The Tualatin River Watershed Demonstration Project: Drinking Water Source Protection and Habitat Conservation Landscape Analysis

Final Report

Enabling Source Water Protection:
Aligning State Land Use and Water Protection Programs
September 2010

About *Enabling Source Water Protection*:

Under cooperative agreement with the US Environmental Protection Agency, the **Smart Growth Leadership Institute** and the **Trust for Public Land**, in partnership with the **Association of State Drinking Water Administrators** and the **River Network** have selected several state partners for a project focused on Protecting Drinking Water Sources through alignment of state land use and drinking water programs.

By working with state program managers, recognized national experts in land use, land conservation, and water quality protection, the project aims to help states work across political and programmatic boundaries to better align planning, economic development, regulation and conservation to protect drinking water sources at the local and watershed levels. Protecting drinking water sources through better land use management requires strong collaboration among state agencies and between all levels of government and concerned stakeholders.

Funding for this particular project was also provided in part by a generous donation from the Doris Duke Charitable Foundation in support of habitat conservation planning.

About the project team:

The Trust for Public Land (TPL) is a private non profit organization that works nationwide to conserve land for people to enjoy as parks, gardens, and other natural places, ensuring livable communities for generations to come. Since 1972, TPL has completed more than 3,000 conservation real estate transactions in 46 states, conserving more than 2 million acres.

The **Smart Growth Leadership Institute (SGLI)**, a project of Smart Growth America, was created by former Maryland Governor Parris N. Glendening to help state and local leaders design and implement effective smart growth strategies. SGLI manages the Governors' Institute on Community Design, a national, non-partisan program created specifically to assist governors, their cabinet, and top staff as they make investments in their communities and guide growth and development in their states.

The **Association of State Drinking Water Administrators (ASDWA)** supports states in their efforts to protect public health through the assurance of high quality drinking water and provides advice, counsel, and expertise to organizations and entities having an interest in drinking water including Congress and EPA.

The **River Network** is a national nonprofit organization working for clean and healthy waters. River Network is unique among national organizations because it supports grassroots groups working for watershed protection. The network consists of thousands of organizations, including grassroots watershed associations, statewide conservation groups, large river basin groups, Native American tribes, fishing and boating associations, businesses, state and federal governmental agencies and other national environmental organizations.

I. Introduction

Located just west of the Portland Metropolitan area, the Tualatin River serves as the primary source of drinking water for residents of Washington County, the fastest growing county in Oregon. Although most growth has taken place in the eastern part of the Tualatin watershed, development generates additional demands on resources throughout the watershed. The watershed is varied, with a mix of urban, suburban, and rural land uses, in addition to industrial forestry and agriculture. In the coming years, expected population growth and land use changes could potentially threaten the quality of the drinking water supply for the region.

The Tualatin River watershed is an ideal demonstration subject around which project partners[1] have developed a tool to simultaneously analyze multiple conditions that influence drinking water source protection efforts. Once rolled out for other drinking watersheds, this geographic information system (GIS) application can help to evaluate and administer policies and programs to protect and improve the quality of public drinking water sources throughout the state.

The primary goal of this demonstration project was to develop a GIS-based tool that can identify the healthy lands within the watershed most important for conservation of water quality as well as impaired lands within the watershed where restoration efforts will protect water quality. In addition, the GIS-based tool incorporates the best available data sets that illustrate the location of critical natural habitats, so that habitat conservation potential can be evaluated simultaneously with water quality protection.

This report describes the project components and makes recommendations for use of the GIS-based tool in Oregon. These uses include:

> **Voluntary land conservation** - The data layers, when overlaid in the combination recommended by the Technical Advisory Team, highlight the most important intact natural lands that ought to be conserved to help maintain current water quality levels. It can also be used to demonstrate the overlap with critical natural habitats. Many of these lands are already publicly owned, but some are in private ownership. Land conservation specialists can review the maps and reach out to landowners to see if they are willing to sell or donate land that can be managed for water quality benefits and habitat conservation.

> **Voluntary land restoration** - Other data layers, when overlaid in a combination recommended by the Technical Advisory Team, highlight the most important degraded lands that ought to be restored to help improve water quality. Many of these lands are already publicly owned, but some are in private ownership. Technical service providers can review the maps and offer landowners resources to help them employ best management practices on their lands.

---

[1] Project partners are representatives from Oregon Department of Environmental Quality, Water Quality Division; The Trust for Public Land; and River Network. This project was funded by a grant from the U.S. Environmental Protection Agency and a donation of the Doris Duke Charitable Foundation. The opinions in this report are those of the contributors and do not necessarily reflect the views of the project funders.

Land use regulation guidance - The GIS tool can inform local government planning and zoning decisions so that they better protect drinking water sources.

Public health protection – The tool can be used to prioritize places to improve existing pollution controls and management practices to address risks to public health through drinking water, recreation and fish consumption. For instance, it incorporates information on the locations of underground storage tanks, NPDES permits, and septic systems.

Minimize risks from natural disasters – Data layers showing the flood zone and vulnerable soils identify some of the lands most vulnerable to natural disasters. Their locations may be useful to decision makers who identify priority areas, and plan for prevention, treatment needs, mitigation and/or alternative water sources.

Water quality data potential – With some added features, the GIS tool's land use information, together with DEQ's existing monitoring data, could be used to track implementation and effectiveness of best management practices (BMPs) for source water protection, and point towards potential improvements.

II. Development of the GIS landscape analysis tool

The Trust for Public Land (TPL), with assistance from Oregon DEQ Drinking Water Protection Program and a Technical Advisory Team, developed the GIS tool using ESRI's ArcGIS 9.3.1 platform. Project partners used ModelBuilder, Spatial Analyst and TPL custom tools to identify priorities for land conservation, land acquisition and natural resource management.

A Technical Advisory Team (TAT), listed in Appendix B, guided development of the GIS landscape analysis tools. Project partners hand-selected TAT members based on their work and interests in the study area and their ability to contribute to the Team's diversity of experience.

The landscape analysis contains three parts or goals:

(1) Land conservation prioritization for drinking water source/water quality protection;
(2) Land restoration prioritization for drinking water source/water quality improvement; and
(3) Land prioritization of habitat conservation opportunities.

TAT members suggested criteria for each of these goals and identified existing GIS datasets that reflect the criteria and contain the best available data with current local and national research. See Appendix C for criteria used within each goal. More than 40 separate GIS data layers were created, developed, or acquired (completed). Depending on the user's objective, these GIS data layers can be used independently or in combination. The GIS data layers collected as part of the project fit into three categories, land uses and characteristics, sensitive areas, and potential sources of contaminants / permits. For more detailed information on the GIS datasets, see also Appendix E.

Project partners then refined the landscape criteria listed under each goal, and the TAT members reviewed and evaluated them. Finally, the TAT members weighted the criteria and used the GIS model to combine them into prioritization results and maps, one for conservation for water quality purposes, one for restoration for water quality purposes, and one demonstrating habitat conservation opportunities with an overlay of the new Synthesis Conservation Opportunity Areas developed by The Nature Conservancy.

The result is a set of maps that show where communities should prioritize investments of limited resources in order to meet goals related to drinking water source protection, water quality protection and land restoration. See Appendix D for final project maps. The areas in hues of red and orange are those identified by the GIS landscape analysis as opportunity areas. The water quality protection map highlights 80,000 acres as the most important lands for water quality protection. This represents about 18% of the whole study area. Of that,only 6,000 acres, or 1% of the entire study area, are identified as the “highest” priority. The water quality restoration map highlights 32,000 acres across the study area as priority for restoration, which is about 7% of the study area. The habitat conservation map highlights 56,000 acres as priority for habitat conservation, which represents about 12% of the entire study area. The habitat map also shows overlap with Synthesis Conservation Opportunity Areas, which are priority areas identified by the Nature Conservancy that will likely soon be adopted by the Oregon Conservation Strategy. Appendix E includes more information about this strategy.

Note that the GIS mapping products represent a first pass at identifying those key lands. Further analysis and outreach to landowners is necessary to “groundtruth” the mapping results. GIS datasets may be inaccurate or outdated, and it is important to verify results with follow-up conversations or site visits, where appropriate.

During discussion, members of the TAT mentioned that it is difficult to create maps like these that are intended to serve multiple purposes because in some cases decision-makers are most interested in the landscape characteristics and making decisions based on those alone, but in other cases the current or potential land management situation is very relevant. Current or potential land management activities could not be integrated into this landscape-based analysis.

Besides developing the maps, TPL conveyed the GIS framework via desktop delivery in June 2010 to the Oregon Department of Environmental Quality Drinking Water Protection Program. Delivery included training on how to manage, update and replicate the analysis in other watersheds in the future. This option allows Oregon Department of Environmental Quality Drinking Water Protection Program GIS staff to have complete access to the model framework, and allows staff to perform maintenance on the model as data and priorities change, to produce maps and property profile reports in house, and to extend the model with additional criteria if desired.

III. Application of GIS landscape analysis to focus on parcel prioritization for land conservation

A group of land conservation professionals who work with willing sellers identified additional factors that can be search terms to evaluate parcels across the landscape. These factors may be practical considerations for real estate specialists; the potential project may have higher conservation importance or be more apt to attract outside funding sources if it meets some or all of these criteria.

For example, a land conservation specialist can search for parcels that are above or below a certain size, adjacent to existing protected land, adjacent to the Tualatin River, vacant, and/or assessed above or below a certain value. Other search terms include: contains farmland soil, within an Urban Growth Boundary (UGB), within a Conservation Opportunity Area, and within a Forest Legacy Area. Users can also search by jurisdiction name.

The on-line mapping site is a tool that can be used for conservation work. Properties can be scored and ranked based on meeting certain criteria, and site users can work from the lists they create to identify lands and work with private landowners who are willing sellers or donors. They can create a report for an individual high-scoring parcel, providing detailed information that can be used, for instance, to determine what matching funding sources may apply or whether to consider purchasing a property that a landowner has offered to donate or sell.

An on-line mapping site (OMS) was created with password-protected access for the members of the Technical Advisory Team and Parcel Prioritization Group so that they can access, query, and print custom maps from the datasets that have been developed for this project. The site is: http://tplgis.org/Tualatin/. The site has already been valuable to the Trust for Public Land Oregon staff that uses it to run queries to investigate conservation value of particular parcels. TPL will maintain the OMS for one year. During that time, Oregon DEQ Drinking Water Protection Program can be contacted for access to the password protected portions of the site (Phone: 503-229-6798). Decisions about how to fund the continuation of the OMS will depend on rates of usage and user evaluations. TPL will track this information and consult with partners and users to determine how to proceed after the first year.

IV. Application of GIS landscape analysis for source water protection using local policies and programs

The information contained in the GIS landscape analysis can be used in ways beyond land protection to improve source water protection. For example, the GIS layers, in strategic combinations, can assist in land use planning and prioritization for public investment (grants and technical resources), protection through overlay districts, zoning or other designations, restoration efforts, facility siting and additional research. The data is relevant to state and local agencies, utilities, private entities, and other local decision makers whose activities affect current or potential future drinking water resources.

The following list describes some of the ways these datasets can be used to protect source water. A number of these applications already exist in Oregon; this is a general list and not specific recommendations to the state of Oregon or those within the state.

- **Grants**

The GIS tool can be valuable to those making investments in watershed protection for complementary objectives such as Clean Water Act Section 319 grants, Farm Bill conservation programs, Clean Water and Drinking Water State Revolving Funds, EPA education and outreach grants. Other states such as North Carolina award points for projects proposed in source watersheds.

