Groundwater Quality in Oregon

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State of Oregon
Department of
Environmental
Quality

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

The Oregon Groundwater Quality Protection Act of 1989 (ORS 468B.150 – 468B.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. 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 protect groundwater from pollution, clean up polluted groundwater, and monitor and assess groundwater quality. DEQ implements these programs though partnerships with the Oregon Department of Human Services, Oregon Water Resources Department, Oregon Department of Agriculture, Oregon State University, and many other state, local, and private organizations, businesses, and individuals

Groundwater quality protection is a critical component of Oregon's overall water quality protection and management strategy. DEQ implements programs to address area-wide groundwater contamination resulting wholly or in part from nonpoint source pollution, as well as programs to address point source pollution. These efforts protect rural residential drinking water supplies as well as other beneficial uses of groundwater and help maintain the quality of Oregon's rivers and streams by improving and protecting the groundwater that flows into surface waters.

Major accomplishments by DEQ for the 2001-2003 biennium include:

Southern Willamette Valley Groundwater Assessment

DEQ focused groundwater monitoring and assessment activities on the Southern Willamette Valley to obtain information on the extent of impaired groundwater and the likely sources for groundwater contaminants.

Northern Malheur County and Lower Umatilla Basin Groundwater Management Areas

DEQ continued monitoring regional groundwater quality in two declared Groundwater Management Areas and implementing activities specified in the locally developed Action Plans to restore groundwater quality. In Northern Malheur County, monitoring shows contaminant levels have stopped increasing. In the Lower Umatilla Basin, the voluntary adoption of best management practices is being implemented.

La Pine National Demonstration Project

This project, funded by a $5.5 million 5-year federal grant, is researching cumulative groundwater contamination problems arising from the widespread use of on-site septic systems for household sewage treatment and disposal. A variety of innovative on-site systems have been installed and the effect of these systems on groundwater quality is being monitored. A maintenance program for on-site systems is also being developed to ensure the systems are working effectively and to minimize their impacts on groundwater. A three-dimensional groundwater and nutrient fate and transport model to show where and how groundwater and contaminants move is in the final stages of development.

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. The Department of Environmental Quality (DEQ) has primary responsibility for implementing groundwater protection in Oregon. DEQ uses a combination of programs within the agency to protect groundwater from pollution, clean up polluted groundwater, and monitor and assess groundwater quality. DEQ implements these programs though partnerships with the Oregon Department of Human Services, Oregon Water Resources Department, Oregon Department of Agriculture, Oregon State University, and many other state, local, and private organizations, businesses, and individuals

This report will present information on:

