes used as drinking water sources or ensuring that livestock and their waste are not getting into water sources;
- Avoiding or limiting building, development, and ground disturbance activities within 50-100 meters of streams, reservoirs, or lakes used as drinking water sources;
- Limiting changes to pre-development hydrology during residential development in a drinking water source area;
- Restricting use of pesticides and other toxic chemicals near water sources.

The landowner and the PWS or municipality would negotiate a mutually beneficial arrangement to reduce risk to source water in a binding attachment to the title in exchange for monetary recompense. Easements can be permanent or have an expiration date, but they are passed along with the title when a property changes hands, so a new agreement would not need to be negotiated if the land is sold to new owners.

A similar option to easements which is currently being developed and put into use are payments for ecosystem services (PES). In principle, a PES agreement is simple: the landowner agrees to implement low-risk practices which go beyond the regulatory minimum or avoid management practices altogether in exchange for compensation for some or all of the lost revenue. The PWS or municipality and the landowner enter into a contract for a set term, setting out the management practices to be implemented and the compensation to be paid. Unlike with easements, this agreement is not attached to the land's title but is a contract between the two parties. However, a PES agreement could include clauses requiring minimum or maximum durations for the agreement and/or provisions for property transfer to new owners.

A land trust is a nonprofit organization that, as all or part of its mission, actively works to conserve land by undertaking or assisting in land or conservation easement acquisition, or by its stewardship of such land or easements. Trusts can also purchase private land and then give or sell it to other nonprofits or the public (through government ownership). Land trusts work with landowners and the community to conserve land by accepting donations of land, purchasing land, negotiating private, voluntary conservation agreements on land, and stewarding conserved land through the generations to come. Unlike for-profit corporations, land trusts do not have to maximize profits and financial assets for shareholders, so management goals and practices can more easily incorporate ecological values and long-term (100+ years) time horizons. Land trusts are particularly well suited to linking isolated protected areas into a cohesive, resilient ecosystem (see **Funds and Resources** section).

Most land trusts are community based and deeply connected to local needs, so they are well-equipped to identify land that offers critical natural habitat as well as land offering recreational, agricultural and other conservation value. There are several types of land trusts:

- Conservation land trust: A land trust is a nonprofit organization that, as all or part of its mission, actively works to conserve land by undertaking or assisting in land or conservation easement acquisition, or by its stewardship of such land or easements.
- Alternative type of land trust: The legal title of the property in question is held by another person (a trustee) while the original owner retains all of the rights and privileges of property ownership.
- Community land trusts (CLTs): A community land trust is a private, non-profit corporation, created to acquire and hold land for the benefit of a community, and provide secure affordable access to land and housing for community residents. CLTs offer a balanced approach to ownership: the nonprofit trust owns the land and leases it for a nominal fee to individuals who own the buildings on the land. In particular, Community land trusts attempt to meet the needs of residents least served by the prevailing land market. Community land trusts help communities to:
  - Gain control over local land use and reduce absentee ownership;
  - Provide affordable housing for lower income residents in the community;
  - Promote resident ownership and control of housing;
  - Keep housing affordable for future residents;
  - Capture the value of public investment for long-term community benefit;
  - Build a strong base for community action.

CLIMATE RESILIENCE

The effects of climate change will likely be many faceted. *Precipitation, temperature, coastal inundation, and ecosystem changes could all contribute to changes in coastal drinking water supplies.* There are many technical data sources available for exploring the potential effects of global climate change along the Oregon coast (Dalton et al 2013; Mote et al 2014; Abatzoglou et al 2014). The results are from extensive modeling efforts and the input parameters are varied depending upon the model type. Modeling results must be carefully evaluated and selection of results that represent the area of interest requires research to find applicable datasets for spatial and temporal analysis.

The Oregon State Legislature established the *Oregon Climate Change Research Institute* (OCCRI) within the Department of Higher Education in 2007. OCCRI is a network of over 150 researchers at Oregon State University (OSU), 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 (http://occri.net/).

Oregon produced a statewide Climate Change Adaptation Framework (http://www.oregon.gov/energy/GBLWRM/docs/Framework_Final_DLCD.pdf) in late 2010. 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 eleven 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. Oregon's Framework is the first *risk-based* state-level climate change adaptation plan in the nation. The Framework begins to build capacity in Oregon to address climate variability and change. It builds capacity for action by distilling the pertinent science out of the global- and national-scale flood of information about future conditions and what needs to be done to address those conditions.

Planning for climate change adaptation and community resilience to natural hazards mostly occurs by individual jurisdictions and agencies. However, the effects of climate change will occur in many ways across the entire landscape, regardless of agency authorities or jurisdictional boundaries. Climate adaptation priorities and the policies, requirements and incentives of different entities to address those priorities have generally not been identified and implemented at the landscape scale. This project provided a forum where agencies and communities collaborated to identify both priority climate risks and measures to address those risks in a specific region of the state. The premise of this project was that collaboration, coordination, and alignment of all the efforts by different actors into a regional adaptation strategy will result in more effective adaptation measures at the federal, state and local level.

In July 2014, the Oregon Department of Land Conservation and Development convened federal and state agencies and local governments to collaborate in the design and development of a regional climate

change adaptation strategy for Clatsop and Tillamook Counties. DLCD completed the document in February 2015 entitled "*Regional Framework for Climate Adaptation: Clatsop and Tillamook Counties"* (Weber 2015). The purpose of the project is to align authorities and develop objectives and priorities for climate adaptation/community resilience at the landscape scale, selecting Tillamook and Clatsop Counties on the North Coast for the first regional planning effort.

The Regional Framework describes likely future climate conditions as the foundation for adaptation and resilience planning. It includes collaboratively-developed goals and objectives (desired future conditions); priorities for investments in adaptation; and changes needed in policies, programs, incentives or regulations. The Regional Framework provides the foundation for local measures to address climate change and improve community resilience.

The US EPA has also developed a "**Climate Ready Water Utilities Toolbox**" to provide access to resources containing climate-related information relevant to the water sector (US EPA 2015). The Toolbox contains resources organized into categories to help guide the user to the most relevant information. Hundreds of additional resources in the Toolbox can be searched by geographic region, water utility type and size, water resources, climate change impact, and climate change response strategies. EPA will update the resources frequently to provide the most current water sector climate change information

The **US Climate Resilience Toolkit** is now available online to help interested citizens, communities, businesses, resource managers, planners, and policy leaders at all levels of government manage their climate-related risks and opportunities, and improve their resilience to extreme events. This initial toolkit was developed by a partnership of Federal agencies and organizations led by NOAA, response to the *President's Climate Action Plan* and *Executive Order 13653 – Preparing the United States for the Impacts of Climate Change*. The toolkit is comprised of a five step process that users can follow to initiate, plan, and implement projects to become more resilient to climate-related hazards, as well as case studies, a catalog of resources, maps, and more. The initial emphasis of the toolkit is on providing Federal government information and decision support resources to help the nation address challenges in the areas of coastal flood risk and food resilience. The toolkit is expected to expand over time to include information from state and local governments, businesses, academia, and NGO's; and address other topics such as human health, ecosystem vulnerability, water resources, energy supply and infrastructure. The listings below can provide a starting point for climate change analysis.
General information on climate change can be found at:
http://www.epa.gov/climatechange/science/future.html
http://cpo.noaa.gov/Home/SiteNav.aspx

Included in the Climate Resilience Toolkit is the **Climate Resilience Evaluation and Awareness Tool** (CREAT). This tool allows utilities to explore the costs and benefits of extreme event preparation and climate change adaptation strategies from doing nothing to making changes to infrastructure to watershed and ecological management. The tool is built so that it can be uniquely tailored to a utility's particular assets and the threats that it faces. There are helpful default settings, and most of the needed information can also be customized based on local knowledge. Through exploring different scenarios, a utility can estimate capital costs of different adaptation actions and get monetary estimates of the reduced risk to the utility if it takes measures to adapt to our changing climate and more frequent extreme weather events, compared to a business-as-usual approach. A wide variety of adaptive

measures are included in the tool along with estimates of their benefits. In addition, the difference between the historic climate scenario and future climate scenarios can be explored and shown graphically to communicate the benefits of implementing changes to operations, infrastructure, and land management. Drinking water protection staff at DEQ can help water utilities understand and utilize CREAT. Information on CREAT and the tool itself can be found here: http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm .

Modeled simulations of global climate change effects can be at global, regional, and sub-regional scales. The following information identifies several models that can be helpful in beginning research on climate change effects. Oregon DEQ is available to assist public water systems in exploring climate change impacts as they prepare for possible climate change affects on their water sources. Because many climate change modeling exercises are conducted at a regional scale, it can be challenging to find a scale more appropriate for local areas. USGS has developed a National Climate Change Viewer which mathematically scales down climate change model results from regional to sub-regional scale to provide better resolution. The data is a compilation of results from over 30 climate models. Data is available at the county level in the model. To assist in using the on-line model, a tutorial is available at: http://www.usgs.gov/climate_landuse/clu_rd/apps/nccv_documentation_v1.pdf
To use the model follow this link:
http://www.usgs.gov/climate_landuse/clu_rd/apps/nccv_viewer.asp

Changes in precipitation may be either rain or snowfall. Temporal changes in the rainfall could affect water supplies. Rainfall patterns may change. Snowfall may be reduced leading to lower snow pack water available during the drier seasons. Data sets can be found at:
http://gis.ucar.edu/data/climate

Like precipitation changes, **temperature variation** may occur. Higher temperatures mean less time for precipitation to be absorbed, or enter the soil, more evaporative loss from upper soils layers, and greater evapotranspiration from plant life. These processes also affect water availability. Data sets can be found at: http://gis.ucar.edu/data/climate

The National Center for Atmospheric Research (NCAR) "Climate Inspector" web tool can help visualize potential changes in temperature and precipitation in Oregon. Access to the tool is at:
https://gisclimatechange.ucar.edu/inspector

Coastal inundation would not only displace people from homes and property but could affect groundwater sources located in aquifers found in sandy or otherwise porous soils along the coast. These groundwater sources would be placed at risk due to saltwater intrusion and potential contamination from ocean waters. In addition, surface water intakes along the coast and within the modeled inundation area and height could become unusable. A useful tool can be found at:
http://catalog.data.gov/dataset/usgs-map-service-coastal-vulnerability-to-sea-level-rise

Climate Solutions University is a training program to prepare your community for climate adaptation. Smart planning protects citizens from floods and drought, conserves water resources, preserves watershed health, stabilizes microclimates, maintains species habitat, preserves the economy, and ensures community climate resilience. *Climate Solutions University, Forest & Water Strategies* is a two-

step program, where you create and implement a climate adaptation plan for your community. They can help you raise the funds to participate. They accept applications on an annual basis.
http://www.mfpp.org/csu/

FUNDS AND RESOURCES

There are a variety of sources for grants and loans to fund drinking water infrastructure and source protection projects. This section will provide brief descriptions and contact information for more prominent funding sources, as well as sources of free or low-cost technical assistance. **Appendix 5** will list other websites and resources available to public water system and community members seeking to work on watershed protection.

Oregon Health Authority (OHA)

Drinking Water Services
Phone: 971-673-0405
Website: www.healthoregon.org/dwp

Note that for Safe Drinking Water Act funds, the Infrastructure Finance Authority provides the financial services for OHA:

Business Oregon
Infrastructure Finance Authority (IFA)
Phone: 503-986-0123
Website: www.orinfrastructure.org

Drinking Water State Revolving Fund (DWSRF)

From the Safe Drinking Water Act, there are several types of funding available for eligible protection projects. *Loans are available from OHA through the Infrastructure Finance Authority.* Drinking water system projects must resolve a health hazard or non-compliance issue. Eligible activities include planning, engineering, design, construction, property acquisition, system purchases, consolidation/regionalization, environmental review, legal costs, and security. Any public and privately-owned Community & Nonprofit Non-Community water systems are eligible, except federally-owned systems.

- Maximum $6 million, $8 million with Drinking Water Advisory Committee approval
- Interest rate fluctuates quarterly (set at 60-80% of state/local bond rate)
- 20-year term maximum
- Disadvantaged community eligible for a 30-year term
- Principle forgiveness possible

Submit letter of interest anytime; OHA conducts quarterly review and ranking. Call Oregon OHA Drinking Water Services at 971-673-0422 or go to the OHA website: www.healthoregon.org/srf
or contact IFA at 503-986-0123; www.orinfrastructure.org

Drinking Water Source Protection Fund (DWSPF)

From the Safe Drinking Water Act, loans and grants are also available for drinking water protection projects: low interest loans up to a maximum of $100,000 per project, and grant funds up to $30,000 per water system. Eligible systems include any public and privately-owned Community and Nonprofit Non-Community water systems with a completed Source Water Assessment are able to demonstrate a direct link between the proposed project and maintaining or improving drinking water quality. 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. Projects can

take either a local or regional approach. Local projects are defined as activities that concentrate on a public water system's source area(s). Regional projects are defined as activities that involve multiple communities and/or water systems attempting to address a common source water issue or group of issues.

The categories for eligible projects for DW Source Protection funding include the following:

Refined Delineation OHA and DEQ have completed delineations for most drinking water source areas (DWSA) for the community and non-community public water systems. DWSAs include aquifer recharge areas for groundwater sources and watershed areas for surface sources. DW Source Protection funding can be used to complete, update, or refine DWSA delineations using new or additional site-specific information as part of a more comprehensive protection strategy.

Updated Assessment

Inventory – Projects that improve upon existing potential contaminant source inventories available from the DEQ database, Geographic Information System, and Assessment Reports prepared by OHA/DEQ. A project could involve expanding or updating the inventory of land uses or existing and potential point and non-point contaminant sources.

Evaluation – Projects establishing a water quality monitoring project to evaluate existing and potential threats to water quality. This could include evaluating and prioritizing potential threats (or protection activities) based upon new or more detailed information.

Source Protection Planning

Projects designed to identify appropriate protection measures, including development of a comprehensive DW Source Protection plan, educational projects, projects to identify and ensure implementation of Best Management Practices (BMPs), development of local DW Source Protection ordinances, development of restoration or conservation plans for the source area for future easement or land acquisition.

Implementation

Funds can be used to implement many types of protection strategies in drinking water source areas. This can include implementation of any *eligible activities that will reduce risks within the source water area or would contribute to a reduction of contaminant concentration within the drinking water source(s)*.

Examples of the types of projects that can be funded include:

- Implementing drug-take-back projects in source areas
- Projects for reducing pesticide application rates and loadings in source area
- Implementing pesticide and household hazardous waste collection events
- Closure of high-risk abandoned or unused (private or irrigation) wells close to supply well
- Projects for reforestation or replanting in sensitive or riparian areas
- Installation of fencing to protect sensitive riparian source areas
- Installation of signs at boundaries of zones or protection areas
- Projects for assessing risks from onsite systems near supply wells, inspections, pump-outs, or decommissioning onsite systems.
- Secondary containment for high-risk ABOVE ground tanks
- Focused workshop events for household/business instruction for changing to alternative nonhazardous product usage ("green chemical" products)
- Seismic spill prevention or inspection project in proximate areas for high-risk sources

- Permanent abandonment (i.e. filling in) of inadequately constructed private wells within the source area
- Installation of fencing around the immediate intake or well area to provide protection
- Structures to divert contaminated stormwater runoff affecting the source area
- Set up ecosystem services (or similar) project in watershed to fund preservation areas
- Implementation of pollution prevention or waste reduction projects
- Restoration and/or conservation projects within the drinking water source area
- Implementation of water reuse and other conservation measures related to source protection
- Implementation of best management practice projects
- Implementation of conservation easements to protect sensitive source areas
- Implementation of a drinking water source protection ordinance
- Establishing management plans for easements or lands purchased within source areas
- Development of educational flyers/brochures for purposes of public education
- Purchase of lands within the drinking water source area (funded only via low interest loans)

Any *Public and Privately-owned Community and Nonprofit Non-Community water systems* with a completed *Source Water Assessment* are eligible for funds. A "community water system" is defined as a public water system that has 15 or more service connections used by year-round residents, or which regularly serves 25 or more year-round residents. This includes water systems that are owned privately, by non-profit or public entities such as a city, district, or port. A "nonprofit non-community water system" is a public water system that is not a community water system and that regularly serves at least 25 people (more than 6 months per year) and is legally recognized under Oregon law as a nonprofit entity.
Check with OHA on the letter of interest submittal schedule. Call Oregon OHA Drinking Water Services at 971-673-0422 or go to the OHA website: www.healthoregon.org/srf
or contact IFA at 503-986-0123; www.orinfrastructure.org

Oregon Department of Environmental Quality (DEQ)

Clean Water State Revolving Fund
503-229-6412
Website: www.deq.state.or.us/wq/loans/loans.htm

Clean Water State Revolving Fund (CWSRF)
For publicly-owned wastewater treatment facility projects, loans are available for planning, design, and construction projects. Eligible applicants include: Indian tribal governments, cities, counties, sanitary districts, soil and water conservation districts, irrigation districts, various special districts and certain intergovernmental entities. CWSRF loan guidelines include:

- Up to 20-year term
- Substantially discounted interest depending on loan type
- Annual loan fee of 0.5% of the outstanding balance (planning loans exempt from this fee)
- Possible principle forgiveness

Applications are accepted year round with scheduled review and ranking in the first week of January, May and September. Contact the Oregon Department of Environmental Quality (DEQ); for a list of officers, go to www.deq.state.or.us/wq/loans/loans.htm

CWSRF Pollution Reduction Funding

The Clean Water State Revolving Fund loan program provides low-cost loans to public agencies for the planning, design or construction of various projects that *prevent or mitigate water pollution*. Loans are available for emergencies, urgent repair and local community projects that address water pollution (including non-point sources of pollution). CWSRF loans can have substantially discounted interest depending on the loan type and there may also be an opportunity for principle forgiveness. Public agencies (including municipalities, counties, and soil and water conservation districts) may consider the "Sponsorship Option", "Nonpoint Source Project", or "Local Community Loan" to address local water pollution within their jurisdiction.

The Sponsorship Option is a financing mechanism that allows a public agency with the authority to finance and implement a wastewater facility project and an eligible nonpoint source control or estuary management activity through one CWSRF loan with a discounted loan interest rate which can result in a financial incentive that benefits ratepayers while accomplishing a nonpoint source control activity. For example, sponsorship option projects can include protection or restoration of riparian (streamside) habitat, establishing conservation easements or acquiring riparian lands or wetlands. The public agency can enter into an agreement with a partner (like a local government, non-governmental organization or private entity) who implements the pollution control activity.

Public agencies may also consider a Local Community Loan Program using DEQ's CWSRF funding to establish their own local loan program to address local water pollution within their jurisdiction by making local loans to citizens or other constituents to address specific types of local water pollution or protection. The advantage to this approach is that it provides financial resources to public agencies that they might not otherwise have to assist citizens with local sources of water pollution. For example, this approach has been used in the Clackamas River watershed to address manure management, irrigation efficiency and other rural landowner issues with the next phase potentially addressing rural septic system assistance and repair.

Planning loans and non-point source loans can also be used to enhance or protect water quality. Planning loans can be used toward the costs of monitoring, data collection, evaluation, analysis, security evaluations, report preparation, environmental review, public education, review process, and any other activity leading to a written plan for the project. Non-point source loans can be used to implement various projects.

More information on DEQ's Clean Water State Revolving Fund program can be found here: http://www.deq.state.or.us/wq/loans/loans.htm. For specific information on the Sponsorship Option, Planning Loans, Nonpoint Source Loans, or Local Community Loans, see http://www.deq.state.or.us/wq/loans/apps.htm. The application requirements for CWSRF loans may take significant 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 their DEQ CWSRF Project Officer at the earliest opportunity (http://www.deq.state.or.us/wq/loans/contacts.htm)

Supplemental Environmental Projects (SEPs)

Supplemental Environmental Projects are administered by DEQ's Office of Compliance and Enforcement. When DEQ assesses civil penalties for environmental law violations, violators can offset up to 80% of

their monetary penalty by agreeing to pay for 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. Coastal PWSs can develop a "SEP Application" with general information that OCE can distribute to respondents. Community organizations with proposed projects are also free to contact respondents on their own initiative. The enforcement case does not necessarily have to be in the same area (watershed/county, etc.) as the environmental project or even address the same media (i.e. air/water/land). Interested parties can sign up for DEQ's public notifications via email at http://www.oregon.gov/deq/Pages/publicnotice.aspx - when signing up, select types of information (select "enforcement actions") and which counties or subbasins are of interest.