- **Technical resources**

The GIS tool can be useful in the hands of agencies, local governments, and private companies working on clean-up or restoration of waterways and the lands around them. Technical resources include in-depth research, monitoring, compliance inspections, clean-up assistance, restoration partnerships, and outreach to promote voluntary improvements with private well owners, onsite systems and businesses. Often state agencies have the authority to provide these types of technical resources to promote better source water protection, but insufficient capacity to do so everywhere. Technical resource providers can deploy their services in areas identified by the GIS tool where there is overlap between particular factors. Here are some examples:

- Risk-free pesticide disposal can be offered to landowners in areas where there is a specific crop type, vulnerable soils, and proximity to public water intakes and wells.
- Access to the State Fire Marshal's information on hazardous substances through a state agency-developed database can be provided to local governments with the greatest source water vulnerabilities identified by looking at the flood zone, wetlands, ground water well density, soils, and public drinking water intakes and well locations.
- State agency support of Aquifer Storage and Recovery Projects can be prioritized based on vulnerable soils, floodplain location, proximity to potential contaminant sources, and proximity to public water intakes and wells.
- Dissemination of Information and deployment of assistance supporting the development of TMDLs can be prioritized based on the risks to downstream source waters as identified using the layers that show public drinking water intakes/well areas and potential vectors for contamination such as vulnerable soils, flood zone, or ground water well density. This prioritization can also take into account the activities proposed for implementation of the TMDL recommendations (i.e. what sources are required to do and where they are located with respect to the source waters).

Using similar data, NGOs and/or government agencies in other watersheds throughout the state (or in other states) could develop projects to improve septic system management. For example, the Eugene Water and Electric Board (EWEB) created a program in response to an issue on the McKenzie River. Approximately 4,000 homes in the McKenzie River watershed upstream of EWEB's drinking water intake rely on septic systems to dispose of their wastewater and sewage. EWEB implemented a voluntary program that provided participating homeowners living in "higher risk" areas with educational materials, inspections, free pump-outs and assistance in obtaining financial assistance for repairs if needed. Over 400 septic inspections were successfully completed as part of this project. Approximately 11% of the systems were found to need major repairs or replacement and another 25% were not functioning properly and required pump outs. The data collected from these inspections has helped to better understand the types of septic systems in the watershed, how systems were sited where property is adjacent to the river, and typical reasons for failure. Feedback from homeowners was overwhelmingly positive and has led to additional interest in this project.

- **Local government awareness in land use decision-making**

The GIS tool can aid cities and counties in evaluating proposed changes to or regular updates of Comprehensive Plans, proposals for conditional use permits, and the “economic, social, environmental and energy” (ESEE) consequences of allowing conflicting uses. By examining layers that identify vulnerable soils, flood zones and proximity to drinking water intakes and wells in particular, local decision makers would have better information about areas that both need protection in a Comprehensive Plan and need protection against variances and conflicting uses.

- **Local government awareness in development of protective ordinances**

Local governments can develop ordinances to protect natural resources, and, in some cases they are required to develop ordinances regarding significant resources. A GIS tool like this one would provide local officials with more data regarding public water supplies, soils, and potential contaminants than they would otherwise have available when developing ordinances.

In the Tualatin basin, Clean Water Services, the wastewater and stormwater utility, has developed regulations that guide practices throughout the watershed. The utility has already used data from many of the layers in the GIS tool to develop these regulations. While these regulations are focused on stormwater management practices, they provide many benefits to source water as well. Clean Water Services’ regulations serve as an example for applications in other parts of the state and as an example for communities in other states.

- **Improvement in permitting and implementation of NPDES program (particularly stormwater management plans and implementation)**

State stormwater programs and local governments developing and implementing stormwater management plans can benefit from GIS. The success of many stormwater management practices often relies upon soil type and, if poorly designed, they could contaminate ground or surface water sources. GIS can provide valuable information to permit-writers, applicants, and potentially affected downstream water systems regarding the vulnerability of the water body and the proximity of proposed discharges to water supply intakes. While some of this information, such as the downstream drinking water intakes, is already available to permit writers, the combination of information from two or more layers can provide additional benefit.

- **Improvement in best management practices in drinking watersheds**

Land uses such as agriculture and forestry dominate the landscape in rural Oregon, where many public water systems draw their source water. Land management agencies can use the GIS tool to prioritize efforts to improve management practices in drinking source watersheds and ground water source areas. For example, Oregon DEQ has worked with the Departments of Agriculture and Forestry, as well as with the State Marine Board and the Department of Geology and Mineral Industries. This work has included providing source water assessment information, including drinking water intakes, and ongoing technical advice on including source water protection measures into their programs.

- **Siting decisions**

A GIS tool – like that which is the foundation of the landscape analysis for the Tualatin Watershed – can be valuable to any agency responsible for approving public or private facility, infrastructure or septic siting. In combination, GIS layers can tell a particular story about what uses should or should not be allowed and whether construction on a site is going to result in unacceptable risks to drinking water sources. The layers themselves can provide a snapshot of cumulative impacts at a particular location. In the case of septic system siting, regulators can only evaluate capacity and setback at an individual site, but a GIS tool can allow for analysis of the cumulative impact of high septic density on the drinking water source.

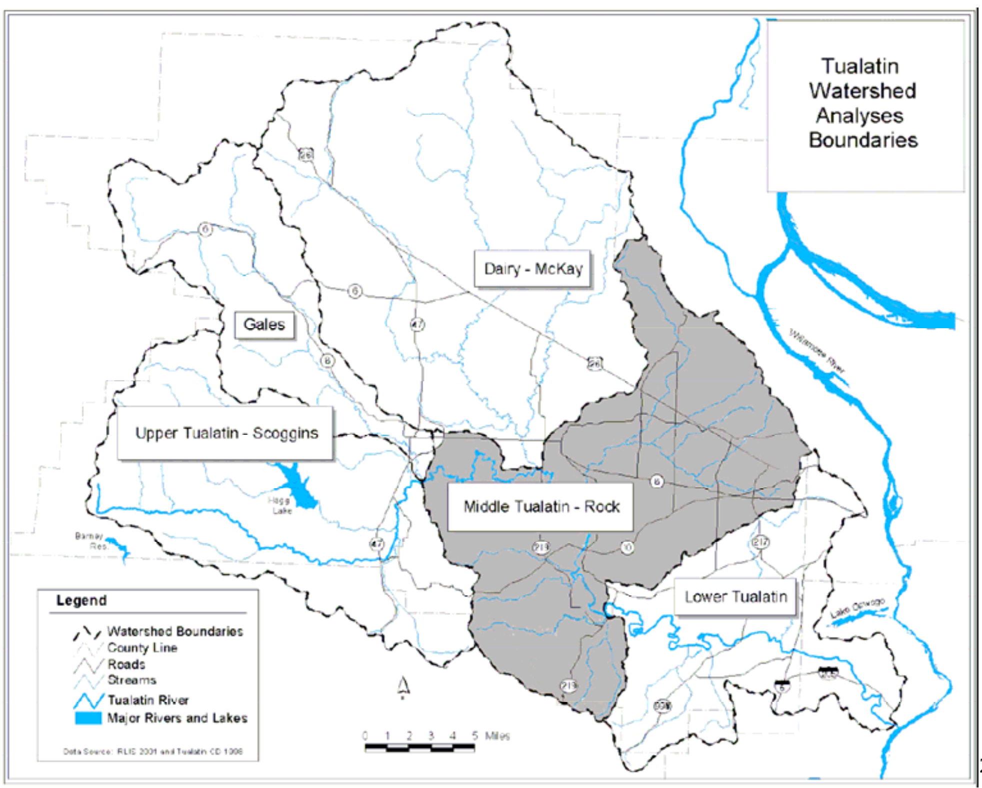
Appendix A

The Tualatin River Watershed Demonstration Project: Drinking Water Source Protection and Habitat Conservation Landscape Analysis

Current Conditions Review
September 11, 2009

INTRODUCTION

The Tualatin River flows through northwestern Oregon from the eastern side of the Coast Range to the Willamette River. Characteristics of the 83 mile-long river change dramatically over its course. Near its headwaters in the Coast Range, the river is narrow with several waterfalls. As it leaves the mountains and travels into Patton Valley, it continues to widen, eventually achieving an average width of about 150 feet before the confluence with the Willamette River.[1] The Tualatin River Basin drains a 712 square mile land area. It is located predominantly within Washington County, although portions reach into Clackamas, Tillamook, Columbia, and Yamhill Counties.



[2]

[1] U.S. Geological Survey, Oregon Water Science Center, Tualatin River Basin Water Quality Assessment ("USGS Assessment"), http://or.water.usgs.gov/tualatin/pn356.html.
[2] Graphic, Middle Tualatin-Rock Creek Watershed Analysis Summary, Tualatin River Watershed Council, at. 1.

As part of the Portland Metropolitan area, Washington County shares in the growth and change experienced throughout the region. In fact, Washington County is the fastest growing county in Oregon.[3] Although most growth has taken place in the eastern part of the Tualatin Basin, it generates additional demands on resources throughout the watershed. The Tualatin River serves as the primary source of drinking water for residents of the cities of Hillsboro, Forest Grove, and Beaverton as well as thousands of other Washington County residents. In the coming years, population growth and land use changes around the Tualatin River are expected to increase, as are the associated water quality impacts. Proper management of growth, water supply, and water quality is necessary in order to ensure safe and continuous supply of safe, clean drinking water for current and future residents of Washington County.

THE STUDY AREA – THE UPPER TUALATIN-SCOGGINS AND GALES CREEK WATERSHEDS

Residents of the Tualatin River Basin depend on the Tualatin River for drinking water, irrigation, recreation, and waste removal.[4] Surface water intakes for drinking water on the Tualatin River are located in the Upper Tualatin-Scoggins and Gales Creek watersheds, in the western and southwestern portion of the Tualatin River Basin.[5] A cumulative total of 467 stream miles are upstream of the primary drinking water intakes in the two watersheds. Together, the watersheds drain over 200 square miles (nearly 137,000 acres).[6] Tributaries to the Tualatin River in this area include Carpenter Creek, Dilley Creek, Scoggins Creek, Ayers Creek, Roaring Creek, Lee Creek, and Sunday Creek.

Drinking Water Supply

The Joint Water Commission (JWC) is the largest water treatment plant in Oregon, with the capacity to produce up to 75 million gallons of drinking water per day.[7] The JWC is the primary drinking water supplier to residents of Washington County, serving over 400,000 people in the Portland Metropolitan area.[8]

The JWC has only one surface water intake for drinking water supply along the Tualatin River.[9] During wet winter months, it pulls all the water it treats directly from the river.[10] As the river flow decreases during the dry summer months, the JWC's right to draw from the Tualatin River is suspended. Therefore, during the summer the JWC obtains water from the Barney Reservoir. The Barney Reservoir itself is outside the study area, but it is used to store and provide supplemental water within the study area through a 6500 foot pipeline that diverts water from the

---

[3] Hawksworth, J.T. 2000. Upper Tualatin-Scoggins Watershed Analysis. Bureau of Land Management/Washington Soil and Water Conservation District ("Upper Tualatin-Scoggins Analysis") at 95.
[4] USGS Assessment.
[5] Oregon Department of Environmental Quality, Source Water Assessment Summary Brochure, Joint Water Commission (PWS#4100379) and Hillsboro-Cherry Grove (PWS #4100985) ("JWC Source Water Assessment"), http://www.deq.state.or.us/wq/dwp/docs/swasummary/pws00379985.pdf.
[6] Upper Tualatin-Scoggins Analysis, 1; Breuner, N. 1998. Gales Creek Watershed Assessment Project. Tualatin River Watershed Council ("Gales Creek Assessment") at 1.
[7] City of Hillsboro 2009 Water Quality Report, http://www.ci.hillsboro.or.us/Water/Documents/2009CCR.pdf. Average daily demand from the system is approximately 34 mgd year round. The plant has peaked at 88% capacity.
[8] Joint Water Commission, Who We Are, http://jwcwater.org/.
[9] JWC Source Water Assessment.
[10] Joint Water Commission, Water Sources, http://jwcwater.org/.