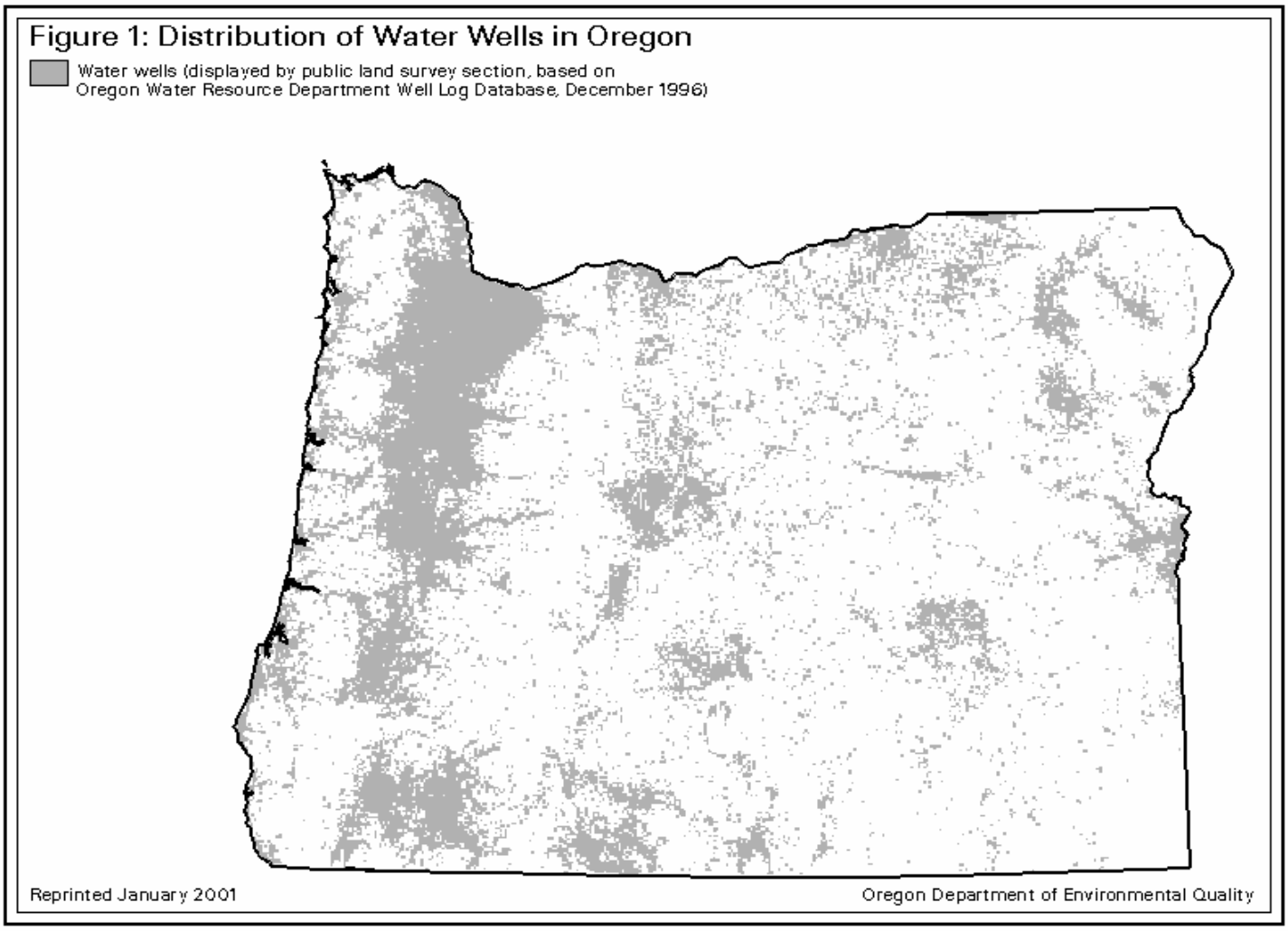
- The status of groundwater in Oregon based on groundwater monitoring and assessment information;
- Groundwater restoration activities in two declared Groundwater Management Areas;
- Groundwater protection activities by DEQ and other agencies;
- Groundwater quality projects funded by state grants and loans; and
- Future directions for groundwater quality protection.

Status of Groundwater in Oregon

The groundwater resource 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 (2,459) 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 the 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 of water wells in the state that tap groundwater resources.



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.

Specific requirements 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.

One part of the statewide groundwater assessment effort established by the Groundwater Protection Act is for state agencies to collect data from residential drinking water wells at the time of a real estate transaction. This effort is overseen by the Oregon Department of Human Services (DHS). The seller of a residential property is required to have drinking water analyzed for nitrates and coliform bacteria and to submit the data to DHS. Between 1989 and 1998, over 14,000 wells were tested. The percent of wells with nitrate levels above the federal drinking water standard of 10 mg/L varies from 0% to 18% in different counties across the state. This

information is still submitted to DHS, but during the 2001-2003 biennium no staff resources were available to manage and evaluate the data.

The second method of assessment is a more thorough groundwater investigation done by DEQ. This type of assessment typically includes a brief hydrogeological and land use evaluation, careful well screening, and quality-controlled sampling and analysis. DEQ prioritizes areas for assessment using criteria such as sensitivity of the aquifer to contamination, growth pressures in the area, evidence of existing or emerging groundwater contamination, land uses that pose a risk to groundwater, population density, and allocates available technical staff resources to conduct assessments.

Between 1980 and 2000, DEQ conducted 45 groundwater quality assessments. 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. **Appendix 1** provides a summary of groundwater assessments and the contaminants found.

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.

In addition to these state initiatives, the United States Geological Survey (USGS) has conducted assessments of groundwater in Oregon. As part of the National Water Quality Assessment program, a Willamette Basin Study was conducted. Groundwater quality data were collected during 1993 from 70 shallow domestic wells. Further work was done in 1996 and 1997 by USGS and the Oregon Water Resources Department in the Willamette Basin to focus on arsenic in groundwater. Summary information from these studies is included in **Appendix 1**.