Oregon Watershed Enhancement Board (OWEB)

775 Summer St. NE Suite 360
Salem, OR 97301
Phone: (503) 986-0178
Website: www.oregon.gov/OWEB
The Oregon Watershed Enhancement Board (OWEB) is a state agency that provides grants to help Oregonians take care of local streams, rivers, wetlands and natural areas. Community members and landowners use scientific criteria to decide jointly what needs to be done to conserve and improve rivers and natural habitat in the places where they live. OWEB grants are funded from the Oregon Lottery, federal dollars, and salmon license plate revenue. The agency is led by a 17 member citizen board drawn from the public at large, tribes, and federal and state natural resource agency boards and commissions. OWEB provides grants to projects that contribute to the Oregon Plan for Salmon and Watersheds and the Oregon Conservation Strategy by protecting, restoring and improving clean water and fish and wildlife habitat. See the OWEB website for more information on grants: http://www.oregon.gov/OWEB/GRANTS/pages/index.aspx

Oregon Sea Grant (OSG)

Oregon State University
Corvallis, Oregon
Phone 541-737-2714
http://seagrant.oregonstate.edu/

Oregon Sea Grant serves Oregon coastal communities through integrated research, education and public engagement on ocean and coastal issues. Based at Oregon State University, OSG is part of the national network of NOAA Sea Grant College Programs, dedicated to promoting environmental stewardship, long-term economic development and responsible use of America's coastal, ocean and Great Lakes resources. OSG targets research on better defining the relationships between the many pressures that can degrade water quality: climate change, upland and coastal land use, fish and habitat restoration efforts, aquatic invasive species. OSG works with groups whose interests sometimes come in conflict - landowners, outdoor recreationists, farmers and woodland managers, local government, the general public - to seek solutions that will help sustain healthy watersheds and our precious water resources. OSG focuses on the question of resilience - the ability to plan, adapt and rebound in the face of change by supporting physical and social science research aimed at better understanding ocean and

coastal processes and the socio-economic barriers to hazard and climate change preparation.
http://seagrant.oregonstate.edu/coastal-hazards-and-climate-change

OSG and OSU Extension produce textbooks and other publications on such topics as conservation-friendly gardening, sustainable living and low-impact development. OSG also partners with the Oregon State Marine Board to develop the Clean Vessel Act (CVA) Education Initiative. Funded by the Clean Vessel Act of 1992, the goal of the CVA Education Initiative is to improve boaters' awareness, accessibility and use of sewage pump-outs, dump stations, and floating toilets. Publications and resources available from OSG about watershed health can be found here:
http://seagrant.oregonstate.edu/sgpubs/collection/watersheds-and-wetlands

Every two years, OSG awards approximately $2 million in research grants addressing community preparedness for climate change, watershed health, other urgent or emerging regional needs with high relevance to coastal communities. For more information on grants, see:
http://seagrant.oregonstate.edu/research

Department of Agriculture - Natural Resources Program

635 Capitol St. NE
Salem, OR 97301-2532
Phone: 503 986-4700
http://www.oregon.gov/ODA/programs/NaturalResources
The Oregon Department of Agriculture (ODA) is responsible for developing plans to prevent and control water pollution from agricultural activities and soil erosion on rural lands. ODA's Natural Resources Program aims to conserve, protect, and develop natural resources on public and private lands in order to ensure that agriculture will continue to be productive and economically viable in Oregon. Natural Resources Programs work to do the following:

- Address water quality and natural resource conservation on agricultural lands
- Protect Oregon's environment and public health by ensuring the proper and legal sale, use, and distribution of pesticide products
- Assist local soil and water conservation districts as they help landowners properly manage Oregon's natural resources

More information on the Agricultural Plan Areas and Regulations can be found at:
http://www.oregon.gov/ODA/programs/NaturalResources/Pages/AgWaterQuality.aspx
The local ODA Water Quality Specialist for coastal drinking water source areas can be found at:
http://oregon.gov/ODA/programs/NaturalResources/Pages/AgWaterQuality.aspx

Department of Agriculture - Soil and Water Conservation Districts

http://www.oregon.gov/ODA/SWCD/
SWCD Program and Water Quality Program Manager: John Byers, 503 986-4718
The Soil and Water Conservation District (SWCD) Program provides services to the 45 Soil and Water Conservation Districts throughout Oregon. The Districts that provide services to the coastal watersheds include:

Clatsop SWCD
Phone: 503 325-4571
Email: office@clatsopswcd.org
Web: www.clatsopswcd.org

Coos SWCD
Phone: 541 396-6879
Email: info@coosswcd.org
Web: www.coosswcd.org

Curry County SWCD
Phone: 541 247-2755 ext. 0#
Email: liesl.coleman@currywatersheds.org
Web: www.currywatersheds.org

Lincoln SWCD
Phone: 541 265-2631
Email: info@lincolnswcd.org
Web: www.lincolnswcd.org

Siuslaw SWCD
Phone: 541 997-1272
Email: siuswcd@qwestoffice.net
Web: www.siuswcd.com

Tillamook County SWCD
Phone: 503 842-2240 ext. 114
Email: ray.monroe@or.nacdnet.net

Umpqua SWCD
Phone: 541 662-1341
Email: rhonda@umpquasoilandwater.com
Website: www.umpquasoilandwater.com

U.S. Environmental Protection Agency
Catalog of Federal Funding Sources for Watershed Protection

This is an online, free searchable database of financial assistance sources (grants, loans, cost-sharing) available to fund a variety of watershed protection projects.
https://ofmpub.epa.gov/apex/watershedfunding/f?p=fedfund:1

U.S. Environmental Protection Agency
Community Action for a Renewed Environment (CARE) Grants

Eligible Projects
Prevention of human exposure to harmful pollution; improve water quality. Form community-based collaborative partnerships; identifying and developing an understanding of the many local sources of

risk from toxic pollutants and environmental concerns; and setting priorities for the reduction of the identified risks and concerns of the community

Eligible Applicants

Local, public non-profit institution/organizations, federally-recognized Indian tribal government, Native American organizations, private non-profit institution/organization, quasi-public nonprofit institution/organization both interstate and intrastate, local government, colleges, and universities CARE Request for Proposal will not be issued in 2013

Funding Available

Level 1: $75,000 to a maximum of $100,000, with an average project funding of about $90,000

How To Apply

www.epa.gov/care

U.S. Environmental Protection Agency
Cooperative Watershed Management Program

Eligible Projects

Improve water quality; improve ecological resiliency of a river or stream; and to reduce conflicts over water at the watershed level by supporting the formation of watershed groups to develop local solutions to address water management issues

Eligible Applicants

States, Indian tribes, local and special districts (e.g., irrigation and water districts, county soil conservation districts, etc.), local governmental entities, interstate organizations, and non-profit organizations. To be eligible, applicants must also meet all of the following requirements: (1) Significantly affect or be affected by the quality or quantity of water in a watershed; (2) Be capable of promoting the sustainable use of water resources; (3) Be located in the western United States specifically: Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington.

Funding Available

Funding level: $22,000-$100,000 Match: Non-federal cost share is not required. A schedule for Fiscal Year 2014 funding opportunity is currently under development.

How To Apply

http://www.usbr.gov/WaterSMART/cwmp/index.html

U.S. Environmental Protection Agency - Region 10
Environmental Finance Center - Boise State University

Free technical assistance is available through EPA's Environmental Finance Centers. Boise State University is the site of the Environmental Finance Center for US EPA Region 10. Their mission is to provide help to those facing the "how to pay" challenges of environmental protection. EFC-10 is committed to helping the regulated community build and improve the technical, managerial, and financial capabilities needed to comply with federal and state environmental protection laws.

http://efc.boisestate.edu

U.S. Department of Commerce
Community Development Block Grant Planning Program

Region 10 HUD
Seattle Regional Office
Phone: (206) 220-5101
http://portal.hud.gov/hudportal/HUD?src=/states/washington/offices
http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs

Eligible Projects

· Comprehensive plans
· Infrastructure plans
· Feasibility studies
· Community action plans
· Low-income housing assessments

Eligible Applicants

Projects must principally benefit low- to moderate-income people in non-entitlement cities and counties.

· Cities or towns with fewer than 50,000 people
· Counties with fewer than 200,000 people

Funding Available

Grants

· Up to $24,000 for a single jurisdiction
· Up to $35,000 for single jurisdiction projects that address urgent public health and safety needs
· Up to $40,000 for multiple jurisdictions/joint application

How To Apply

2013 applications accepted beginning May 2013 through April 2014 on a fund-available basis.

Contact

http://portal.hud.gov/hudportal/HUD?src=/states/washington/offices

U.S. Department of Agriculture, Natural Resources Conservation Service
Environmental Quality Incentives Program (EQIP)

Eligible Projects

Grants available for best management practices and conservation on private, non-industrial forestland and agricultural lands. Financial assistance to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air and related resources on agricultural land and non-industrial private forestland. In addition, a purpose of EQIP is to help producers meet Federal, State, Tribal and local environmental regulations.

Eligible Applicants

Owners of land in agricultural or forest production or persons who are engaged in livestock, agricultural or forest production on eligible land and that have a natural resource concern on the land

Funding Available

Financial and technical assistance to agricultural and forestland producers through contracts up to 10 years. Not to exceed $300,000 for all EQIP contracts entered into during any six-year period. If NRCS determines project has special environmental significance the payment limitation is a maximum of $450,000.

How To Apply
Those who are applying for EQIP for the first time should schedule a meeting with NRCS to discuss their options before moving forward.
Contact
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/

U.S. Department of Agriculture, Rural Development
Water and Waste Disposal Direct Loans and Grants

Eligible Projects
Pre-construction and construction associated with building, repairing, or improving drinking water, solid waste facilities and wastewater facilities
Eligible Applicants
· Cities or towns with fewer than 10,000 population
· Counties, special purpose districts, non-profit corporations or tribes unable to get funds from other sources at reasonable rates and terms
Funding Available
Loans. Grants in some cases. Interest rates vary (currently 2.125 – 3.5%). Up to 40-year loan term. No pre-payment penalty.
How To Apply
Applications accepted year-round on a fund-available basis.
http://www.rurdev.usda.gov/UWPdispdirectloansgrants.htm

U.S. Department of Agriculture, Farm Service Agency
Emergency Forest Restoration Program

Eligible Projects
The EFRP helps the owners of non-industrial private forests restore forest health damaged by natural disasters. The local FSA County Committee implements ERFP for all disasters with the exceptions of drought and insect infestations. In the case of drought or an insect infestation, the national FSA office authorizes ERFP implementation.
For land to qualify for ERFP funds, the damage from the natural disaster must create new conservation problems that if not dealt with would:

- Harm the natural resources on the land
- Significantly affect future land use

Eligible Applicants
Only owners of nonindustrial private forests with tree cover existing before the natural disaster occurred are eligible to apply. The land must be owned by a private individual, group, association, corporation or other private legal entity that has decision making authority on the land and doesn't use the land for business purposes. The FSA County Committee inspects the damage to determine if forest land is eligible for EFRP.
Funding Available
Funding for EFRP is determined by Congress. Up to 75% of the cost to implement emergency conservation practices can be provided, however the final amount is determined by the committee reviewing the application. The FSA County Committee is able to approve applications up to $50,000 while $50,000 to $100,000 requires state committee approval. Amounts over $100,000 require the

approval of the national FSA office. Additionally, a limit on payments of $500,000 per person or entity per disaster applies.

How To Apply

https://www.fsa.usda.gov/FSA/webapp?area=home&subject=diap&topic=efrp

Rural Community Assistance Corporation (RCAC)

ENVIRONMENTAL PROGRAMS
1020 S.W. Taylor Street Suite 450
Portland, OR 97205

Local contacts:

Chris Marko, Rural Development Specialist 503- 228-1780
RosAnna Noval, Rural Development Specialist 503-308-0207
Email: cmarko@rcac.org; rnoval@rcac.org
Website: www.rcac.org

At the national level, RCAC has a variety of loans for water and/or wastewater planning, environmental work, and other work to assist in developing an application for infrastructure improvements

Eligible Applicants

Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 or less if guaranteed by USDA Rural Development financing.

Funding Available

- Maximum $50,000 for feasibility loan
- Maximum $350,000 for pre-development loan
- 1 year term
- 5.5% interest rate

How To Apply

Applications accepted anytime. Applications available on-line at www.rcac.org

National contact

Josh Griff, 720-951-2163, jgriff@rcac.org

Water Research Foundation - Source Water Protection Cost-Benefit Tool

This is a free, online suite of tools designed to assist in evaluating the triple bottom-line costs and benefits of different source water protection options. Cost/benefit calculations help evaluate, prioritize, justify, and ultimately implement source water protection initiatives.
http://www.swptool.org/index.cfm

Source Water Collaborative – led by U.S. Environmental Protection Agency

Technical assistance and lists of resources and contacts are available from this national network that has worked to promote drinking water protection for several years. The Source Water Collaborative is a network of federal, state, and local organizations led by US EPA. Some of the key Source Water Collaborative members include the US EPA, US Department of Agriculture, AWWA, American Planning Association, ASDWA, ACWA, National Rural Water Association, Groundwater Protection Council, National Association of Counties, and The Trust for Public Land. Resources can be found here: www.protectdrinkingwater.org

Ecotrust

http://www.ecotrust.org/

Ecotrust works to protect and restore watersheds and the economic and public health of the communities that depend upon them. Ecotrust develops and applies strategic approaches that improve habitat for native fish and wildlife, create local jobs and recreational opportunities, increase public awareness of the value of nature's services like water, and ensure a more reliable access to clean water for all members of the Oregon communities. Ecotrust provides Ecosystem Services, GIS Analysis, Mapping, Cartography, Data and Software Development, Economic Impact Assessment, etc.

Ecotrust Forest Management is a forestland investment management and advisory services company that manages land on behalf of investors and forestland owners to enhance forest health and productivity, and to produce a diverse array of forest products and services including timber, biomass, carbon, and improved habitat and water quality. EFM seeks to capture a wide array of funding sources — New Market Tax Credits, carbon credits, conservation easements, and restoration funding — to supplement private capital resources in the acquisition and management of forestland.
Call 503-467-0805 or visit http://ecotrustforests.com

LAND TRUSTS

Coalition of Oregon Land Trusts

The Coalition of Oregon Land Trusts (COLT) is a newly formed nonprofit representing and serving Oregon's land trusts. Its mission is to serve and strengthen the land trust community in Oregon. Oregon's land trust community is working at local, regional, and statewide scales with landowners, communities, public agencies and other partners to maintain the state's natural heritage and the economies it supports. COLT will accomplish its mission by strengthening public policies and programs that are supportive of land conservation, helping to build capacity within and across land trusts, and communicating to key audiences about the role of land trusts in conserving Oregon's natural heritage and healthy human communities that depend on it. There are currently 18 land trusts that are members of COLT.

Coalition of Oregon Land Trusts
322 NW 5th, Suite 312
Portland, OR 97209
Phone: 503-719-4732
http://oregonlandtrusts.org/

Land Trust Alliance

The Land Trust Alliance is a national conservation organization that works preserve land through conservation and easements, so land and natural resources get protected. The Alliance is based in Washington, D.C., and has several regional offices.

Northwest Conservation Manager
1353 Officers Row
Vancouver, WA 98661
Phone: (971) 202-1483
http://www.landtrustalliance.org/
Resources to assist in locating a land trust can be found here:
http://findalandtrust.org/states/oregon41

Individual land trusts which may be of assistance include:

The Trust for Public Land http://www.tpl.org/services/conservation-transactions

The Nature Conservancy http://www.nature.org/

FOUNDATIONS

The Oregon Community Foundation / Community Grant Program

Eligible Projects
Community Livability, Environment & Citizen Engagement (*10 to 20 percent of grants*)

- Promote leadership development, volunteerism, immigrant integration, and civic participation
- Support stewardship and appreciation of Oregon's outdoor spaces and scenic beauty
- Address social, economic and environmental challenges or opportunities by bringing together disparate stakeholders
- Preserve places essential to communities' civic and historic identities

Eligible Applicants

- Nonprofits with tax-exempt status under Section 501(c)(3)

Funding Available

- Average grant is $20,000. OCF typically receives 300 to 350 proposals per grant cycle and funds 110 to 120 of these

How To Apply
http://www.oregoncf.org/grants-scholarships/grants/community-grants

National Fish and Wildlife Foundation

Eligible Projects
Environmental Solutions for Communities (1:1 match required)

- Supporting sustainable agricultural practices and private lands stewardship;
- Conserving critical land and water resources and improving local water quality;
- Restoring and managing natural habitat, species and ecosystems that are important to community livelihoods;

- Facilitating investments in green infrastructure, renewable energy and energy efficiency; and
- Encouraging broad-based citizen and targeted youth participation in project implementation.

Eligible Applicants

- Non-profit 501(c) organizations, state government agencies, local governments, municipal governments, Indian tribes, educational institutions

Funding Available

- Approximately $2,500,000 is available nationwide for 2015 projects
- Grants range from $25,000 to $100,000

Contact:

Sarah McIntosh, Coordinator, Community-Based Conservation
202-595-2434 Sarah.McIntosh@nfwf.org

Access Fund Foundation

Eligible Projects

Land Acquisitions: Considering the management and financial resources of land ownership, the Access Fund views land acquisitions as a tool of last resort and have adopted the following guidelines for land acquisition projects. If you are requesting funds for a land acquisitions please call the Access Fund before submitting your application.

- The area must be imminently threatened with permanent closure or sale to an outside party that may consider land development opportunities or other uses threatening its climbing and/or access resources.
- The area can be acquired for a reasonable price (reasonable price being one that falls within existing market values and is not in excess of appraised value), together with a reasonable budget (including secured funding) or secured exit-strategy for management by another land trust, local climbers organization or governmental agency.
- A fully executed purchase agreement stating how the project will be funded is required before Access Fund grant funds will be allocated to any acquisition.
- A high degree of matching funds is required. The Access Fund's role in land acquisitions is as an additional, not primary, funding resource.
- Applicants whose projects require continued payments and/or financing should submit a plan describing how these payments will be met in the future. These include, but are not limited to, property tax payments, loan payments, lease and mortgage payments. This payment plan will be taken into consideration during the grant review process.

Eligible Applicants

- Local climbing groups, individuals or organizations (Note: tax exempt 501(c)(3) status is not a pre-requisite); governmental agencies that wish to sponsor or organize a local project; conservation organizations and land trusts.

Funding Available

- $1,000 to $4,000. The Access Fund considers requests for over $10,000, but these projects should have national significance and utilize a high degree of matching funds.

How To Apply

2015 Deadline: August 1st
http://www.accessfund.org/

Contact:

info@accessfund.org

The Collins Foundation

Eligible Projects

Land Acquisitions

- Grants are made only for projects that directly benefit the residents of Oregon

Eligible Applicants

- Nonprofits with tax-exempt status under Section 501(c)(3) / agencies that have current registration with the offices of the Oregon State Attorney General and the Secretary of State.

Funding Available

- Varies; grants may range from $3000 to $150,000

How To Apply

www.collinsfoundation.org

The Esco Foundation

Eligible Projects

Land Acquisitions

Eligible Applicants

- Nonprofits with tax-exempt status under Section 501(c)(3)

Funding Available

- Total giving $600,750

How To Apply

503-225-2935---request application form

Giles W. and Elise G. Mead Foundation

Eligible Projects

- Preserving and improving the environment
- Primary emphasis forestry, fisheries and the sustainable use of natural resources in western North America

Eligible Applicants

- Nonprofits with tax-exempt status under Section 501(c)(3) in western North America.

Funding Available

- Past grants ranged from $15,000 to $100,000

How To Apply

http://www.gileswmeadfoundation.org/

Rose E. Tucker Charitable Trust

Eligible Projects

- Giving limited to organizations and projects in OR, with emphasis on the metropolitan Portland area. Land acquisition is a type of support listed.

Eligible Applicants

- Nonprofits with tax-exempt status under Section 501(c)(3)

Funding Available

Past grants ranged from $6,000 to $150,000

How To Apply

Deadlines: none; Board meets approximately every 2 months

Contact:

Tuckertrust@stoel.com

Doris Duke Charitable Foundation

Eligible Projects

The foundation's grant-making is designed to provide frameworks and concrete examples of how practitioners can protect biodiversity in light of climate change through strategic land conservation. The program's adaptation efforts focus on three critical land conservation activities undertaken by non-profit organizations and government natural resource agencies:

- Habitat conservation planning (i.e., the identification of which sites should be conserved in their natural state to benefit wildlife);
- Permanent land protection (i.e., the acquisition of conservation easements or fee title to secure high priority sites); and C) Management of lands already in protected status. The goal for each of these activities is to encourage the conservation community to augment the dominant species-based approach to wildlife conservation with a focus on maintaining ecosystem functionality as climate change takes hold.
- The program has adopted three approaches to achieve its objectives: 1) Identifying resilient landscapes; 2) Protecting resilient landscapes; and 3) Managing conserved lands.

Eligible Applicants

Nonprofits with tax-exempt status under Section 501(c)(3)

Funding Available

Past grants ranged in the $100K

How To Apply

http://www.ddcf.org/Programs/Environment/

Bonneville Environmental Foundation

Eligible Projects

Renewable power and acquire, maintain, preserve, restore, protect, and/or sustain fish and wildlife habitat within the Pacific Northwest.

Interest area: Watershed Restoration Program

Supports restoration of damaged watershed ecosystems; supports communities trying to heal their local watersheds by supporting watershed restoration projects grounded in the best available watershed science.

Eligible Applicants

Nonprofit organizations.
Appendix B, page 27
Funding Available
Varies.
How To Apply
www.b-e-f.org
Open grants and RFPs: http://www.b-e-f.org/open-rfps-and-grants/
Contact:
503-248-1905

The Bullitt Foundation

Eligible Projects
Program priorities:

- Manage freshwater resources: control, use, distribution, conservation;
- Conserve and restore resilient watersheds, wetlands and estuaries;
- Maintain a working land base for sustainable agriculture and forestry;
- Enforce laws and policies intended to assure air and water quality;
- Create landowner incentives for maintaining and enhancing ecosystem services, including the
- development of market-based mechanisms.

Eligible Applicants
Nonprofit organizations in Washington, Oregon, Idaho, western Montana, south-central Alaska, and British Columbia. Within that broad geographic range, work is targeted to specific sub-regions generally associated with major population centers.
Funding Available
Varies. Past grants ranged from $10,000 to over $600,000.
How To Apply
www.bullitt.or

Weyerhaeuser Foundation

Eligible Projects
Forestry practices, manufacturing's effects on air, water and land; free trade, recycling, diversity, land conservation and environmental education. Land acquisitions or conservation easement projects may fit with the Foundation’s priorities and goals.
Eligible Applicants
Educational institutions, non-profit organizations, research institutions in Oregon and Washington.
Funding Available
$1,000 - $50,000
How To Apply
http://www.wfamilyfoundation.org/

Laird Norton Foundation

Eligible Projects

Projects contribute to a heightened awareness of the ecological, social and economic significance of water sources and watersheds. Preference will be given to projects which demonstrate innovative measures for protecting and restoring water resources and which involve local communities and/or regional institutions.

Eligible Applicants

Nonprofit organizations working in Hood Canal (WA), Upper Deschutes (OR), and Rogue (OR) watersheds.

Funding Available

Varies. 2013 grants ranged from $10k to $100k.

Appendix B, page 29

How To Apply

http://www.lairdnorton.org

206-501-4509

REFERENCES

Abatzoglou, J. T., D. E. Rupp, P. W. Mote. 2014. Seasonal climate variability and change in the Pacific Northwest of the United States**.** Journal of Climate, (27), 2125-2142, doi:10.1175/JCLI-D-13-00218.1.