Trask River to the Tualatin River. The reservoir holds 20,000 acre-feet of water. It is owned and operated by the Barney Reservoir Joint Ownership Commission, which includes members of the JWC.

The JWC also has some rights to use water from Scoggins Reservoir or Hagg Lake, a man-made reservoir on Scoggins Creek. Hagg Lake was created for the primary purpose of flood control for the Tualatin Valley.[11] During the summer, Hagg Lake is used to irrigate agricultural areas, to provide industrial and municipal water to several parts of Washington County, and for recreation.[12] It is also used to supplement water flow to the lower Tualatin River to enhance water quality standards. Hagg Lake holds approximately 53,000 acre-feet of water, most of which is owned by the Tualatin Valley Water District.[13] The reservoir is currently under Bureau of Reclamation ownership, although a transfer into local ownership is currently being explored.

Ownership in the JWC is shared by five agencies: the City of Hillsboro, the City of Forest Grove, the City of Beaverton, the City of Tigard, and the Tualatin Valley Water District. In addition to its membership in the JWC, the City of Hillsboro owns and operates a slow sand filter plant located at Haines Falls on the Tualatin River.[14] This plant is the only water supply source for the unincorporated community of Cherry Grove, and the primary water source for the unincorporated community of Dilley, the City of Gaston, and LA Water Cooperative.[15] The City of Forest Grove also draws water from five surface-water intakes on city-owned land in the Gales Creek Watershed.[16] The City of Beaverton has three operating aquifer storage and recovery (ASR) wells.[17] Beaverton injects water into underground aquifers, the ASR wells, for storage during the wet season and pumps it out for use during the dry season. All the water Beaverton injects into the ASR wells is treated drinking water from the JWC Treatment Plant.

Wastewater Treatment

Clean Water Services is the wastewater and stormwater utility for most Washington County residents.[18] The wastewater utility treats nearly 64 million gallons of wastewater daily at four treatment plants. Treated water is then discharged directly into the Tualatin River downstream of the JWC drinking water intake. Clean Water Services also manages stream flow for water quality purposes in the Tualatin River by releasing water from Hagg Lake and the Barney Reservoir. During the summer months, Clean Water Services' water releases from the two

---

[11] U.S. Department of the Interior, Bureau of Reclamation, Scoggins Dam, http://www.usbr.gov/projects/Facility.jsp?fac_Name=Scoggins+Dam&groupName=Overview.
[12] Sullivan, A.B. and Rounds, S.A. 2005. Modeling Hydrodynamics, Temperature, and Water Quality in Henry Hagg Lake, Oregon 2000-03. United States Geological Survey, at 2.
[13] Joint Water Commission, Water Sources, http://jwcwater.org.
[14] City of Hillsboro Water System, http://www.ci.hillsboro.or.us/Water/WaterSystem.aspx.
[15] March 31, 2008 correspondence from Kevin Hanway, City of Hillsboro Water Department Director, to Bob Gustavson, District Forester, Forest Grove District, Oregon Department of Forestry ("Hanway correspondence").
[16] City of Forest Grove Water Quality Report 2008, http://www.forestgrove-or.gov/city-services/water-treatment.html; Oregon Department of Environmental Quality, Source Water Assessment Summary Brochure, City of Forest Grove (PWS# 410305) http://www.deq.state.or.us/wq/dwp/docs/swasummary/pws00305.pdf
[17] City of Beaverton 2008 Water Quality Report, http://www.beavertonoregon.gov/departments/publicworks/Utilities/docs/BeavertonCCR2008.pdf, at 8.
[18] Clean Water Services, About Us, http://www.cleanwaterservices.org/AboutUs.

reservoirs and two advanced treatment facilities comprise half of the flow in the lower Tualatin River.[19]

Land Use and Ownership
Eighteen percent of the entire Tualatin River Basin is in urban land use.[20]

Forestry is the dominant land use activity over much of the Upper Tualatin-Scoggins watershed.[21] (See **Table A** for a breakdown of forested land types.) Agriculture is also of major economic importance in the watershed, but the amount of farm and agricultural land is expected to slowly decrease, while timber operations are expected to remain constant or increase as the forests reach merchantable age.[22] The most important mineral resource in the Upper Tualatin-Scoggins watershed is crushed rock. As of 1998, there were 11 active quarries in the watershed as well as a number of abandoned rock pits.[23] Urban land use is limited, and for the most part is concentrated around the cities of Gaston and Forest Grove.

Table A. Forestland in the Upper Tualatin-Scoggins Watershed	
Industrial forestland	47.8%
BLM owned/managed	6.4%
State owned/managed	17.6%
Private non-industrial forestland	28.2%

Bureau of Land Management, Upper Tualatin-Scoggins Watershed Analysis.

In the Gales Creek watershed, local laws restrict land use mostly to forestry, agriculture, scattered rural residences, and rural services.[24] As in the Upper Tualatin-Scoggins watershed, the dominant land use is forestry. Irrigated and non-irrigated agricultural uses are also widely occurring. Industrial activity in the watershed is limited and related to resource extraction, staging areas for industrial forest and agriculture, and development within the city of Forest Grove.

Land ownership in the Upper Tualatin-Scoggins watershed is primarily private. (See **Table B** for a breakdown of land ownership in the study area.) The largest single use of privately owned land is private industrial timberland.[25] The majority of public land in the watershed is managed by the Oregon Department of Forestry or the Bureau of Land Management. Two-thirds of the Gales Creek watershed is privately owned as either industrial forestland or private agricultural and rural residential.[26] The majority of public land is owned and managed by the Oregon Department of Forestry as the Tillamook State Forest. The City of Forest Grove owns the remaining public land, which it manages for drinking water supply and potential timber harvest. There are no federal lands in the Gales Creek watershed.

---

[19] Clean Water Services, July 2, 2009 News Release, July 2, 2009, http://www.cleanwaterservices.org/AboutUs/News/WaterRelease.
[20] Tualatin Basin Effective Impervious Area Reduction Task Force Report. 2002 Draft. Clean Water Services.
[21] Upper Tualatin-Scoggins Analysis at 24.
[22] *Id*. at 138.
[23] *Id.* at 96.
[24] Gales Creek Assessment at 2.
[25] Upper Tualatin-Scoggins Analysis at 20.
[26] Gales Creek Assessment at 2.

Table B. Land Ownership and Use in the Study Area		
	Upper Tualatin-Scoggins Watershed	Gales Creek Watershed
Privately owned	87%	64%
Publicly owned	13%	36%
Private industrial forest land	36.5%	26%
Private agricultural or rural residential	N/A	38%

Bureau of Land Management, Upper Tualatin-Scoggins Watershed Analysis; Tualatin River Watershed Council, Gales Creek Watershed Assessment Project.

Water Quantity and Use

Water quantity in the Tualatin River is based on precipitation, so flow is higher in the winter months and lower in the summer. The decreased summer flow raises real concerns about adequate water supply for irrigation and local use. Water is over-allocated in several parts of the Upper Tualatin-Scoggins watershed and new allocations are restricted accordingly.[27]

The largest use of water in the Upper Tualatin-Scoggins watershed is irrigation. Instream diversions for agriculture account for the greatest use of surface water resources.[28] Some water rights are assigned for instream uses, typically to sustain populations of fish and wildlife, such as salmon and steelhead trout. However, instream uses have relatively junior priority dates and are lost when river flow drops. An instream leasing program has been established to provide an incentive to senior water right holders to lease their rights for instream use.[29]

Irrigation is also overwhelmingly the predominant use of water in the Gales Creek watershed.[30] Approximately 71 percent of water rights are for irrigation, with domestic water supply and storage, the second greatest uses, each accounting for about six percent of water rights. Other water uses include nursery, municipal, instream use, livestock, and commercial power development.

Water quantity is a growing concern in the region as a whole. Water needs are expected to double by 2050 as a result of growing population in the Tualatin River Basin.[31] Increased demand is expected to be in the range of 50,000 acre-feet of water annually. Local water resource agencies are collaborating to address future water needs and have proposed two alternatives for further study. Both include raising the dam at Hagg Lake and installing a raw water pipeline pumpback system. One alternative would also expand the Willamette River Water Treatment Plant, which is outside of the study area. Currently, a Draft Planning Report/Environmental Impact Statement is being prepared to address the implications of these alternatives.

[27] Upper Tualatin-Scoggins Analysis at 46.
[28] Upper Tualatin-Scoggins Analysis at 48, 138.
[29] *Id.* at 50
[30] Gales Creek Assessment at 52.
[31] Tualatin Basin Water Supply, http://www.tualatinbasinwatersupply.org.

Groundwater
Groundwater supplies in the Upper Tualatin-Scoggins are more limited than in other parts of the Tualatin Basin.[32] Nevertheless, unconfined aquifers in the Wapato Valley alluvium provide an important groundwater source. During the wet winter months the water table can rise to the surface, causing flooding of seasonal wetlands. The aquifers in the Upper Tualatin-Scoggins watershed are not conducive to drinking water supply.[33]

Recreation
Hiking, camping, fishing, birding, cycling, touring, and off highway vehicle use are popular recreational uses in the Upper Tualatin-Scoggins watershed.[34] In the Gales Creek watershed, recreational uses include fishing and water contact recreation.[35] Hagg Lake and the Barney Reservoir are both popular recreation sites. Motorized vehicles are permitted on Hagg Lake. Access to the Barney Reservoir is more restricted, and only electric motorized activity is allowed on the reservoir.[36]

Native Species and Critical Habitat
Much of the Upper Tualatin-Scoggins watershed contains valuable salmonid habitat. Steelhead trout, identified as a threatened species and cutthroat trout, listed on the Oregon Sensitive Species list, are both found within the watershed.[37] Steelhead and cutthroat trout are also found within the Gales Creek watershed, as are coho salmon.[38] The Tualatin River Water Council completed a Lower Gales Creek Habitat Enhancement Plan, a five-year anadromous fish habitat enhancement plan for a four mile stretch of Gales Creek in 2003.[39]

The greatest contiguous stand of Late Successional Reserve forest in Oregon is found on federal lands in the Upper Tualatin-Scoggins watershed.[40]

Roads
There are approximately 477 miles of roads located within the Upper Tualatin-Scoggins watershed.[41] This includes roads with rock or natural surfaces that are used for vehicular driving or for logging. Legacy roads, or discontinued roads once used for logging are not included in this total.

---

[32] Upper-Tualatin Scoggins Analysis at 53.
[33] Conversation with Niki Iverson, City of Hillsboro Water Resource Manager, August 6, 2009.
[34] *Id.* at 24.
[35] Gales Creek Assessment at 37, 54.
[36] Conversation with Niki Iverson, City of Hillsboro Water Resources Manager, August 6, 2009.
[37] Upper Tualatin-Scoggins Analysis at 17-18.
[38] Gales Creek Assessment at 32.
[39] Tualatin River Watershed Council, Lower Gales Creek Habitat Enhancement Plan, http://www.trwc.org/tualatin-info/gales/gales2/gales-plan.html.
[40] Upper Tualatin-Scoggins Analysis at 18.
[41] *Id.* at 99.

