DEQ Report to the Legislature

State of Oregon
Department of
Environmental
Quality

# Groundwater Quality in Oregon

**January 2007**

This report has been prepared by the Department of Environmental Quality (DEQ) in accordance with the requirements of the Groundwater Quality Protection Act of 1989:

**Oregon Revised Statute 468B.162(3)**:
*In addition to its duties under subsection (1) of this section, the department shall, on or before January 1 of each odd-numbered year, prepare a report to the Legislative Assembly. The report shall include the status of ground water in Oregon, efforts made in the immediately preceding year to protect, conserve and restore Oregon's ground water resources and grants awarded under ORS 468B.169.*

# Contents

# Executive Summary

Groundwater makes up approximately 95% of available freshwater resources in Oregon. Approximately 70% of all Oregon residents rely on groundwater for drinking water. The goals of the Oregon Groundwater Quality Protection Act of 1989 (ORS 468B.150 – 468B.190) are to prevent contamination of the State's groundwater resources, conserve and restore groundwater, and maintain the high quality of Oregon's groundwater resource for present and future uses. The Act established a policy that all state agencies' rules and programs are to be consistent with this goal of protecting drinking water resources and public health. The Department of Environmental Quality (DEQ) has primary responsibility for implementing groundwater protection in Oregon.

**Budget Constraints**

In the early 1990's, DEQ had 12 staff working to implement the Groundwater Quality Protection Act. By 2005 staffing in the Groundwater Act program had been reduced from 12 to 5. This is due to the decrease in both federal and state funds over the years and increases in costs. With this level of staffing, DEQ's Groundwater Act program consists of technical assistance, minimal statewide coordination, and implementation of groundwater monitoring and restoration activities in three Groundwater Management Areas (GWMA) where DEQ has found high levels of nitrate pollution in groundwater. These include the Southern Willamette Valley, North Malheur County, and Lower Umatilla Basin GWMAs. Nitrate values greater than 10 mg/L in drinking water can pose a risk of developing methemoglobinemia or "blue baby" syndrome to infants and developing fetuses. Nitrate can interfere with the ability of blood to carry vital oxygen to body tissues, and the most severe cases can be fatal. Due to reduced resources, DEQ has not been able assess whether other areas in Oregon also suffer from significant groundwater pollution.

For the 2007-2009 biennium, DEQ will not have sufficient State and federal resources to maintain the current level of staffing for the Groundwater Act program. The current Governor's Recommended Budget provides resources for 2.5 FTE of Groundwater Act work instead of the 5 FTE in the 2005-07 biennium, cutting an already eroded program in half. With only 2.5 FTE of resources for the Groundwater Act, DEQ will have to reduce existing groundwater monitoring, technical assistance, and public outreach and education activities.

**2005-07 Program Accomplishments**

<u>Southern Willamette Valley Groundwater Management Area</u>
The Southern Willamette Valley GWMA was declared on May 10, 2004 after DEQ identified significant nitrate pollution. In the Southern Willamette Valley Groundwater Management Area, virtually all residents drink groundwater, either from public water suppliers or private wells.

DEQ convened a citizen advisory committee to prepare an Action Plan for reducing groundwater nitrate concentrations in the Southern Willamette Valley GWMA. The plan calls for implementing voluntary actions to address four main land uses including Residential, Agricultural, Commercial/Industrial /Municipal, and Public Water Supplies. The voluntary measures include outreach, education, research, financial incentives, land-use planning, increasing public awareness, to encourage positive changes in land use and adoption of best management practices (BMPs) to improve groundwater quality. As the Lead Agency for this

project, one of DEQ's primary roles is to monitor 40 wells in the area to measure success in reducing nitrate concentrations. The final plan was approved by the citizen advisory committee on November 9, 2006, and accepted by DEQ in December 2006.

With the level of resources for the Groundwater Act program in the Governor's Recommended Budget, DEQ will need to reduce its work which could include cutting the level of monitoring in half, reduced technical assistance, and reduced public outreach and education activities.

Northern Malheur County and Lower Umatilla Basin Groundwater Management Areas

The Northern Malheur County GWMA was declared in 1989 after significant groundwater nitrate contamination was identified in the northeastern portion of the county. The Lower Umatilla Basin Groundwater Management Area was declared in 1990 after nitrate contamination in groundwater was identified in the northern portions of Umatilla and Morrow Counties. DEQ has continued monitoring regional groundwater quality in the Northern Malheur County GWMA (38 wells) and Lower Umatilla Basin GWMA (36 wells) while local citizens implemented activities specified in the locally developed Action Plans (such as a reduction in fall fertilization) to reduce nitrate concentrations and restore groundwater quality. In Northern Malheur County, monitoring shows nitrate contaminant levels have started decreasing. In the Lower Umatilla Basin, the voluntary adoption of BMPs (such as better nutrient management) is being implemented.

With the level of resources for the Groundwater Act program in the Governor's Recommended Budget, DEQ will need to reduce its work which could include cutting the level of monitoring in half, reduced technical assistance, and reduced public outreach and education activities.

La Pine National Demonstration Project

This project, funded by a $5.5 million 5-year grant from the Environmental Protection Agency, researched cumulative groundwater nitrate contamination problems arising from the widespread use of onsite septic systems for household wastewater treatment and disposal. DEQ, in cooperation with Deschutes County, studied a variety of innovative onsite systems installed in the La Pine region and monitored the effect of these systems on groundwater quality. An advisory committee developed a recommended maintenance program for onsite septic systems to ensure they work effectively and minimize their impacts on groundwater. The United States Geological Service developed a three-dimensional groundwater and nutrient fate and transport model to show where and how groundwater and contaminants move through the aquifer system. A final report for the La Pine Project is under review by the US Environmental Protection Agency. The model results will be used by DEQ and Deschutes County to determine optimum lot (septic system) density and treatment standards that will be protective of groundwater in the area.

# Introduction

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

The Department of Environmental Quality (DEQ) has primary responsibility for implementing groundwater protection in Oregon. However, because of dwindling budget resources and other water quality priorities, DEQ's groundwater quality protection efforts have decreased significantly in the last 5 to 10 years and have become increasingly fragmented between multiple programs administered out of multiple offices. DEQ no longer has the resources to provide a coordinated groundwater quality protection program or to provide ongoing groundwater monitoring and assessment. In the early 1990's, DEQ had 12 staff dedicated to the Groundwater program; this was reduced to five in the early 2000's. Additionally, DEQ will reduce the number of FTE from 5 to 2.5 during 2007-2009 because of the decrease in both federal and state funds and increase in costs. This anticipated reduction in funding will result in the loss of Water Quality headquarters technical groundwater support for rule making, regional staff, other agencies, and the public; a 1 FTE reduction in technical support and 50% reduction in groundwater quality monitoring in the three Ground Water Management Areas (GWMA); and the inability to perform additional groundwater assessments to identify and address groundwater problems. Without headquarters technical support, DEQ will not be able to insure and coordinate groundwater protection implementation in Oregon. A reduction in GWMA staff and sampling of contaminants (including nitrates and pesticides) will greatly inhibit the implementation of the voluntary Action Plans and, therefore, restoration of the groundwater in these areas. Private drinking water wells in Oregon (more than 600,000) are not regulated under the Safe Drinking Water Act, therefore, without new groundwater assessments contamination affecting these wells may go largely undetected. DEQ would also significantly reduce existing work with state and local agencies and communities to evaluate the effectiveness of best management practices, and reduce public outreach and education activities.

This report will present information on the:

- Status of groundwater in Oregon;
- Groundwater restoration activities in three declared Groundwater Management Areas;
- Groundwater protection activities by DEQ and other agencies;
- Funding groundwater quality projects in Oregon; and
- Future directions for groundwater quality protection.