Blomquist, J. D., Janet M. D., 2001. Pesticides in Water-Supply Reservoirs and Finished Drinking Water: A Pilot Monitoring Program. USGS Open File Report 01-456

Dalton, M., P.W. Mote, and A.K. Snover, eds., 2013: Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities. 224 pp. Island Press.

Dello, K.D., and P.W. Mote, eds, 2010: Oregon Climate Assessment Report. COAS, OSU
Oregon Climate Change Research Institute Website: http://occri.net/

Freeman J., R. Madsen, K. Hart. 2008. *Statistical Analysis of Drinking Water Treatment Plant Costs, Source Water Quality, and Land Cover Characteristics.* Trust for Public Land.

Gartner, T., Mehan III, T., Mulligan, J., Roberson, J.A., Stangel, P., Qin, Y., 2014. Protecting Forested Watersheds is Smart Economics for Water Utilities. American Water Works Association Journal 106.9 September 2014.

Jackson, C.R., C.A. Sturm, and J.M. Ward. 2001. Timber harvest impacts on small headwater stream channels in the coast ranges of Washington. *Journal of the American Water Resources Association* **37:** 1533-1549.

Kelsey, H.M., D.C. Engebretson, C.E. Mitchell, and R.L. Ticknor, Topographic Form of the Coast Ranges of the Cascadia Margin in Relation to Coastal Uplift Rates and Plate Subduction. *Journal of Geophysical Research*, 99/ 12,245-12,255, 1994.

Kibler, KM, A Skaugset, LM Ganio, and MM Huso. 2013. Effect of contemporary forest harvesting practices on headwater stream temperatures: Initial response of the Hinkle Creek catchment, Pacific Northwest, USA. *Forest Ecology and Management* **310:** 680-691.

Kolpin, D.W., Furlong, E.T., Meyer, M.T., Thurman, E.M., Zaugg, S.D., Barber, L.B., and Buxton, H.T., 2002, Pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000—A national reconnaissance: Environmental Science and Technology, v. 36, no. 6, p. 1202-1211, doi:10.1021/es011055j.

Long, C.J., Whitlock, C., Bartlein, P.J., and Millspaugh, S.H., 1998, A 9000-year fire history from the Oregon Coast Range, based on a high-resolution charcoal study: Canadian Journal of Forest Research, v. 28, p. 774-787.

Montgomery, D.R., K.M. Schmidt, H.M. Greenberg, and W.E. Dietrich, Forest clearing and regional landsliding, *Geology,* 28, 311-314, 2000

Mote, P., A.K. Snover, S. Capalbo, S.D. Eigenbrode, P. Glick, J. Littell, R. Raymondi, and S. Reeder, 2014: Ch. 21: Northwest. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 495-521.

Oregon Department of Human Services Public Health Division and Oregon Department of Environmental Quality. 2010. Interagency Agreement – Harmful Blue-Green Algae Monitoring. DHS/OEPH Agreement #131357.

Paerl, Hans W., N. S. Hall and E. S. Calandrino. 2011. Controlling Harmful Cyanobacterial Blooms in a World Experiencing Anthropogenic and Climatic-induced Change. Science of the Total Environment. 409 (2011) 1739-1745.

Rashin, E.B., C.J. Clishe, A.T. Loch, and J.M. Bell. 2006. Effectiveness of timber harvest practices for controlling sediment related water quality impacts. *Journal of the American Water Resources Association* **42:** 1307-1327.

Robison, E.G., K. Mills, J. Paul, L. Dent, and A. Skaugset. 1999. Oregon Department of Forestry Storm Impacts and Landslides of 1996: Final Report. Forest Practices Technical Report No. 4. Oregon Department of Forestry, Salem, Oregon.

Schaedel, Andy. 2011. Oregon Department of Environmental Quality Harmful Algal Bloom (HAB) Strategy, Water Quality Division, June 2011.

Seeds, Josh. 2010. *Turbidity Analysis for Oregon Public Water Systems - Water Quality in Coast Range Drinking Water Source Areas*. Oregon Department of Environmental Quality, Water Quality Division, June 2010.

Trombulak, S.C., and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. *Conservation Biology* **14:** 18-30.

Turner, T.R., S.D. Duke, B.R.Fransen, M.L. Reiter, A.J. Kroll, J.W. Ward, J.L. Bach, T.E. Justice, and R.E. Bilby. 2010. Landslide densities associated with rainfall, stand age, and topography on forested landscapes, southwestern Washington, USA. *Forest Ecology and Management* **259:** 2233-2247.

US EPA Climate Ready Water Utilities Toolbox. 2015.
Website: http://www.epa.gov/safewater/watersecurity/climate/toolbox.html

Weber, J. A. 2015. Regional Framework for Climate Adaptation: Clatsop and Tillamook Counties. Joint project by the NOAA's Oregon Coastal Management Program, Oregon Sea Grant, and the Oregon Department of Land Conservation and Development.

Figures

DEQ
State of Oregon Department of Environmental Quality

Oregon Health Authority

Figure 1
Coastal Drinking Water Source Areas
Public Water Systems

North Coast

Mid Coast

South Coast

South Coast

Legend

- South Coast Basin
- Mid Coast Basin
- North Coast Basin
- Drinking Water Source Areas
- Major rivers (NHD High flowline)
- County boundary
- City limits (ODOT, 2012)
- State boundary

1:1,178,974

0 5 10 20 30 40 Miles

Oregon Lambert projection

Oregon Department of Environmental Quality/Environmental Solutions Division
Drinking Water Protection Program - GIS
File:\\Deqhq1\dwp\PWSProjects\CoastalPWSResiliencyProject\Fig1_CoastalDWSAS_byWRDBasin.mxd
Prepared by: S. Aalbers (12DEC2014), Printed: 12DEC2014 (sda)


Figure 2
North Coast
Drinking Water Source Areas
Public Water Systems
North Coast
Youngs River
Lewis & Clark
Water District:
North Fork/Barney Creek
South Fork/Barney Creek
City of Astoria:
Cedar Creek
Middle Lake
Bear Creek
Wickiup Water District:
Little Creek
Big Fat Buck Creek
Seaside Water Department:
Necanicum River
South Fork Necanicum River
City of Warrenton:
Camp "C" Creek
Little South Fork - Lewis & Clark River
Big South Fork - Lewis & Clark River
Lewis & Clark River
Fishhawk Lake Recreation Club Inc.
Fishhawk Creek
City of Vernonia
Rock Creek
City of Cannon Beach
Elk Creek - West Fork
Arch Cape Water District:
Shark Creek
Asbury Creek
Berndt Creek Water Corp
Rock Creek
City of Nehalem
Bob's Creek
Manzanita Water Department:
Middle Fork Anderson Creek
West Fork Anderson Creek
Wheeler Water System:
Vosburg Creek
Jarvis Creek
Timber Water Association
Nehalem River
Rockaway Beach
Water District:
Jetty Creek
Oceanside Water District
Short Creek
Netarts Water District
East Fall Creek
City of Tillamook Water Department:
Fawcett Creek
Killam Creek
Beaver Water District
Beaver Creek
Tierra Del Mar Water Company
Beltz Creek
Neskowin Regional
Water District:
Hawk Creek
Legend
North Coast Surface Water DWSAs
North Coast Basin
Major rivers (NHD High flowline)
County boundary
City limits (ODOT, 2012)
State boundary
1:550,000
0 2 4 8 12 16 20
Miles
Oregon Lambert projection
Astoria
Warrenton
Gearhart
Seaside
Cannon Beach
Nehalem
Manzanita
Wheeler
Rockaway Beach
Garibaldi
Bay City
Tillamook
Clatskanie
Rainier
Prescott
Vernonia
Columbia City
St. Helens
Scappoose
Banks
Yamhill
Carlton
Sherwood
Newberg
Dundee
Wilsonville
Lafayette
McMinnville
Dayton
St. Paul
Donald
Aurora
Hubbard
Amity
Sheridan
Willamina
Oregon Department of Environmental Quality/Environmental Solutions Division
Drinking Water Protection Program - GIS
File:\\Deqhq1\dwp\PWSProjects\CoastalPWSResiliencyProject\Fig2_NorthCoastDWSAs.mxd
Prepared by: S. Aalbers (11DEC2014), Printed: 11DEC2014 (sda)
This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. This information or data is provided with the understanding that conclusions drawn from such information are the responsibility of the user. Multiple surface water intakes may exist for any public water system (PWS). GPS intake locations are as close to actual intake as was physically practical during field work.

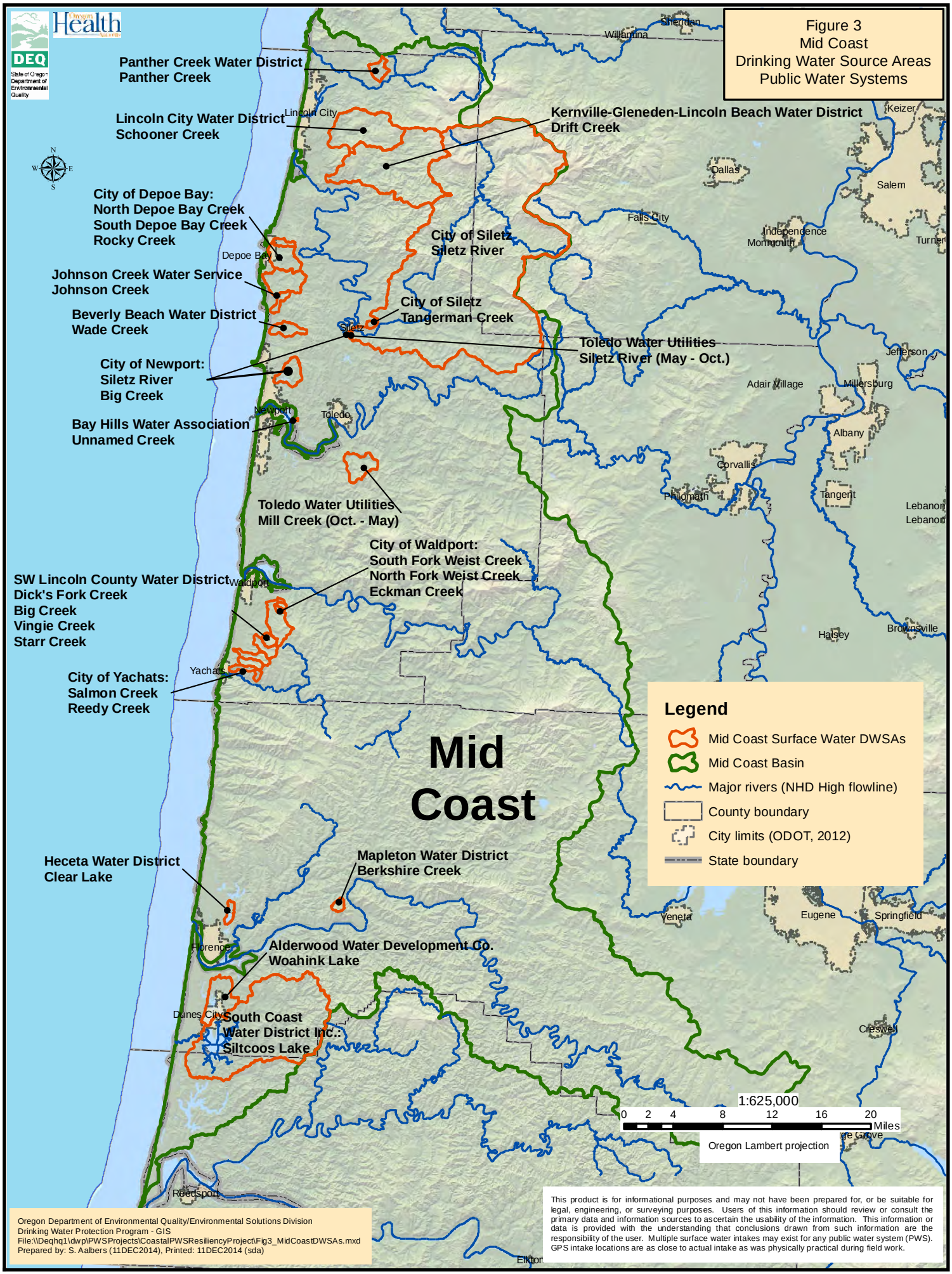


Figure 3
Mid Coast
Drinking Water Source Areas
Public Water Systems
Panther Creek Water District
Panther Creek
Lincoln City Water District
Schooner Creek
Kernville-Gleneden-Lincoln Beach Water District
Drift Creek
City of Depoe Bay:
North Depoe Bay Creek
South Depoe Bay Creek
Rocky Creek
City of Siletz
Siletz River
Johnson Creek Water Service
Johnson Creek
City of Siletz
Tangerman Creek
Beverly Beach Water District
Wade Creek
Toledo Water Utilities
Siletz River (May - Oct.)
City of Newport:
Siletz River
Big Creek
Bay Hills Water Association
Unnamed Creek
Toledo Water Utilities
Mill Creek (Oct. - May)
City of Waldport:
South Fork Weist Creek
North Fork Weist Creek
Eckman Creek
SW Lincoln County Water District
Dick's Fork Creek
Big Creek
Vingie Creek
Starr Creek
City of Yachats:
Salmon Creek
Reedy Creek
Mid Coast
Heceta Water District
Clear Lake
Mapleton Water District
Berkshire Creek
Alderwood Water Development Co.
Woahink Lake
South Coast
Water District Inc.:
Siltcoos Lake
Legend
Mid Coast Surface Water DWSAs
Mid Coast Basin
Major rivers (NHD High flowline)
County boundary
City limits (ODOT, 2012)
State boundary
1:625,000
0 2 4 8 12 16 20
Miles
Oregon Lambert projection
Willamina
Sheridan
Keizer
Dallas
Salem
Falls City
Independence
Monmouth
Turner
Jefferson
Adair Village
Millersburg
Albany
Corvallis
Philomath
Tangent
Lebanon
Halsey
Brownsville
Yachats
Waldport
Newport
Toledo
Siletz
Depoe Bay
Lincoln City
Florence
Dunes City
Yoncalla
Eugene
Springfield
Creswell
Reedsport
This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. This information or data is provided with the understanding that conclusions drawn from such information are the responsibility of the user. Multiple surface water intakes may exist for any public water system (PWS). GPS intake locations are as close to actual intake as was physically practical during field work.
Oregon Department of Environmental Quality/Environmental Solutions Division
Drinking Water Protection Program - GIS
File:\\Deqhq1\dwp\PWSProjects\CoastalPWSResiliencyProject\Fig3_MidCoastDWSAs.mxd
Prepared by: S. Aalbers (11DEC2014), Printed: 11DEC2014 (sda)

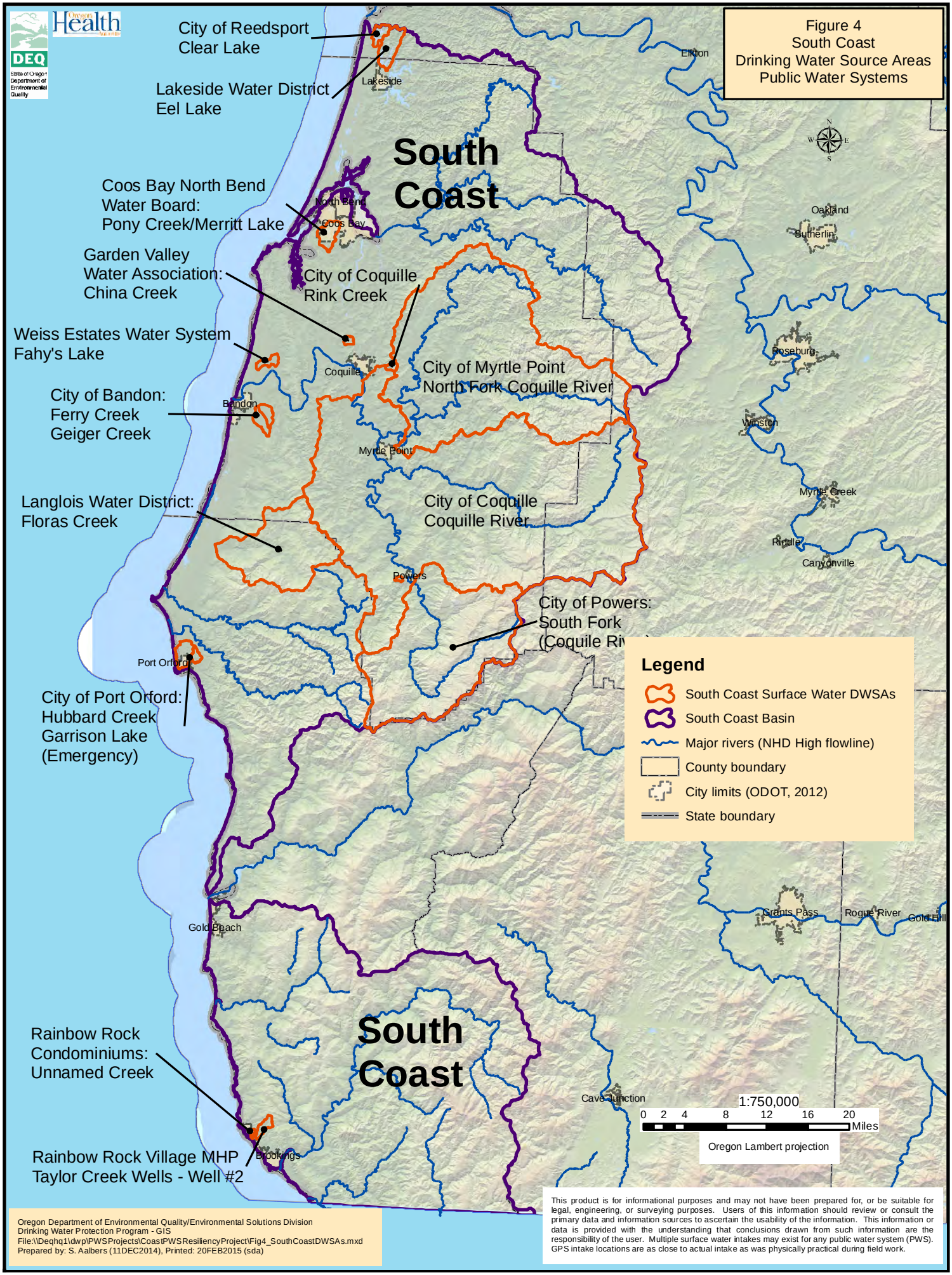
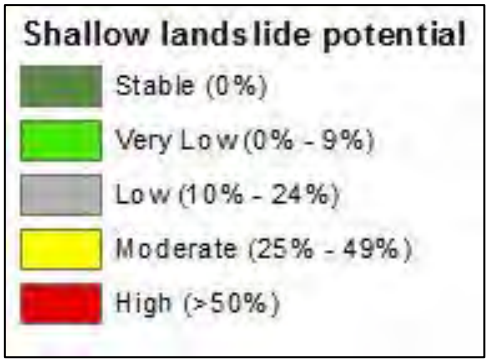


Figure 4
South Coast
Drinking Water Source Areas
Public Water Systems
City of Reedsport
Clear Lake
Lakeside Water District
Eel Lake
Coos Bay North Bend
Water Board:
Pony Creek/Merritt Lake
Garden Valley
Water Association:
China Creek
Weiss Estates Water System
Fahy's Lake
City of Bandon:
Ferry Creek
Geiger Creek
Langlois Water District:
Floras Creek
City of Port Orford:
Hubbard Creek
Garrison Lake
(Emergency)
Rainbow Rock
Condominiums:
Unnamed Creek
Rainbow Rock Village MHP
Taylor Creek Wells - Well #2
City of Coquille
Rink Creek
City of Myrtle Point
North Fork Coquille River
City of Coquille
Coquille River
City of Powers:
South Fork
(Coquile Ri
South
Coast
South
Coast
Lakeside
North Bend
Coos Bay
Coquille
Bandon
Myrtle Point
Powers
Port Orford
Gold Beach
Brookings
Elkton
Oakland
Sutherlin
Roseburg
Winston
Myrtle Creek
Riddle
Canyonville
Grants Pass
Rogue River
Cave Junction
Legend
South Coast Surface Water DWSAs
South Coast Basin
Major rivers (NHD High flowline)
County boundary
City limits (ODOT, 2012)
State boundary
1:750,000
0 2 4 8 12 16 20
Miles
Oregon Lambert projection
This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. This information or data is provided with the understanding that conclusions drawn from such information are the responsibility of the user. Multiple surface water intakes may exist for any public water system (PWS). GPS intake locations are as close to actual intake as was physically practical during field work.
Oregon Department of Environmental Quality/Environmental Solutions Division
Drinking Water Protection Program - GIS
File:\\Deqhq1\dwp\PWSProjects\CoastPWSResiliencyProject\Fig4_SouthCoastDWSAs.mxd
Prepared by: S. Aalbers (11DEC2014), Printed: 20FEB2015 (sda)

Legend for Figures 5 & 6

	Boating access sites; OR State Marine Board (91313)
	Drinking water source area; OR Dept. of Environmental Quality, Water Quality, Drinking Water Protection Program (24NOV2014)
	Agricultural area; OR Dept. of Environmental Quality, Water Quality, Drinking Water Protection Program (14JAN2015). Note: This GIS layer was created by the Drinking Water Protection Program using geospatial techniques and two different datasets; the National Agricultural Statistics Service 2007 "cdl_awifs_r_or_2007.tif" and Agricultural Zoning from the BLM " Oregon_Washington Surface Management Ownership_2009, Ownership_poly."
	Confined animal feeding operations; OR Dept. of Agriculture (20080506)
	Hazardous Substance Information System; OR Dept. of Environmental Quality, Land Quality Section (26AUG2010)
	Mining permits; OR Dept. of Geology and Mineral Industries (16JAN2014)
	Solid waste permit site; OR Dept. of Environmental Quality, Land Quality, SWMS (28SEP2012)
	Domestic wastewater treatment & WQ permits; OR Dept. of Environmental Quality, Water Quality Program, SIS (28SEP2012)
	2010 Water Quality Limited (303(d)) streams; OR Dept. of Environmental Quality, Water Quality, Standards and Assessments (13SEPT2013)
	Streams with high soil erosion potential (w/in 300 ft NHD buffer); OR Dept. of Environmental Quality, Water Quality, Drinking Water Protection Program (28OCT2014)
	Streams from the National Hydrography Dataset (Flowline); U. S. Geologic Survey (08JAN2013)



Shallow Landslide Potential

Notes on the landslide potential base layer:

1. The shallow landslide potential model results displayed here is based on unpublished work by OR DEQ's Water Quality Program TMDL staff. The modeling technique is still under development and was designed specifically for the mid-coast area for Oregon. This work is unpublished; please contact Oregon DEQ's Environmental Solutions Division/Water Quality Program for further information on the model.
2. The landslide potential analysis uses the February1996 rainfall/flood event in Oregon as a worst case hydrologic scenario.