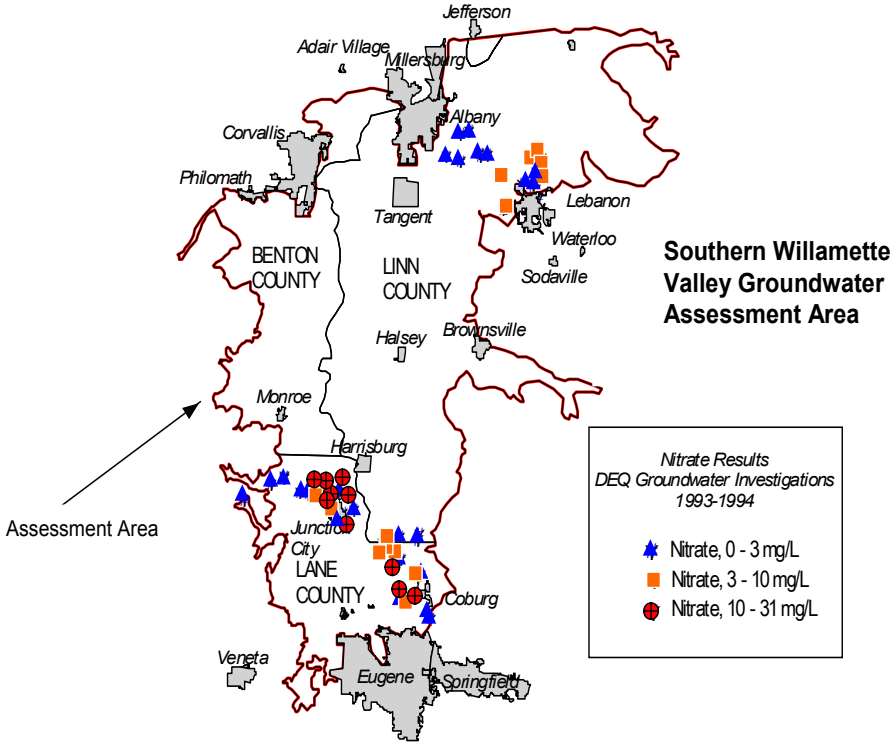
During the 2001-2003 biennium, the focus of groundwater assessment work in Oregon has been in the southern Willamette Valley. This effort is described below. In addition, a research project to investigate and protect groundwater in the La Pine area in central Oregon is ongoing and is described in later sections of this report.

Willamette Valley Groundwater Assessment

Groundwater is the principal source of drinking and irrigation water for a large number of residents in the Willamette Valley. Almost all rural residents rely on private wells for their water supply. Groundwater assessments conducted by DEQ in 1993 and 1994 documented significant groundwater contamination from nitrate and other pollutants in the Willamette Valley lowlands between Eugene and Albany. As shown in **Figure 2**, 20% of the wells sampled had nitrate concentrations in excess of the federal drinking water standard (10 mg/l). The highest level detected within the study area was 31 mg/l. The studies also raised concerns about pesticide contamination. As a rapidly developing portion of the state with groundwater quality concerns, the southern Willamette Valley is a high priority area for addressing area-wide groundwater problems.

In 2000 through 2002, DEQ focused state monitoring and assessment activities in the southern Willamette Valley. In 2001, an extensive sampling effort of 480 wells found more than 20% had nitrate concentrations greater than 7 mg/L. This nitrate level is the trigger level to declare a Groundwater Management Area under Oregon law. More sampling in this area in 2002 will analyze groundwater from domestic residential wells for nitrates, pesticides, and other indicators of water quality. This data will be available in 2003. The assessment will provide information on the geographic extent of impaired groundwater and the likely sources for groundwater contaminants and will determine if a Groundwater Management Area declaration is needed.

Figure 2: Nitrate Concentrations in the Willamette Valley Groundwater Assessment Area



Groundwater Quantity Assessment and Management

The Water Resources Department (WRD) manages groundwater to provide a sustainable resource to meet Oregon's water supply needs. Assessments by WRD provide basic information on the quantity of available groundwater and the characteristics of the groundwater aquifers in the state. When groundwater supply problems arise, WRD may restrict groundwater use by imposing area wide classifications, limitations on withdrawals, and conditions on groundwater withdrawal permits.