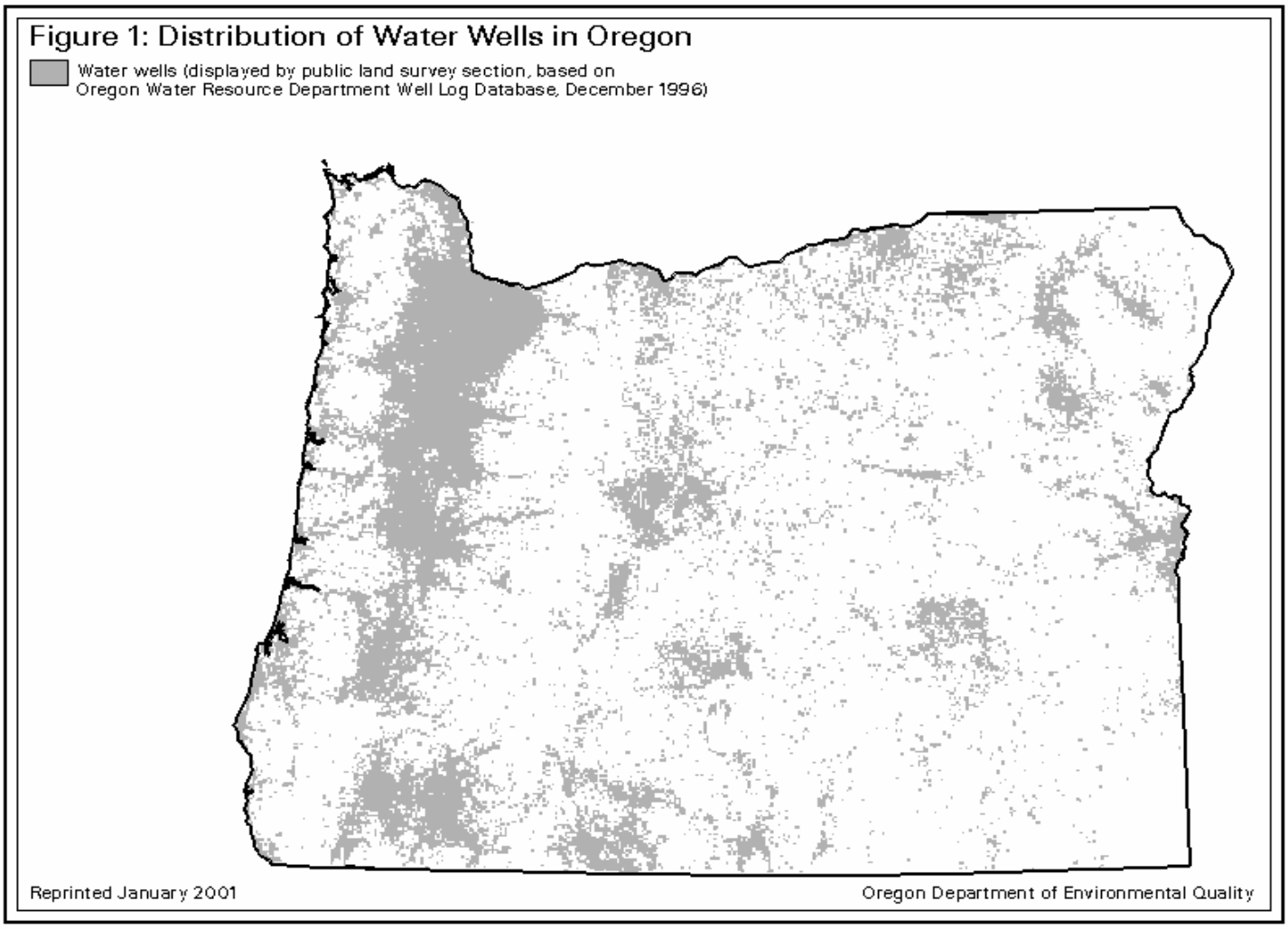
# Status of Groundwater in Oregon

Groundwater in Oregon has many valuable uses and functions:

- Groundwater makes up approximately 95% of available freshwater resources.
- Groundwater is the primary source of drinking water and its use is increasing.
    - Approximately 70% of all Oregon residents rely on groundwater for drinking water.
    - Over 90% of rural Oregonians rely on groundwater for drinking water.
    - Over 90% of Oregon public water supply systems get their water exclusively from groundwater.
    - Over 400,000 Oregonians get their drinking water from individual home water supply wells.
- Oregon's businesses require clean groundwater for industries such as food processing, dairies, manufacturing, and computer chip production.
- Groundwater provides irrigation water for Oregon agriculture and water for livestock.

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

As surface water resources are used to capacity, Oregonians are becoming more dependent on groundwater resources and they expect those resources to remain clean, available and useable. As the population of Oregon grows, the importance of the groundwater resource to meet the demands of that population will increase. Figure 1 shows the distribution (as of 1/2001) of water wells in the state that tap groundwater resources.




## DEQ Groundwater Monitoring and Assessment Program

One of the requirements of Oregon's Groundwater Protection Act (ORS468B.190) is to conduct an ongoing statewide groundwater monitoring and assessment program to identify and characterize the quality of Oregon's groundwater resources. DEQ uses its current limited resources to conduct some monitoring within the GWMAs only. But these monitoring activities will be reduced by 50% if the 2.5 FTE positions are not restored. Specific requirements of the Act are to evaluate areas of the state that are especially vulnerable to contamination, identify long-term trends in groundwater quality, evaluate the ambient quality of groundwater resources, and identify any emerging groundwater quality

problems. Data from these assessments may provide the basis for DEQ to declare a Groundwater Management Area if area-wide problems are found.

Between 1980 and 2000, DEQ conducted 45 groundwater quality assessments (See Appendix 1). These assessments covered approximately 6.4% of the total land area of the state, and 30.8% of the area in Oregon where groundwater is used. The assessment data provide a general rating of the overall quality of the groundwater resource available in Oregon for use as drinking water. The data show nitrate is the most commonly detected contaminant, followed by pesticides, volatile organic compounds, and bacteria. To evaluate impairment, the levels of detected contaminants are compared to the federal drinking water standards. However, many organic chemicals, pesticides, and herbicides do not have drinking water standards and the detection of any level of these contaminants in groundwater indicates a potential concern. In 35 of 45 studies completed through 2000, the assessment results show some impairment or reason for concern. In Oregon, the detection of contaminants in groundwater at one half the drinking water standard, or at 70% of the nitrate drinking water standard, can be the basis for declaring a Groundwater Management Area.

### Other Groundwater Monitoring and Assessment Activities

Domestic drinking water supply wells are not routinely tested for water quality, but state law requires testing at the time of a real estate transaction (RET). A home owner selling a property with a drinking water well must test the water for nitrate and total coliform bacteria. The owner submits the test results to the Oregon Department of Human Services Drinking Water Program (DHS). Between 1989 and 2003, about 24,633 nitrate tests were performed by home owners. This data is not routinely evaluated at the current time due to a lack of resources. However, in 2004 DEQ, through a 319 grant, created a database and summarized the RET data through December 2003. These data provide a broad overview of groundwater quality in those areas. Most of the domestic well tests (82%) show nitrate levels below 2 mg/L and reflect background groundwater quality. Approximately 14% of the tests showed nitrate levels above background groundwater quality and about 1.7% of the wells tested exceeded the federal drinking water standard of 10 mg/L.