Land ownership (Bureau of Land Management)

Notes:

1. The dataset has been modified by grouping land owner categories in order to simplify data display on the map.
2. This GIS layer was created by the Drinking Water Protection Program using geospatial techniques and two different datasets; the National Agricultural Statistics Service 2007 " cdl_awifs_r_or_2007.tif" and Agricultural Zoning from the BLM " Oregon_Washington Surface Management Ownership_2009, Ownership_poly."

Note on Imagery_Mosaic2011 base layer:

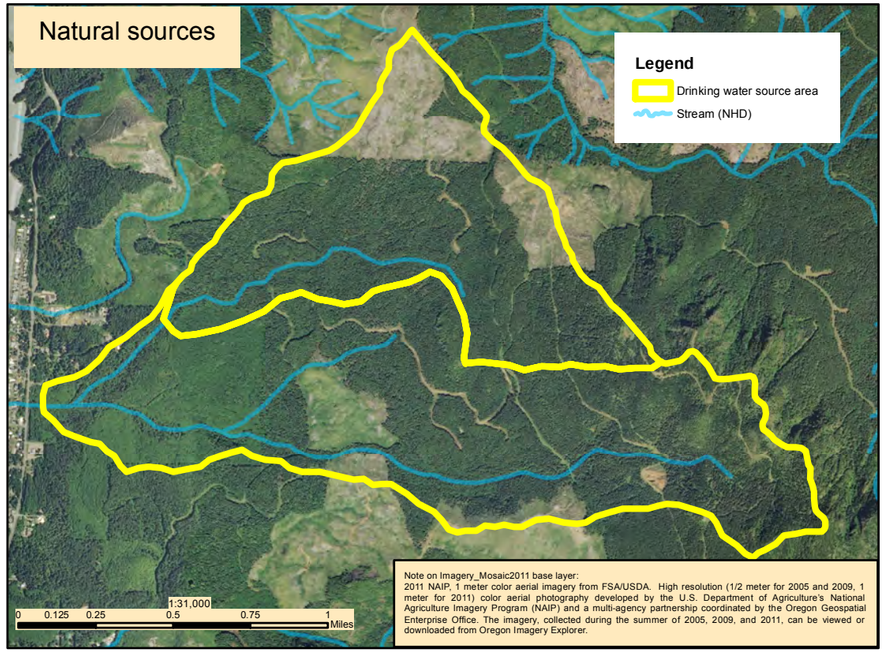
2011 NAIP, 1 meter color aerial imagery from FSA/USDA. High resolution (1/2 meter for 2005 and 2009, 1 meter for 2011) color aerial photography developed by the U.S. Department of Agriculture's National Agriculture Imagery Program (NAIP) and a multi-agency partnership coordinated by the Oregon Geospatial Enterprise Office. The imagery, collected during the summer of 2005, 2009, and 2011, can be viewed or downloaded from Oregon Imagery Explorer.

Figure 5. Example - Arch Cape Drinking Water Source Area
Anthropogenic & Natural Susceptibility Sources
(See Legend page for Figures 5 & 6 notes and symbol key.)

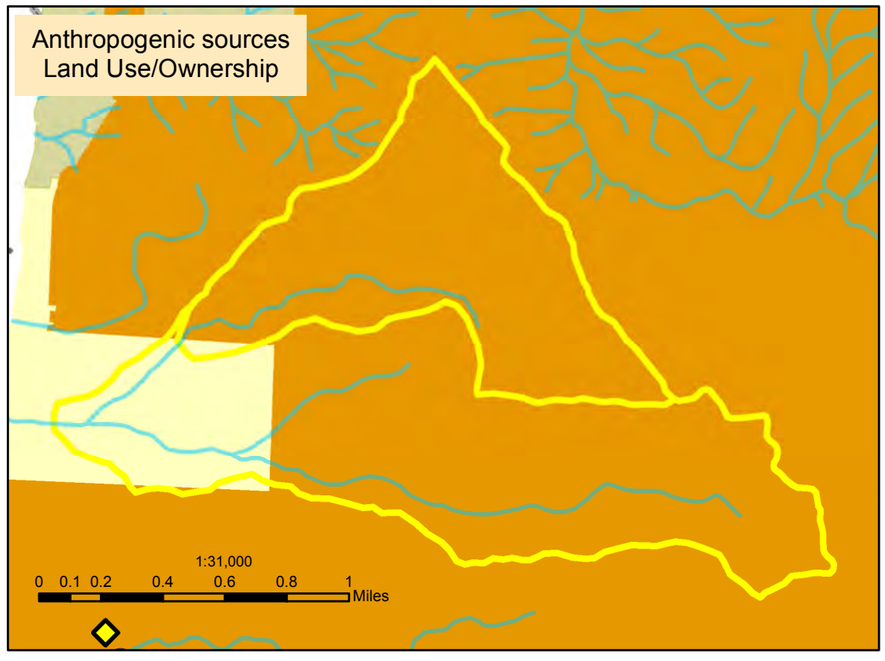
Oregon Health Authority

DEQ — State of Oregon Department of Environmental Quality

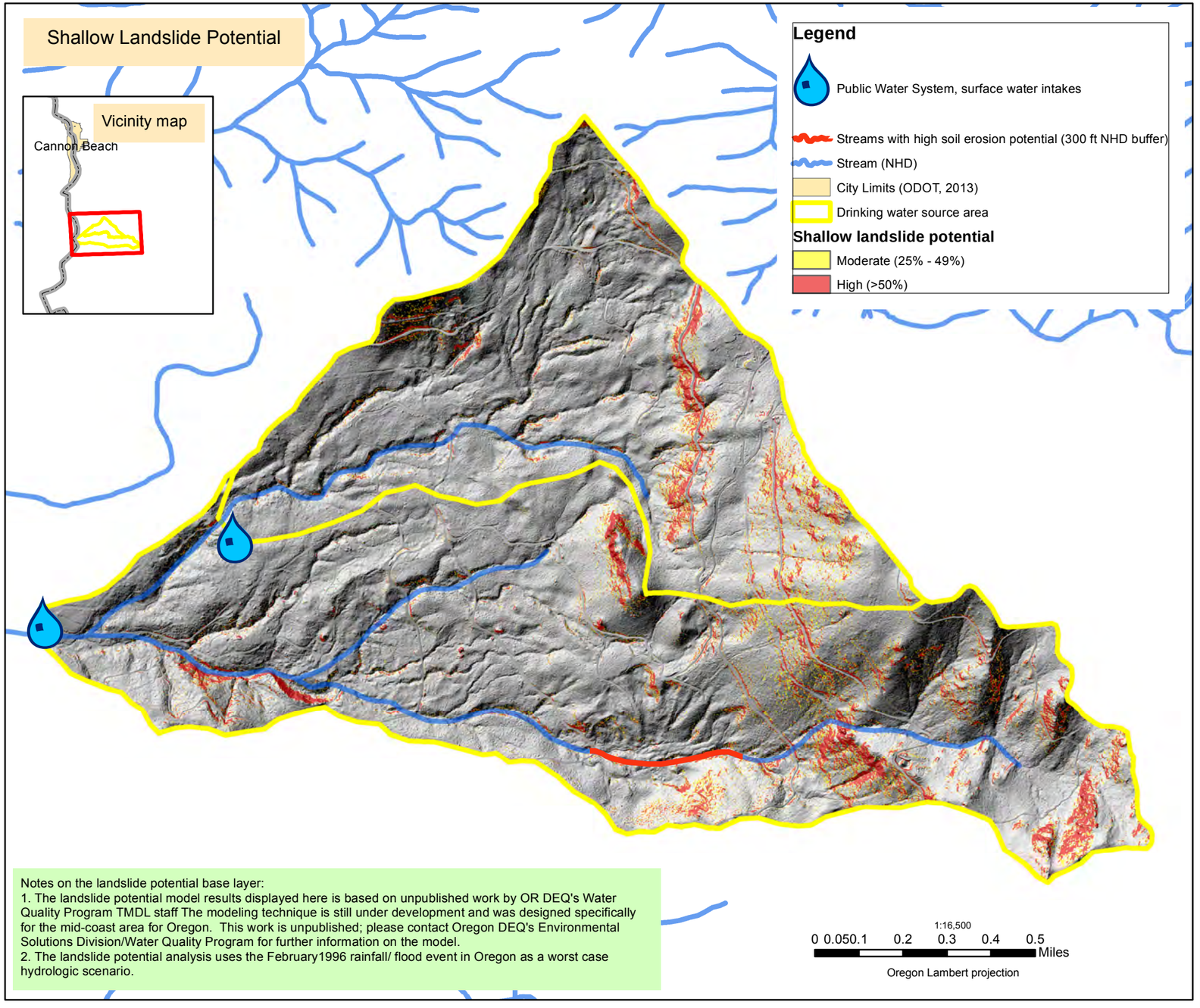
Natural sources



Anthropogenic sources
Land Use/Ownership



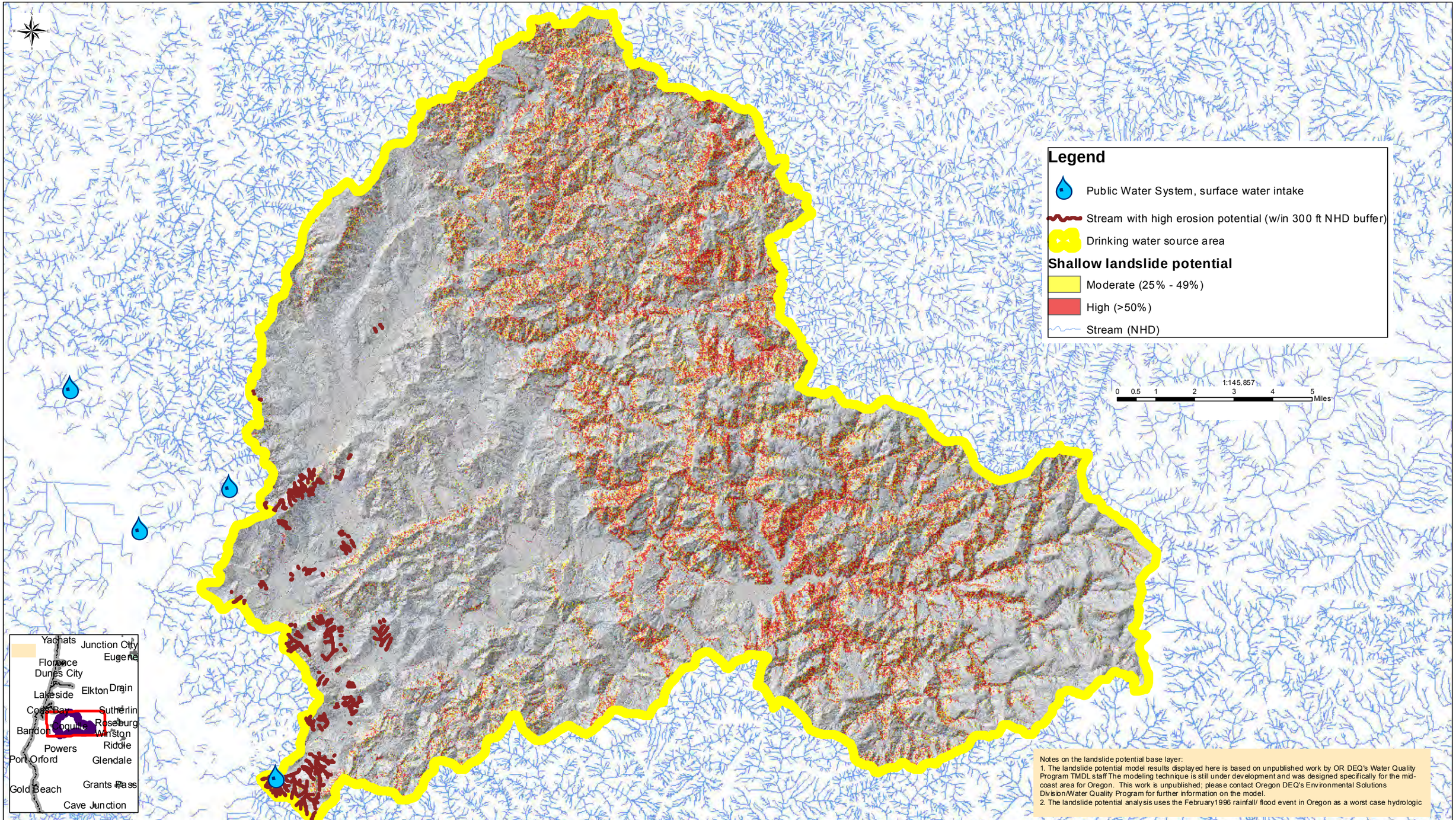
Shallow Landslide Potential



Notes on the landslide potential base layer:
1. The landslide potential model results displayed here is based on unpublished work by OR DEQ's Water Quality Program TMDL staff The modeling technique is still under development and was designed specifically for the mid-coast area for Oregon. This work is unpublished; please contact Oregon DEQ's Environmental Solutions Division/Water Quality Program for further information on the model.
2. The landslide potential analysis uses the February1996 rainfall/ flood event in Oregon as a worst case hydrologic scenario.

Oregon Department of Environmental Quality/Environmental Solutions Division/Water Quality Program
Drinking Water Protection Program/GIS
Projection: Oregon Lambert (Lambert Conformal Conic)
GCS_North_American_1983, Datum: D_North_American_1983
File:\\Deqhq1\dwp\PWSProjects\CoastalPWSResiliencyProject\Fig5_ArchCape_Drinking_Water_Source_Area.mxd
Prepared by: S. Aalbers (12DEC2015), Rev. 27JAN2015 (sda), Printed: 20FEB2015

Figure 6a. Example Myrtle Point Drinking Water Soure Area
Shallow Landslide Potential
(See Legend page for Figures 5 & 6 notes and symbol key.)

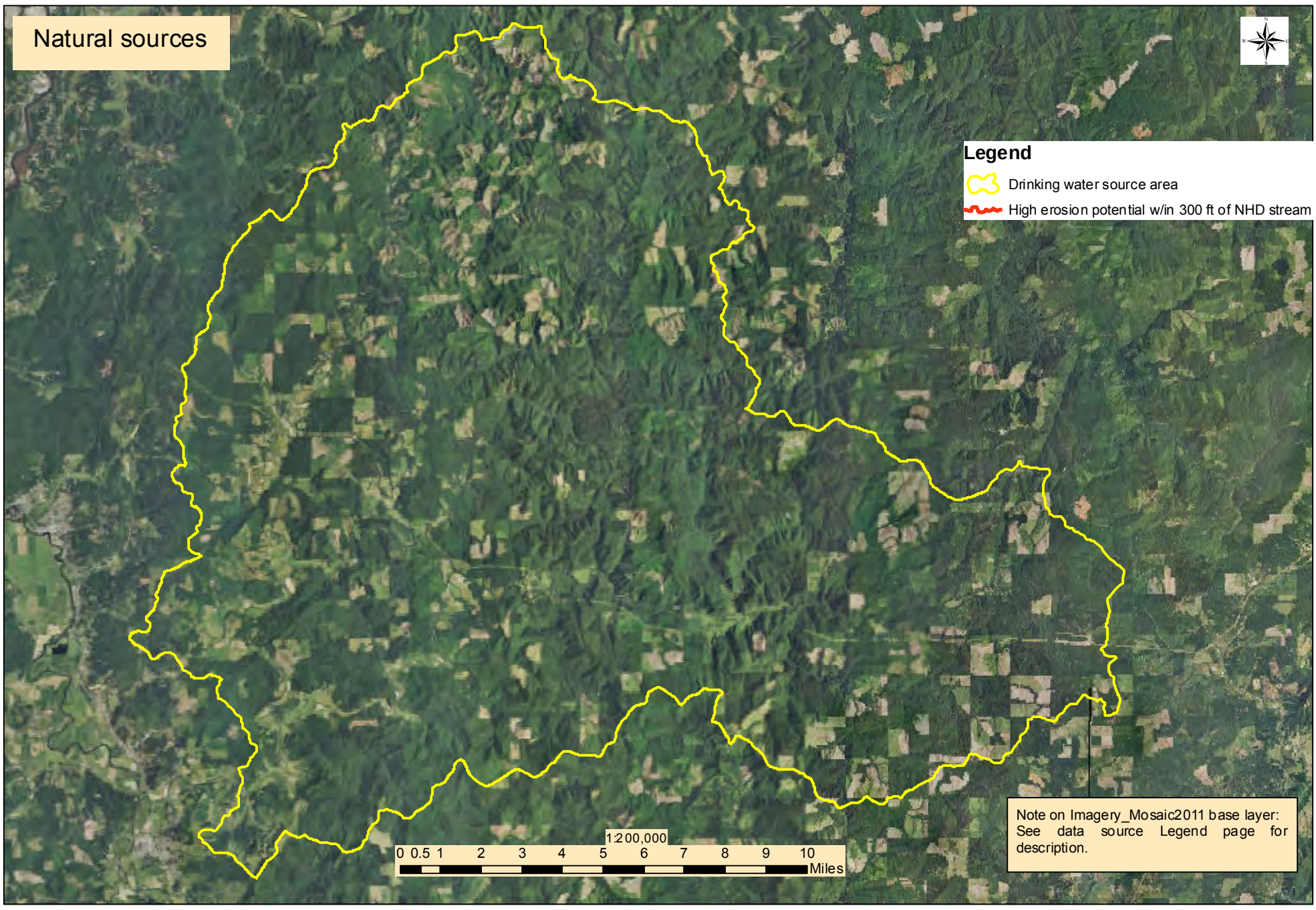


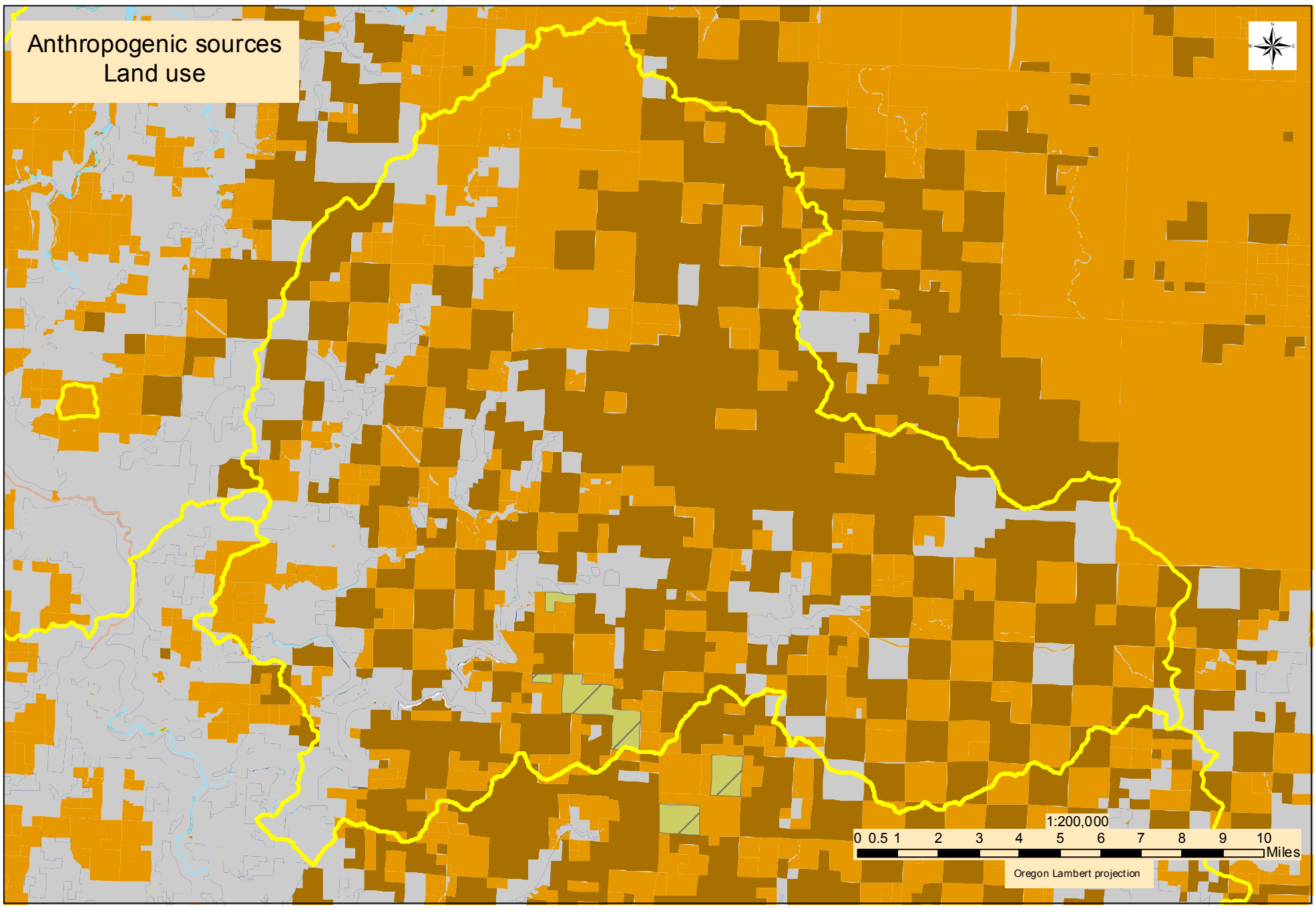
Notes on the landslide potential base layer:
1. The landslide potential model results displayed here is based on unpublished work by OR DEQ's Water Quality Program TMDL staff The modeling technique is still under development and was designed specifically for the mid-coast area for Oregon. This work is unpublished; please contact Oregon DEQ's Environmental Solutions Division/Water Quality Program for further information on the model.
2. The landslide potential analysis uses the February1996 rainfall/ flood event in Oregon as a worst case hydrologic

Oregon Department of Environmental Quality/Environmental Solutions Division/Water Quality Program
Drinking Water Protection Program/GIS
Projection: Oregon Lambert (Lambert Conformal Conic)
GCS_North_American_1983, Datum: D_North_American_1983
File: \\Deqhq1\dwp\PWSProjects\CoastalPWSResiliencyProject\Fig6a_Example_MrytlePoint_Drinking_Water_Source_Area - Shallow_Landslide_Potential.mxd
Prepared by: S. Aalbers (28JAN2015), Printed: 20FEB2015 (sda)

Note:
LiDAR data are from Oregon Department of Geology and Mineral Industries Lidar Data Quadrangles for the Oregon Coast. See the following web page for more details:
http://www.oregongeology.org/sub/projects/olc/default.htm

Figure 6b: Example - Myrtle Point Drinking Water Source Area
Anthropogenic & Natural Sources
(See Legend page for Figures 5 & 6 notes and symbol key.)