WRD declares a Critical Groundwater Area (CGWA) when necessary to re-establish a balance between supply and demand after groundwater pumping has created instability, overdraft, and interference in the groundwater resource. When a CGWA has been declared, WRD can place restrictions on further allocation of groundwater and mandate reductions in water use if necessary. There are six CGWAs in the state: one in northern Malheur County, three in the Lower Umatilla Basin, one near The Dalles, and one in the northern Willamette Valley.

In the 2001-2003 biennium, several major area wide groundwater quantity studies were underway by WRD. These included basin wide studies in the Upper Deschutes, Willamette, and Klamath basins. A detailed study around the town of Bonanza in the Klamath Basin was also conducted. The Deschutes and Willamette basin studies will be completed in 2003. The Klamath Basin study will be completed in 2005. The Willamette Basin study includes an investigation of the occurrence of arsenic in groundwater, which may limit the beneficial use of groundwater in some areas of the basin.

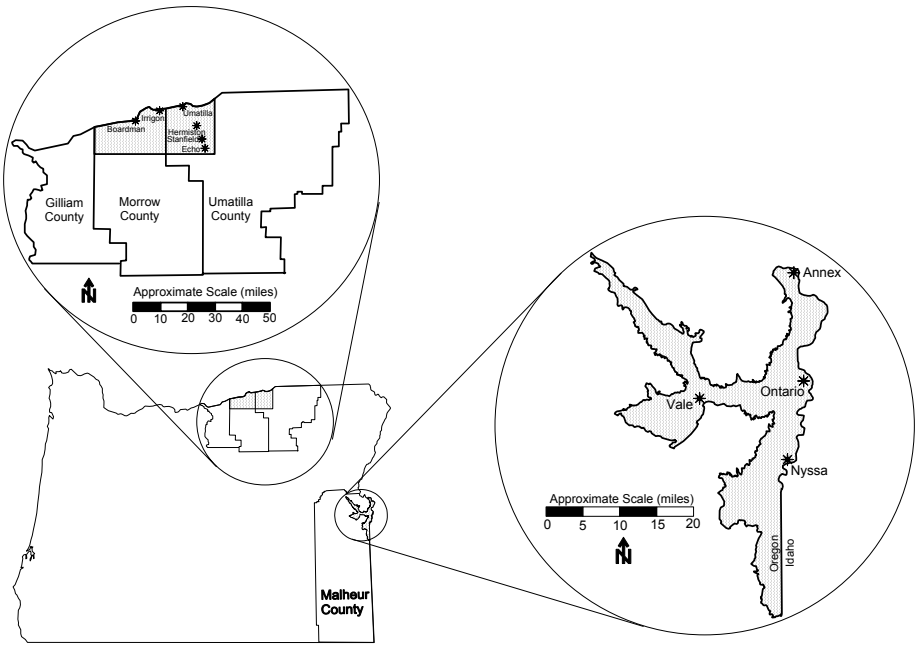
Groundwater Restoration in Oregon

Groundwater Management Areas

Data from the groundwater assessment program are used to identify localized or area-wide groundwater contamination problems. If area-wide contamination is found at consistently high enough levels, an area could 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 two GWMAs – the Northern Malheur County Groundwater Management Area and the Lower Umatilla Basin Groundwater Management Area, shown on **Figure 3**. DEQ is currently assisting with the 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 3
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

[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.

groundwater is present in the shallow alluvial sand and gravel aquifer which receives a large proportion of its recharge from irrigation canal leakage and irrigation water.

The Northern Malheur County Action Plan, dated December 1991, includes recommendations that allow farmers to customize best management practices (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 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 210 water quality plans have been developed, accounting for 35% to 40% of the total acreage in the Northern Malheur County GWMA.

Currently, DEQ samples a network of approximately 38 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 and Dacthal was conducted in 2000 using the 8.5 years of data since implementation of the Action Plan. The analysis indicated that the area-wide nitrate trend was no longer increasing. Rather, the area trend was either flat or slightly decreasing. Individual wells showed a mix of increasing, decreasing, and flat nitrate trends across the area. The trend analysis also revealed an area-wide downward trend for Dacthal. 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. 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 Groundwater Management Area 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 Health Division 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 best management practices (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 an irrigation water management plan.