## Groundwater Restoration in Oregon

### Groundwater Management Areas

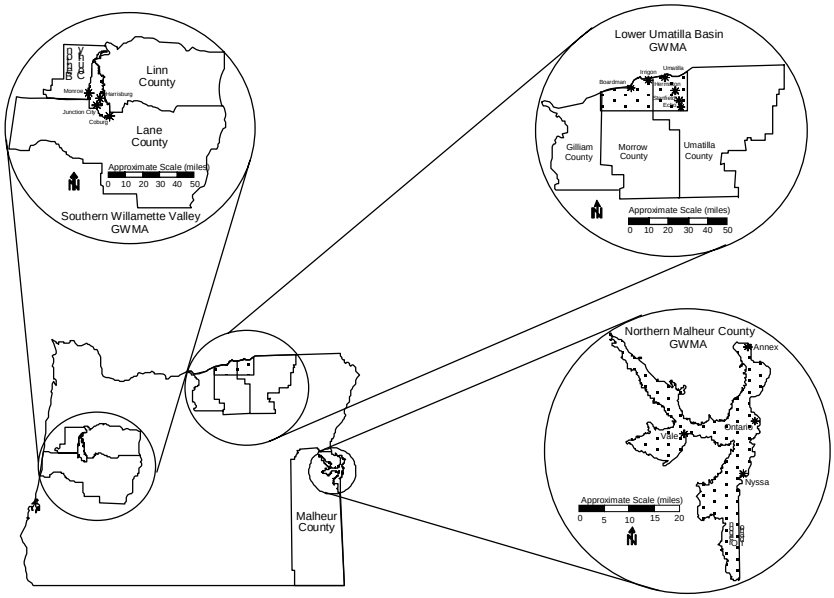
Data from the groundwater assessment program is used to identify localized or area-wide groundwater contamination problems. If area-wide contamination is found at consistently high enough levels, an area can be declared a Groundwater Management Area (GWMA) under Oregon law[1]. When this situation arises, the Groundwater Protection Act requires the establishment of a local Groundwater Management Area Committee comprised of affected and interested parties. This committee works with state agencies to develop and implement an action plan to reduce groundwater contamination originating from point and non-point source activities in the area.

Oregon currently has three GWMAs (Figure 2) including the Northern Malheur County GWMA, the Lower Umatilla Basin GWMA, and the recently declared Southern Willamette Valley GWMA. All three GWMAs were declared for widespread nitrate contamination. In infants and developing fetuses, nitrate great than 10 mg/L can interfere with the ability of blood to carry vital oxygen to body tissues resulting in methemoglobinemia or “blue baby” syndrome. DEQ is currently assisting with the

[1] ORS 468B.180. The Department of Environmental Quality shall declare a ground water management area if, as a result of information provided to the department or from its statewide monitoring and assessment activities under ORS 468B.190, the department confirms that, as a result of suspected nonpoint source activities, there is present in the ground water:
(a) Nitrate contaminants at levels greater than 70 percent of the levels established pursuant to ORS 468B.165; or
(b) Any other contaminants at levels greater than 50 percent of the levels established pursuant to ORS 468B.165.

implementation of the GWMA Action Plans which includes maintaining groundwater quality monitoring networks, reviewing existing data to assess groundwater quality trends, and supporting local efforts to implement Best Management Practices (BMPs) to maintain and restore groundwater quality.

**Figure 2. Location of Oregon's Groundwater Management Areas**




## Northern Malheur County Groundwater Management Area

The Northern Malheur County GWMA was declared in 1989 after significant groundwater contamination was identified in the northeastern portion of the county. Land use in the county is dominated by agriculture. Thirty-four percent of the wells sampled had nitrate levels above the drinking water standard of 10 mg/l. The presence of the pesticide Dacthal was an additional concern. Sampling confirmed that most of the contaminated groundwater is present in the shallow alluvial sand and gravel aquifer which receives a large proportion of its recharge from infiltration of irrigation canal leakage and irrigation water.

The Northern Malheur County Action Plan, dated December 1991, includes recommendations that allow farmers to customize BMPs to their farm's needs. The Committee chose to implement the Action Plan on a voluntary basis recognizing that individuals, businesses, organizations, and governments will, if given adequate information and encouragement, take positive actions and adopt or modify practices and activities to reduce contaminant loading to groundwater. The success of the action plan is gauged by both the adoption of BMPs and improvement of water quality within the GWMA.

The Natural Resources Conservation Service and the Soil and Water Conservation District are working with farmers to develop water quality plans to address groundwater concerns. Alternative irrigation and fertilization management practices have been designed and recommended for the area. To date, approximately 247 water quality plans have been developed, accounting for 42% of the total acreage in the Northern Malheur County GWMA.

Currently, DEQ samples a network of approximately 35 wells every other month for analysis of nitrate and Dacthal and does a more complete analysis approximately once a year. A formal trend analysis of nitrate concentrations was conducted in 2006 using the 14.5 years of data since implementation of the Action Plan. The analysis indicated that the area-wide nitrate trend was slightly decreasing. Individual wells showed a mix of decreasing (55%), increasing (32%), and statistically insignificant (13%) trends across the area. Recommendations from the trend analysis include focusing additional attention on areas where groundwater quality is not improving as quickly as anticipated. Progress is being made at the land surface through the implementation of BMPs. However, it may take years or even decades for groundwater quality to return to natural background levels.

## Lower Umatilla Basin Groundwater Management Area

The Lower Umatilla Basin GWMA was declared in 1990 after nitrate contamination was identified in the northern portions of Umatilla and Morrow Counties. Groundwater samples from private wells identified nitrate contamination above the 10 mg/L drinking water standard in 33% of the samples collected from the area. DEQ worked together with the Oregon Water Resources Department and Oregon Department of Human Services – Drinking Water Program on a comprehensive study of the area in the early 1990s that identified five sources of nitrate loading to groundwater:

- Irrigated agriculture,
- Land application of food processing water,
- Septic systems (rural residential areas),
- Confined animal feeding operations, and
- Washout lagoons at the Umatilla Chemical Depot.

The Lower Umatilla Basin Action Plan was finalized in December 1997. This voluntary plan focuses on education and outreach, identifying and encouraging adoption of appropriate BMPs and making soil sampling and groundwater nitrate testing equipment and supplies available for local use. In addition, over 90% of the total acres in the Lower Umatilla Basin GWMA are covered by individual farm-specific irrigation water management plans.

Similar to Northern Malheur County, DEQ samples a network of approximately 36 wells every other month for analysis of nitrate. Approximately once a year, these wells are sampled for a larger list of contaminants including major ions, metals, and pesticides. These data are being used to evaluate changes in groundwater quality over time in response to adoption of BMPs. Implementation of the Action Plan also includes ongoing community outreach and education efforts highlighting groundwater quality concerns and solutions. In November 2002, the "First Four-Year Evaluation of Action Plan Success and 2001 Annual Progress Report" was finalized. The report concludes that sufficient progress has been made toward reaching the implementation goals to continue the voluntary nature of the Action Plan. Efforts are currently underway to gather the information to complete the Second Four-Year Evaluation of Action Plan Success.

<u>Perchlorate in the Lower Umatilla Basin GWMA</u>

Perchlorate is a chemical contaminant that is found nationally at low levels in the environment including water, milk and some foods. It can be anthropogenic but is also naturally occurring. Perchlorate was detected near military facilities in the Lower Umatilla Basin GWMA in 2001 and 2003. In fall 2003, perchlorate was included in a regional groundwater sampling event that was part of the ongoing nitrate investigation to see if perchlorate was localized or generally present in the area. Perchlorate was detected in about half of the 133 wells sampled.