Oregon DEQ/Environmental Solutions Division/Water Quality Program/Drinking Water Protection Program/GIS
Projection: Oregon Lambert (Lambert Conformal Conic)
GCS_North_American_1983, Datum: D_North_American_1983
File: \\Deqhq1\dwp\PWSProjects\CoastalPWSResiliencyProject\Fig6b_Example_MrytlePoint_Drinking_Water_Source_Area - Natural_&_Anthropogenic_Sources.mxd
Prepared by: S. Aalbers (27JAN2015), Rev. 30JAN2014 (sda), Printed: 20FEB2015

Appendix 1

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.

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

WHAT IS THE SOURCE WATER COLLABORATIVE?

These national organizations have united to protect America's drinking water at the source – in the lakes, rivers, streams and aquifers we tap for drinking purposes. The Source Water Collaborative (SWC) was originally formed in 2006 with the goal to combine the strengths and tools of a diverse set of member organizations to act now, and protect drinking water sources for generations to come.

sourcewater COLLABORATIVE

Comprised of federal, state, and local partners, the SWC has come together to further the goals of protecting sources of drinking water – recognizing that resources are extremely limited, authorities are split, and the actors who can actually protect source waters are diffuse. Each national organization in the Collaborative understands and appreciates the importance of source water protection. Individually, each promotes implementation of source water protection in their overall mission. Each organization recognizes the synergy of coordinated actions and the need for leveraging each other's resources in order to increase the chances for success over each entity going it alone.

- American Planning Association
- American Water Works Association
- Association of Clean Water Administrators
- Association of Metropolitan Water Agencies
- Association of State and Territorial Health Officials
- Association of State Drinking Water Administrators
- Clean Water Action/Clean Water Fund
- Environmental Finance Center Network
- Ground Water Protection Council
- Groundwater Foundation
- National Association of Conservation Districts
- National Environmental Services Center
- National Ground Water Association
- National Rural Water Association
- North American Lake Management Society
- River Network
- Rural Community Assistance Partnership
- Smart Growth America
- U.S. Department of Agriculture - Natural Resources Conservation Service
- U.S. Environmental Protection Agency
- U.S. Forest Service (Northeastern Area)
- Water Systems Council

For a complete list of SWC members and available tools and resources, see www.sourcewatercollaborative.org.

Note: *All actions that EPA may take in furtherance of this statement are subject to the availability of appropriated funds and the parties to this agreement will not submit a claim to EPA for compensation for services rendered as part of this agreement. In signing this statement, none of the Source Water Collaborative member organizations, including the EPA, are obligating funds nor making a commitment to provide funding to any organization or individual in the future. Further, EPA cannot endorse the sale or purchase of products or services developed by the participating organizations.*

Appendix 2

Coastal Watershed Land Use and Susceptibility Analysis

Table 1. Summary of Land Use/Ownership

Table 2. Summary of Natural and Anthropogenic Potential Pollutants

Table 3. Summary of Water Quality Monitoring Date and Treatment Methods

Table 1. Summary of Land Use/Ownership

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Name	Drinking Water Source Name	Population (includes wholesale buyers) (1)	Number of Public Water Systems Served (1)	System Type (2)	Drinking Water Source Area Size (Sq.Mi.) (3)	Agricultural Land Use (%)	Private Industrial Forest Land Use (%)	Private (Rural/Non-industrial) Land Use (%)	Local Govt Land Use (%)	State Forest Land Use (%)	Other State Lands Land Use (%)	BLM Land Use (%)	USFS Land Use (%)	Tribal Land Use (%)	Other Land Use (Water) (%)	Notes
1	North	Clatsop	Lower Columbia	00063	Wickiup	Big Fat Buck and Little Creek	1,720	1	C	2.12	0.0%	**78.9%**	0.0%	**21.1%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80 acres adjacent to Little Cr. intake owned by PWS. City of Astoria ownes land in Big Fat Buck Cr. watershed but not near intake. Priv Ind. Forest in 3-4 land owners
2	North	Clatsop	Lower Columbia	00055	Astoria	Bear Creek, Cedar Creek and Middle Lake	11,272	6	C	4.27	0.0%	**4.9%**	0.0%	**95.1%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	City of Astoria owns most of watershed.
3	North	Clatsop	Lower Columbia	00062	Youngs River Lewis & Clark WD	North and South Forks Barney Creek	2,700	1	C	2.97	0.0%	**98.5%**	0.0%	**1.5%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Private Non-industrial - 40 acres adjacent to intake owned by PWS. Priv Ind. Forest all one land owner
4	North	Clatsop	Lower Columbia	00932	Warrenton	Big SF, Little SF, Camp C & Lewis & Clark River	10,545	2	C	28.71	0.0%	**93.0%**	0.0%	0.0%	0.0%	**7.0%**	0.0%	0.0%	0.0%	0.0%	Priv Ind. Forest all one land owner
5	North	Clatsop	Necanicum	00799	Seaside	South Fork Necanicum R. and Necanicum R.	6,672	2	C	55.10	**0.0%**	**89.2%**	**5.6%**	**2.6%**	**1.3%**	**1.2%**	0.0%	0.0%	0.0%	0.0%	~960 acres adjacent to SF Necanicum R. intake owned by PWS. ~55 acres adjacent to Necanicum R. intake owned by PWS. Private/rural residential for rest. Agricultural lands in North Coast Basin Ag WQMP Area. Priv Ind. Forest primarily all two land owners.
6	North	Clatsop	Necanicum	00164	Cannon Beach	Elk Creek - West Fork	1,690	1	C	8.25	0.0%	**99.1%**	0.0%	**0.7%**	**0.0%**	**0.2%**	0.0%	0.0%	0.0%	0.0%	~200 acres adjacent to intake owned by water district. Priv Ind. Forest primarily all two land owners.
7	North	Clatsop	Necanicum	00802	Arch Cape WD	Shark and Asbury Creek	110	1	C	1.95	0.0%	**86.6%**	**13.4%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Priv Ind. Forest primarily all two land owners
8	North	Tillamook	Nehalem	00505	Manzanita	West & MiddleFork Anderson Creek	3,200	1	C	0.89	0.0%	**91.8%**	0.0%	**8.2%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Some acreage adjacent to West Fork and Anderson Creek intakes owned by Nehalem PWS. Remaining upper portion of watersheds owned by one Priv Ind. Forest owner
9	North	Tillamook	Nehalem	00554	Nehalem	Bob's Creek	1,700	1	C	0.66	0.0%	**10.0%**	0.0%	**90.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	~800 acres of watershed and surrounding area owned by PWS . 90% of watershed is owned by City of Nehalem - remaining upper portion by one Priv Ind. Forest owner
10	North	Tillamook	Nehalem	00708	Rockaway Beach	Jetty Creek	2,600	1	C	2.05	0.0%	**100.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Priv Ind. Forest by two land owners.
11	North	Tillamook	Wilson-Trask-Nestucca	00585	Oceanside	Short Creek	615	1	C	2.04	0.0%	**99.9%**	**0.1%**	**0.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Priv Ind. Forest by two land owners.
12	North	Tillamook	Wilson-Trask-Nestucca	00556	Netarts	East Fall Creek (West Fall Creek not delineated)	1,800	1	C	0.57	0.0%	**100.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Priv Ind. Forest by two land owners.
13	North	Tillamook	Wilson-Trask-Nestucca	00893	Tillamook	Killam & Fawcett Creek	7,383	11	C	9.65	**0.0%**	**32.1%**	**2.2%**	**38.4%**	**26.9%**	**0.5%**	0.0%	0.0%	0.0%	0.0%	~2400 acres in both intake watersheds (mostly near Killiam Creek intake) owned by PWS. Priv Ind. Forest by one land owner
14	North	Tillamook	Wilson-Trask-Nestucca	00199	Beaver	Beaver Water District	600	1	C	29.14	**5.7%**	**42.2%**	**8.9%**	0.0%	**9.8%**	**0.3%**	**8.9%**	**24.2%**	0.0%	0.0%	Agricultural lands in North Coast Basin Ag WQMP Area. Multiple landowners - Priv Ind. Forest is primarily by two land owners
15	North	Tillamook	Wilson-Trask-Nestucca	00610	Tierra Del Mar	Beltz Creek	150	1	C	0.25	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**100.0%**	0.0%	0.0%	US Forest Service
16	North	Tillamook	Wilson-Trask-Nestucca	00970	Neskowin	Hawk Creek	300	1	C	2.41	0.0%	**76.1%**	**13.2%**	0.0%	0.0%	0.0%	0.0%	**10.7%**	0.0%	0.0%	Upper watershed one Priv Ind. Forest owner; lower has 4 owners with smaller tracts
17	North	Washington	Nehalem	00898	Timber WA	Nehalem River	180	1	C	12.17	0.0%	**9.5%**	**4.5%**	0.0%	**86.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	Primarily Tillamook State Forest
18	North	Columbia	Nehalem	05737	Berndt Creek Water	Rock Creek	14	1	C	55.16	0.0%	**68.0%**	**3.3%**	0.0%	**28.6%**	**0.1%**	0.0%	0.0%	0.0%	0.0%	Multiple land owners including Priv Ind. Forest and State Forest
19	North	Columbia	Nehalem	00922	Vernonia	Rock Creek	2,475	1	C	5.56	0.0%	**69.2%**	**29.9%**	**0.8%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Agricultural lands in North Coast Basin Ag WQMP Area. Multiple land owners.
20	North	Columbia	Nehalem	00124	Fishhawk Lake Rec. Club	Fishhawk Creek	350	1	C	15.63	0.0%	**40.3%**	**4.3%**	**0.0%**	31.5%	23.9%	0.0%	0.0%	0.0%	0.0%	Multiple private landowners, State forest in upper watershed

Table 1. Summary of Land Use/Ownership

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Name	Drinking Water Source Name	Population (includes wholesale buyers) (1)	Number of Public Water Systems Served (1)	System Type (2)	Drinking Water Source Area Size (Sq.Mi.) (3)	Agricultural Land Use (%)	Private Industrial Forest Land Use (%)	Private (Rural/Non-industrial) Land Use (%)	Local Govt Land Use (%)	State Forest Land Use (%)	Other State Lands Land Use (%)	BLM Land Use (%)	USFS Land Use (%)	Tribal Land Use (%)	Other Land Use (Water) (%)	Notes
21	Mid	Lincoln	Siletz-Yaquina	00603	Panther Creek WD	Panther Creek	680	1	C	1.73	0.0%	**28.5%**	**4.4%**	0.0%	0.0%	0.0%	**2.7%**	**64.4%**	0.0%	0.0%	Small parcel near intake owned by water district; upper watershed primarily 2 Priv Ind. Forest owners; multiple private owners in lower watershed
22	Mid	Lincoln	Siletz-Yaquina	00483	Lincoln City	Schooner Creek	20,830	1	C	14.98	0.0%	**22.2%**	**7.5%**	**0.1%**	0.0%	0.0%	**3.2%**	**67.0%**	0.0%	0.0%	Priv Ind. Forest is primarily 2 owners with many small private lots also.
23	Mid	Lincoln	Siletz-Yaquina	00324	Kernville-Gleneden-Lincoln Beach WD	Drift Creek	4,158	2	C	34.72	0.0%	**44.9%**	**0.0%**	**0.0%**	0.0%	0.0%	**8.3%**	**46.7%**	0.0%	0.0%	9.2 acres parcel near intake owned by water district. Priv Ind. Forest near intake owned by 2 owners (may be high priority for acquisition). US Forest Service thru most of lower watershed. Priv Ind. Forest in upper 1/3 of watershed.
24	Mid	Lincoln	Siletz-Yaquina	00254	Depoe Bay	South & North Depoe Bay Creek, Rocky Creek	1,398	1	C	10.46	0.0%	**93.7%**	**5.1%**	**0.6%**	0.0%	0.0%	**0.6%**	0.0%	0.0%	0.0%	Priv Ind. Forest by one land owner
25	Mid	Lincoln	Siletz-Yaquina	01072	Johnson Cr. Wtr. Srvc.	Johnson Creek	340	1	C	1.03	0.0%	**95.8%**	**4.2%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Priv Ind. Forest by two land owners
26	Mid	Lincoln	Siletz-Yaquina	00568	Beverly Beach	Wade Creek	150	1	C	2.28	0.0%	**100.0%**	**0.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Priv Ind. Forest by two land owners
27	Mid	Lincoln	Nehalem	00566	Newport (Big Cr.)	Big Creek	10,160	1	C	3.18	0.0%	**68.9%**	**6.3%**	**24.9%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	~533 acres owned by PWS. Lower watershed owned by City of Newport and small rural residential parcels. Primarily three Priv Ind. Forest owners in upper watershed.
28	Mid	Lincoln	Siletz-Yaquina	00821	Siletz (Tangerman)	Tangerman Creek	1,200	1	C	0.46	**0.0%**	**88.2%**	**9.8%**	**1.2%**	0.0%	0.0%	**0.8%**	0.0%	0.0%	0.0%	~5 acres owned by PWS. Small parcel near intake owned by water district - rest is one Priv Ind. Forest owner
29	Mid	Lincoln	Siletz-Yaquina	00899	Toledo (Mill)	Mill Creek (Oct. - May)	8,820	2	C	4.15	0.0%	**23.3%**	**0.0%**	**13.8%**	0.0%	0.0%	0.0%	**62.8%**	0.0%	0.0%	Lower watershed owned by City. US Forest Service land and one Priv Ind. Forest owner in upper watershed
30	Mid	Lincoln	Siletz-Yaquina	00566 00821 00899	Newport, Siletz, Toledo Water Utilities (Siletz R.)	Siletz River	20,180	4	C	204.32	**1.7%**	**74.8%**	**4.4%**	**0.0%**	**5.2%**	**1.1%**	**10.4%**	0.0%	**2.4%**	0.0%	Agricultural lands in Mid Coast Ag WQMP Area. Two Priv Ind. Forest owners and multiple small rural residential(?) lots
31	Mid	Lincoln	Siletz-Yaquina	00564	Bay Hills	Unnamed Creek	45	1	C	0.04	0.0%	**8.4%**	**11.9%**	**79.7%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Small watershed primarily owned by water district
32	Mid	Lincoln	Alsea	00926	Waldport	North & South Fork Weist Creek & Eckman Creek	3,000	1	C	4.98	0.0%	**17.0%**	**10.3%**	0.0%	**0.9%**	0.0%	**2.5%**	**69.4%**	0.0%	0.0%	US Forest Service/BLM near Weist Cr. Intakes; Priv Ind. Forest primarily one owner and several other private lots.
33	Mid	Lincoln	Alsea	00925	SW Lincoln Co. WD	Starr, Dicks Fork, Big, Vingie Creeks	3,000	1	C	5.39	0.0%	0.0%	**0.6%**	0.0%	0.0%	0.0%	0.0%	**99.4%**	0.0%	0.0%	Private lot near Vingie Cr. intake - high potential for acquisition; rest is US Forest Service and BLM
34	Mid	Lincoln	Alsea	00966	Yachats	Salmon and Reedy Creek	1,000	1	C	1.21	0.0%	**23.1%**	0.0%	**1.9%**	0.0%	0.0%	0.0%	**75.0%**	0.0%	0.0%	~10 acres near Salmon Cr. Intake owned by PWS. Lot near Salmon Cr. intake owned by water district. 2 large lots in lower watershed owned by investment co (possible development) high priority for protection. Rest by US Forest Service/BLM
35	Mid	Lane	Siuslaw	00301	**Heceta WD**	Clear Lake	4,500	1	C	0.96	0.0%	**5.0%**	**65.7%**	**1.1%**	0.0%	0.0%	0.0%	0.0%	0.0%	**28.2%**	manually adjusted "undetermined" areas of the land use layer (94%) to reflect primarily residential and undeveloped private lands (~64%) and water (~30%) . all private lots
36	Mid	Lane	Siuslaw	00507	Mapleton WD	Berkshire Creek	750	1	C	0.78	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**100.0%**	0.0%	0.0%	US Forest Service
37	Mid	Lane	Siltcoos	00304	Alderwood WDC	Woahink Lake	35	1	C	6.77	0.0%	**29.3%**	**46.9%**	0.0%	0.0%	**6.1%**	**0.0%**	0.0%	0.0%	**17.7%**	Multiple small lots; Priv Ind. Forest primarily one owner
38	Mid	Lane	Siltcoos	00302	South Coast WD	Siltcoos Lake	150	1	C	61.98	**0.1%**	**32.6%**	**15.7%**	0.0%	0.0%	**0.1%**	**2.0%**	**41.3%**	0.0%	**8.1%**	Agricultural lands in Mid Coast Ag WQMP Area. Priv Ind. Forest primarily three owners
39	South	Douglas	Coos	00699	Reedsport	Clear Lake	4,784	1	C	2.16	**0.3%**	**37.6%**	**20.9%**	0.0%	0.0%	**6.9%**	0.0%	**12.2%**	0.0%	**22.0%**	Tax lot data not available for Douglas Co.
40	South	Coos	Coos	00463	Lakeside WD	Eel Lake	1,700	1	C	6.05	0.0%	**56.5%**	**23.6%**	0.0%	0.0%	**10.3%**	0.0%	0.0%	0.0%	**9.6%**	Area near intake State of Oregon and Bandon Biota ("residential-unimproved"). Tax lot data not available for Douglas Co.
41	South	Coos	Coos	00205	Coos Bay/North Bend	Pony Creek/Merritt Lake	38,000	1	C	4.00	0.0%	**0.5%**	**10.5%**	88.9%	0.0%	**0.0%**	0.0%	0.0%	0.0%	**0.0%**	Most of watershed owned by water district.

Table 1. Summary of Land Use/Ownership

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Name	Drinking Water Source Name	Population (includes wholesale buyers) (1)	Number of Public Water Systems Served (1)	System Type (2)	Drinking Water Source Area Size (Sq.Mi.) (3)	Agricultural Land Use (%)	Private Industrial Forest Land Use (%)	Private (Rural/Non-industrial) Land Use (%)	Local Govt Land Use (%)	State Forest Land Use (%)	Other State Lands Land Use (%)	BLM Land Use (%)	USFS Land Use (%)	Tribal Land Use (%)	Other Land Use (Water) (%)	Notes
41	South	Coos	Coquille	00214	Garden Valley WA	China Creek	30	1	C	0.66	0.0%	**99.0%**	**1.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	One Priv Ind. Forest owner
42	South	Coos	Coquille	05581	Weiss Estates	Fahy's Lake	27	1	C	1.61	**40.8%**	0.0%	**59.2%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Agricultural lands in Coos-Coquille Ag WQMP Area. Multiple small owners - Bandon golf course and residential near intake and upper watershed all cranberry bogs
43	South	Coos	Coquille	00074	Bandon	Ferry and Geiger Creek	3,000	1	C	3.99	**19.4%**	**0.3%**	**66.3%**	**14.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	~.25 sq mile around intakes owned by PWS and 0.3 sq mile parcel in upper watershed owned by PWS. Agricultural lands in Coos-Coquille Ag WQMP Area. Lots near intake owned by water district. Cranberry bogs and forest with multiple landowners throughout rest of watershed.
44	South	Coos	Coquille	00213	Coquille	Coquille River and Rink Creek	4,935	4	C	494.49	**12.9%**	**44.3%**	**18.4%**	**0.2%**	0.0%	**0.0%**	**21.0%**	**1.8%**	**1.3%**	**0.1%**	Rink Cr. watershed owned by PWS. Agricultural lands in Coos-Coquille Ag WQMP Area. Coquille R. watershed has multiple lots; lots of AG/farms; and Priv Ind. Forest by multiple land owners.
45	South	COOS	Coquille	00551	Myrtle Point	North Fork Coquille River	2,451	1	C	282.70	**6.1%**	**34.8%**	**13.3%**	**0.0%**	0.0%	0.0%	**44.9%**	0.0%	**0.7%**	**0.1%**	Agricultural lands in Coos-Coquille Ag WQMP Area. Multiple lots; lots of AG/Farms; Priv Ind. Forest by multiple land owners
46	South	Coos	Coquille	00672	Powers	South Fork (Coquille River) and Bingham Cr.	750	1	C	147.39	**0.7%**	**31.6%**	**2.3%**	**0.1%**	0.0%	**0.0%**	**0.3%**	**65.0%**	0.0%	**0.0%**	<1 acre near Coquille R. intake owned by PWS. ~1/3 of Bingham Cr. watershed owned by PWS. Small parcel near intake owned by water district; Priv Ind. Forest = primarily one land owner
47	South	Curry	Sixes	00466	Langlois WD	Floras Creek	232	1	C	61.02	**4.4%**	**37.9%**	**49.8%**	0.0%	0.0%	0.0%	**7.9%**	0.0%	0.0%	0.0%	Agricultural lands in Curry Ag WQMP Area. Tax lot data not available for Curry Co.
48	South	Curry	Sixes	00670	Port Orford	Hubbard Creek and Garrison Lake (Emergency)	1,135	1	C	4.45	**4.2%**	**5.1%**	**86.3%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**4.4%**	Agricultural lands in Curry Ag WQMP Area. Tax lot data not available for Curry Co.
49	South	Curry	Chetco	01062	Rainbow Rock Village MHP	Taylor Creek Wells - Well #2	200	1	C	1.62	**0.1%**	**1.1%**	**98.8%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Tax lot data not available for Curry Co.
50	South	Curry	Chetco	01361	Rainbow Rock Condos	Unnamed Creek	80	1	C	0.24	**0.1%**	0.0%	**99.9%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	Tax lot data not available for Curry Co.
GW - SW is inactive/ Emerg.	North	Tillamook	Nehalem	00952	Wheeler	Vosburg and Jarvis Creek ("Abandoned" as of 04/03/2003)	360	2	C	0.57		**98.3%**	**1.7%**				0.0%	0.0%			~13 acres adjacent to Jarvis Cr. intake owned by PWS. Priv Ind. Forest by one land owner.
Observations:	20 PWSs North Coast 17 PWSs Mid Coast 13 PWSs South Coast	7 Clatsop 1 Washington 3 Columbia 9 Tillamook 13 Lincoln 4 Lane 1 Douglas 8 Coos 4 Curry					32% (16/50) PWSs serve < 3,300 people 75% (37/50) PWSs serve < 3,300 people	32% (16/50) PWSs serve < 3,300 people 75% (37/50) PWSs serve < 3,300 people													Many PWSs own land near their intake. Report provides recommendations for land use in water district owned areas that supports drinking water quality goals. Note that South Coast PWS DWSAs are characterized by many relatively small lots with private residential, rural residential, and agricultural ownership. Mid Coast and North Coast have much more large lots dominate by private timber.