WATER QUALITY

The forested portion of the Upper Tualatin-Scoggins watershed generally has higher water quality than lower portions of the watershed.[42] Water quality decreases in the valleys on the lower reaches of the tributaries, which generally have less shade and higher temperature, lower dissolved oxygen, and increased sedimentation, turbidity, nutrient levels and bacteria levels. Similarly, the lower mainstem of Gales Creek generally has poorer water quality conditions due to low gradient, low summer flow, and high summer temperatures.[43] Over the past decade, water quality sampling of tributaries in the Upper Tualatin-Scoggins watershed have revealed slight to moderate ecological impairment due to *E coli* bacteria, high coliform levels, low dissolved oxygen, and high temperature.[44] High nitrate and ammonium levels also impair water quality in the Upper Tualatin-Scoggins watershed.[45] Parameters of concern for Gales Creek include bacteria, temperature, dissolved oxygen, and pH.[46]

TMDLs

Total Maximum Daily Loads (TMDLs) are restoration plans that define the maximum amount of a pollutant that a water body can receive and still meet water quality standards. TMDLs are developed by states for water bodies that are designated as impaired, meaning they are unable to meet established water quality standards that are intended to protect beneficial uses. The major beneficial uses in Upper Tualatin-Scoggins and Gales Creek watersheds are similar and include domestic municipal consumption, fisheries (warm and cold water), water contact recreation, irrigation, maintaining downstream water quality, livestock watering, resident fish and aquatic life, and wildlife.[47] These beneficial uses depend on the criteria (or limits) established for water quality parameters of temperature, nutrients, suspended sediment, turbidity, dissolved oxygen, and bacteria.

As of the last completed state water quality assessment, TMDLs had been approved along the Tualatin River for temperature, bacteria, dissolved oxygen, and chlorophyll a/elemental phosphorus.[48] Chlorophyll a may interfere with water supply.[49] TMDLs were needed for iron and manganese. An excessive concentration of either could impact human health and aquatic life. Alkalinity and phosphate phosphorus were noted as potential concerns. Flow reduction and habitat modification also had negative impacts on the water quality of the Tualatin River, although because these conditions are not pollutants, a TMDL is not appropriate.

---

[42] *Id.* at 59
[43] Gales Creek Assessment at 54.
[44] Upper Tualatin-Scoggins Analysis at 61-68.
[45] *Id.* at 69.
[46] Gales Creek Assessment at 54.
[47] Upper Tualatin-Scoggins Analysis at 59; Gales Creek Assessment at 54.
[48] Tualatin River Subbasin Total Maximum Daily Load (TMDL). 2001. Oregon Department of Environmental Quality.
[49] Water quality assessment – Oregon's 2004/2006 Integrated Report Database, http://www.deq.state.or.us/wq/assessment/rpt0406/search.asp#instr.

Phosphorus

Soils in the Upper Tualatin-Scoggins watershed are believed to be naturally high in phosphorus.[50] Most phosphorus in the Upper Tualatin River and Scoggins Creek seems to come from natural sources such as groundwater flowing through regions underlain by sedimentary rock.[51] Increased erosion of high phosphorus soil can also contribute to high phosphorus levels in the river. In addition, agricultural and timber operations such as fertilization and slash burning can be sources of phosphorus and may have a greater impact on water quality in tributary streams.[52] High phosphorus levels are likely correlated with livestock, agricultural, and nursery operations in the lower half of the Upper Tualatin-Scoggins watershed. In recent years, excessive nutrient loads have caused problems with anabaena algal blooms in the Barney Reservoir.[53] Erosion of phosphorus-rich soils, caused by fertilization and clear-cutting, may contribute to high phosphorus levels in the reservoir. Other probable anthropogenic sources of phosphorus within the Tualatin River Basin include wastewater treatment plants and sanitary sewer systems; cross connections between sanitary and storm sewer systems; discharges from other permitted sites; urban runoff from fertilizer and cross connections; rural runoff from septic system failure, hobby farms, horse pastures, and fertilizer; agricultural runoff from fertilizer, animal waste, and erosion; forestry operations, from roads and culverts; septic system failure; and in stream and near stream erosion.[54]

Bacteria

Probable sources of bacteria in the Tualatin River Basin are the four wastewater treatment plants and sanitary sewer systems: Durham, Rock Creek, Hillsboro, and Forest Grove.[55] Only Durham and Rock Creek discharge during the summer, when water quality concerns are more prominent. Other probable sources of bacteria include: discharges from other permitted sites; direct deposit by birds and other animals; illegal dumping; urban runoff from pet and animal waste; failing septic systems; cross connections and overflows from sanitary sewer systems; rural runoff from hobby farms, horse pastures, and septic failure; and agricultural runoff from animal waste.

Temperature

Human activity can greatly influence water temperature in the Tualatin River Basin.[56] Disturbances in riparian vegetation and stream surface shading, channel widening, reduced flow volumes due to withdrawals for irrigation or municipal use, increased high temperature discharge, and disconnected floodplains can all contribute to elevated water temperature. Water temperature can have a significant impact on aquatic life.

---

[50] Upper Tualatin-Scoggins Analysis at 15.
[51] Upper Tualatin-Scoggins Analysis at 127.
[52] Upper Tualatin-Scoggins Analysis at 67, 128.
[53] Oregon Department of Water Quality, Status Report on Hillsboro Public Water Supply, February 29, 2008 ("Hillsboro Status Report").
[54] Appendix I, Tualatin River Subbasin Water Quality Management Plan (WQMP). 2001. Oregon Department of Environmental Quality ("WQMP Appendix I"), at I-7.
[55] *Id.* at I-8.
[56] *Id.* at I-9.

Dissolved Oxygen
Ammonia has been identified as a pollutant contributing to low dissolved oxygen (DO) levels in the Tualatin River.[57] DO levels can reach critical levels as a result of nitrification in the summer and fall. The major sources of ammonia in the Tualatin River during the summer and fall are the Durham and Rock Creek wastewater treatment plants. Neither are located within the study area. Volatile organic solids may also contribute to low DO levels. Sources of volatile solids in the Tualatin River Basin include urban runoff, rural runoff, agricultural runoff, forestry runoff, instream and near-stream erosion, and algal detritus.

Sedimentation and Erosion
Most upland areas in the Upper Tualatin-Scoggins watershed have a highly erodible soil mantle. The heavy forest cover moderates erosion, but human activity such as forest clearing and soil disturbance can accelerate erosion.[58] Road building activities are the most significant human source of accelerated surface erosion and excessive sediment delivery to streams.[59] Agriculture is also a potentially major contributor to erosion and sedimentation. This is particularly a problem with poorly buffered or poorly vegetated streams.

Best management practices (BMPs) and riparian buffers can generally help reduce erosion. However, there has historically been a low level of landowner participation in BMP programs developed by government conservation agencies in the Upper Tualatin-Scoggins watershed as compared with the rest of the Tualatin Basin.[60] In addition, although road-related mass wasting and erosion have declined with improved road-building practices, the continued existence and location of older roads remains a source of concern.

Notably, the Hillsboro slow sand filter plant is extremely sensitive to additional sediment loads.[61] It must cease intakes from the Tualatin River when influent reaches five NTU. Debris flows and land slides lead to high turbidity, which requires Hillsboro to shut off its intake about three times annually. The terrain near the slow sand filter plant is also prone to landslides, which have previously caused temporary closings of the plant.[62] Although the JWC plant is able to handle higher turbidity levels than the Hillsboro slow sand filter plant, treatment time and costs increase with greater sedimentation levels as do problems with taste and odor.[63]

Other Potential Contaminant Sources
The Oregon Department of Environmental Quality (DEQ) has identified a total of 306 potential contaminant sources within the JWC and Hillsboro public drinking water supply areas.[64] 295 of those sources are within "sensitive areas." These are areas with high soil permeability, erosion potential, and runoff potential, as well as areas that are within 1000 feet of rivers or streams. Potential contaminant sources fall broadly within the categories of agricultural/forest

---

[57] Tualatin River Subbasin Water Quality Management Plan (WQMP). 2001. Oregon Department of Environmental Quality ("WQMP") at I-6.
[58] Upper Tualatin-Scoggins Analysis at 8, 41.
[59] Upper Tualatin-Scoggins Analysis at 38.
[60] Upper Tualatin-Scoggins Analysis at 42.
[61] Hanway correspondence.
[62] Hillsboro Status Report.
[63] Hanway correspondence.
[64] JWC Source Water Assessment.

management, commercial land uses, and residential or municipal land uses, and include utility stations, mines or gravel pits, and boarding stables. Other prevalent high risk uses in the study area include irrigated crops, grazing animals (more than five per acre), and perennial transportation/stream crossings.

Emerging contaminants are not a major concern in the Upper Tualatin-Scoggins and Gales Creek watersheds.[65] However, a recent DEQ screening found a high concentration of DEET pesticide in portions of the Tualatin River. The level of DEET identified suggests it is being directly applied somewhere in the watershed. Because the pesticide reporting requirements in effect in Oregon are at a watershed scale, it is difficult to pinpoint the source of the potential contaminant.

The U.S. Fish and Wildlife Service has proposed establishing the Wapato Lake Unit Tualatin River National Wildlife Refuge within the Upper Tualatin-Scoggins and Gales Creek watersheds.[66] The refuge would support habitat for numerous types of migratory birds and native fish species and may also have water quality benefits.[67] Potential adverse water quality effects include taste and odor problems.[68] Proper management of the Wildlife Refuge is important in order to avoid an undesirable impact on the watershed.

POPULATION CHANGE AND LAND DEVELOPMENT PATTERNS

Washington County is the fastest growing and second most populated county in Oregon, with most of the population concentrated on the eastern 15 percent of the Tualatin River Basin.[69] The 2008 population estimate for Washington County was 529,216, an 18.8 percent increase since 2000.[70] Washington County's population is growing faster than the state as a whole, which experienced only a 10.8 percent population increase during the same time period. It is also growing faster than the most populated county in the state, Multnomah County, which experienced only an eight percent population increase between 2000 and 2008. Washington County's population has more than doubled since 1980 and increased nearly 500 percent since 1960.[71] The Oregon Office of Economic Analysis population forecast for Washington County shows the population could grow to 788,162 by 2030.[72] If this forecast is accurate, it could mean another 48.9 percent increase in population over the 2008 estimate.

Population increase is placing the greatest demand on resources within the Upper Tualatin-Scoggins watershed.[73] Urban growth within the watershed is expected to be concentrated along

---

[65] Conversation with Niki Iverson, City of Hillsboro Water Resource Manager, August 6, 2009.
[66] Tualatin River National Wildlife Refuge Proposed Wapato Lake Unit Draft Land Conservation Plan and Environmental Assessment. 2006. U.S. Fish and Wildlife Service, at 1.
[67] *Id.* at 42.
[68] Conversation with Niki Iverson, City of Hillsboro Water Resource Manager, August 6, 2009.
[69] Tualatin River Watershed Council, Frequently Asked Questions, http://www.trwc.org/tualatin_info.html.
[70] U.S. Census Bureau, Quick Facts, http://quickfacts.census.gov/qfd/states/41/41067.html.
[71] U.S. Census Bureau, Oregon Population of Counties by Decennial Census: 1900 to 1990, http://www.census.gov/population/cencounts/or190090.txt.
[72] Oregon Office of Economic Analysis, State and County Population Forecasts and Components of Change, 2000 to 2040, http://www.oregon.gov/DAS/OEA/docs/demographic/pop_components.xls.
[73] Upper Tualatin-Scoggins Analysis at 139.

the Highway 47 corridor near Gaston, the only area within the watershed zoned for urban land uses.[74] Most of the growth in the watershed is expected to be rural residential uses. Population growth in the Gales Creek watershed is expected to be fairly limited. Most population growth will occur within Forest Grove, the only incorporated city in the Gales Creek watershed.[75]

THE LOWER TUALATIN WATERSHED

The Lower Tualatin watershed was historically heavily forested in old-growth timber.[76] Now, after more than a century of logging, agricultural conversion, and urbanization, timber accounts for only a small portion of land cover in the watershed. Industrial forestland is limited to 100 acres.[77] While a combined total of 10 percent of the land in the watershed is zoned for forestry or mixed agriculture and forestry, 52 percent of the land in the watershed is currently developed or zoned for urban uses, and another 22 percent of the land in the watershed is zoned for rural residential use.[78] Most of the urban population is concentrated in the northeast portion of the watershed, which includes parts of the City of Portland.[79] In the western portion of the watershed, agriculture is a significant economic activity.