Multiple, subsequent sampling events have been conducted by DEQ, EPA, the Navy, and private companies. A total of 391 groundwater samples have been collected from 288 locations with perchlorate concentrations ranging from non-detect to 29.2 parts per billion (ppb) with an average of 3.3 ppb.

Concentrations were generally low and do not appear to represent a single contaminant plume. The full geographic extent of perchlorate in groundwater has not been determined but it is clear that it occurs at low levels over a wide area. The source(s) of perchlorate in the Lower Umatilla Basin GWMA remains unknown. It is possible that both naturally occurring and manufactured sources of perchlorate are contributors. Perchlorate concentrations typically decrease with depth, especially in the basalt wells. Wells with properly constructed seals may aid in reducing exposure to perchlorate. Additional research would be needed to identify the specific perchlorate source(s) in the Lower Umatilla Basin GWMA.

There currently is no federal or Oregon drinking water standard for perchlorate. EPA has adopted a reference dose that translates to 24.5 ppb, if all exposure comes through drinking water. However, if exposure also comes from food, the "safe" level in water would be lower.

State and federal agencies (including DEQ, ODA, DHS, OSU extension, EPA, and the Agency for Toxic Substances and Disease Registry [ATSDR]) are working to assess perchlorate in the area and ensure that food and water supplies are safe. For example, EPA is conducting crop sampling while DHS and ATSDR are working on finalizing their Exposure Investigation.

### Southern Willamette Valley Groundwater Management Area

Over the last 20 years, many studies and sampling programs have focused on groundwater quality in the Southern Willamette Valley. Although low levels of nitrate are naturally present, the probable causes of nitrate contamination in the Southern Willamette Valley are from sources related to human activity such as fertilizers, large wastewater facilities, animal waste, and septic systems.

Over 20% of 476 wells sampled in 2000 to 2001 had nitrate concentrations in excess of the State Maximum Measurable Contaminant Levels of 7 mg/L Nitrate-N, a level that can trigger a declaration of a Groundwater Management Area under Oregon law. The highest level detected within the study area was 23 mg/l. In 2002, DEQ resampled those wells that tested greater than 7 mg/L during the 2000-2001 study. In addition to the nitrate analyses, DEQ included testing for pesticides, bacteria and a variety of other geochemical parameters and potential contaminants. Nitrate was confirmed at levels significantly above 7 mg/L, the highest value found was 28 mg/L. The nitrate data from this and previous groundwater studies in the area document a regional groundwater quality concern. The pesticide data did not provide adequate information to characterize the entire study area, however the results were sufficient to conclude that pesticides are present, but not at levels greater than health advisory standards, and were found at levels that were 30% or less of any applicable standard.

On May 10, 2004, the DEQ declared a Groundwater Management Area for portions of the Southern Willamette Valley. The location of this GWMA is depicted in Figure 3. DEQ was named as the lead agency and a GWMA Committee was appointed to develop an Action Plan. The first meeting of the Southern Willamette Valley GWMA Committee was held on September 23, 2004. The following flow diagram (Figure 4) depicts how this Committee functioned while drafting the Groundwater Management Area Action Plan. This committee met regularly, and worked with many stakeholders, for almost 20 months to produce a draft Action Plan. A final Action Plan was approved at the November 9, 2006 Southern Willamette Valley GWMA Committee meeting. The voluntary action plan provides about 60 strategy recommendations related to agriculture, residential, commercial/industrial/municipal, and public water system to reduce nitrate contributions and prevent further groundwater contamination. Education and outreach are key components of the Action Plan. DEQ installed 25 monitoring wells in the Southern Willamette Valley, and obtained the approval from 15 residents to include their domestic well in a long term monitoring program. Baseline and on-going monitoring will provide data to track changes in groundwater quality. Further information can be found at: **http://groundwater.oregonstate.edu/willamette/index.html**.

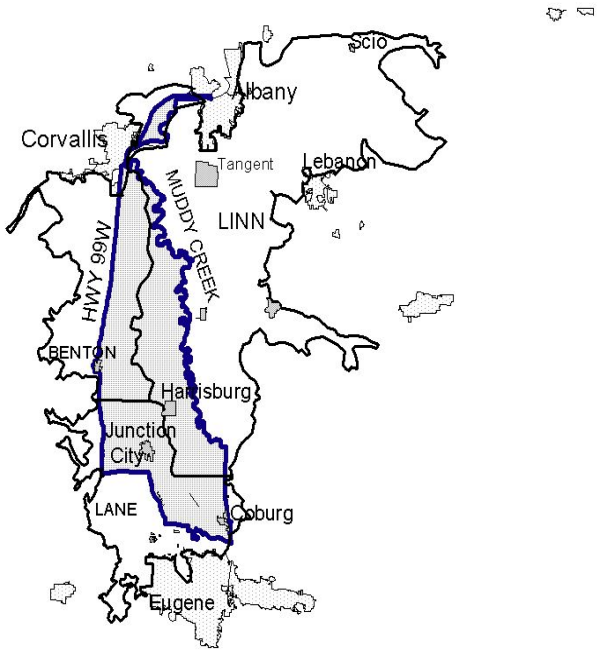



**Figure 3: Southern Willamette Valley Groundwater Management Area**

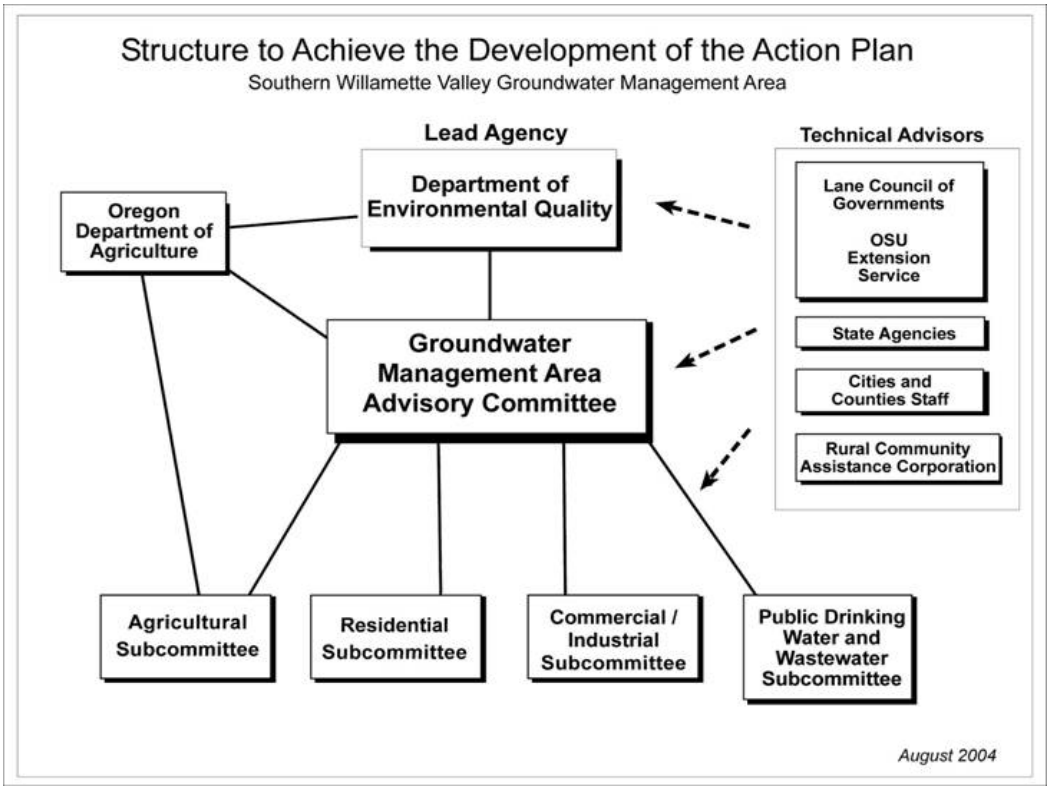



**Figure 4. Southern Willamette Valley Groundwater Management Area Committee to develop Action Plan.**

# Groundwater Protection in Oregon

Groundwater is present beneath almost every land surface and is sometimes at very shallow depths. It is vulnerable to contamination from activities that take place on the land as well as from discharges of wastes and pollutants at or below the ground surface. Once groundwater becomes contaminated it is very difficult to clean up. Because groundwater moves very slowly, the contamination may persist for tens, hundreds, or even thousands of years. Likewise, groundwater that is currently being contaminated may not affect beneficial uses until some time far into the future. This contamination may impair groundwater for use as drinking water and may affect the quality of the surface waters where it discharges.