Notes:

(1) There are independent public water systems that purchase water from the water systems listed and distribute it within their service areas. The total population served listed includes these "wholesale" customers and the total number of PWSs using the source water is also provided.

(2) System Type

C - "Community Water System (C)" means a public water system that has 15 or more service connections used by year-round residents, or that regularly serves 25 or more year-round residents.

NTNC - "Non-Transient Non-Community Water System (NTNC)" means a public water system that is not a Community Water System and that regularly serves at least 25 of the same persons over 6 months per year.

NC - "Transient Non-Community Water System (NC)" means a public water system that serves a transient population of 25 or more persons.

(3) DWSA - drinking water source area - delineated as the 5th-field watershed upstream of the intake. Note that Oregon's surface water source areas are delineated intake to intake. For watersheds with more than one intake, the DWSA is the watershed segment from the PWSs intake to the next intake upstream. All protection areas upstream of a specific water system's intake are included in the drinking water source area for that water system and PWSs are encouraged to work with other water providers and other entities within the Subbasin as they evaluate land use and move forward with developing protection strategies.

(4) Data Sources:

(a) USFS and BLM land calculation based on GIS data (BLM OR Management Ownership Dissolve Polygon) obtained from BLM at: http://www.blm.gov/or/gis/data-details.php?id=425. Publication date: 20130718

(b) Private industrial forest land - from data entitled "Private_Industrial_2006_ORLambert.shp" from the Oregon Dept. of Forestry (ODF) last updated in 2013 and BLM OR Management Ownership Layer last updated 2013.

(c) Agricultural land combination of agricultural land zoning from DLCD and NASS data from NRCS

(d) Local govt - combined from BLM ownership and individual tax lot data from counties

(e) all other catagories (BLM, USFS, State, etc) from BLM 06202013 data

NA- Not applicable

Table 2. Summary of Natural and Anthropogenic Potential Pollutants

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Name	Drinking Water Source Name	Drinking Water Source Area Size (Sq.Mi.) [1]	Stream Miles in DWSA	High Soil Erosion Potential Percent (% stream mi w/ high erosion located w/in 300' of the stream)[2]	Percent DWSA w/ High to Mod. Shallow Landslide Potential [3]	Relative risk ranking for percent DWSA w/ Higher to Mod. Shallow Landslide Potential [4]	Mapped landslides present? [5]	Quarry (DOGAMI)	Boat Ramp (OSMB)	Marina (OSMB)	CAFO (ODA)	WWTP (DEQ)	Haz Mat Storage/Use (DEQ/SFM)	SWMS/Landfill (DEQ)	Other	No identified PCSs	Potential Pollutants (DOGAMI Gravel mines, OSMB boating, CAFOs, SFM, RegDB)
1	North	Clatsop	Lower Columbia	00063	Wickiup	Big Fat Buck and Little Creek	2.12	6.48	0.0%	N/A (no LIDAR)	N/A	yes but mapped as inactive									**N**	none
2	North	Clatsop	Lower Columbia	00055	Astoria	Bear Creek, Cedar Creek and Middle Lake	4.27	14.52	0.0%	N/A (no LIDAR)	N/A	yes but mapped as inactive									N	none
3	North	Clatsop	Lower Columbia	00062	Youngs River Lewis & Clark WD	North and South Forks Barney Creek	2.97	7.42	82.8%	N/A (no LIDAR)	N/A	yes but mapped as inactive									**N**	none
4	North	Clatsop	Lower Columbia	00932	Warrenton	Big SF, Little SF, Camp C & Lewis & Clark River	28.71	78.84	45.8%	N/A (no LIDAR)	N/A	yes but mapped as inactive									**N**	none
5	North	Clatsop	Necanicum	00799	Seaside	South Fork Necanicum R. and Necanicum R.	55.10	127.39	13.1%	4.5%	Lower	yes - historic slides and major landslide deposits mapped as inactive. Historic slides mapped along 101 near Necanicum R. intake.	**Y**	**Y**				**Y**		compost		Klootchy Creek Park boat ramp, Compost operation, basalt/gravel mine (1 close to intake), several regDB sites inc. SFM, ECSI, UST LUST, SIS, HW
6	North	Clatsop	Necanicum	00164	Cannon Beach	Elk Creek - West Fork	8.25	75.70	38.9%	14.9%	Mod	yes but mapped as inactive									**N**	none
7	North	Clatsop	Necanicum	00802	Arch Cape WD	Shark and Asbury Creek	1.95	4.58	7.8%	9.9%	Lower	yes but mapped as inactive									**N**	none
8	North	Tillamook	Nehalem	00505	Manzanita	West & MiddleFork Anderson Creek	0.89	7.91	2.8%	13.7%	Mod	yes but mapped as inactive									**N**	none
9	North	Tillamook	Nehalem	00554	Nehalem	Bob's Creek	0.66	7.30	41.0%	20.3%	Higher	yes but mapped as inactive									**N**	none
10	North	Tillamook	Nehalem	00708	Rockaway Beach	Jetty Creek	2.05	23.30	0.0%	12.5%	Mod	landslide areas mapped near intake and in mid-watershed									**N**	none
11	North	Tillamook	Wilson-Trask-Nestucca	00585	Oceanside	Short Creek	2.04	20.83	100.0%	6.9%	Lower	no mapped landslide areas	**Y**									gravel mining in upper watershed
12	North	Tillamook	Wilson-Trask-Nestucca	00556	Netarts	East Fall Creek (West Fall Creek not delineated)	0.57	4.37	100.0%	1.8%	Lower	landslide areas mapped near intake; 2 historic landslides mapped in upper watershed	**Y**									gravel mining in upper watershed
13	North	Tillamook	Wilson-Trask-Nestucca	00893	Tillamook	Killam & Fawcett Creek	9.65	70.00	22.0%	16.0%	Higher	yes - near intake and upper watershed. Earth flow (2014) mapped in upper watershed for Fawcett Cr.									**N**	none

Table 2. Summary of Natural and Anthropogenic Potential Pollutants

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Name	Drinking Water Source Name	Drinking Water Source Area Size (Sq.Mi.) [1]	Stream Miles in DWSA	High Soil Erosion Potential Percent (% stream mi w/ high erosion located w/in 300' of the stream)[2]	Percent DWSA w/ High to Mod. Shallow Landslide Potential [3]	Relative risk ranking for percent DWSA w/ Higher to Mod. Shallow Landslide Potential [4]	Mapped landslides present? [5]	Quarry (DOGAMI)	Boat Ramp (OSMB)	Marina (OSMB)	CAFO (ODA)	WWTP (DEQ)	Haz Mat Storage/Use (DEQ/SFM)	SWMS/Landfill (DEQ)	Other	No identified PCSs	Potential Pollutants (DOGAMI Gravel mines, OSMB boating, CAFOs, SFM, RegDB)
14	North	Tillamook	Wilson-Trask-Nestucca	00199	Beaver	Beaver Water District	29.14	216.28	47.5%	15.3%	Higher	yes - landslide areas mapped in upper watershed. Several landslide points mapped including 3 earth flows near intake suggesting due to "recent clear cut"				Y		Y		onsite		Large capacity septic system (onsite) near intake, 2 small CAFOs, UST, HW, SFM
15	North	Tillamook	Wilson-Trask-Nestucca	00610	Tierra Del Mar	Beltz Creek	0.25	1.94	100.0%	12.7%	Mod	none									N	
16	North	Tillamook	Wilson-Trask-Nestucca	00970	Neskowin	Hawk Creek	2.41	20.81	100.0%	14.3%	Mod	landslide areas mapped in mid-watershed and 2 historic slides mapped									N	none
17	North	Washington	Nehalem	00898	Timber WA	Nehalem River	12.17	26.40	0.0%	6.4%	Lower	yes but very limited									N	none
18	North	Columbia	Nehalem	05737	Berndt Creek Water	Rock Creek	55.16	119.43	59.5%	3.1%	Lower	multiple historic landslides mapped	Y									1 basalt mine - closed
19	North	Columbia	Nehalem	00922	Vernonia	Rock Creek	5.56	9.35	6.1%	1.0%	Lower	yes - mapped as inactive.						Y				HW, SFM, UST, LUST
20	North	Columbia	Nehalem	00124	Fishhawk Lake Rec. Club	Fishhawk Creek	15.63			3.1%	Lower	small areas throughout watershed with earth flows mapped due to natural factors and recent clear cuts.									N	none (HW/fuels @water treatment plant)
21	Mid	Lincoln	Siletz-Yaquina	00603	Panther Creek WD	Panther Creek	1.73	11.41	100.0%	6.0%	Lower	landslide areas mapped in mid-watershed	Y									1 sand & gravel mine
22	Mid	Lincoln	Siletz-Yaquina	00483	Lincoln City	Schooner Creek	14.98	93.20	100.0%	14.5%	Mod	landslide areas mapped in mid-watershed									N	none
23	Mid	Lincoln	Siletz-Yaquina	00324	Kernville-Gleneden-Lincoln Beach WD	Drift Creek	34.72	213.12	60.5%	21.1%	Higher	landslide areas mapped in mid-watershed									N	none
24	Mid	Lincoln	Siletz-Yaquina	00254	Depoe Bay	South & North Depoe Bay Creek, Rocky Creek	10.46	79.91	96.2%	12.0%	Mod	landslide areas mapped throughout watershed		Y	Y			Y				boat launch, marina, limited haz. mat storage.
25	Mid	Lincoln	Siletz-Yaquina	01072	Johnson Creek Wtr. Srvc.	Johnson Creek	1.03	7.38	68.2%	15.2%	Higher	landslide areas mapped in mid-watershed									N	none
26	Mid	Lincoln	Siletz-Yaquina	00568	Beverly Beach	Wade Creek	2.28	15.29	69.9%	15.9%	Higher	none									N	none
27	Mid	Lincoln	Nehalem	00566	Newport (Big Cr.)	Big Creek	3.18	20.98	88.5%	14.6%	Mod	landslide areas mapped near intake	Y									1 gravel mine
28	Mid	Lincoln	Siletz-Yaquina	00821	Siletz (Tangerman)	Tangerman Creek	0.46	2.77	52.2%	7.8%	Lower	none									N	none
29	Mid	Lincoln	Siletz-Yaquina	00899	Toledo (Mill)	Mill Creek (Oct. - May)	4.15	28.06	0.1%	16.7%	Higher	very limited									N	none

Table 2. Summary of Natural and Anthropogenic Potential Pollutants

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Name	Drinking Water Source Name	Drinking Water Source Area Size (Sq.Mi.) [1]	Stream Miles in DWSA	High Soil Erosion Potential Percent (% stream mi w/ high erosion located w/in 300' of the stream)[2]	Percent DWSA w/ High to Mod. Shallow Landslide Potential [3]	Relative risk ranking for percent DWSA w/ Higher to Mod. Shallow Landslide Potential [4]	Mapped landslides present? [5]	Quarry (DOGAMI)	Boat Ramp (OSMB)	Marina (OSMB)	CAFO (ODA)	WWTP (DEQ)	Haz Mat Storage/Use (DEQ/SFM)	SWMS/Landfill (DEQ)	Other	No identified PCSs	Potential Pollutants (DOGAMI Gravel mines, OSMB boating, CAFOs, SFM, RegDB)
29	Mid	Lincoln	Siletz-Yaquina	00566 00821 00899	Newport, Siletz, Toledo Water Utilities (Siletz R.)	Siletz River	204.32	213.12	5.3%	14.1%	Mod	small areas throughout watershed	Y	Y				Y				Boat launches, gravel mines, HW, 3 ECSI in upper watershed, SFM
30	Mid	Lincoln	Siletz-Yaquina	00564	Bay Hills	Unnamed Creek	0.04	0.23	100.0%	11.5%	Mod	landslide areas mapped near intake									N	none
31	Mid	Lincoln	Alsea	00926	Waldport	North & South Fork Weist Creek & Eckman Creek	4.98	34.61	99.9%	3.1%	Lower	none									N	none
35	Mid	Lane	Siuslaw	00507	Mapleton WD	Berkshire Creek	0.78	6.53	100.0%	N/A (no LIDAR)	N/A (no LIDAR)	none									N	none
36	Mid	Lane	Siltcoos	00304	Alderwood WDC	Woahink Lake	6.77	35.62	70.6%	3.5%	Lower	limited landslide deposits mapped						Y		LCSS (onsite)		septic system/UICs at Honeyman, boat ramps, commercial trucking facilities/gas stations with UST, haz mat and stormwater permits
37	Mid	Lane	Siltcoos	00302	South Coast WD	Siltcoos Lake	61.98	682.95	89.5%	23.0%	Higher	multiple historic landslide points and deposits throughout watershed.		Y	Y							multiple boat ramps and marina
38	South	Douglas	Coos	00699	Reedsport	Clear Lake	2.16	10.47	19.4%	8.0%	Lower	none									N	none
39	South	Coos	Coos	00463	Lakeside WD	Eel Lake	6.05	40.23	81.5%	19.5%	Higher	Mapped landslides present		Y	?							boat ramp, Tugman St. Park UICs
40	South	Coos	Coos	00205	Coos Bay/North Bend	Pony Creek/Merritt Lake	4.00	14.52	65.6%	1.3%	Lower	limited slide deposits in mid watershed	Y									1 quarry
41	South	Coos	Coquille	00214	Garden Valley WA	China Creek	0.66	3.34	100.0%	4.2%	Lower	limited slide deposits in mid watershed									N	none
42	South	Coos	Coquille	05581	Weiss Estates	Fahy's Lake	1.61	2.40	0.0%	0.4%	Lower	none	Y					Y				1 quarry, some haz mat/contractors
43	South	Coos	Coquille	00074	Bandon	Ferry and Geiger Creek	3.99	12.11	0.7%	1.9%	Lower	none									N	none
44	South	Coos	Coquille	00213	Coquille	Coquille River and Rink Creek	494.49	3602.15	37.0%	9.1%	Lower	Limited landslide deposits near Rink Cr. Intake. Multiple landslide deposits and points mapped throughout the Coquille R. watershed	Y	Y		Y	Y	Y				multiple PCSs in Coquille R. watershed inc quarries, boat launches, CAFOs, haz mat storage/use, UST/LUST, WWTP discharge. None identified in Rink Cr. DWSA.
45	South	Coos	Coquille	00551	Myrtle Point	North Fork Coquille River	282.70	2169.63	1.5%	19.1%	Higher	multiple landslide deposits and points mapped throughout the watershed	Y	Y		Y		Y				multiple PCSs inc quarries, boat launches, CAFOs, haz mat storage/use, UST/LUST
46	South	Coos	Coquille	00672	Powers	South Fork (Coquille River) and Bingham Cr.	147.39	488.56	26.5%	14.5%	Mod	multiple landslide points in upper watershed for Coquille R. intake, none mapped in Bingham Cr. DWSA.		Y								1 boat ramp
47	South	Curry	Sixes	00466	Langlois WD	Floras Creek	61.02	443.05	96.1%	7.0%	Lower	large area of landslide deposits mapped near intake and in mid watershed	Y					Y				quarries, USTs

Table 2. Summary of Natural and Anthropogenic Potential Pollutants

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Name	Drinking Water Source Name	Drinking Water Source Area Size (Sq.Mi.) (1)	Stream Miles in DWSA	High Soil Erosion Potential Percent (% stream mi w/ high erosion located w/in 300' of the stream)(2)	Percent DWSA w/ High to Mod. Shallow Landslide Potential (3)	Relative risk ranking for percent DWSA w/ Higher to Mod. Shallow Landslide Potential (4)	Mapped landslides present? (5)	Quarry (DOGAMI)	Boat Ramp (OSMB)	Marina (OSMB)	CAFO (ODA)	WWTP (DEQ)	Haz Mat Storage/Use (DEQ/SFM)	SWMS/Landfill (DEQ)	Other	No identified PCSs	Potential Pollutants (DOGAMI Gravel mines, OSMB boating, CAFOs, SFM, RegDB)
48	South	Curry	Sixes	00670	Port Orford	Hubbard Creek and Garrison Lake (Emergency)	4.45	26.51	0.0%	1.6%	Lower	limited landslide deposits in mid watershed	**Y**	**Y**			**Y**	**Y**	**Y**	ECSI		Garrison Lake - boat launch, quarry, haz mat storage/use, WWTP discharge, closed landfill, ECSI. None identified for Hubbard Cr.
49	South	Curry	Chetco	01062	Rainbow Rock Village MHP	Taylor Creek Wells - Well #2	1.62	10.87	79.8%	6.8%	Lower	none	**Y**					**Y**				1 quarry, haz mat
50	South	Curry	Chetco	01361	Rainbow Rock Condos	Unnamed Creek	0.24	1.26	0.0%	0.2%	Lower	none									**N**	none
GW - SW is inactive/ Emerg.	North	Tillamook	Nehalem	00952	Wheeler	Vosburg and Jarvis Creek ("Abandoned" as of 04/03/2003)	0.57	5.64	0.0%	4.8%	Lower	yes - landslide deposits mapped									**N**	none
Observations:	20 PWSs North Coast 17 PWSs Mid Coast 13 PWSs South Coast	7 Clatsop 1 Washington 3 Columbia 9 Tillamook 13 Lincoln 4 Lane 1 Douglas 8 Coos 4 Curry							36% (18/50) PWSs have >80% of stream miles with high erosion soils 52% (26/50) PWSs have >50% of stream miles with high erosion soils		For use in this evaluation, 0-10%=relatively lower risk, 10-15% = moderate risk; and >15% =relatively Higherer risk. Individual maps for each coastal public water system are avaliable detailing landslide potential and other factors (such as proximity to the intake or potential for downstream sediment transport) that may impact risk levels.		14	9	2	3	2	12	1			

Notes:

(1) DWSA - drinking water source area - delineated as the 5th-field watershed upstream of the intake. Note that Oregon's surface water source areas are delineated intake to intake. For watersheds with more than one intake, the DWSA is the watershed segment from the PWSs intake to the next intake upstream. All protection areas upstream of a specific water system's intake are included in the drinking water source area for that water system and PWSs are encouraged to work with other water providers and other entities within the Subbasin as they evaluate land use and move forward with developing protection strategies.

(2) High Soil Erosion Potential for non-Forest Service lands is determined by combining the effects of slope and the soil erodibility factor ("K-factor") using SSURGO and STATSGO data. The K-factor quantifies the susceptibility of soil particles to detachment and movement by water including the effects of rainfall, runoff, and infiltration. Soils with "high" soil erodibility ratings are considered sensitive to extensive ground disturbance such as some yarding methods and road building activities. Soils classified as "high" include soil with slopes of 30% (or greater) and K-factors (kffactor - rock free) of 0.25 (or greater). Soil Resource Inventory (SRI) information from the US Forest Service was used to determine erosion potential on National Forest lands. Erosion potential for soils represented in the SRI data is based on available representative data attributes such as sedimentation yield potential, sediment, or surface soil erosion potential. Specific information on the factors used for each National Forest to evaluate sensitivity is available from DEQ upon request. This layer was developed in Oregon's Source Water Assessments program to assist public water systems prioritize drinking water protection strategies within their source area.

(3) Shallow landslide susceptibility based on modeling of slope stability using LiDAR data. Prepared by S.Aalbers using R.Michie Shallow Landslide Model see \\Deqhq1\dwp\PWSProjects\CoastalPWSResiliencyProject\Landslide_workingFiles\FinalAllRasterTables_06NOV2014.xlsx

(4) Max of 23% identified in coastal water systems DWSAs. For use in this evaluation, 0-10%=relatively lower risk, 10-15% = moderate risk; and >15% =relatively higher risk. Note that maps detailing landslide potential are available for each coastal public water system and other factors (such as proximity to the intake or potential for downstream sediment transport) may impact risk levels.