Similar to Northern Malheur County, DEQ samples a network of approximately 38 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 additional 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.

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 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 many other state, local, and private organizations, businesses, and individuals. **Appendix 2** summarizes Oregon's groundwater protection programs and identifies the primary responsible state agency. **Appendix 3** identifies potential sources of ground water contamination and, when data is available for Oregon, identifies the numbers of sites or facilities that are currently known in each category.

La Pine National Demonstration Project

The La Pine area of central Oregon is a rural residential area that has experienced periods of 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 water supply wells serving small-scale subdivisions, schools and businesses in the region. Most homes in the area use individual on-site sewage waste disposal systems. The porous and permeable pumice soils, shallow groundwater table, and relatively high development densities in the region create a threat to shallow groundwater. Groundwater assessments have found nitrate concentrations in ground water that approach the drinking water standard (10 mg/L) in several of the 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. The studies 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. The study will evaluate innovative nitrogen reducing on-site system technologies, and develop and use a three-dimensional groundwater flow and contaminant transport model to develop a comprehensive groundwater protection strategy.

The La Pine Demonstration Project includes elements to:

- Install and retrofit up to 50 innovative denitrification systems in the most problematic high-density areas.
- Initiate a system maintenance infrastructure.
- Establish a 130-well groundwater monitoring network of existing private and public water supply wells.
- Conduct laboratory testing of on-site systems to evaluate performance and effects on groundwater quality.
- Conduct 3-dimensional groundwater flow modeling and nitrogen contaminant fate and transport modeling, and assess optimum lot density based on model results.
- Establish a low-interest loan fund for septic system repair.
- Establish a method for development right transfer, lot purchase and other legal obligations associated with properties to decrease overall lot density.

A baseline groundwater sampling of 199 domestic and public water supply wells was conducted in 2000. Data collection and evaluation were done in 2001 and 2002. Results show 10% of the sampled wells 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 nitrates from on-site septic systems are in the early stages of creating groundwater contamination. On-site septic systems have been discharging nitrates for over 40 years, but contamination has only begun to reach groundwater in the past 10 years. The predicted nitrate addition to groundwater is high as contaminants continue to move into the groundwater from existing systems and from systems that may be built in the future.

As of November 2002, 16 innovative on-site systems and 3 control on-site systems have been installed. The effect of these systems on groundwater quality is being monitored through a network of more than 100 monitoring wells and several extensive sampling events involving public and private wells. In addition, some data has been collected to evaluate groundwater and surface water interaction along the Deschutes and Little Deschutes Rivers within the study area, although a full evaluation is beyond the scope of this project. A report on the monitoring and modeling efforts will be issued by USGS in 2003. Updates on the project are available on-line at: http://www.co.deschutes.or.us/CDD/EnvHealth/index.cfm?fuseaction=demoproj

Source Water Assessment and Drinking Water Protection Programs

The Federal Safe Drinking Water Act requires states to develop Source Water Assessments for public drinking water supply systems (surface water and groundwater sources). DEQ and the Oregon Department of Human Services Drinking Water Program (DHS) implement this program for Oregon. The assessment for each drinking water system includes a delineation 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.

In Oregon, 2460 public water systems using groundwater sources will receive source water assessments by June 2005. DHS conducts the well head delineations and sensitivity analyses for groundwater systems. DEQ is responsible for surface water delineations and watershed sensitivity analyses. DEQ and DHS are conducting inventories of potential contamination sources in all the public water systems being assessed. As of June 2002, DHS has completed 1250 of 2460 groundwater source delineations and sensitivity analyses; DEQ and DHS have conducted 1100 of 2460 contamination source inventories for groundwater systems. Work to complete these source water assessments will continue through the 2003-2005 biennium.

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 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 provides some direct technical assistance to communities as they determine how 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.

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 source assessments (details available online at: http://www.water.ci.portland.or.us/groundwater/wellheadpro.htm).