Water quality in the Lower Tualatin watershed reflects the surrounding land uses. The greatest concentration of impaired streams in the Tualatin Basin is in the Lower Tualatin watershed.[80] Parameters of concern include bacteria (specifically *E coli*), dissolved oxygen, phosphorus, ammonia, nitrogen, temperature, and heavy metals. As a result of high bacteria levels, most major streams in the Lower Tualatin watershed are impaired for water contact recreation.[81]

It is believed that removal of riparian forests in the watershed increased the Tualatin River's exposure to sunlight, resulting in higher water temperature and reduced dissolved oxygen levels.[82] Forest removal also contributed to increased streambank erosion and reduced filtration of sediments from upland runoff, which in turn resulted in increased turbidity and suspended solids. In essence, the conversion from forests to agriculture brought with it greater erosion; greater sediment loads in surface runoff; and higher delivery of sediments, absorbed nutrients, organic matter, and pesticides to streams. Urbanization has also taken its toll, in the form of slope destabilization, increased sediment delivery to streams, and increased pollutant-containing surface runoff.

Impaired water quality in the Lower Tualatin watershed does not impact drinking water quality for most watershed residents, as their primary drinking water source is the Bull Run watershed, outside of the Tualatin River Basin. The Bull Run watershed, in Mount Hood National Forest, is

---

[74] *Id.* at 95
[75] Gales Creek Assessment at 9.
[76] Hawksworth, J.T. 2001. Lower Tualatin Watershed Analysis. Washington Soil and Water Conservation District ("Lower Tualatin Watershed Analysis") at 101.
[77] *Id.* at 23.
[78] *Id.* at 95.
[79] *Id.* at 20.
[80] *Id.* at 65.
[81] *Id.* at 127.
[82] *Id.* at 123.

one of the highest quality raw surface water sources in the country.[83] In stark contrast to the variety of uses found within the Tualatin River Basin, public entry into the Bull Run watershed has been prohibited since 1904. Land management activities in the watershed are restricted by federal law to those necessary to protect water quality, operate water supply, and operate hydroelectric power facilities in the watershed.[84]

The same level of protection is not available, and probably not desirable, in the Tualatin River Basin. Still, for the hundreds of thousands of people that depend on the Tualatin River for drinking water, some safeguards are needed to ensure continued high water quality. Strategic protection of the land that most affects drinking water quality in the Tualatin River Basin can limit the impact of population growth and land use change. Through well-planned land conservation, threats to the quality of the drinking water supply can be minimized.

CONCLUSION

Threats to drinking water quality in the Tualatin Basin come from a combination of natural occurrences and anthropogenic activities. Erosion of the naturally phosphorus-rich soils is accelerated by land use practices in the watershed. Agriculture, timber operations, and residential services also increase the amount of phosphorus in the water. Erosion also contributes to increased sediment levels and high turbidity, both of which threaten drinking water quality in the basin.

GIS modeling can help address the threat of erosion and associated water quality impacts. By identifying erosion-prone areas, such as those with high soil erodibility and steep slopes, the land conservation model can help locate lands that are high priorities for protection so erosion of high phosphorus soil is not increased by future land uses. The land restoration model can identify locations where agricultural or timber operations may be leading to increased sedimentation near the JWC intake and Hillsboro slow sand filter plant.

Bacteria also threatens drinking water quality in the Tualatin Basin. Most bacteria in the Tualatin River stems from human activities. The land restoration model can identify the presence of possible bacteria sources, such as urban, rural, and agricultural runoff origins in proximity to water.

Land protection efforts in the identified areas, such as more land acquisition or more stringent land use regulations, can help prevent future water quality decline. Land conservation may be preferred in areas with little human activity and high ecological function. However, as land conservation requires willing sellers or donors, land use regulations may be the best alternative. The GIS analysis can help identify the locations where protective regulation may be the most effective in reducing future threats to drinking water quality.

[83] Portland Water Bureau, Bull Run Watershed, http://www.portlandonline.com/water/index.cfm?c=48915&.
[84] 16 U.S.C. § 482b (2008).

Appendix B

Tualatin Source Water / Habitat Protection Project

Trust for Public Land / River Network / Smart Growth Leadership Institute / Oregon DEQ

Project Management Team

Kelley Hart
Associate Director Conservation Vision
The Trust for Public Land
202-543-7552
kelley.hart@tpl.org

Bob Heuer
GIS Program Manager
The Trust for Public Land
1600 Lena St. Bldg. C
Santa Fe, New Mexico 87505-3891
505-982-6966
bob.heuer@tpl.org

Gayle Killam
Protection and Restoration Program Director
River Network
520 SW 6th Ave, Ste #1130
Portland, Oregon 97204
503-542-8387
GKillam@rivernetwork.org

Sheree Stewart
Drinking Water Protection Coordinator
Oregon DEQ
HQ- Water Quality
811 SW 6th
Portland, Oregon 97204-1390
503-229-5413
Stewart.sheree@deq.state.or.us

Steven Aalbers
Drinking Water Protection Information Coordinator\GIS
Oregon DEQ
HQ- Water Quality
811 SW 6th
Portland, Oregon 97204-1390
503-229-6798
aalbers.steven@deq.state.or.us

Technical Advisory Team (TAT)

Avis Newell
Tualatin Basin Coordinator
Oregon DEQ, Northwest Region
2020 SW 4th Avenue, Ste #400
Portland, Oregon 97201-4987
503-229-6018
Newell.avis@deq.state.or.us

Barbara Stifel
Environmental Health Specialist
Department of Human Services
971-673-0429
barbara.l.stifel@state.or.us

Doug White
Community Services Specialist
Department of Land Conservation and Development
888 NW Hill Street, Ste #2
Bend, OR 97701
541-318-8193
doug.white@state.or.us

Amanda Punton
Natural Resource/Aggregate Specialist
Department of Land Conservation and Development
635 Capitol St. NE, Suite 150
Salem 97301-2540
971-673-0961
amanda.punton@state.or.us

Niki J. Iverson
Water Resources Manager
City of Hillsboro
Hillsboro Civic Center
150 E Main St, 3rd Floor
Hillsboro, OR 97123
503-615-6770
nikii@ci.hillsboro.or.us

Kristel Fesler
Water Resources Technician II
City of Hillsboro
Hillsboro Civic Center
150 E Main St, 3rd Floor
Hillsboro, OR 97123
503-928-1445
kristelf@ci.hillsboro.or.us

Rich Hunter
Clean Water Services
2550 SW Hillsboro Highway
Hillsboro, Oregon 97123
503-681-3638
HunterR@CleanWaterServices.org

Helen Rueda
U.S. Environmental Protection Agency
Oregon Operations
805 SW Broadway, Suite 500
Portland, OR 97205
503-326-3280
rueda.helen@epa.gov

Stewart Rounds
U.S. Geological Survey
Oregon Water Science Center
2130 SW 5th Avenue
Portland, OR 97201
503-251-3280
sarounds@usgs.gov

Nels Mickaelson
GIS Coordinator
Washington County
503-846-8039
nels_mickaelson@co.washington.or.us
nels.m@verizon.net (use for attachments)

Steve Campbell
Soil Scientist/Soil Data Quality Specialist
NRCS
1201 NE Lloyd Blvd, Suite 900
Portland, OR 97232
Phone: (503) 414-3009
steve.campbell@or.usda.gov

Chad McGrath
Soil Scientist
NRCS
1201 NE Lloyd Blvd, Suite 900
Portland, OR 97232
503-414-3003
Chad.Mcgrath@or.usda.gov

April Olbrich
Council Coordinator
Tualatin River Watershed Council
P.O. Box 338
Hillsboro, OR 97123
503-846-4810
trwc@easystreet.net

Miranda Wood
Conservation Strategy GIS Analyst
Natural Resources Information Management Program
Oregon Department of Fish and Wildlife
Salem, OR
503-947-6075
miranda.l.wood@state.or.us

Michael Schindel
Director of Conservation Information Systems
The Nature Conservancy
821 S.E. 14th Avenue
Portland, Oregon 97214
503-802-8122
mschindel@tnc.org

Lori Hennings
Metro Regional Center
Senior Natural Resource Scientist
600 NE Grand Ave.
Portland, OR 97232-2736
503-797-1940
lori.hennings@oregonmetro.gov

Ryan Michie
Water Quality Analysts
Oregon DEQ
811 SW 6th
Portland, Oregon 97204-1390
503-229-6162
michie.ryan@deq.state.or.us

Appendix C

Tualatin River Watershed Demonstration Project

Drinking Water Source Protection and Habitat Conservation Landscape Analysis

April 27, 2010

Goal	Criteria	Criteria Weights	Methodology	Data	Data Source
Protect Water Quality in Source Areas					
	Water Setbacks	**12%**	Analysis identifies as high priority (5) land within 200' setback on each side of rivers, streams, and lakes	PNW Hydrography water courses PNW Hydrography water bodies	OR DEQ OR DEQ
	Flood Zone	**12%**	Analysis identifies as high priority (5) the 100 year flood zone and as a medium priority (3) the 500 year flood zone if not already identified as high priority.	Flood Zone	FEMA Q3 update Clean Water Services (update Washington County)
	Public Drinking Water Intake/Well Source Areas	**13%**	Analysis identifies as high priority (5) groundwater drinking water source areas with TOT 0- 15 years including springs and surface water drinking water source areas.	Public Water System Groundwater Drinking Water Source Areas Surface Water Drinking Water Source Areas	OR DEQ OR DEQ
	Ground Water Well Density	**5%**	Analysis identifies PLSS sections containing community well locations and prioritizes sections based on domestic and irrigation well density. Sections received the following priority: Contains Community well or 16-19 wells = 5 12-15 wells = 4; 8-11 wells = 3; 4-7 wells = 2; 1-3 wells = 1	Well Locations (2007) Public Land Survey System (PLSS)	Oregon Water Resources Dept. via TNC Oregon Water Resources Dept.
	Vulnerable Soils	**12%**	Analysis identifies as high priority (5) vulnerable soils located in urban and agricultural areas. As medium high priority (4) vulnerable soils located on private forest lands and as medium priority (3) vulnerable soils located on Federal, State, Local forest lands.	Highly Erodible Land (HEL) Class 1 High Runoff Potential Drinking Water Sensitivity High Permeability Soils Drinking Water Sensitivity Statewide Landslide Information Database of Oregon (SLIDO) v1 Regional Vegetation/Landuse Raster (2008)	OR DEQ OR DEQ OR DEQ OR Dept Geology via OR DEQ TNC
	Wetlands	**12%**	Analysis identifies as high priority (5) all wetlands.	Oregon Wetlands Cover (2009)	Wetland Conservancy via TNC
	Forest Lands	**12%**	Analysis identifies as high priority (5) forest lands.	Regional Vegetation/Landuse Raster (2008)	TNC
	Upland Areas	**5%**	Analysis identifies as high priority (5) upland areas.	Synthesis Conservation Opportunity Areas (2009)	TNC
	Vacant Lands within UGB	**5%**	Analysis identifies as high priority (5) vacant lands within the UGB.	Tualatin Land Improvement Vacant (1990) Portland Area Urban Growth Boundary (2007) Metro Urban Growth Boundary	OR DEQ via all counties Metro OR DEQ Metro
	Agricultural Crop Type	**12%**	Analysis compares crop type ranking for pesticide, fertilizer, herbicide run-off to surface water for two years (2007, 2009). The analysis identifies the highest ranking (1-5) crop type between those two years. High priority = crop type with lowest ranking for surface run-off; Low priority = crop type with highest surface run-off. (Crop type ranking of 1-5 was provided by NRCS. A rank of 5 is highest threat for run-off)	National Agricultural Statistics Service Cropland Data (2007, 2009)	US Department of Agriculture