(5) DOGAMI Statewide Landslide Information Database of Oregon Release 2 (SLIDO-2)

NA- Not applicable

Acronyms:

CAFO - Confined or Concentrated Animal Feeding Operation
ECSI - DEQ Environmental Cleanup Site Information System
LUST - DEQ leaking underground storage tank

HW - DEQ Hazardous Waste Management site
RegDB – identified on a DEQ or other agency Regulatory Database
SIS - DEQ Source Information System for water discharge permit sites
SFM - State Fire Marshall Hazardous Material Handlers site list
SWMS – DEQ Solid Waste Disposal/Landfill Permits list
UIC – DEQ Underground Injection Control list

UST - DEQ registered underground storage tank list

Table 3. Summary of Water Quality Monitoring Data and Treatment Methods

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Short Name	Drinking Water Source Name	Drinking Water Source Area Size (Sq.Mi.)	Number of Public Water Systems Served [2]	DEQ/other source water test data ND - All parameters not detected NA - source water not analyzed	SDWIS Detections/ alerts (2004-2014) TTHM (total trihalomethanes) and HAA5 (Halocetic Acids) are typical disinfection byproducts	Safe Drinking Water Information System (SDWIS) Bacteria Alerts (TCR=Total Coliform Rule)	Treatment Process
1	North	Clatsop	Lower Columbia	00063	Wickiup	Big Fat Buck and Little Creek	1,720	1	4-Methyl-2-pentanone (MIBK) detected at Big Fat Buck Creek (1/2014)	Ethylbenzene, xylene at Big Fat Buck Cr. (2013) Diquat at Little Cr. (2013)+ occ. HAA5	1 TCR (2005)	Slow sand for Big Fat/Little Fat Buck Creeks & Rapid sand for Little Creek
2	North	Clatsop	Lower Columbia	00055	Astoria	Bear Creek, Cedar Creek and Middle Lake	11,272	6	NA	HAA5 (32 alerts)	6 TCR alerts (2004-2011)	Slow sand
3	North	Clatsop	Lower Columbia	00062	Youngs River Lewis & Clark WD	North and South Forks Barney Creek	2,700	1	NA	TTHM/HAA5 (4 alerts)	5 TCR alerts (2007-2012)	Membrane filtration
4	North	Clatsop	Lower Columbia	00932	Warrenton	Big SF, Little SF, Camp C & Lewis & Clark River	10,545	2	NA	TTHM/HAA5 (4-6 alerts)	1 TCR alert (2008)	Membrane filtration
5	North	Clatsop	Necanicum	00799	Seaside	South Fork Necanicum R. and Necanicum R.	6,672	2	DEET (spring only); Diethylphthalate (spring only); Cholesterol; and Bis(2-ethylhexyl)phthalate (fall only) detected at SF Necanicum R. intake (5/13/2008 & 10/14/2008) DEET; Cholesterol; Coprostanol; beta-Sitosterol; Stigmastanol; PDBE-209; 2,4-Dimethylphenol; Phenanthrene; and Chloromethane detected at Necanicum R. intake (7/10/2012)	Di(2-ethylhexyl)phthalate (1 alert, 2012) TTHM/HAA5 (1 alert, 2004)	4 TCR alerts (2005-2013)	Rapid sand & rapid mix
6	North	Clatsop	Necanicum	00164	Cannon Beach	Elk Creek - West Fork	1,690	1	NA	Coliform at Howell Spring Source (GW)	2 TCR alerts and 1 E.Coli Alert (2013)	Slow sand
7	North	Clatsop	Necanicum	00802	Arch Cape WD	Shark and Asbury Creek	110	1	No detects for SOCs (2009)	Turbidity, TTHM/HAA5 (14 alerts thru 2011 when Membrane Filtration system was installed)	None	Membrane filtration
8	North	Tillamook	Nehalem	00505	Manzanita	West & MiddleFork Anderson Creek	3,200	1	NA	none - SW intakes listed as Emergency Source only	None	Membrane filtration (listed as Emergency Source only)
9	North	Tillamook	Nehalem	00554	Nehalem	Bob's Creek	1,700	1	NA	TTHM/HAA5 (3-4 alerts)	3 TCR alerts (2005-2011)	Cartridge filtration
10	North	Tillamook	Nehalem	00708	Rockaway Beach	Jetty Creek	2,600	1	sulfometuron-methyl detected: POSIS and grab(2013)	Sodium, Coliform, TTHM (23 alerts) & HAA5 (7 alerts)	3 TCR alerts (2005-2013)	Membrane filtration
11	North	Tillamook	Wilson-Trask-Nestucca	00585	Oceanside	Short Creek	615	1	NA	Coliform (2013), TTHM (2 alerts)	1 TCR alert (2013)	Rapid sand
12	North	Tillamook	Wilson-Trask-Nestucca	00556	Netarts	East Fall Creek (West Fall Creek not delineated)	1,800	1	NA	Dalapon (2006), Sodium (2006)	None	Rapid sand
13	North	Tillamook	Wilson-Trask-Nestucca	00893	Tillamook	Killam & Fawcett Creek	7,383	11	Sulfometuron-methyl at Killiam Cr. Intake (2013) and Aminomethylphosphonic acid (AMPA); Glyphosate; and Sulfometuron - methyl at Fawcett Cr. Intake (2013)	TTHM (1 alert)	1 TCR alert (2008)	Rapid sand
14	North	Tillamook	Wilson-Trask-Nestucca	00199	Beaver	Beaver Water District	600	1	Sulfometuron-methyl, DEET (2013)	limited chlorination byproducts and TTHM/HAA5 (1 alert 2006)	None	Rapid sand
15	North	Tillamook	Wilson-Trask-Nestucca	00610	Tierra Del Mar	Beltz Creek	150	1	NA	TTHM (1 alert, 2005)	2 TCR alerts (2006, 2010)	Cartridge filtration
16	North	Tillamook	Wilson-Trask-Nestucca	00970	Neskowin	Hawk Creek	300	1	ND in 2013 North Coast Toxics sampling	None	None	Membrane filtration
17	North	Washington	Nehalem	00898	Timber WA	Nehalem River	180	1	NA	None	3 TCR alerts (2004-2006)	Membrane filtration
18	North	Columbia	Nehalem	05737	Berndt Creek Water	Rock Creek	14	1	NA	Toluene (6 alerts 2008-2014), Ethylbenzene (1 alert 2011)	1 TCR alert (2008)	Rapid sand
19	North	Columbia	Nehalem	00922	Vernonia	Rock Creek	2,475	1	Atrazine, Desethylatrazine, DEET, (2013) Cholesterol, Coprostanol, beta-Sitosterol, Stigmastanol, PDBE-209, 2,4-Dimethylphenol, Chloromethane (7//2012)	None	None	Rapid sand and rapid mix

Table 3. Summary of Water Quality Monitoring Data and Treatment Methods

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Short Name	Drinking Water Source Name	Drinking Water Source Area Size (Sq.Mi.)	Number of Public Water Systems Served [2]	DEQ/other source water test data ND - All parameters not detected NA - source water not analyzed	SDWIS Detections/ alerts (2004-2014) TTHM (total trihalomethanes) and HAA5 (Halocetic Acids) are typical disinfection byproducts	Safe Drinking Water Information System (SDWIS) Bacteria Alerts (TCR=Total Coliform Rule)	Treatment Process
20	North	Columbia	Nehalem	00124	Fishhawk Lake Rec. Club	Fishhawk Creek	350	1	NA	Perchloroethylene (PCE) (2 alerts 2008/09), TTHM (2011)	None	Rapid sand
21	Mid	Lincoln	Siletz-Yaquina	00603	Panther Creek WD	Panther Creek	680	1	NA	HAA5 (1 alert, 2013)	None	Slow sand
22	Mid	Lincoln	Siletz-Yaquina	00483	Lincoln City	Schooner Creek	20,830	1	beta-Sitosterol, Stigmastanol, Bis(2-ethylhexyl)phthalate (6/8/2010 & 7/28/2010)	HAA5 (4 alerts, 2008-14)	3 TCR alerts (2012-2014)	Rapid sand and rapid sand mix
23	Mid	Lincoln	Siletz-Yaquina	00324	Kernville-Gleneden-Lincoln Beach WD	Drift Creek	4,158	2	NA	none	None	Slow sand
24	Mid	Lincoln	Siletz-Yaquina	00254	Depoe Bay	South & North Depoe Bay Creek, Rocky Creek	1,398	1	NA	none	None	Rapid sand and rapid mix
25	Mid	Lincoln	Siletz-Yaquina	01072	Johnson Creek Wtr. Srvc.	Johnson Creek	340	1	NA	TTHM (1 alert, 2013)	None	Rapid sand and rapid mix
26	Mid	Lincoln	Siletz-Yaquina	00568	Beverly Beach	Wade Creek	150	1	NA	TTHM (1 alert, 2014)	None	Rapid sand
27	Mid	Lincoln	Nehalem	00566	Newport (Big Cr.)	Big Creek	10,160	1	NA	TTHM/HAA5 (7-8 alerts, 2003-2011)	None	Rapid sand
28	Mid	Lincoln	Siletz-Yaquina	00821	Siletz (Tangerman)	Tangerman Creek	1,200	1	NA	TTHM (1 alert, 2004)	1 TCR alert (2005)	Rapid sand
29	Mid	Lincoln	Siletz-Yaquina	00899	Toledo (Mill)	Mill Creek (Oct. - May)	8,820	2	NA	None	None	Rapid sand and rapid mix
29	Mid	Lincoln	Siletz-Yaquina	00566 00821 00899	Newport, Siletz, Toledo Water Utilities (Siletz R.)	Siletz River	20,180	4	Atrazine, beta-Sitosterol, Stigmastanol (6/8/2010 & 7/28/2010) ND for gasoline products (~14 samples between 2/4/2011 & 3/2/2011)	TTHM/HAA5 (7-8 alerts for City of Newport, 2003-2011); TTHM (1 alert for City of Siletz, 2004)	1 TCR alert for City of Siletz (2005)	Rapid Sand
30	Mid	Lincoln	Siletz-Yaquina	00564	Bay Hills	Unnamed Creek	45	1	NA	TTHM/HAA5 1-3 alerts 2009-2013)	None	Rapid sand
31	Mid	Lincoln	Alsea	00926	Waldport	North & South Fork Weist Creek & Eckman Creek	3,000	1	NA	Ethylbenzene, xylene (2006-2013)	None	Rapid sand and rapid mix
32	Mid	Lincoln	Alsea	00925	SW Lincoln Co. WD	Starr, Dicks Fork, Big, Vingie Creeks	3,000	1	NA	Hexachlorocyclopentadiene (1 alert, 2004), TTHM/HAA5 (1-3 alerts 200-204)	1 TCR alert & 1 E.Coli alert (2010)	Rapid sand and rapid mix
33	Mid	Lincoln	Alsea	00966	Yachats	Salmon and Reedy Creek	1,000	1	NA	None	None	Rapid sand and rapid mix
34	Mid	Lane	Siuslaw	00301	**Heceta WD**	Clear Lake	4,500	1	NA	Ethylbenzene, xylene, Perchloroethylene (PCE) (1 alert 2004)	2 TCR alerts and 1 E.Coli alert (2005, 2008)	Rapid sand and rapid mix
35	Mid	Lane	Siuslaw	00507	Mapleton WD	Berkshire Creek	750	1	NA	HAA5/TTHM (5 alerts 2008-2014)	1 TCR alert (2009)	Pressure sand filtration
36	Mid	Lane	Siltcoos	00304	Alderwood WDC	Woahink Lake	35	1	Cholesterol, Coprostanol, beta-Sitosterol, Stigmastanol, 2,4-Dimethylphenol, Naphthalene, Phenanthrene, Chloromethane (7/10/2012)	TTHM (1 alert 2014)	7 TCR alerts and 1 E.Coli alert (2005-2013)	Pressure sand and cartridge filtration
37	Mid	Lane	Siltcoos	00302	South Coast WD	Siltcoos Lake	150	1	DEET, Cholesterol, Coprostanol, beta-Sitosterol, Stigmastanol, 2,4-Dimethylphenol, Naphthalene, Phenanthrene, Chloromethane (7/10/2012)	Hexachlorocyclopentadiene (1 alert, 2004), TTHM/HAA5 (1-3 alerts 2004-2014)	None	Pressure sand and cartridge filtration
38	South	Douglas	Coos	00699	Reedsport	Clear Lake	4,784	1	Cholesterol, beta-Sitosterol, Stigmastanol (9/21/2010)	Bromate (2006-2014) TTHM (1 alert 2005)	7 TCR alerts (2005-2014)	Unfiltered (filtration exemption)

Table 3. Summary of Water Quality Monitoring Data and Treatment Methods

Order (North to South)	Coastal Location	County Served	Subbasin	PWS ID	PWS Short Name	Drinking Water Source Name	Drinking Water Source Area Size (Sq.Mi.)	Number of Public Water Systems Served [2]	DEQ/other source water test data **ND -** All parameters not detected **NA** - source water not analyzed	SDWIS Detections/ alerts (2004-2014) TTHM (total trihalomethanes) and HAA5 (Halocetic Acids) are typical disinfection byproducts	Safe Drinking Water Information System (SDWIS) Bacteria Alerts (TCR=Total Coliform Rule)	Treatment Process
39	South	Coos	Coos	00463	Lakeside WD	Eel Lake	1,700	1	DEET, Cholesterol, Coprostanol, beta-Sitosterol, Stigmastanol, 2,4-Dimethylphenol, Phenanthrene, Chloromethane (7/10/2012)	None	1 TCR alert (2005)	Rapid sand and rapid mix
40	South	Coos	Coos	00205	Coos Bay/North Bend	Pony Creek/Merritt Lake	38,000	1	NA	None	4 TCR alerts (2007-2014)	Rapid sand and rapid mix
41	South	Coos	Coquille	00214	Garden Valley WA	China Creek	30	1	NA	TTHM/HAA5 (1-2 alerts 2005-2008)	9 TCR alerts (2006-2014)	Pressure sand filtration
42	South	Coos	Coquille	05581	Weiss Estates	Fahy's Lake	27	1	NA	TTHM/HAA5 (1 alerts 2014)	3 TCR alerts (2007-2008)	Cartridge filtration
43	South	Coos	Coquille	00074	Bandon	Ferry and Geiger Creek	3,000	1	2,4-Dimethylphenol, Naphthalene, Phenanthrene, Chloromethane, Iron (>SMCL) (7/9/2012 - Ferry-Geiger blend)	Xylene (2004)	1 TCR alert (2009)	Rapid sand and rapid mix (with UV)
44	South	Coos	Coquille	00213	Coquille	Coquille River and Rink Creek	4,935	4	NA	limited chlorination byproducts and phthalate (all in 2006), TTHM/HAA5 (11 alerts, 2004-2010)	7 TCR alerts & 1 E.Coli alert (2004-2014)	Rapid sand
45	South	Coos	Coquille	00551	Myrtle Point	North Fork Coquille River	2,451	1	NA	TTHM (3 alerts 2004-07)	1 TCR alert (2005)	Rapid sand and rapid mix
46	South	Coos	Coquille	00672	Powers	South Fork (Coquille River) and Bingham Cr.	750	1	NA	phthalate (1 alert 2008)	1 TCR & 1 E.Coli alert (2006)	Rapid sand
47	South	Curry	Sixes	00466	Langlois WD	Floras Creek	232	1	Cholesterol, Coprostanol, beta-Sitosterol, Stigmastanol, 2,4-Dimethylphenol, Phenanthrene, Chloromethane (7/9/2012)	TTHM/HAA5 (2 alerts 2004-2010)	2 TCR alerts (2008)	Rapid sand
48	South	Curry	Sixes	00670	Port Orford	Hubbard Creek and Garrison Lake (Emergency)	1,135	1	Hubbard Cr. - Cholesterol, beta-Sitosterol, Stigmastanol, and Bis(2-ethylhexyl)phthalate (9/21/2010). Garrison Lake - General parameter sampling conducted 1997-2012 - see LASAR	TTHM/HAA5 (2-5 alerts 2004-2014)	None	Rapid sand and rapid mix
49	South	Curry	Chetco	01062	Rainbow Rock Village MHP	Taylor Creek Wells - Well #2	200	1	NA	None	None	Pressure sand filtration
50	South	Curry	Chetco	01361	Rainbow Rock Condos	Unnamed Creek	80	1	NA	phthalate (1 alert 2007)	None	Rapid sand
GW - SW is inactive/ Emerg.	North	Tillamook	Nehalem	00952	Wheeler	Vosburg and Jarvis Creek ("Abandoned" as of 04/03/2003)	360	2	NA	none - switched to GW	None	
Observations:	20 PWSs North Coast 17 PWSs Mid Coast 13 PWSs South Coast	7 Clatsop 1 Washington 3 Columbia 9 Tillamook 13 Lincoln 4 Lane 1 Douglas 8 Coos 4 Curry					32% (16/50) PWSs serve < 3,300 people 75% (37/50) PWSs serve < 3,300 people	32% (16/50) PWSs serve < 3,300 people 75% (37/50) PWSs serve < 3,300 people			17/50 PWSs have had more than 1 TCR alert	29/50 rapid sand (58%) 5/50 (10%) slow sand 7/50 (14%) Membrane Filtration 8/50 (16%) use pressure sand or cartridge filters 1 unfiltered/Exemption(Reedsport)

Notes:

1) System Type

C - "Community Water System (C)" means a public water system that has 15 or more service connections used by year-round residents, or that regularly serves 25 or more year-round residents.

NTNC - "Non-Transient Non-Community Water System (NTNC)" means a public water system that is not a Community Water System and that regularly serves at least 25 of the same persons over 6 months per year.

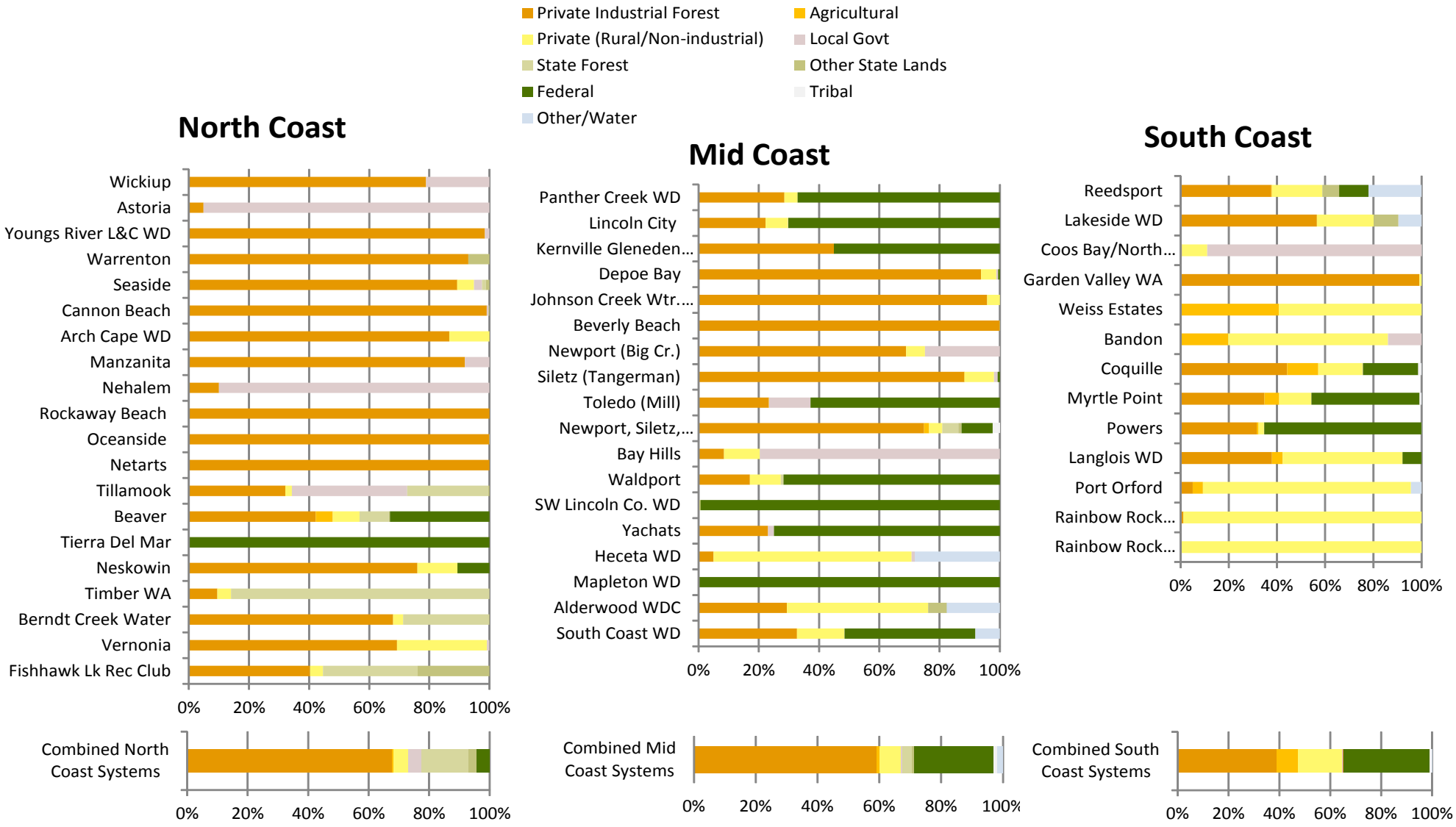
NC - "Transient Non-Community Water System (NC)" means a public water system that serves a transient population of 25 or more persons.

(2) There are independent public water systems that purchase water from the water systems listed and distribute it within their service areas. The total population served listed includes these "wholesale" customers and the total number of PWSs using the source water is also provided.

(3) DWSA - drinking water source area - delineated as the 5th-field watershed upstream of the intake. Note that Oregon's surface water source areas are delineated intake to intake. For watersheds with more than one intake, the DWSA is the watershed segment from the PWSs intake to the next intake upstream. All protection areas upstream of a specific water system's intake are included in the drinking water source area for that water system and PWSs are encouraged to work with other water providers and other entities within the Subbasin as they evaluate land use and move forward with developing protection strategies.

NA- Not applicable

Appendix 3: Coastal Watershed Land Ownership Data Summary



Land use in each source area is a key factor for evaluating potential risk to the drinking water supply. Overall, land ownership in coastal public water system source areas is 48% private industrial forest land, 28% federal ownership (USFS or BLM), 13% private ownership, 6% agricultural land use, and 5% other land uses such as state forest, local government, tribal lands, and water.