The Department of Environmental Quality (DEQ) has primary responsibility for implementing groundwater protection in Oregon. DEQ uses a combination of programs in the agency to help prevent groundwater contamination from point and non-point sources of pollution, clean up pollution sources, and monitor and assess groundwater and drinking water quality. DEQ implements some programs though partnerships with the Oregon Department of Human Services, Oregon Water Resources Department, Oregon Department of Agriculture, Oregon State University, and other state, local, and private organizations, businesses, and individuals. **Appendix 2** summarizes Oregon's groundwater protection programs and identifies the primary responsible state agency.

### La Pine National Demonstration Project

The La Pine area of central Oregon is a rural residential area that is experiencing rapid development and population growth. In the 1960s, large tracts of land were subdivided into 15,000 lots as small as one-half acre. The primary source of drinking water for the 12,000 residents of the area is shallow groundwater tapped by over 4,000 individual domestic wells that are typically less than 50 feet deep. In addition, there are about 100 community public water system wells serving small-scale subdivisions, schools and businesses in the region. Most homes in the area use individual onsite wastewater treatment systems (onsite septic systems). The porous and permeable pumice soils, shallow groundwater table, and relatively high development densities in the region created a threat to shallow groundwater. Groundwater assessments found nitrate concentrations in drinking water wells that approached the drinking water standard (10 mg/L) in several of the oldest and most densely developed areas. The Deschutes and Little Deschutes Rivers, both listed as water-quality limited streams by DEQ, flow through the region and potentially receive discharge from the shallow aquifer.

In the mid-1990s, Deschutes County and DEQ assessed the potential impact of residential development in the La Pine region on groundwater quality. Preliminary studies and 2-dimensional groundwater modeling at that time predicted that nitrate levels in groundwater would exceed the Federal Maximum Contaminant Level of 10 mg/L within 20 years.

In 1999, the United States Congress awarded a $5.5 million 5-year grant to DEQ, Deschutes County, and the U.S. Geological Survey as part of the National Decentralized Wastewater Treatment and Disposal Demonstration Project. The objective of the study is to protect the La Pine area groundwater quality because it is the sole source of drinking water for the region. The study evaluated innovative nitrogen reducing onsite system technologies and developed and used a three-dimensional groundwater flow and contaminant transport model to develop a comprehensive groundwater protection strategy.

The La Pine Demonstration Project included elements to:

- Install and monitor (system effluent and monitoring well samples) up to 50 innovative nitrogen reducing systems,
- Initiate an onsite system maintenance program,

- Conduct 3-dimensional groundwater flow modeling and nitrogen contaminant fate and transport modeling and assess optimum lot density and treatment standards based on model results, and
- Establish a low-interest loan fund for septic system repair or replacement.

DEQ and Deschutes County Environmental Health Division staff conducted baseline groundwater sampling of 199 domestic and public water supply wells in 2000. Similar data collection and evaluation continued in 2001 and 2002. Results show 10% of the wells sampled had nitrate concentrations above background levels of nitrate. These results and other data from the study show that groundwater moves slowly in the area, and that nitrate from onsite wastewater treatment systems are in the early stages of creating groundwater contamination. Onsite systems have been discharging nitrate for over 40 years, but contamination has only begun to reach the groundwater tapped for drinking water supplies in the past 10 to 15 years. The predicted quantity of nitrogen contributed to groundwater is high as contaminants continue to move into the groundwater from an ever increasing population of existing systems. The contaminant load to the aquifer will increase with the population as the remaining vacant buildable lots are developed.

In total, 15 types of innovative onsite systems and 3 types of control (standard, pressure distribution and sand filter systems) onsite systems have been installed. The La Pine project has monitored a total of 49 onsite systems beginning in 2000. Sampling ended in December 2004. The effect of these systems on groundwater quality was monitored through a network of nearly 200 shallow monitoring wells and several extensive sampling events involving public and private domestic water wells. Data from the shallow monitoring wells capturing the influence of onsite systems drainfields indicate significant impacts from those systems, particularly those systems that do not reduce nitrogen. Conventional systems, including standard tank and gravity drainfield, pressure distribution systems, and sand filters provide minimal nitrogen reduction, and therefore minimal protection for the groundwater in this area. Some data have been collected to evaluate groundwater and surface water interaction along the Deschutes and Little Deschutes Rivers within the study area, although a full evaluation was beyond the scope of this project. A report on the monitoring and modeling efforts will be issued by USGS in 2007. Updates on the project are available on-line at: http://marx.deschutes.org/deq/lapineindex.htm. The final report for the La Pine Project is currently under review by the US Environmental Protection Agency.

## Source Water Assessment and Drinking Water Protection Programs

In 1996, the Federal Safe Drinking Water Act required states to develop Source Water Assessments for public water supply systems (surface water and groundwater sources). DEQ and the Oregon Department of Human Services Drinking Water Program (DHS) implemented this program for Oregon.

In Oregon, 2460 public water systems using groundwater sources received source water assessments by June 2005. DHS conducted the source area delineations and sensitivity analyses for groundwater wells. DEQ was responsible for surface water delineations and watershed sensitivity analyses. DEQ and DHS also conducted inventories of potential contamination sources in all the public water systems. The assessment reports sent to each public water system included a map of the groundwater and surface water source areas, evaluation of the sensitivity of the source area, and an inventory of the potential contamination sources in the area.

The source water assessments provide the basis for a community to voluntarily develop a plan to protect the source area that supplies their drinking water. The drinking water protection plans generally focus on reducing the impact of one or two primary pollutants within the source area. The primary incentive for local communities to develop and implement drinking water protection is the benefit of a more secure source of high quality water. Other incentives may include a reduction in public water supply monitoring requirements and the reduced likelihood of costs for replacement and/or treatment of contaminated drinking water. DEQ and DHS provide direct technical assistance to communities as they develop plans

to protect their local public drinking water sources. The contaminant source inventories in the delineated wellhead protection areas provide useful information as the community evaluates the risks and develops a protection plan. Typical contaminant sources found in the inventories completed in the past year include high density housing, septic systems, auto repair shops, gas stations, irrigated crops, managed forest land, grazing animals, and transportation corridors.

There is currently 1 FTE funded by the Safe Drinking Water Act to provide technical assistance for groundwater protection for public water systems. A number of communities and public water systems are currently working to develop plans to protect their drinking water source area. The plan completed by Junction City with assistance from the Lane Council of Governments was one of the first plans certified by DEQ and is an example of the approach taken by the community (available on-line at http://www.deq.state.or.us/wq/dwp/DWPPlanJC.pdf ). The communities of Fairview, Gresham, and Portland have also developed a comprehensive drinking water protection plan in the Columbia South Shore Wellfield to incorporate the information from their groundwater sources (details available online at: http://www.water.ci.portland.or.us/groundwater/wellheadpro.htm).