Statewide Groundwater Vulnerability Analysis Project

During 2001, DEQ conducted work on a statewide groundwater vulnerability project. The goal of the project was to provide a set of tools to assess and evaluate groundwater sensitivity and vulnerability. The work was intended to provide a screening tool to indicate regional areas where groundwater could potentially be impacted by human activities.

The project was designed to:

- Collect and summarize various data sets and data analyses in a Geographic Information System source;
- Use data from studies by DEQ and the Oregon Department of Human Services (DHS) to statistically correlate groundwater quality to physical site data; and
- Create generalized statewide and regional maps of groundwater sensitivity and vulnerability.

The initial results have revealed several short-comings in the project approach leading to inaccurate statistical correlations and conclusions. The project approach was limited by the lack of key data to provide large area coverages for the base statistical analysis. When the output from the model was compared to detailed information available in Groundwater Management Areas, such as the lower Umatilla Basin, and in areas with ongoing groundwater investigations, such as the La Pine area in central Oregon, the model conclusions were found to be inconsistent with conclusions from the area-specific studies.

The original work plan for this project envisioned generating maps of the state showing where groundwater is vulnerable to human activities. While the statistical GIS model at this point is not capable of generating these maps with a level of accuracy that would make this a useful tool, DEQ will review the model to consider refinements and application in smaller areas.

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. Funding for below market loans to public agencies is also available through the Clean Water State Revolving Fund. A summary of groundwater projects funded by DEQ and ODA in the 2001-2003 biennium is included in **Appendix 4**.

Future Direction

The primary objectives for groundwater quality protection in the 2003-2005 biennium include the following:

- Complete the technical study in the Southern Willamette Valley and declare a Groundwater Management Area if warranted.
- If a Southern Willamette Valley GWMA is declared, develop an action plan to reduce area-wide groundwater contamination.

- Continue to implement the Lower Umatilla Basin and Northern Malheur County Groundwater Management Area 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.
- Complete reports on the results of research in the La Pine area and develop and utilize methods to address on-site septic system density issues.
- Complete scheduled drinking water Source Water Assessments and provide technical assistance to communities developing drinking water protection plans.
- Continue funding and support of research, education, and implementation of best management practices for groundwater protection.

Appendix 1 - Groundwater Quality Assessment Projects

Summary as of November 2002

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	Nitrates, Pesticides	None	-	1990
Deschutes	La Pine	6	65	4	Nitrates	Nitrates	Septic	1982
Deschutes	La Pine	2	103	4	Nitrates	Nitrates	Septic	1995
Deschutes	La Pine	1	199	1	Nitrates	Nitrates	Septic	2000
Deschutes	Mosier	4	12	1	Nitrates, Inorganics, Organics	None	-	1987
Deschutes	Prineville	1	11	1	Nitrates, Pesticides	Benzene	Underground Storage Tanks	1990
Deschutes	Prineville	1	20	4	Nitrates	Nitrates	Septic/Agriculture	1993
Deschutes	Rufus	2	4	4	Nitrates, Pesticides, Organic Compounds	Nitrates	Municipal, Agriculture	1996
Grande Ronde	City of Imbler	2	24	4	Nitrates, Pesticides	Nitrates	Agriculture, Septic	1986
Grande Ronde	Upper Grande Ronde	1	36	1	Nitrates, Other	Nitrates, VOC	Varied	1993
Hood	Hood River	1	11	1	Nitrates, Pesticides, Organic Compounds	Nitrates	Septic	1995
Klamath	Klamath Falls	3	50	3	Nitrates, Pesticides	Nitrates, Ammonia	Natural ammonia, Agriculture, Septic	1990
Malheur	Northern Malheur County GWMA[III]	Ongoing	38 (213 in early assessment)	4	Nitrates, Pesticides	See Note [IV]	Agriculture	2002
Malheur Lake	Burns/Hines	1	17	1	Nitrates, Pesticides, Organic Compounds	None	-	1994
North Coast	Clatsop Plains	10	83	3	Bacteria, VOCs, Nitrates	Nitrates	Septic/Municipal	1998
North Coast	Tillamook	2	25	1	Nitrates, Bacteria, VOCs, Inorganics	Nitrates, VOCs	Septic, CAFO, Industrial	1998
Powder	Haines	2	14	2	Nitrates, Herbicides	Picloram	County Highway Maintenance	1989
Rogue	Grants Pass	12	53	2	Nitrates, Inorganics, Organics	VOCs	Unknown	1994
Rogue	Jackson County	1	30	1	Inorganic, Organic, Pesticides	None	-	1992

