Oregon's 2002 Section 305(b) Report

Prepared by Oregon Department of Environmental Quality

January 2003

Overview of Oregon's Water Protection Program

Oregon's Surface Water Protection Program

The Oregon Department of Environmental Quality (ODEQ) is responsible for assuring that the state's waters are drinkable, fishable and swimable. In partnership with other natural resource agencies, ODEQ is working to preserve and protect watershed health and to restore threatened salmon populations. ODEQ protects water quality in Oregon by:

- Setting water quality standards necessary to support all beneficial uses, including protection of public health, recreational activities, aquatic life, and water supplies.
- Requiring that the discharge of pollutants into State waters be minimized and that the impact of human activities on water quality be minimized.
- Provide financial assistance for communities to upgrade waste water treatment facilities.
- Provide financial assistance to implement programs to control non point source pollution.
- Provide technical assistance and outreach/education.
- Assessing water quality in surface waters and groundwater, to determine if standards are met for protection of public health, fish and other aquatic life, and other uses.
- Where water quality is not acceptable, developing corrective actions and implementing them.
- Periodic re-assessment to determine progress.

Setting water quality standards

The water quality standards program is one of the cornerstones of the Clean Water Act. Through this program States set water quality standards for waters within their jurisdiction. Water quality standards consist of three components. First water quality standards define a use for a water body. Uses are based on how the water has actually been used since November 1975 (existing uses) or the designation can be based on a goal (goal use) that will be achieved in the future (EPA, 11/2002, Water Quality Standards Clean Water Act § 303(c)) (http://yosemite.epa.gov/R10/WATER.NSF).

Existing or goal uses of a water body might include salmonid spawning, water contact recreation and fishing. A water body often has to support several uses, including cold-water fish like salmon and trout, fishing and irrigation. Federal law requires that ODEQ protect the most sensitive of these uses.

The second component of water quality standards is the criteria which describe the conditions necessary to support the designated uses. Criteria can be numeric limits for individual pollutants or narrative descriptions of desired conditions. Narrative criteria describe what Oregon's waters will be "free from", like oil and scum, color and odor and other substances that can harm people and fish. Numeric criteria assign numbers that represent limits and/or ranges of chemical concentrations, like oxygen, or physical conditions, like temperature. Water quality standards also contain antidegradation policies designed to protect improvements in water quality.

According to the federal Clean Water Act, States are to review their water quality standards at least once every 3 years. During this review, States revise standards to incorporate the latest scientific information and to make any other revisions the State determines are needed. During this review ODEQ examines scientific information with a technical advisory committee. The technical committee typically evaluates the methodologies used to develop criteria and develops a range of possible criteria which is forwarded to a second group, a policy advisory committee. The policy advisory committee's role is to review the alternatives and select one. The Oregon Environmental Quality Commission actually adopts the changes to the water quality standards, after extensive public review. The Environmental Protection Agency reviews and approves the adopted standards.

ODEQ's last triennial review took place from 1992-1996. ODEQ submitted its revised standards to EPA in 1996 and received approval in 1999. ODEQ began its current review cycle in the fall of 1999 and expects to complete this review by 2003. As part of this triennial review, ODEQ is reviewing and revising the temperature criteria, revising numeric criteria for 250 "toxics" pollutants and developing numeric biological criteria.

Limiting the discharge of pollutants into State waters

Wastewater Permits

The wastewater permit program has been the bedrock of ODEQ's water quality program since the first permits were issued in the late 1960's, and is credited with significant improvements in water quality in many Oregon rivers. The permit program identifies point sources of wastewater with a potential for serious water quality or public health impacts, and requires that those facilities obtain and comply with a wastewater discharge permit. Permit conditions generally include effluent limits; periodic monitoring to ensure that the effluent limits are being met; compliance conditions requiring improvements in operation or special studies; special operating conditions; and other administrative requirements such as prompt reporting of any spills. In addition to issuing permits, ODEQ also conducts periodic inspections and reviews permittee monitoring records to insure that the terms of the permit are being met and no unacceptable impact on public waters is occurring.

ODEQ operates two wastewater discharge permit programs. Since 1973, point source wastewater discharges to surface waters are permitted under National Pollutant Discharge Elimination System (NPDES) permits. These permits contain effluent limits, self monitoring and reporting requirements and best management practices as necessary to adequately regulate the discharge. The primary purpose of these permits

is to insure that wastewater discharges do not cause harm to the receiving waters or endanger public health.

Wastewater discharges that affect land quality and/or groundwater, for example wastewater discharges to drain fields or spray irrigation systems, are regulated under Water Pollution Control Facilities (WPCF) permits. The primary purpose of these permits is to protect public health and groundwater.