### Other Groundwater Protection Efforts

There are several programs within DEQ that contribute to the protection of groundwater through the implementation of regulations, standards and permitting activities. These programs include underground storage tanks, solid waste landfills, remediation sites, underground injection control systems (UIC), on-site systems, and permitting of industrial, municipal, or domestic wastewater facilities having a discharge of wastewater to land.

The Underground Storage Tank (UST) Program is part of DEQ's Land Quality Division. The UST Program helps to protect groundwater by handling issues related to regulated tank registration, testing, and compliance, and cleanup of releases of leaking petroleum tanks including releases from home heating oil tanks. Compliance and prevention requires the registration of tanks and specifies the technical requirements for new and existing UST systems. Service provider and supervisor licensing requires both companies (service providers) and individuals (supervisors) to obtain a license before performing UST work. Cleanup activities within this program require the timely reporting of petroleum releases, and the investigation and remediation of soil and groundwater contamination resulting from leaks and spills of petroleum products. There are over 25,000 USTs that have been decommissioned and thousands more operating under permits. The Solid Waste Program permits several different types of solid waste disposal facilities including municipal solid waste landfills, petroleum contaminated remediation facilities, and compost operations. These permitting activities help to protect groundwater resources by requiring liners under solid waste landfills and other standards to control leachate of liquids from these facilities. The Site Response Program works to investigate and clean up contaminated hazardous waste sites throughout Oregon. Many of these sites have historically contributed to the contamination of groundwater. By cleaning up these sites future contamination of groundwater by chemicals or pollutants is prevented.

The Underground Injection Control Program works to protect groundwater through the approval and permitting of drywells, sumps, and other injection devices that discharge a variety of residential, commercial, and industrial fluids below the ground. Injection systems are required to be designed, installed, maintained, and, in many cases, monitored so that they are protective of groundwater resources. There are over 46,000 injection systems registered in Oregon, most of which handle stormwater flow from streets, parking lots and businesses. The current level of funding for the UIC program is inadequate to run the statewide program. DEQ is proposing, during the 2007-2009 legislative session, the establishment of new UIC fees to provide the resources to adequately run the program and retain primacy of the program. If the fees are not approved, DEQ will relinquish primacy of the UIC program back to EPA.

The Onsite Wastewater Management Program (onsite systems) consists of the permitting of hundreds of thousands of onsite systems (formerly called septic systems) throughout Oregon. Approximately one-third of all Oregonians rely on onsite systems as a means to treat residential wastewater. This program helps to protect groundwater resources by requiring systems to be designed and installed according to state regulations that include prescriptive siting and performance standards.

The Wastewater Permitting Program regulates thousands of industrial, municipal and domestic facilities in Oregon. Municipal and domestic facilities collect and treat sewage from residences and industrial facilities generate and treat manufacturing and processing wastewater. Through the use of Water Pollution Control Facility and National Pollutant Discharge Elimination permits DEQ regulates domestic, municipal and industrial facilities activities (such as lagoons and land application systems) to protect groundwater resources.

# Funding Groundwater Quality Projects in Oregon

The 1989 Groundwater Protection Act authorized DEQ to fund research and development projects related to groundwater quality, particularly in Groundwater Management Areas. However, no dedicated funding source was established for this purpose. A fee on fertilizer products purchased in Oregon was instituted as part of the act to fund groundwater quality research associated with the interaction of pesticides or fertilizer and groundwater. The grant fund is administered by the Oregon Department of Agriculture. In previous biennia, the grant fund has been used for research projects in the two declared Groundwater Management Areas in the state. Revisions to the fertilizer law in 2001 expanded the use of the fund to include research related to the interaction of fertilizer, agricultural mineral or agricultural amendment products and groundwater or surface water, eliminated research on pesticides and groundwater, and established a committee to advise ODA on funding of research grants.

DEQ has allocated federal grants available through Clean Water Act Section 319 to groundwater projects in limited areas. Funding for below market loans to public agencies is also available through the Clean Water State Revolving Fund. A summary of groundwater related projects funded by DEQ and ODA during 2005 and 2006 is included in **Appendix 3**.

# Future Direction

DEQ's objectives for groundwater quality protection in the 2007-2009 biennium include the following activities. However our ability to implement the activities in the three GWMAs and groundwater protection in general will be diminished by 50% due to the proposed reduction of 2.5 FTE during the 2007-2009 biennium.

- In accordance with the Southern Willamette Valley GWMA Action Plan, coordinate implementation activities to reduce area-wide groundwater contamination.
- Using the 25 monitoring wells installed by DEQ and 15 domestic wells, continue with the groundwater monitoring program for the Southern Willamette Valley GWMA to determine background.
- Evaluate the effectiveness of implemented conservation enhancement practices in reducing nitrate loading to the groundwater in the Southern Willamette Valley GWMA.
- Continue to implement the Lower Umatilla Basin and Northern Malheur County GWMA Action Plans and evaluate the performance or success of the management plans in reducing groundwater contamination. Also, continue regional groundwater monitoring networks in the two GWMAs.
- Finalize reports on the results of research in the La Pine area and develop and use methods to address onsite wastewater treatment system impacts. Continue to work cooperatively with Deschutes County to implement groundwater protection programs for the region.

- Complete additional drinking water Source Water Assessments as new systems come online and provide technical assistance to communities developing drinking water protection plans.
- Continue funding and support of research, education, and implementation of BMPs for groundwater protection.

## Appendix 1 - Groundwater Quality Assessment Projects

*Summary as of November 2006*

| Basin | Project Name | No. of Sample Events | No. of Wells Sampled | Groundwater Quality Rating[I] | Contaminants Of Concern | Contaminants Found [II] | Suspected Contaminant Sources | Date Last Monitored |
|---|---|---|---|---|---|---|---|---|
| Deschutes | Bend | 1 | 8 | 1 | Nitrate, Pesticides | None | - | 1990 |
| Deschutes | La Pine | 6 | 65 | 4 | Nitrate | Nitrate | Onsite Systems | 1982 |
| Deschutes | La Pine | 2 | 103 | 4 | Nitrate | Nitrate | Onsite Systems | 1995 |
| Deschutes | La Pine | 1 | 199 | 1 | Nitrate | Nitrate | Onsite Systems | 2000 |
| Deschutes | La Pine | Ongoing | 192 | 3 | Nitrate | Nitrate | Onsite Systems | 2004 |
| Deschutes | Mosier | 4 | 12 | 1 | Nitrate, Inorganics, Organics | None | - | 1987 |
| Deschutes | Prineville | 1 | 11 | 1 | Nitrates | Benzene | Onsite/Agriculture | 1990 |
| Deschutes | Rufus | 1 | 4 | 4 | Nitrate | Nitrate | Onsite/Agriculture | 1993 |
| Deschutes | Rufus | 2 | 4 | 4 | Nitrate, Pesticides | Nitrate | Agriculture | 1996 |
| Grande Ronde | City of Imbler | 2 | 24 | 4 | Nitrates, Other | Nitrate | Varied | 1986 |
| Hood | Hood River | 1 | 36 | 1 | Nitrate, Other | Nitrates | Varied | 1993 |
| Hood | Hood River | 1 | 11 | 1 | Nitrate, Pesticides | Nitrate | Onsite Systems | 1995 |
| Klamath | Klamath Falls | 3 | 50 | 3 | Nitrate, Pesticides | Nitrate, Ammonia | Agriculture | 1990 |
| Malheur | Burns/Hines | 1 | 17 | 4 | Nitrate, Pesticides | None | - | 2004 |
| North Coast | Clatsop Plains | 10 | 83 | 3 | Nitrate, Pesticides, VOCs, Bacteria | Nitrate, VOCs, Bacteria, Pesticides | Septic, Municipal | 1998 |
| North Coast | Tillamook | 2 | 83 | 3 | Bacteria, VOCs, Nitrate | Nitrate | Onsite/Municipal | 1998 |
| Powder | Haines | 2 | 25 | 1 | Nitrate, Bacteria, VOCs, Inorganics | Nitrate, VOCs | Onsite, CAFO, Industrial | 1998 |
| Rogue | Haines | 2 | 14 | 2 | Nitrate, Herbicides | VOCs | Unknown | 1989 |
| Rogue | Grants Pass | 12 | 53 | 2 | Nitrate, Inorganics, Organics | VOCs | Unknown | 1994 |
| Rogue | Jackson County | 1 | 30 | 1 | Inorganic, Organic, Pesticides | None | - | 1992 |
| Rogue | North Bear Creek Valley | 1 | 19 | 3 | Nitrate, Pesticides, Organic Compounds | Nitrate, Pesticide, VOCs | Onsite, Agriculture | 1995 |
| South Coast | Harbor Bench | 3 | 15 | 3 | Nitrate, Pesticides | 1,2-DCP, Aldicarb, Nitrate | Agriculture | 1991 |
| Statewide | Department of Human Services Public Drinking | Varies | 2,459 ground water systems | 154 maximum level violations reported | Bacteria, Disinfectants, Inorganics, Organics, Radiological | Nitrate, Arsenic, Coliform, Cadmium, Mercury, Lead, Copper, VOCs, Pesticides | Various | 2001 |