Appendix 4

Table 1: Riparian Management Widths: Coastal Forestry & Agriculture

All distances are outside boundary of zone in feet from bankfull width (edge of typical high-water level).
[For example, Oregon Private RMA for Large F is 0-20 no cut, 21-100 limited entry.]

Stream Classification[C1]	Oregon Private Forests		Oregon State Forests			Federal Forests	Agriculture
	No Cut	**Limited Entry[P1]**	**No Cut**	**Mature Forest**	**Limited Entry**	**Aquatic Conservation Strategy**	**Site Capable Vegetation**
Large F	20	100 (230/100)	25	100[S3]	170[S6]	2 SPTH[F1] (300-400ft)	Undefined[A1]
Medium F	20	70 (120/74.7)	25	100 [S3]	170 [S6]	2 SPTH[F1] (300-400ft)	Undefined[A1]
Small F	20	50 (40/34.8)	25	100 [S3]	170 [S6]	2 SPTH[F1] (300-400ft)	Undefined[A1]
Large D	20	70 (90/56.0)	See F	See F	See F	2 SPTH[F1] (300-400ft)	Undefined[A1]
Medium D	20	50 (50/43.6)	See F	See F	See F	2 SPTH[F1] (300-400ft)	Undefined[A1]
Small D	20	None	See F	See F	See F	2 SPTH[F1] (300-400ft)	Undefined[A1]
Large N	20	70 (90/56.0)	25	100 [S3]	170 [S7]	2 SPTH[F1] (300-400ft)	Undefined[A1]
Medium N	20	50 (50/43.6)	25	100 [S3]	170 [S7]	2 SPTH[F1] (300-400ft)	Undefined[A1]
Small Np	0	0/10[P2]	25[S1]	100[S4]	170 [S8]	2 SPTH[F1] (300-400ft)	Undefined[A1]
Small Ns	0	0/10[P2]	25/0[S2]	100[S5]	170 [S8]	1 SPTH[F1] (150-200ft)	Undefined[A1]

C1: Type F = Streams with anadromous or "game" fish (e.g. cutthroat trout)
Type D = Streams with qualifying fish that are used for domestic (drinking) water
Type N(p/s) = Stream with neither qualifying fish nor domestic use; (p/s) designates perennial or seasonal
Large = >10cfs (cubic feet per second) average annual flow
Medium = 2-10cfs (cubic feet per second) average annual flow
Small = <2cfs (cubic feet per second) average annual flow

P1: (ft^2 per 1000ft of stream/ft^2 per acre) = Coast Range and South Coast regions' standard target for required conifer basal area retention in square feet per 1000ft/square feet per acre *for clearcut harvests*. Lower basal area retention is allowed if active restoration (e.g. large wood placement) is part of the harvest operation. Other regions may have slightly higher or lower retention (see OAR 629-640-0100 (6) (a) Table 1).

P2: Understory vegetation and conifers less than 6 inches in diameter breast height retained within 10 feet in Eastern Cascades and Blue Mountain regions; retained within 10 feet in larger drainages in South Coast region (160 acres), Interior region (330 acres), and Siskiyou region (580 acres); and no retention in Coast Range and West Cascades regions (see OAR 629-640-0200 (6) Table 5).

S1: Applied to at least 75% of the reach including junctions with Type F streams.

S2: High Energy reaches and Potential Debris Flow Track reaches have 25ft no-cut buffer. Other small seasonal Type N reaches have no retention requirements.

S3: Manage for mature forest condition and retain at least 50 trees per acre.

S4: 15-25 conifer trees and snags per acre.

S5: 15-25 conifer trees and snags per acre on High Energy reaches, 10 conifer trees and snags per acre on other Type N seasonal streams.

S6: 10-45 conifer trees and snags per acre.

S7: At least 10 conifer trees and snags per acre.

S8: 0-10 conifer trees and snags per acre. Doesn't apply to seasonal streams other than High Energy reaches.

F1: SPTH= site potential tree height, the maximum height a mature conifer tree is expected to reach based on the productivity of the site. It ranges from 150-200 feet.
Federal forestlands are managed under the Northwest Forest Plan which requires management for ecological purposes only in the riparian reserves.
Bureau of Land Management lands in western Oregon are undergoing revisions to their management plans that are expected to reduce the size of riparian reserves while continuing to protect water quality.

A1: Agricultural water quality rules for the North Coast, Mid Coast, Coos-Coquille, and Curry Water Quality Management Areas do not specify distances for riparian management rule requirements. Rules vary by WQMA but generally require agricultural activities in the riparian area to allow for establishment, growth, and maintenance of vegetation consistent with "vegetative site capability", shade production, and sediment filtration. See here for details: http://www.oregon.gov/oda/programs/NaturalResources/Pages/AgWaterQuality.aspx .

Appendix 4

Table 2: Riparian Protection Requirement Widths: Coastal County Ordinances

All distances are outside boundary of zone in feet from bankfull width (edge of typical high-water level).

Stream Features	Clatsop	Columbia	Coos	Curry	Douglas	Lane	Lincoln	Tillamook
>1000cfs	-	75	-	75	-	-	-	-
Type F <1000cfs	-	50	-	-	-	-	-	-
<1000cfs	-	25	-	50	-	-	-	-
Resource Class I	-	-	-	-	-	100	-	-
Nonresource Class I	-	-	-	-	-	50	-	-
>15ft width	-	-	-	-	-	-	-	50/25[T1]
≤15ft width	-	-	-	-	-	-	-	15
All	50	-	50	-	50	-	50	-

T1: 50 foot riparian protection for "lakes and reservoirs of one acre or more, estuaries, and the mainstems of the following rivers where the river channel is more than 15 feet in width; Nestucca, Little Nestucca, Three Rivers, Tillamook, Trask, Wilson, Kilchis, Miami, Nehalem and North and South Fork Nehalem River." All others over 15ft in width have a 25ft buffer.

Forestry and agriculture activities are governed by rules set by the Oregon Departments of Forestry and Agriculture, respectively (see Table 1).
Generally, building and removal of riparian vegetation are prohibited within the defined riparian areas. Wetlands and lakes are also covered by these buffers. Some exceptions exist; links and page numbers are provided below for reference with regard to details:

Clatsop Co http://www.co.clatsop.or.us/sites/default/files/fileattachments/land_use_planning/page/613/standards_document_codified_03-29-13.pdf pg 89
Columbia Co http://www.co.columbia.or.us/files/lds/2011-01%20CCZO.pdf pp 186-197
Coos Co http://www.co.coos.or.us/Portals/0/Planning/Article%204.4%20General%20Development%20Standards.pdf
Curry Co http://www.oregon.gov/LCD/OCMP/docs/Public_Notice/CurryCounty_ZoningOrdinance_EPs.pdf pp 138-
Douglas Co http://www.co.douglas.or.us/planning/Plan_docs/LUDO/Ch3_32.pdf 3.32.200
Lane Co http://www.lanecounty.org/Departments/CC/LaneCode/Documents/LaneCodeChapter16Section250-253_2014_11_05.pdf pp 16-507—16-513
Lincoln Co http://www.oregon.gov/lcd/ocmp/docs/public_notice/2012-lcc_eps.pdf pp 125-126
Tillamook Co http://www.co.tillamook.or.us/gov/ComDev/documents/luo/4.080.pdf

Appendix 5

Additional Resources for Drinking Water Protection

PRIMARY WEBSITES

Oregon Health Authority
Regulations for drinking water, health effects information, data, etc.:
http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Pages/index.aspx

Oregon DEQ's Drinking Water Protection
http://www.deq.state.or.us/wq/dwp/dwp.htm
Technical resources, best management practices, fact sheets, etc.:
http://www.deq.state.or.us/wq/dwp/assistance.htm

Department of Geology and Mineral Industries
Information on landslides, mapping, 3D terrain, and LiDAR:
http://www.oregongeology.org/sub/projects/olc/default.htm

Oregon Geospatial Enterprise Office
For Oregon Geographic Information Systems (GIS) data layers:
http://www.oregon.gov/DAS/CIO/GEO/pages/index.aspx

US Geological Survey
Information on toxics, monitoring data, and human health benchmarks, etc.:
http://toxics.usgs.gov/regional/emc/index.html
http://health.usgs.gov/dw_contaminants/

Google Earth
For maps, satellite imagery, etc.:
https://earth.google.com/

State of Oregon
Department of
Environmental
Quality

Web Resources and Factsheets for Water Quality Protection

Updated: May 2015

PLEASE NOTE: The Internet URL Addresses listed in this document were included as a convenience for the users of this document. All URL Addresses were functional at the time this publication was posted. For active links, this list is located at http://www.oregon.gov/DEQ/WQ/pages/index.aspx

General Water Quality Information	
Handbook for Developing Watershed Plans to Restore and Protect Our Waters (EPA)	http://water.epa.gov/polwaste/nps/handbook_index.cfm
Water Quality Model Code and Guidebook (DLCD)	http://www.oregon.gov/LCD/pages/waterqualitygb.aspx
DEQ Toxics Reduction Strategy	http://www.deq.state.or.us/toxics/docs/ToxicsStrategyNov28.pdf
Oregon's Groundwater Protection Program – who does what? (DEQ)	http://www.deq.state.or.us/wq/groundwater/agencies.htm
Groundwater Basics for Drinking Water Protection (DEQ)	http://www.deq.state.or.us/wq/pubs/factsheets/drinkingwater/GroundwaterBasics.pdf
Protecting Oregon's Groundwater from Contamination (OSU)	http://groundwater.orst.edu/groundwater/
Oregon Climate Change Research Institute	http://occri.net/
Climate Impacts in the Northwest (EPA)	http://www.epa.gov/climatechange/impacts-adaptation/northwest.html
Climate science, data, tools, and information (NOAA)	http://www.noaa.gov/climate.html
Harmful Algae Blooms (OHA) FAQs, guidelines for lake managers and outreach materials	https://public.health.oregon.gov/HealthyEnvironments/Recreation/HarmfulAlgaeBlooms/Pages/index.aspx
Harmful Algal Blooms (DEQ) - agency strategy, actions to control/eliminate & prevention	http://www.deq.state.or.us/wq/algae/algae.htm
Residential Areas, Parks and Golf Courses	
Domestic Well Safety Program (OHA) – Resources and contacts for domestic/private wells	http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/SourceWater/DomesticWellSafety/Pages/index.aspx
Well Water Program (OSU)- tech. assistance for domestic/private wells & septic systems	http://wellwater.oregonstate.edu/
Oregon's Domestic Well Testing Program for Real Estate Transactions	http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/SourceWater/DomesticWellSafety/Pages/Testing-Regulations.aspx
After You Buy: Wells, Septic Systems, and a Healthy Homesite (NRCS)	http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_042403.pdf
Household Hazardous Waste Program website (DEQ)	http://www.deq.state.or.us/lq/sw/hhw/index.htm
Household Hazardous Waste - locally-sponsored collection programs	http://www.deq.state.or.us/lq/sw/hhw/collection.htm
Household Pharmaceutical Waste Disposal (DEQ)	https://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/SourceWater/Pages/takeback.aspx
Household Hazardous Wastes (EPA)	http://www.epa.gov/epawaste/conserve/materials/pubs/hhw-safe.pdf
Recycle Used Motor Oil Resources (EPA)	http://www.epa.gov/osw/conserve/materials/usedoil/ydiydi.htm
Frequently Asked Questions About Heating Oil Tanks (DEQ)	http://www.deq.state.or.us/lq/tanks/hot/homeowners.htm
Proper Care/Maintenance of Heating Oil and Other Unregulated Tank Systems	http://www.deq.state.or.us/lq/pubs/factsheets/tanks/hot/ProperCareMaintenance.pdf

Residential Areas, Parks and Golf Courses (cont.)	
Oregon resources for on-site septic systems (DEQ)	http://www.oregon.gov/deq/WQ/Pages/onsite/SepticSmartHome.aspx
Oregon's Onsite Wastewater Management Program (Septic Systems) (DEQ)	http://www.deq.state.or.us/wq/onsite/onsite.htm
Local Outreach Toolkit for Septic Systems (EPA)	http://water.epa.gov/infrastructure/septic/local-outreach-toolkit.cfm
A Homeowners Guide to Septic Systems (EPA)	http://www.epa.gov/owm/septic/pubs/homeowner_guide_long.pdf
Septic Tank Maintenance (DEQ)	http://www.deq.state.or.us/wq/pubs/factsheets/onsite/septictankmaint.pdf
Septic Systems OSU Extension website (OSU)	http://wellwater.oregonstate.edu/septic-systems-0
Groundwater protection and your septic system (National Small Flows Clearinghouse)	http://www.nesc.wvu.edu/pdf/ww/septic/septic_tank3.pdf
Combating Illegal Dumping (DEQ)	http://www.deq.state.or.us/lq/sw/disposal/illegaldumping.htm
Water Well Owner's Handbook & other related guidance documents (WRD)	http://www.oregon.gov/owrd/pages/pubs/index.aspx
Oregon Water Resources Department	http://egov.oregon.gov/OWRD/
Disposal of Chlorinated Water from Swimming Pools and Hot Tubs (DEQ)	http://www.deq.state.or.us/wq/pubs/factsheets/wastewater/bmpchlorwaterdisp.pdf
Source Water Protection Publications (EPA) for managing various including: Septic Systems Turfgrass and Garden Fertilizer Application Small-Scale Application of Pesticides Small Quantity Chemical Use Pet and Wildlife Waste Storm Water Runoff	http://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action=Publications&view=filter&document_type_id=103
Integrated Plant Protection Center (OSU)	http://ipmnet.org/
National Pesticide Information Center	http://npic.orst.edu/
Integrated Pest Management and Pesticide Safety for Schools (OSU)	http://www.ipmnet.org/Tim/PSEP_home.htm
School Lab Cleanout Program (DEQ)	http://www.deq.state.or.us/lq/labcleanout.htm
Golf Course Integrated Pest Management (IPM) tool and BMP Generator	http://www.greengolfusa.com/tiki-index.php
EcoBiz Certified Landscapers and Auto Repair Shops	http://ecobiz.org/find-an-ecobiz/
Agriculture/Forestry Land Uses	
Tips for Small Acreages in Oregon (NRCS) - Fact Sheets on wells, septic systems, animals, crops, weeds, streamside erosion protection. Includes specific factsheets for Eastern and Western Oregon.	http://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/?cid=nrcs142p2_046062
Source Water Protection Publications (EPA) for managing various activities including: Agricultural Fertilizer Application Large-Scale and Small-Scale Application of Pesticides Livestock, Poultry and Horse Waste Above Ground and Underground Storage Tanks Small Quantity Chemical Use Turfgrass and Garden Fertilizer Application	http://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action=Publications&view=filter&document_type_id=103

Agriculture/Forestry Land Uses (cont.)	
Oregon Small Farms (OSU Extension) Information on Crops, Grains, Livestock, Pastures, and Soils (see tabs at top of page for multiple resources)	http://smallfarms.oregonstate.edu/
Pesticide Stewardship Partnerships and Waste Pesticide Collection Events (DEQ/ODA)	http://www.deq.state.or.us/wq/pesticide/pesticide.htm
Managing Waste Pesticide (DEQ)	http://www.deq.state.or.us/lq/hw/pesticide.htm
Oregon Department of Agriculture (ODA) – resources for reducing impacts	http://www.oregon.gov/oda/Pages/default.aspx
Soil and Water Conservation Districts (OACD) – technical assistance for rural landowners and growers	http://oacd.org/conservation-districts/directory
Natural Resources Conservation Service, Oregon (NRCS)	http://www.or.nrcs.usda.gov/
NRCS Financial Assistance Programs	http://www.nrcs.usda.gov/wps/portal/nrcs/main/or/programs/financial/
Oregon Department of Fish and Wildlife Hatchery Information (ODFW)	http://www.dfw.state.or.us/fish/hatchery/
Animal Care and Handling Facilities (from California stormwater program)	https://www.casqa.org/sites/default/files/BMPHandbooks/BMP_IndComm_Appendix_D.pdf
Managing Small-acreage Horse Farms (OSU)	http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/19670/ec1558.pdf
Irrigation well use and maintenance	See resources for domestic wells under Information for Residential Areas
National Management Measures to Control Nonpoint Source Pollution from Forestry (EPA)	http://water.epa.gov/polwaste/nps/forestry/forestrymgmt_index.cfm
Managing Nonpoint Source Pollution from Forestry (EPA)	http://water.epa.gov/polwaste/nps/outreach/point8.cfm
Water quality impacts information from US Forest Service - Part III: Chapter 10: Forest Management; Chapter 13: Pesticides and Part IV: Chapter 14-16 Animals	http://www.srs.fs.fed.us/pubs/gtr/gtr_srs039/
Forest Practices Board Manual (Washington Dept. of Natural Resources)	http://www.dnr.wa.gov/BusinessPermits/Topics/ForestPracticesRules/Pages/fp_board_manual.aspx
Forest Management Certification Principles and Criteria (Forest Stewardship Council)	https://us.fsc.org/forest-management-certification.225.htm
Commercial/Industrial/Municipal Land Uses	
Drinking Water Protection Strategies for Commercial & Industrial Land Uses (DEQ)	http://www.deq.state.or.us/wq/dwp/docs/DWPStrategiesCommercialIndustrial.pdf
Business and Industry tips for reducing water quality impacts (DEQ)	http://www.deq.state.or.us/wq/pubs/factsheets/drinkingwater/busindtips.pdf
Source Water Protection Publications (EPA) for managing various including: Above Ground and Underground Storage Tanks Aircraft and Airfield Deicing Operations Highway Deicing Operations Vehicle Washing Pet and Wildlife Waste Small Quantity Chemical Use Storm Water Runoff	http://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action=Publications&view=filter&document_type_id=103
Free Assistance from DEQ's Toxics Use and Waste Reduction Assistance Program	http://www.deq.state.or.us/lq/pubs/docs/hw/TABrochure.pdf

Commercial/Industrial/Municipal Land Uses (cont.)	
10 Ways for Businesses to Prevent Pollution, Conserve Resources and Save Money (with pollution prevention resources for various industry sectors) (DEQ)	http://www.deq.state.or.us/programs/sustainability/10ways-businesses.htm
Managing Used Computers and Other Electronic Equipment (DEQ)	http://www.deq.state.or.us/lq/pubs/factsheets/ManagingUsedComputers.pdf
Computer and Electronic Equipment Recyclers (DEQ)	http://www.deq.state.or.us/lq/pubs/factsheets/OregonECyclesConsumers.pdf
Use of Injection Control Systems and Groundwater Protection (DEQ)	http://www.deq.state.or.us/wq/pubs/factsheets/uic/shallowinjwell.pdf
Underground Injection Control (UIC) Program (DEQ)	http://www.deq.state.or.us/wq/uic/uic.htm
Industrial Stormwater Best Management Practices Manual (DEQ)	http://www.deq.state.or.us/wq/wqpermit/docs/IndBMP021413.pdf
Best Mgmt Practices for Industrial Activity Storm Water Discharges (DEQ)	http://www.deq.state.or.us/wq/stormwater/docs/nwr/indbmps.pdf
Construction Stormwater Best Management Practices Manual (DEQ)	http://www.deq.state.or.us/wq/wqpermit/docs/general/npdes1200c/BMPManual.pdf
Illicit Discharge and Source Tracing Guidance Manual (Washington Stormwater Center)	http://www.wastormwatercenter.org/illicit-connection-illicit-discharge
Low Impact Development O&M guidance (Washington Stormwater Center)	http://www.wastormwatercenter.org/lid-om-guidance/
Green Infrastructure (EPA)	http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm
Stormwater Solutions (OSU) Technical assistance on low-impact development	http://extension.oregonstate.edu/stormwater/
DEQ Recommended Best Management Practices For Washing Activities	http://www.deq.state.or.us/wq/pubs/bmps/washactivities.pdf
Best Management Practices (BMPs) for Non-Profit Washing Activities (DEQ)	http://www.deq.state.or.us/wq/pubs/bmps/washactsnoprft.htm
DEQ's Environmental Cleanup Program	http://www.deq.state.or.us/lq/cu/index.htm
Underground Storage Tank Program	http://www.deq.state.or.us/lq/tanks/ust/index.htm
Proper Care and Maintenance of Heating Oil and Other Unregulated Tank Systems	http://www.deq.state.or.us/lq/pubs/factsheets/tanks/hot/ProperCareMaintenance.pdf
Frequently Asked Questions About Heating Oil Tanks (DEQ)	http://www.deq.state.or.us/lq/tanks/hot/homeownersfaq.htm
Heating Oil Tank Program (DEQ)	http://www.deq.state.or.us/lq/tanks/hot/index.htm
Leaking Underground Storage Tank Program	http://www.deq.state.or.us/lq/tanks/lust/index.htm
EcoBiz Certified Landscapers and Auto Repair Shops	http://ecobiz.org/
Water quality impacts information from USFS - Part V: Chapter 18-20 Mining and Oil/Gas	http://www.srs.fs.fed.us/pubs/gtr/gtr_srs039/
Dam Safety Publications and Resources FEMA website	https://www.fema.gov/dam-safety-publications-resources
Healthcare: Pollution Prevention & Best Management Practices (EPA)	http://www.epa.gov/region1/healthcare/bmp.html
Boating/Marinas/Recreation Areas	
Oregon Clean Marina Program and Clean Boats Challenge (OSMB)	http://www.oregon.gov/OSMB/Clean/index.shtml
Clean Boater Guide (OSMB)	http://www.oregon.gov/OSMB/Clean/docs/Clean_Boater_Booklet_Final.pdf
Marine Sewage and Wastewater Disposal (DEQ)	http://www.oregon.gov/OSMB/Clean/docs/marinesanitation.pdf
Best Management Practices for Oregon's Marinas (DEQ)	http://www.deq.state.or.us/wq/pubs/bmps/marinas.pdf
Water quality impacts information from US Forest Service - Part II: Chapters 7-8: Recreation; Chapter 5: Dams and Chapter 9: Roads	http://www.srs.fs.fed.us/pubs/gtr/gtr_srs039/