Tualatin River Watershed Demonstration Project

Drinking Water Source Protection and Habitat Conservation Landscape Analysis

April 27, 2010

Goal	Criteria	Criteria Weights	Methodology	Data	Data Source
Restore Water Quality in Source Areas					
	RWQ01 Water Quality Limited Streams and Lakes	**9%**	Analysis identifies as high priority (5) areas 150 feet from centerline of category 5 and TMDL Approved streams and first 50 feet from centerline of category 4A; identifies as medium high priority (4) next 100 feet from centerline of category 4A. Where polygon data is available the setback is measured from the edge of the polygon.	OR Streams Water Quality Limited 303(d) poly	OR DEQ TNC
	RWQ02 Biodiversity Restoration	**9%**	Analysis identifies as high priority (5) for restoration areas identified as riparian and integrated.	Synthesis Conservation Opportunity Areas	TNC
	RWQ03 Potential Contaminant Sources	**9%**	Analysis identifies as high priority (5) Underground Storage Tanks (UST), Leaking UST, Underground Injection Control (UIC), Solid Waste Sites, State Fire Marshal HSIS, Hazardous Waste Sites, and Potential Contaminant Sources (high risk point) with 100' setback that are within 500' of a stream or contain permeable soil (QAL). Analysis identifies as medium priority (3) all UST, Leaking UST, UIC's, Solid Waster Sites, State Fire Marshal HSIS, Hazardous Waste Sites, and Potential Contaminant Sources (high risk) with 100' setback that fall outside the above criteria and all Potential Contaminant Sources (moderate risk) with 100' setback. Analysis identifies as low priority (1) Potential Contaminant Sources (low risk point) with 100 ft setback.	Potential Contaminant Sources 2FEB2010 Underground Injection Control (UIC) Sites 17NOV2009 Underground Storage Tank (UST) Sites 3FEB2010 Leaking Underground Storage Tank (UST) Sites 3FEB2010 State Fire Marshal Facilities HSIS 16FEB2010 Solid Waste Sites 4FEB2010 Environmental Clean-up Sites 3FEB2010 Hazardous Waste Sites 3FEB2010 Tualatin Permeable QAL Soils	OR DEQ OR DEQ OR DEQ Facility Profiler OR DEQ Facility Profiler OR State Fire Marshal HSIS via DEQ OR DEQ Facility Profiler OR DEQ Facility Profiler OR DEQ Facility Profiler OR DEQ
	RWQ04 Effective Stream Shade	**9%**	Analysis identifies as high priority (5) effective stream shade areas with a 200' setback that are within 100 feet from the stream centerline or 100 feet from edge of stream polygon that contain 0% shade and a difference calculation of >= 20%.	Willamette Basin Effective Shade	OR DEQ
	RWQ05 Proximity to Confined Animal Feeding Operations	**9%**	Analysis identifies areas with a 100' setback that are within 500 feet of streams or located within high soil permeability QAL soil area. If a Large CAFO site it is identified as high priority (5). If a Medium or State CAFO site it is medium priority (3). If none of the above and status is NP or outside selection criteria it is identified as low priority (1).	Confined Animal Feeding Operations (CAFO) 2008	Oregon Dept. Agriculture via DEQ
	RWQ06 Flood Zones and Wetlands	**9%**	Analysis identifies all Flood Zones and Wetlands as high priority (5).	Flood Zone Oregon Wetlands Cover 2009	GIS Oregon via TNC Clean Water Services (update Washington County) Wetland Conservancy via TNC

Tualatin River Watershed Demonstration Project

Drinking Water Source Protection and Habitat Conservation Landscape Analysis

April 27, 2010

Goal	Criteria	Criteria Weights	Methodology	Data	Data Source
	RWQ07 Agricultural Crop Type	**9%**	Analysis compares crop type ranking for pesticide, fertilizer, herbicide run-off to surface water for two years (2007, 2009). The analysis identifies the highest ranking (1-5) between those two years. High priority = crop type with highest ranking for surface run-off; Low priority = crop type with lowest surface run-off. (Crop type ranking of 1-5 was provided by NRCS. A rank of 5 is highest threat for run-off)	National Agricultural Statistics Service Cropland Data (2007, 2009)	US Department of Agriculture
	PWQ08 Vulnerable Soils	**9%**	Analysis identifies as high priority (5) vulnerable soils located in urban and agricultural areas. As medium high priority (4) vulnerable soils located on private forest lands and as medium priority (3) vulnerable soils located on Federal, State, Local forest lands.	HEL soils High runoff potential Drinking Water sensitivity High permeability soils Drinking Water sensitivity Landslides SLIDOv1 Regional Vegetation/Landuse Raster (2008)	OR DEQ OR DEQ OR DEQ OR Dept Geology via DEQ TNC
	RWQ09 Permitted Water Discharge Sites	**9%**	Analysis identifies as high priority (5) Scoggins Creek segment located below the outfall location; identifies as medium high priority (4) all other stream segments below outfall locations, NPDES domestic and industrial locations; identifies as medium priority (3) NPDES general locations and WPCF locations within 500' of a stream or within permeable soil; identifies as low priority (1) all WPCF locations outside above criteria.	National Pollutant Discharge Elimination System General to Surface Water Water Quality Permit Sites 28JAN2010 National Pollutant Discharge Elimination System IND_DOM to Surface Water Water Quality Permit Sites 26MAR2010 Water Pollution Control Facility General to Surface Water Water Quality Permit Sites 28JAN2010 Water Pollution Control Facility IND-DOM to Surface Water WQ Permit Sites 28JAN2010 Water Quality Outfall Locations 20080127_Risk26MAR2010	OR DEQ OR DEQ OR DEQ OR DEQ OR DEQ
	RWQ10 Proximity to Urban Areas	**9%**	Analysis identifies areas as high priority (5) that are within floodplains or within 150 feet of streams and wetlands and contain 50-100% impervious surface.	National Landcover Database Impervious Surface 2001	USGS
	RWQ11 Tax Lots with Septic	**9%**	Analysis identifies as high priority (5) areas containing septic systems from 1985 and later with a lot size >= 1 acre or that are identified in the Potential Contaminant Source layer as high density septic system locations.	Tax lots - Septic	OR DEQ

Tualatin River Watershed Demonstration Project

Drinking Water Source Protection and Habitat Conservation Landscape Analysis

April 27, 2010

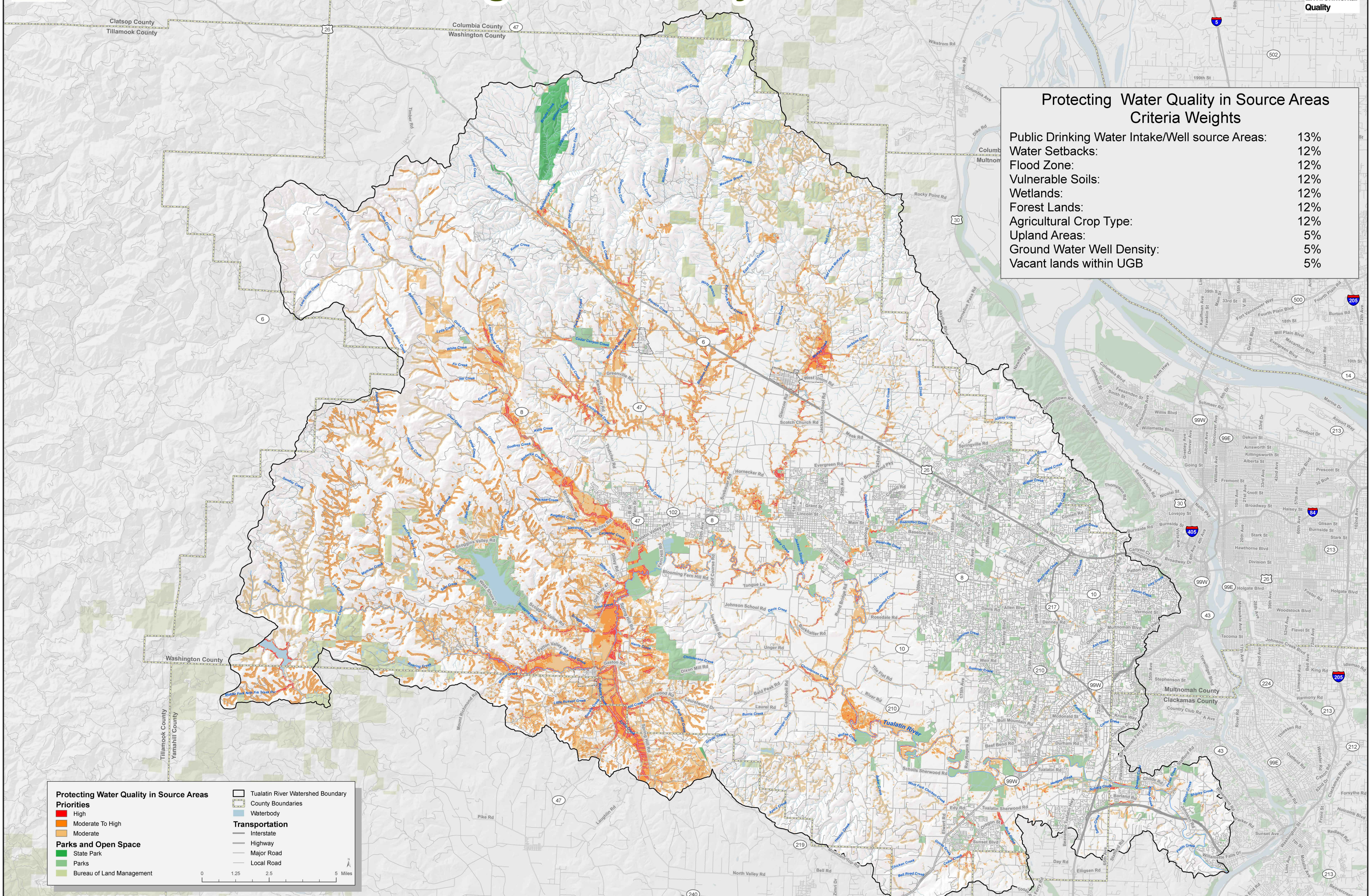
Goal	Criteria	Criteria Weights	Methodology	Data	Data Source
Identify Habitat Conservation Opportunities					
	Conservation Opportunities and Areas of Concern	**12.5%**	Analysis identifies as highest priority (5) all areas identified as Conservation Opportunities or Areas of Concern..	Synthesis Conservation Opportunity Areas Habitats of Concern	TNC Metro Portland
	Streams and Lakes with setback	**12.5%**	Analysis identifies as high priority (5) streams and lakes with a 150' setback.	PNW Hydrography water courses PNW Hydrography water bodies	OR DEQ OR DEQ
	Streams with Fish Habitat Distribution	**12.5%**	Analysis identifies as high priority (5) streams with fish distribution with a 150' setback.	Fish Habitat Distribution - Coho Fish Habitat Distribution - Steelhead - winter	ODFW ODFW
	Wetlands	**12.5%**	Analysis identifies as high priority (5) wetlands with 300' setback. TPL created additional wetland connections using Land Use and aerial imagery to connect isolated wetlands not already connected to streams with the 300' buffer.	Wetlands Wetland Connections TPL	Wetland Conservancy via TNC TPL
	Flood Zone	**12.5%**	Analysis identifies as high priority (5) 100 yr flood zone.	Flood Zone	GIS Oregon via TNC Clean Water Services (update Washington County)
	Forested Habitat	**12.5%**	Analysis identifies as high priority (5) forested lands.	Regional Vegetation/Landuse Raster (2008)	TNC
	Regenerating Habitat	**12.5%**	Analysis identifies as high priority (5) all harvested and burned forest areas.	Regional Vegetation/Landuse Raster (2008)	TNC
	Additional Urban Riparian Wildlife Habitat Concern Areas	**12.5%**	Analysis identifies as high priority (5) urban areas not already identified as high priority in the Streams, Wetlands, Flood Zone, and Conservation Opportunity criteria above.	Metro Title 13	Metro Portland