| Basin | Project Name | No. of Sample Events | No. of Wells Sampled | Groundwater Quality Rating[I] | Contaminants Of Concern | Contaminants Found [II] | Suspected Contaminant Sources | Date Last Monitored |
|---|---|---|---|---|---|---|---|---|
| | Water System Compliance[V] | | | | | | | |
| Statewide | Department of Human Services Real Estate Transaction | Ongoing | 14,127 (1989-1998) | Not rated | Nitrate, Bacteria | Nitrate, Bacteria | Various | Ongoing |
| Statewide | National Pesticide Survey (OR) | 1 | 7 | 1 | Nitrate, Pesticides, Organics | None | - | 1989 |
| Statewide | Voluntary Nitrate Testing | 28 | 1,641 | 2 | Nitrate | Nitrate | Varied; Unknown | 1993 |
| Umatilla | Lower Umatilla Basin GWMA[III] | Ongoing | 38 (198 synoptic) | 3 | Nitrate, Pesticides | Nitrate, EDB, Atrazine, Dacthal, Dicamba, Picloram | Agriculture, Onsite Septic, Industry | 2006 |
| Umatilla | Milton-Freewater | 2 | 40 | 4 | Bacteria, Nitrate, Pesticides | Bacteria | Onsite, Agriculture | 1999 |
| Willamette | Mid-Multnomah | 107 | 25 | 3 | Nitrate | Nitrate, VOCs | Onsite, Urban, Industrial | 1995 |
| Willamette | Sauvie Island | 1 | 3 | 2 | Nitrate, Pesticides | Nitrate | Agriculture | 1985 |
| Willamette | Boring | 14 | 25 | 3 | General | VOCs | Agriculture | 1990 |
| Willamette | Canby | 2 | 21 | 3 | Nitrate, Pesticides | Nitrate, Dacthal | Agriculture, Onsite | 1993 |
| Willamette | Coburg | 4 | 28 | 2 | Nitrate, Pesticides | Nitrate | Agriculture, Onsite | 1994 |
| Willamette | Dever-Conner Albany | 1 | 3 | 2 | Nitrate, Pesticides | Nitrate | Agriculture | 1984 |
| Willamette | Farmington/ Hillsboro | 3 | 15 | 3 | Nitrate, Pesticides | EDB | Agriculture | 1986 |
| Willamette | Florence-Clear Lake Aquifer | 12 | 24 | 1 | Nitrate, Phosphorus | None | - | 1981 |
| Willamette | French Prairie | 1 | 9 | 1 | Nitrate | None | - | 1985 |
| Willamette | Jefferson | 1 | 5 | 3 | Nitrate, Pesticides | Bromocil, Dinoseb | Agriculture | 1985 |
| Willamette | Junction City | 2 | 20 | 4 | Nitrate, Pesticides | Nitrate, VOC | Agriculture, Onsite; Unknown | 1993 |
| Willamette | Lake Labish | 1 | 3 | 2 | Nitrate, Pesticides | Nitrate | Agriculture | 1985 |
| Willamette | Lebanon-Albany | 1 | 19 | 1 | Nitrate, Pesticides | Nitrate | Unknown | 1993 |

| Basin | Project Name | No. of Sample Events | No. of Wells Sampled | Groundwater Quality Rating[I] | Contaminants Of Concern | Contaminants Found [II] | Suspected Contaminant Sources | Date Last Monitored |
|---|---|---|---|---|---|---|---|---|
| Willamette | Milwaukie | 2 | 34 | 3 | Volatile Organic Compounds | VOCs | Industry and Commerce | 1989 |
| Willamette | Mission Bottom | 7 | 90 | 4 | Heavy Metals, Nitrate, Pesticides | Nitrate, EDB | Agriculture, Municipal, Onsite | 1986 |
| Willamette | North Albany Groundwater | 14 | 33 | 2 | Nitrate, VOC, Bacteria | VOCs, Nitrate | Unknown; Onsite | 1996 |
| Willamette | Santa Clara/River Road | 12 | 26 | 4 | Nitrate, Bacteria | Nitrate, Bacteria | Onsite | 1980 |
| Willamette | Scio Groundwater Study | 3 | 14 | 4 | Bacteria | Bacteria | Onsite, Livestock | 1988 |
| Willamette | Woodburn | 2 | 21 | 2 | Nitrate | Nitrate, PCE | Unknown | 1993 |
| Willamette | Southern Willamette Valley | on-going | 480 | 2 | Nitrate, Pesticides | Nitrate, Pesticides | Agriculture, Onsite | 2006 |
| Willamette | USGS NAWQA Willamette Valley [VI] | - | 70 | 2 | Nitrate, Pesticides, VOCs, | Nitrate, Arsenic, 13 Pesticides (Atrazine), 5 VOCs | Agriculture, Urban | 1993 |
| Willamette | USGS/OWRD Cooperative Study[VII] | Varies | 131 | 1, 4 | Arsenic | Arsenic | Natural, possibly agriculture. | 1997 |

Notes:

I. **Groundwater Quality Rating**:
1 = Means less than 10% of wells had a contaminant level over the drinking water standard.
2 = Means 25% or more of wells had nitrate levels between 5 to 10 mg/L, or any well had an organic compound detected.
3 = Means 10% to 25% of wells had a contaminant level over the drinking water standard.
4 = Means more than 25% of wells had a contaminant level over the drinking water standard.

II. **Contaminants:** 1,2 DCP = 1,2 dichloropropane; EDB = Ethylene dibromide; PCE = Perchloroethylene or tetrachloroethylene; PCP = Pentachlorophenol; VOC = Volatile organic compound.