Permits may be designated as either general or individual permits. General permits are issued by ODEQ to cover categories of minor discharges when an individual permit is not necessary to adequately protect water quality. ODEQ may issue a general permit when there are several minor sources or activities involved in similar operations that are discharging similar types of waste. New sources apply to be "assigned" to the general permit that has been issued by ODEQ. Sources that qualify for a general permit do not need to obtain an individual permit. Sources not eligible for a general permit must apply for an individual permit.

Some of the sources covered by general NPDES permits are:

- Storm water
- Fish hatcheries
- Log ponds
- Seafood processing
- Petroleum hydrocarbons cleanup, and
- Vehicle wash water

Tables 1 and 2 summarize the active NPDES and WPCF permits in Oregon as of October, 2002.

Permit Type	Number of Active Permits
NPDES Major – Total	78
Domestic Industrial	55 23
NPDES Minor – Total	289
Domestic Industrial	154 135
WPCF Minor – Total	1016
Domestic Industrial	118 898

Table 1: Individual Wastewater Discharge Permits

Permit Type	Number of Active Permits
NPDES Storm water	1676
NPDES, other than Storm water	567
WPCF On-site	147
WPCF, other than On-site	282

Table 2: General Wastewater Discharge Permits

Between January 2000 and December 2002, ODEQ issued 49 individual NPDES permits; 141 individual WPCF permits and 331 general permits (both NPDES and WPCF).

Major activities done by ODEQ and related to wastewater discharge permits include:

- Permit issuance.
- Inspections of permitted facilities, including biosolids application sites, to determine compliance with rules and the terms of the permit.
- Review of effluent monitoring reports and other reports required by permit, determine compliance with the terms of the permit.
- Issuance of enforcement actions, from administrative Notices of Noncompliance through Civil Penalties and Enforcement Orders.
- Investigate complaints received relating to operation of permitted facilities.

- Develop and implement rules, policies, and guidance relating to permits and permit issues. Provide training and technical assistance to the regulated community, through presentations, guidance documents and personal communications.
- Management of the sewage treatment plant operator's certification program. In Oregon, each sewage treatment system and sewage collection system must be supervised by a properly certified operator. ODEQ runs the operator examination program, and certifies that operators have passed the exam and meet other educational and experience requirements.

On-site Program

More than one million Oregonians, or about 35 percent of the state's population, use on-site sewage systems, also known as septic systems. Most of these are single-family homes in rural areas without access to community sewer systems.

ODEQ manages the on-site sewage treatment and disposal program statewide, and provides direct service for on-site system permitting and installation in 14 counties around the state. These include Clatsop, Coos, Douglas, Josephine, Baker, Grant, Gilliam, Harney, Lake, Morrow, Umatilla, Union, Wallowa, and Wheeler counties. ODEQ issues between three thousand and five thousand new permits annually in direct-service counties.

The 22 remaining Oregon counties manage the program through local governments under contract with ODEQ. People seeking a siting variance in any of Oregon's counties must apply through ODEQ.

Specific activities done by ODEQ in direct service counties include:

- Evaluate proposed building sites to identify what kind of on-site sewage system is suitable for the soils, the risk of groundwater contamination, and whether there is enough land area to support a new and replacement system.

- Issue permits to construct septic systems.

- Inspect new systems to ensure that they are correctly installed and will function properly.

- Work with property owners to repair failing systems.

- Respond to citizen complaints about raw sewage or failed septic systems.

ODEQ also directly administers a statewide program regulating septic system installation and pumping businesses. This work includes:

- Licensing companies which pump out septic tanks.

- Licensing companies that install septic systems.

ODEQ also administers the on-site program statewide. Major work areas include:

- Setting standards for system siting, system construction, and on-site sewage products (i.e. septic tanks and drainfields).

- Providing oversight for counties implementing the on-site program.

- Providing training for county agents.

ODEQ is currently working with an advisory committee to review all elements of the on-site program. To begin the process, in 2002 ODEQ contracted a review of the on-site sewage disposal program, which included an identification of issues and concerns and recommendations for improvements. Additionally, ODEQ surveyed 900 on-site sewage disposal system installers throughout the state, soliciting their opinions of ODEQ's service.

Pretreatment Program

ODEQ also works to minimize the discharge of pollutants through the pretreatment program. Under this program, certain cities are required to develop and operate a regulatory program for dischargers to the municipal sanitary sewer systems. ODEQ duties include review and approval of program documents developed by municipalities, and periodic inspections of municipal programs.