Appendix D

Tualatin River Watershed Demonstration Project:

Drinking Water Source Protection and Habitat Conservation Landscape Analysis

Protecting Water Quality in Source Areas



Special thanks to the following data providers: Clean Water Services, NLCD, Portland Metro, Oregon Dept of Agriculture, Oregon DEQ, Oregon Dept of Fish and Wildlife, Oregon Dept of Geology, Oregon Geospatial Enterprise (GEO), Oregon State Fire Marshal HSIS, Oregon Water Resources Dept, TNC, USDA, and ESRI

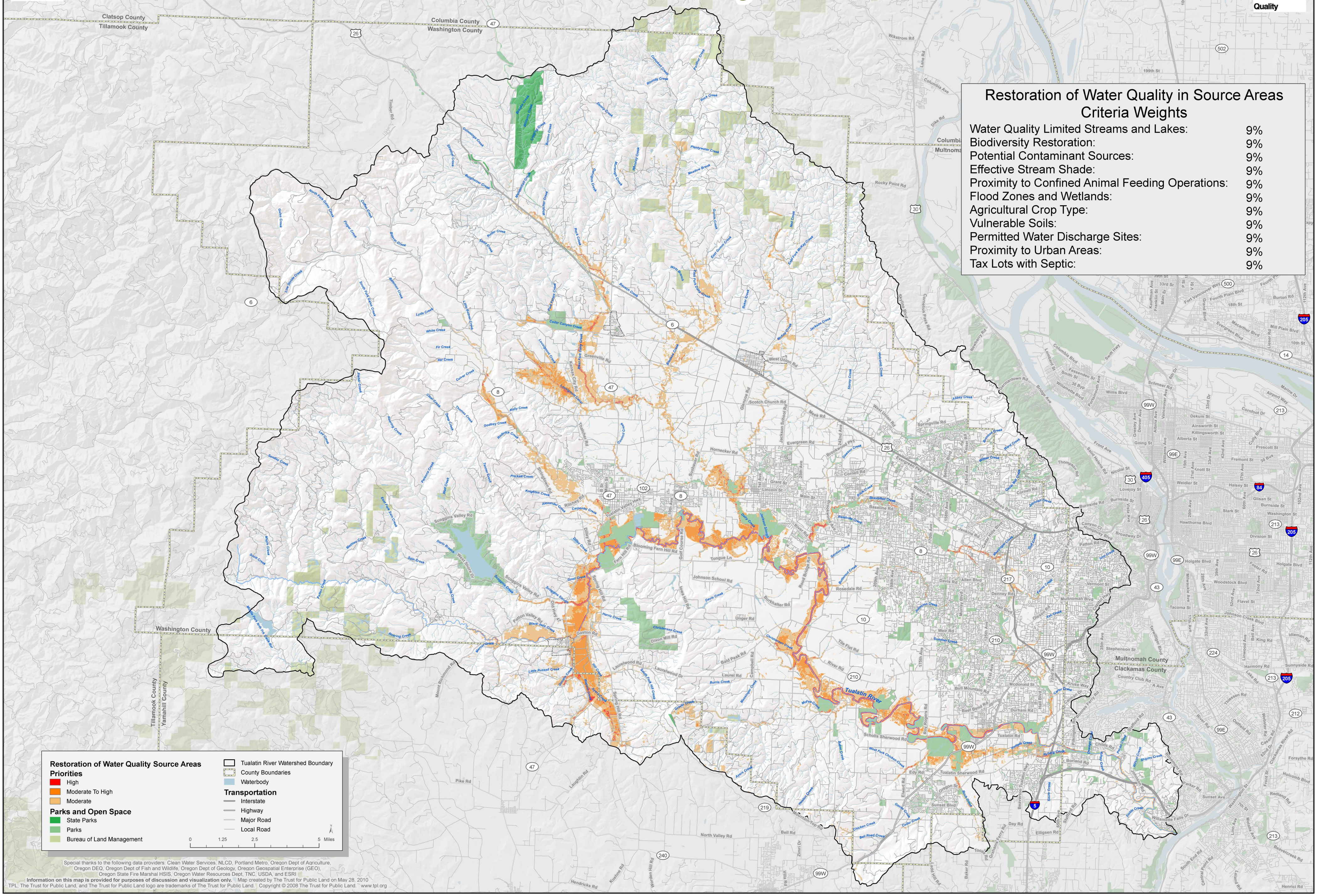
Information on this map is provided for purposes of discussion and visualization only. Map created by The Trust for Public Land on May 28, 2010

Tualatin River Watershed Demonstration Project:

Drinking Water Source Protection and Habitat Conservation Landscape Analysis

Restoration of Water Quality in Source Areas

State of Oregon Department of Environmental Quality



Restoration of Water Quality in Source Areas Criteria Weights

Water Quality Limited Streams and Lakes:	9%
Biodiversity Restoration:	9%
Potential Contaminant Sources:	9%
Effective Stream Shade:	9%
Proximity to Confined Animal Feeding Operations:	9%
Flood Zones and Wetlands:	9%
Agricultural Crop Type:	9%
Vulnerable Soils:	9%
Permitted Water Discharge Sites:	9%
Proximity to Urban Areas:	9%
Tax Lots with Septic:	9%

Special thanks to the following data providers: Clean Water Services, NLCD, Portland Metro, Oregon Dept of Agriculture, Oregon DEQ, Oregon Dept of Fish and Wildlife, Oregon Dept of Geology, Oregon Geospatial Enterprise (GEO), Oregon State Fire Marshal HSIS, Oregon Water Resources Dept, TNC, USDA, and ESRI

Information on this map is provided for purposes of discussion and visualization only. Map created by The Trust for Public Land on May 28, 2010

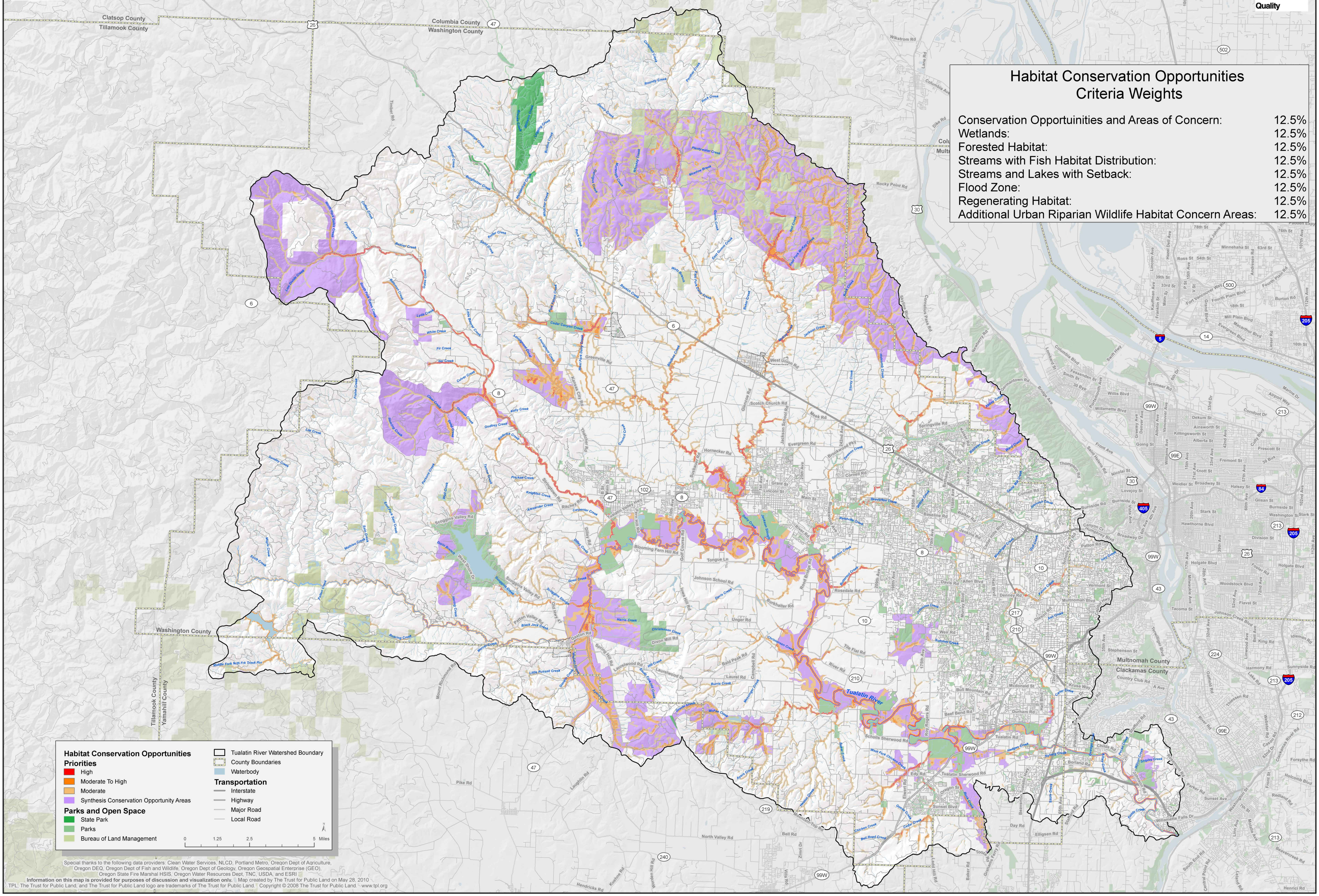
Tualatin River Watershed Demonstration Project:

Drinking Water Source Protection and Habitat Conservation Landscape Analysis

Habitat Conservation Opportunities

THE TRUST for PUBLIC LAND

DEQ State of Oregon Department of Environmental Quality



Special thanks to the following data providers: Clean Water Services, NLCD, Portland Metro, Oregon Dept of Agriculture, Oregon DEQ, Oregon Dept of Fish and Wildlife, Oregon Dept of Geology, Oregon Geospatial Enterprise (GEO), Oregon State Fire Marshal HSIS, Oregon Water Resources Dept, TNC, USDA, and ESRI

Information on this map is provided for purposes of discussion and visualization only. Map created by The Trust for Public Land on May 28, 2010

Appendix E

Description of GIS data layers

A tremendous amount of data and GIS information was gathered as part of this project. More than 40 separate GIS data layers were created, developed, or acquired (completed). Depending on the objective, the GIS data layers can be used independently or in combination with others. The GIS data layers collected as part of the project fit roughly into three categories:

- **LAND USES AND CHARACTERISTICS**
- **SENSITIVE AREAS**
- **POTENTIAL SOURCES OF CONTAMINANTS / PERMITS**

The GIS data layers are each listed in one of these categories below and briefly described.