III. GWMA = Groundwater Management Area

IV. Nitrate, Dacthal, 2,6-Diethylanaline, Methyl parathion, Dimethoate, DDE, Eptam, Metolachlor, Pendimethalin, Trifluralin, Alachlor, Atrazine, Desethyl Atrazine, Propargite, Simazine, Prometon, Metribuzin

V. 2001 Annual Compliance Report on Oregon Public Drinking Water Systems, Oregon Department of Human Services Drinking Water Program. http://www.ohd.hr.state.or.us/dwp/welcome.htm

VI. 1997, Hinkle, S.R., "Quality of Shallow Ground water in Alluvial Aquifers of the Willamette Basin, Oregon, 1993-1995", USGS Water-Resources Investigations Report 97-4082-B

VII. 1999, Hinkle, S.R. and Polette, D.J., "Arsenic in Ground Water of the Willamette Basin, Oregon", USGS Water-Resources Investigations Report 98-4205

## Appendix 2: Oregon Groundwater Protection Programs and Responsibilities

| AGENCY | GROUNDWATER PROTECTION RESPONSIBILITIES |
|---|---|
| **Department of Environmental Quality**<br><br>(**Due to lack of resources and staff, DEQ no longer, wholly or in part, performs these responsibilities.) | **Coordinates interagency management of groundwater to achieve state goal to prevent groundwater contamination. |
| | **Designs and conducts targeted groundwater quality investigations statewide. |
| | **Maintains a groundwater quality database and data repository. |
| | **Responds to area-wide groundwater contamination by working with agencies and local citizens to develop an action plan to address sources. |
| | **Promotes public education and community involvement in groundwater protection programs and citizen monitoring. |
| | **Establishes groundwater quality reference levels and concentration limits. |
| | Issues wastewater discharge permits for Water Pollution Control Facilities (WPCF) that include groundwater protection requirements. |
| | Administers federal National Pollutant Discharge Elimination System (NPDES) program and issues wastewater discharge permits that include groundwater protection requirements. |
| | Administers onsite sewage system program, contracting with some counties. |
| | Shares implementation of the drinking water source water assessment and protection program with DHS. |
| | Certifies drinking water protection plans for public water supply systems. |
| | Administers federal Underground Injection Control program. |
| | Administers a federally funded (Clean Water Act 319) nonpoint source grant program. |
| | Administers solid waste and hazardous waste management programs. |
| | Administers and implements federal Resource Conservation and Recovery Act program. |
| | Administers Underground Storage Tank program. |
| | Administers state environmental cleanup program. |
| | Administers Oregon Dry Cleaner program. |
| **Water Resources Department (WRD)** | Characterizes aquifers and groundwater availability. |
| | Approves water right applications for withdrawals of groundwater. |
| | Implements regulations regarding well construction and decommissioning. |
| | Maintains database of location and construction of wells. |

| AGENCY | GROUNDWATER PROTECTION RESPONSIBILITIES |
|---|---|
| | Coordinates reviews issues permits for aquifer storage and recovery projects. |
| **Department of Human Services (DHS)** | Administers public water system monitoring programs. |
| | Administers real estate transaction well-testing program. |
| | Administers and shares implementation of the drinking water source water assessment program with DEQ. |
| | Certifies delineation of wellhead protection areas. |
| | Provides technical assistance to public water systems on well construction issues. |
| **Oregon Department of Agriculture (ODA)** | Administers programs regulating farming practices to protect groundwater, wellhead protection, groundwater management areas, and areas of groundwater concern. |
| | Develops and implements water quality management plans for groundwater protection. |
| | Administers a groundwater quality research grant program funded by fee on fertilizer product distribution. |
| | Develops and implements a pesticide management program. |
| | Implements Confined Animal Feeding Operations regulations. |
| | Develops or assists in development of management plans for agricultural areas per ORS 468B.184. |
| | Provides pesticide analytical services for groundwater assessments. |
| **Oregon State University (OSU), Agricultural Extension Service and Experimental Stations** | Assists with identification of areas vulnerable to groundwater contamination and conducts nitrate testing of local wells. |
| | Conducts research regarding soil and groundwater contamination and best management practices to prevent contamination. |
| **Department of Land Conservation & Development (DLCD)** | Reviews comprehensive plans for communities to ensure they are consistent with goal of the Groundwater Quality Protection Act (ORS 468B.155). |
| **Oregon Department of Transportation (ODOT)** | Ensures that the goals of the Groundwater Protection Act are incorporated in all aspects of highway and road design and construction. |
| **Department of Geology and Mineral Industries (DOGAMI)** | Ensures that the goals of the Groundwater Protection Act are incorporated. |
| | Regulates drilling and permitting of geothermal wells. |

## Appendix 3 – Funding for Groundwater Projects

| Date | Project | Amount | Description |
|---|---|---|---|
| *Oregon Department of Agriculture – Groundwater Research Grants* | | | |
| 2003-2005 | Oregon State University Environmental & Molecular Toxicology Dept. | $19,731 | Validating Modeling Parameters for Risk Assessment of Metals in Fertilizers |
| 2003- June 2007 | Portland State University Depts. Civil Engineering & Environmental Engineering and Environmental Sciences & Resources | $155,031 | Complete Characterization of Parameters Used in Risk Assessment Models for Heavy Metal Transport Associated with Fertilizer Applications in Oregon |
| 2003 – June 2007 | Oregon State University Environmental & Molecular Toxicology Dept. | $302,955 | Distribution and Fate of Background and Bioavailable Metals in Oregon Agricultural Soils, Plants and Waters |
| | | | |
| *Federal Clean Water Act 319 Grants* | | | |
| 2005 | Oregon State University Bioresources Eng. Dept. | $125,588 | Private well outreach for the Southern Willamette Valley GWMA |
| 2005 | Lane Council of Governments (LCOG ) | $80,000 | Southern Willamette Valley Groundwater Quality Improvement/Protection. GWMA work plan development and planning |
| 2006 | Umatilla Co. Soil Water Conservation District | $20,350 | Lower Umatilla Basin Groundwater Management Area Outreach and Survey. Partial implementation of the GWMA Action Plan |
| 2006 | Umatilla Co. Soil Water Conservation District | $27,540 | Precision Agriculture in the Umatilla Basin. Best Management Practices targeting implementation of GWMA Action Plan |
| 2006 | Lane Council of Governments (LCOG ) | $149,530 | Southern Willamette Valley GWMA Planning and Implementation. Early planning and implementation of S. Willamette Valley GWMA Action Plan |
| | | | |
| *Clean Water State Revolving Fund Loans* | | | |
| 2005 | City of Reedsport | $6,800,000 | The existing old sewer collection system will be upgraded to reduce numerous inefficiencies. |
| 2005 | East Fork Irrigation District | $1,500,000 | This project will replace an open ditch irrigation system with transfer by piping; reducing soil filtration of various pollutants. |
| 2005 | Umatilla County | $336,000 | Build a community wastewater system to replace old and failing onsite systems. |
| 2005 | City of Sweet Home | $2,000,000 | The loan will upgrade existing service laterals to property lines to reduce sewer leakage. |

| Date | Project | Amount | Description |
|---|---|---|---|
| 2005 | Modoc Point Sanitary District | $32,000 | An outdated community drainfield will be replaced with new collection and treatment system. |
| 2005 | City of Vale | $2,710,356 | Upgrade of unlined treatment lagoon to reduce filtration into soil. |
| 2005 | City of Yachats | $5,900,000 | The large portion of the existing wastewater collection system will be upgraded to reduce leakage and increase capacity. |
| 2005 | City of Coburg | $2,710,690 | New sewer collection system for currently unserved community. |
| 2006 | City of Riddle | $788,500 | Replacing 1.5 miles of sewer line and service laterals to correct structural deficiencies. |
| 2006 | City of Lebanon | $3,442,000 | Diverting wastewater effluent flows to riparian property that has the potential to provide secondary, polishing treatment via rapid infiltration and subsurface discharge. |
| | | | |