Objectives of the pretreatment program:

1. Protect publicly owned treatment works (POTW) from pollutants that may cause interference with sewage treatment plant operations.
2. Prevent introducing pollutants into a POTW that could cause pass through of untreated pollutants to receiving waters.
3. Manage pollutant discharges into a POTW to improve opportunities for reuse of POTW wastewater and residuals (sewage sludge).
4. Prevent introducing pollutants into a POTW that could cause worker health or safety concerns, or that could pose a potential endangerment to the public or to the environment.

Provide financial incentives for communities to upgrade waste water treatment facilities.

State Revolving Fund

ODEQ offers low interest loans from the Clean Water State Revolving Loan Fund (SRF) for the planning, design and construction of water pollution control facilities. In the SRF Program, Congress appropriates funds to the Environmental Protection Agency (EPA) for the purpose of capitalizing the SRF Loan Program each year. This grant amount was $1,350,000,000 for the federal fiscal year 2002, and is allocated to all the states and Puerto Rico based on a pre-determined formula. Each state must contribute a minimum matching amount of 20% of this federal grant to the program annually. Oregon's 2002 grant amount is approximately $15,000,000 which, when combined with the State's

required $3,000,000 matching amount and repayments of existing loans, provided the Program with approximately $48,000,000 of available funds for providing assistance to local communities in 2002. Table 3 summarizes the SRF loans awarded for 2001 and 2002.

Table 3: SRF Loan Agreements and Amendments Executed During Calendar Years 2001 & 2002

Borrower	Amount	Binding Date
Haines, City of	100,000.00	1/12/2001
Monument, City of	73,000.00	1/26/2001
Ashland, City of	3,797,397.00	1/17/2001
La Grande, City of	3,797,397.00	2/8/2001
Woodburn, City of	3,000,000.00	2/15/2001
Gresham, City of	2,389,410.00	2/8/2001
Miles Crossing S.D.	80,000.00	2/9/2001
Newport, City of	2,700,000.00	2/14/2001
Wedderburn Sanitary Dist.	45,924.00	6/21/2001
Prairie City, City of	95,651.00	6/14/2001
Myrtle Creek, City of	3,797,397.00	6/29/2001
Grants Pass, City of	2,734,754.00	6/26/2001
Tillamook, City of	229,808.00	7/5/2001
Tillamook, City of	250,000.00	9/5/2001
Independence, City of	20,342.00	9/10/2001
Ashland, City of	1,653,000.00	12/13/2001
Powers, City of	20,000.00	1/22/2002
Cottage Grove, City of	3,720,000.00	1/29/2002
La Grande, City of	3,000,000.00	1/18/2002
Rainier, City of	63,000.00	2/16/2002
Grants Pass, City of	4,265,246.00	2/7/2002
BCVSA	305,000.00	2/21/2002
BCVSA	663,000.00	2/21/2002
Dufur, City of	450,000.00	3/12/2002
Coburg, City of	150,000.00	3/20/2002
Coburg, City of	3,500,000.00	3/20/2002
Myrtle Creek, City of	4,000,000.00	4/16/2002
Maywood Park, City of	30,000.00	5/1/2002
Myrtle Creek, City of	1,000,000.00	5/21/2002
Prineville, City of	7,262,847.00	4/22/2002
Cottage Grove, City of	2,670,000.00	6/13/2002
Wedderburn Sanitary Dist.	17,500.00	7/3/2002
Netarts-Oceanside S.D.	100,000.00	9/17/2002
Ashland, City of	500,000.00	9/17/2002
Salem, City of	6,300,000.00	10/1/2002
Astoria, City of	2,760,000.00	11/12/2002
Hines, City of	949,349.00	11/27/2002
Arch Cape Sanitary Dist.	70,000.00	12/9/2002
Arch Cape Sanitary Dist.	233,000.00	12/9/2002
Sweet Home, City of	2,000,000.00	12/23/2002
Total	**68,793,022.00**	

The program also provides technical assistance. Project officers and engineers are located in the regions, with loan officers located in headquarters. With smaller communities, ODEQ provides extensive technical assistance during the facility planning phase.

Provide financial assistance to implement programs to control non point source pollution

319 Nonpoint Source Grant Program

Grant funds available through Section 319 of the Water Quality Act of 1987 are a critical element in turning Oregon's Nonpoint Source control program into water quality protection realities in watersheds throughout the state. Each year, DEQ identifies programmatic and geographic targets, solicits project proposals, assembles a proposal package for EPA's review, develops contracts and agreements for disbursement of grant funds, oversees program implementation, and evaluates program accomplishments. Grants awarded in 2001 and 2002 are summarized in Tables 4 and 5, respectively.