LAND USES AND CHARACTERISTICS

Land Uses and Urban Growth Boundaries
Sources: Tax lot and land use/ownership maps compiled from various sources including statewide geographic information system (GIS) coverage, federal agencies, and/or local/county planning departments to identify urban, industrial, forest, agricultural, etc. land use designations. May include layers for federal land ownership (BLM, USFS, etc.), agricultural lands, parks and recreation areas, zoning maps, city boundaries, Urban Growth Boundaries (planning boundaries defined in Oregon Land Use Planning laws), and transportation corridors (highways, high use roads and railroads).

Oregon Water Bodies and Water Courses
Source: Statewide or local GIS layers of rivers, streams, lakes, water bodies, wetlands, water diversions/dams. Streams and water bodies from Pacific Northwest (Oregon & Washington) Hydrography Framework; Wetlands from The Wetlands Conservancy's compilation of polygon data from numerous sources (includes the National Wetland Inventory, U.S. Fish and Wildlife Service, Oregon Natural Heritage Information Center, The Wetlands Conservancy, Department of State Lands, and Department of Transportation).

Tualatin Watershed Vacant Lands *– 2 data layers*
Source: analysis of vacant lands from county assessor data and Metro analysis of lands appearing unimproved on aerial photography.

Regional Vegetation/Land Use Raster
Source: The Nature Conservancy – simplified version of the regional vegetation/land use raster developed for the northwestern US; describes the current ecological systems and land use for the Tualatin River Basin.

Impervious Surface
Source: The Multi-Resolution Land Characteristics (MRLC) Consortium produced the National Land Cover Database---participants included USGS, NOAA, EPA, USDA, USFS, NPS, FWS, BLM, and NRCS.

Wetland Connections
Source: The Trust for Public Land – used aerial imagery and landcover data to connect unconnected wetland areas to other wetlands when appropriate to show habitat connectivity.

Oregon Cropland
Source: USDA – raster layer identifying areas by crop type – two datasets representing different years are used to account for possible crop rotation.

> Note: Crop type data will only be a worthwhile contribution (criterion) if it is updated frequently because some of the crop types change frequently. Among the data sets used for this project, crop type may be the most variable year-to-year, and there are some crops that are more likely to change in shorter intervals than others.

Public Land Survey System
Source: Oregon Water Resources Department. This layer is extracted from the original data that contains PLS lines for the State of Oregon. The attributes show township Range and Section values.

> Notes:
> -Important for identifying areas at risk for exposure to groundwater with contaminants introduced by anthropogenic or natural sources.
> -Used to identifying potential risk areas with well densities where the beneficial use of water (for small populations) for drinking and irrigation purposes could lead to human exposure to contaminants and possible introduction of contaminated groundwater to surface water.

SENSITIVE AREAS

Vulnerable Soils
Mapped areas of high sensitivity include areas of high soil erosion and runoff potential, high permeability, and landslides.

> ***High Permeability Soils***
> Source: DEQ DWP analysis of *U.S. Geological Survey* geologic map of Oregon to select highly permeable soils including recent alluvial deposits (Qal), dune sand (Qd), and landslide and debris flow deposits (Qls). Other highly permeable classes (such as karst or fractured basalt areas) may be included in areas where present.
>
> > Notes:
> > -One of the key characteristics for “sensitive areas” in drinking water source areas

-Used to identify areas that may be very vulnerable to rapid infiltration of contaminants to groundwater and subsequent discharge to a stream or lake/reservoir.
-Used to identify areas of high potential groundwater recharge adjacent to streams

High Runoff Potential
Source: DEQ DWP analysis of USDA Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) data. NRCS State Soil Geographic Database (STATSGO) data or US Forest Service Soil Resource Inventory (SRI) data was used where SSURGO data is not available. Attributes evaluated included hydrography type, runoff potential, or water-yield.

Notes:
-One of the key characteristics for "sensitive areas" in drinking water source areas
-Used to identify areas that have the potential for rapid runoff and subsequent transport of sediments and possible contaminants to surface water.

Highly Erodible Land (HEL) Class 1
Source: DEQ DWP analysis using NRCS Highly Erodible Land (HEL) Classes approach for identifying highly erodible soils data; appropriate for use in identifying areas on agricultural lands. Alternate analysis could be completed using USDA NRCS SSURGO data focusing on slope and "K-factor."

Notes:
-One of the key characteristics for "sensitive areas" in drinking water source areas
-Used to identify susceptibility of soil particles to detachment and movement by water including the effects of rainfall, runoff, and infiltration

Landslide Locations
Source: Oregon Department of Geology – database of mapped landslides.
Note: important resource for identifying contributions to high turbidity during storms

Metro Title 13 Lands
Source: Metro Sustainability Center – based on the Metro GIS models for mapping riparian functions, wildlife values.
Note: Identifies regionally-significant riparian and upland wildlife habitat, habitats of concern, and impact areas

Water Quality Limited Streams and Lakes
Source: Oregon Department of Environmental Quality – Water Quality Division – contains a spatial representation of Oregon's 2004/2006 Integrated Report on water quality, including the 303d List of water quality limited waters needing TMDLs.

Notes:

-Identifies overlap of TMDL streams and drinking water intakes, and the occurrence of TMDL streams within Drinking Water Source Areas.
-Indicates where the state is already working on water quality limited streams

Flood Zones
Source: OR GIS – merge of the FEMA Q3 National Flood Hazard Layer (NFHL) data (1980s-90s) with available data from the ongoing NFHL updates. Update of Washington County flood zones were obtained from Clean Water Services.

Groundwater Well Locations
Source: Oregon Water Resources Department – approximate sites of well logs on record.

Willamette Basin Effective Shade
Source: Oregon Department of Environmental Quality. Mapped point locations where anthropogenic activities have altered presence of trees and shrubs that provide shade to the streams in the Willamette Basin streams and promote cooler stream temperatures. Ambient stream temperature is a DEQ water quality narrative standard for beneficial use under state rules. This data was developed as part of an Oregon Department of Environmental Quality study to estimate the cost to restore riparian vegetation and improve stream habitat in the Willamette Basin (report scheduled to be released in 2010). Effective shade modeling was completed to approximate the decrease in solar radiation load resulting from restoration.

Note: Can be used to identify priority areas along streams for focused restoration activities.

Habitats of Concern
Source: Metro Sustainability Center.

Oregon Fish Habitat Distribution (Coho and Steelhead – winter)
Source: Oregon Department of Fish and Wildlife – areas of suitable habitat believed to be used currently by wild, natural, and/or hatchery fish populations.

Groundwater Drinking Water Source Areas – Public Water Systems
Source: Oregon Department of Environmental Quality – Water Quality Division – delineated source areas from Source Water Assessment results for public water systems.

Notes:

-All public water system source areas are delineated and mapped
-This GIS layer is accessible and used by other agencies, the public, and consulting community
-Individual maps of recharge areas are linked on the DWP website
-The source areas are further characterized and evaluated for prioritization statewide and on a county, basin, or watershed scale

Surface Water Drinking Water Source Areas – Public Water Systems
Source: Oregon Department of Environmental Quality – Water Quality Division – delineated fifth-field watersheds from Source Water Assessment results for public water systems.
Notes:
-All public water system source areas are delineated and mapped
-This GIS layer is accessible and used by other agencies, the public, and consulting community
-Individual maps of catchments/surface water supply areas are linked on the DWP website
-The source areas are further characterized and evaluated for prioritization statewide and on a county-by-county, basin, or watershed scale

Synthesis Conservation Opportunity Areas
Source: The Nature Conservancy – delineated priority terrestrial and freshwater sites for habitat and restoration. The Oregon Conservation Strategy will likely adopt these areas during their next required update.

Tualatin River HUC5 with Barney Reservoir
Source: Oregon Department of Environmental Quality – Water Quality Division – the study area for the Tualatin River Watershed Demonstration Project.

POTENTIAL SOURCES OF CONTAMINANTS / PERMITS

This section includes state and federal regulatory program data for point sources of potential contamination as well as potential sources of contamination including commercial/industrial sources, agricultural, forestry, residential, municipal, and transportation land uses.

Potential Contaminant Sources identified in Source Water Assessments for Public Water Systems
Source: Oregon Department of Environmental Quality – Water Quality Division – database/GIS locations of potential contaminant sources identified in Source Water Assessments for public water systems. Over 15,000 potential sources of contamination were identified as part of Oregon's Source Water Assessments.
Notes:
-All data is stored in an Access database and GIS layer and detailed queries or spatial analysis can be performed as needed

-Serves as the basis of determining risks to public water systems and priorities for technical assistance

Leaking Underground Storage Tank Sites
Source: Oregon Department of Environmental Quality – Land Quality Leaking UST database.

Note: The UST Cleanup staff use this list and GIS layer to determine high priorities for their statewide work currently; drinking water is one of the most significant potential impacts that determine their priorities

Hazardous Waste Sites
Source: Oregon Department of Environmental Quality – Facility Profiler.

Septic by Tax Lot
Source: Oregon Department of Environmental Quality – Water Quality Division – analyzed/mapped parcels that contain septic systems

Confined Animal Feeding Operations (CAFO)
Source: Oregon Department of Agriculture – physical locations of permitted properties.

Environmental Clean-up Sites
Source: Oregon Department of Environmental Quality – Land Quality ECSI Cleanup Database.

Underground Injection Control Sites
Source: Oregon Department of Environmental Quality – Water Quality Division – UIC database identifying potential contaminant sources.

Underground Storage Tank Sites
Source: Oregon Department of Environmental Quality – Land Quality Division – UST database.

Solid Waste Sites
Source: Oregon Department of Environmental Quality – Water Quality Division – solid waste database.

State Fire Marshal Facilities
Source: Oregon Department of Environmental Quality – Water Quality Division – GIS geo-coded from the Oregon Department of State Police/Office of State Fire Marshal database with identifiers of hazardous material used, stored, manufactured and/or disposed.

Water Quality Outfall Locations
Source: Oregon Department of Environmental Quality – Water Quality Division

Outfall point locations (mostly GPS located) from Water Quality Division project summer 2008. Includes risk ranking developed specifically for the Tualatin River Watershed Demonstration Project.

Note: This is one of the key characteristics for identifying surface stream segments directly impacted by discharge from permitted water quality sources.

WATER QUALITY PERMITS

NPDES General - Water Quality Permit Sites
Source: Oregon Department of Environmental Quality – Water Quality Division – National Pollutant Discharge Elimination System identifies point locations where permit effluent goes to surface water.

NPDES INDUSTRIAL to Surface Water – Water Quality Permit Sites – includes wastewater treatment plants. Source: Oregon Department of Environmental Quality – Water Quality Division – National Pollutant Discharge Elimination System identifies point locations where permit effluent goes to surface water.

NPDES DOMESTIC to Surface Water – Water Quality Permit Sites – includes wastewater treatment plants. Source: Oregon Department of Environmental Quality – Water Quality Division – National Pollutant Discharge Elimination System identifies point locations where permit effluent goes to surface water.

Water Pollution Control Facility General Permits
Source: Oregon Department of Environmental Quality – Water Quality Division – point locations where permit effluent may or may not go to groundwater depending on the permit.

Water Pollution Control Facility INDUSTRIAL Permits
Source: Oregon Department of Environmental Quality – Water Quality Division – point locations where permit effluent may or may not go to groundwater depending on the permit.

Water Pollution Control Facility DOMESTIC Permits
Source: Oregon Department of Environmental Quality – Water Quality Division – point locations where permit effluent may or may not go to groundwater depending on the permit.