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
Rogue	North Bear Creek Valley	1	19	3	Nitrates, Pesticides, Organic Compounds	Nitrates, Pesticide, VOCs	Septic, Agriculture	1995
South Coast	Harbor Bench	3	15	3	Nitrates, Pesticides	1,2-DCP, Aldicarb, Nitrates	Agriculture	1991
Statewide	Department of Human Services Public Drinking Water System Compliance[V]	Varies	2,459 ground water systems	154 maximum level violations reported	Bacteria, Disinfectants, Inorganics, Organics, Radiological	Nitrates, Arsenic, Coliform, Cadmium, Mercury, Lead, Copper, VOCs, Pesticides	Various	2001
Statewide	Department of Human Services Real Estate Transaction	Ongoing	14,127 (1989-1998)	Not rated	Nitrates, Bacteria	Nitrates, Bacteria	Various	Ongoing
Statewide	National Pesticide Survey (OR)	1	7	1	Nitrates, Pesticides, Organics	None	-	1989
Statewide	Voluntary Nitrate Testing	28	1,641	2	Nitrates	Nitrates	Varied; Unknown	1993
Umatilla	Lower Umatilla Basin GWMA[III]	Ongoing	38 (198 synoptic)	3	Nitrates, Pesticides	Nitrates, EDB, Atrazine, Dacthal, Dicamba, Picloram	Agriculture, Industry	2002
Umatilla	Milton-Freewater	2	40	4	Bacteria, Nitrates, Pesticides	Bacteria	Septic, Agriculture	1999
Willamette	Mid-Multnomah	107	25	3	Nitrates	Nitrates, VOCs	Septic, Urban, Industrial	1995
Willamette	Sauvie Island	1	3	2	Nitrates, Pesticides	Nitrates	Agriculture	1985
Willamette	Boring	14	25	3	General	VOCs	Agriculture	1990
Willamette	Canby	2	21	3	Nitrates, Pesticides	Nitrates, Dacthal	Agriculture, Septic	1993
Willamette	Coburg	4	28	2	Nitrates, Pesticides	Nitrates	Agriculture, Septic	1994
Willamette	Dever-Conner Albany	1	3	2	Nitrates, Pesticides	Nitrates	Agriculture	1984
Willamette	Farmington/ Hillsboro	3	15	3	Nitrates, Pesticides	EDB	Agriculture	1986

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	Florence-Clear Lake Aquifer	12	24	1	Nitrates, Phosphorus	None	-	1981
Willamette	French Prairie	1	9	1	Nitrates	None	-	1985
Willamette	Jefferson	1	5	3	Nitrates, Pesticides	Bromocil, Dinoseb	Agriculture	1985
Willamette	Junction City	2	20	4	Nitrates, Pesticides	Nitrates, VOC	Agriculture, Septic; Unknown	1993
Willamette	Lake Labish	1	3	2	Nitrates, Pesticides	Nitrates	Agriculture	1985
Willamette	Lebanon-Albany	1	19	1	Nitrates, Pesticides	Nitrates	Unknown	1993
Willamette	Milwaukie	2	34	3	Volatile Organic Compounds	VOCs	Industry and Commerce	1989
Willamette	Mission Bottom	7	90	4	Heavy Metals, Nitrates, Pesticides	Nitrates, EDB	Agriculture, Municipal, Septic	1986
Willamette	North Albany Groundwater	14	33	2	Nitrates, VOC, Bacteria	VOCs, Nitrates	Unknown; Septic	1996
Willamette	Santa Clara/River Road	12	26	4	Nitrates, Bacteria	Nitrates, Bacteria	Septic	1980
Willamette	Scio Groundwater Study	3	14	4	Bacteria	Bacteria	Septic, Livestock	1988
Willamette	Woodburn	2	21	2	Nitrates	Nitrates, PCE	Unknown	1993
Willamette	Southern Willamette Valley	2	480	2	Nitrates, Pesticides	Nitrates	Agriculture, Septic	2002
Willamette	USGS NAWQA Willamette Valley [VI]	-	70	2	Nitrates, Pesticides, VOCs,	Nitrates, 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. Nitrates, 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 (DEQ)	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 on-site sewage system program, contracting with some counties.
	Shares implementation of the drinking water source water assessment program with OHD.
	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, and 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 - Sources of Ground Water Contamination

Potential Source	Reporting Period	Number of Sites	Sites with Potential or Confirmed Groundwater Contamination	Contaminants	Notes
Hazardous Substance Releases					
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)	November 2002	94		Hazardous substances	
National Priority List (NPL)	November 2002	12		Hazardous substances	
DEQ Environmental Cleanup Site Information (ECSI)	June 2002	2834	652	Hazardous substances	Sites where No Further Action needed: 748 Groundwater contamination may or may not have been reduced.
DEQ Confirmed Release List (CRL)	June 2002	558		Hazardous substances	
DEQ Inventory of Hazardous Substance Sites	June 2002	315		Hazardous substances	
Leaking Underground Storage Tanks (LUST)	July 2002	19,978	3,252	Petroleum	Sites where No Further Action needed: 755 Groundwater contamination may or may not have been reduced.
Oregon Dry Cleaner Program	April 2002	33		Solvents	
Resource Conservation and Recovery Act (RCRA) Program	2002	78	21 (11 high priority)	Hazardous waste	Sites where No Further Action needed – 31 Groundwater releases controlled - 6 of 11 high priority sites
Hazardous Substance and Petroleum Storage					
Regulated USTS	July 2002	6,095		Gasoline, diesel, other.	

Potential Source	Reporting Period	Number of Sites	Sites with Potential or Confirmed Groundwater Contamination	Contaminants	Notes
Waste Disposal					
Permitted Water Pollution Control Facilities (WPCF)					
On-site sewage systems	2002	632		Nitrates, bacteria, various	Only 1% of on-site systems require WPCF permit
Other facilities	2002	183		Various	
General permits	2002	353		Various	
Underground Injection Systems					
Registered storm water injection systems	2002	31,336		Various	
Other registered injection systems	2002	9,047		Various	
Other					
Land Application – Treated Industrial Effluent	2002	33			Each facility may land apply to more than one land area.
Land Application – Treated Domestic Effluent	2002	89			
Land Application – Biosolids	2002	108			
Solid Waste Landfills	2002	480	84	Hazardous and non-hazardous substances	
Hazardous Waste Landfills	2002	1	1		
Hazardous Waste Generators	November 2002	208 large quantity; 389 small quantity; 3,134 conditionally exempt			
Agricultural Activities					
Confined Animal Feeding Operations	2002	500			
Fertilizer and pesticide applications					

Appendix 4 – Funding for Groundwater Projects

Date	Project	Amount	Description
Oregon Department of Agriculture – Groundwater Research Grants			
2002	Oregon State University Dept of Geosciences	$52,303	Investigation of nitrate and phosphate transport in the Willamette Valley Silt during recharge of groundwater
2002	Oregon State University Bioresources Engineering Dept.	$66,195	Analysis and publication of ten years of nitrate leaching data under a spectrum of high-value cropping systems
2001	Oregon State University Bioresources Engineering Dept.	$88,543	Evaluating control of groundwater contaminants through tile-line management
2001	Oregon State University Bioresources Engineering Dept.	$3,204	Irrigation management workshops
	Total grants: $210,245		
Federal Clean Water Act 319 Grants			
2002	Oregon State University Bioresources Engineering Dept.	$118,108	Upper Willamette groundwater management community outreach and hydrogeologic investigations
2000 - 2002	Oregon State University Malheur Experimental Station	$67,710	Demonstration of soil and water stewardship using drip irrigation
	Total grants: $185,818		
Clean Water State Revolving Fund Loans			
2002	City of Coburg	$150,000	Facility plan for new sewer system to replace failing septic systems
2002	City of Coburg	$3,500,000	Construction of new sewer system
2002	City of Maywood Park	$30,000	Feasibility study for new sewer system to replace failing septic systems
2001	Miles Crossing Sanitary Sewer District	$80,000	Facility plan for new sewer system to replace failing septic systems
2001	City of Haines	$100,000	Infiltration and inflow improvements to collection system
	Total loans: $3,860,000		