Table 4: 2001 319 Projects

Project Title	BUDGET
Student Watershed Research Project	$46,585
Laneda Avenue Street and Storm Drainage Improvements	$30,000
Tillamook Stream Enhancement Projects	$58,725
Nestucca-Neskowin Watershed Council	$15,000
Columbia River TMDL Coordination	$108,538
Lower Columbia River Monitoring and Riparian Restoration Project	$26,265
Nehalem Watershed Health and Riparian Restoration	$46,950
Sam Downs Road – Culvert Replacement	$61,310
Restoration, Enhancement and Protect Sites To Improved Water Quality (WQ) In the Columbia Slough	$21,000
Bacteria Monitoring In The Tillamook Bay Watershed	$10,362
Detecting Fecal Pollution Sources In the Tillamook Watershed	$51,279
Naturescaping for Clean Rivers	$82,813
GPS Monitoring of Manure and Irrigation Delivery Systems On Willamette Valley Dairy Farms	$25,410
Livestock Nutrient and Sediment Monitoring for TMDL Development On Pedee Creek, Tributary to the Luckiamute River	$2,710
Watershed Revegetation Program	$75,000
North Santiam River Water Quality Monitoring and Education Project	$22,250
“Only Rain Down the Drain” Public Awareness Campaign	$55,000
Yamhill Sub-Basin Watershed Landowner Technical Assistance	$46,000
Building For A Better Oregon: Workshops to Control Non-Point Source Pollution From Construction and Road Building Activities	$42,400
Curry Sediment Abatement	$128,580
North Fork of the Smith River Riparian Enhancement Project	$12,000
Grave Creek Watershed Assessment, Planning and Education Effort	$18,480
Private Road Inventory and Sediment Yield Analysis	$16,644

Joyce Ranch Riverbank Stabilization and Riparian Establish Demo Project	$28,325
Umpqua Basin Riparian Fencing/Planting Project	$15,500
Applegate Watershed Riparian Restoration Program	$68,380
Ferry Creek and Geiger Creek Sediment Abatement	$49,610
South Fork Coquille Road and Landing Inventory	$35,750
Little Applegate Fish Passage, Stream Flow and WQ Enhancement Project– (Farmer's Ditch Project)	$70,000
Tenmile Lake's Watershed Riparian and Sediment Assessment	$77,486
Umpqua Stream Temperature Management Planning 2001	$21,000
Port Orford Municipal Water Supply: Sediment Source Reduction	$25,487
Bacteriological Characterization of Direct Bay Tributary Streams in the Coos Estuary, Coos County, OR	$48,228
Sucker Creek Gravel Push-Up Dam Removal and Water Conservation Project	$20,000
Umpqua Basin Watershed Assessment and Action Plan, Phase II	$104,081
A Demo Project to Reduce Risk of Agricultural Nonpoint Source (NPS) through Integrated Pest Management in The Dalles area Orchards	$69,867
Wrentham Soil-Bioengineering Demonstration Project	$66,505
Fifteen Mile Watershed Improvement Project	$60,000
Urban NPS Educational Program	$12,000
Upper Deschutes Water Quality and TMDL Development	$45,611
Walla Walla WQ Monitoring and TMDL Development/Implementation	$26,900
Willow Creek Demonstration and BMP Implementation Project	$42,000
Temperature Assessment in Support of TMDL Development in the Upper Deschutes and Little Deschutes Sub-Basins of Central Oregon	$85,650
Defining the Performance Characteristics of the Standard, Rock Filled, On Site, Sewage Disposal Trench	$75,000
Demonstrations and Innovations to Expand Subsurface Drip Irrigation (SDI) In Oregon	$67,710
OrganoPO4 Runoff and Effects on Salmonids In Hood R. Basin: Monitoring to Evaluate Impact of Load Reduction Practices	$94,140
Grande Ronde Basin Watershed Assessments Willow Creek Upper Wallowa River	$23,000
Oregon NPS Programs: Administration, Coordination and Planning	$509,093
Grande Ronde Monitoring	$93,000
TMDL Modeling in Priority Basins	$193,776
Willamette River Urban Stream Brochure	$11,100
Coastal Zone Nonpoint source	$175,000
Total Funded	**$3,217,500**

Table 5: 2002 319 Projects

PROJECT TITLE	BUDGET
Onsite Set Aside	$150,000
Tenmile Lakes Water Quality Planning and Implementation Phase II	$247,446
Demonstration of soil and water stewardship using drip irrigation	$67,710
Durham quarry development	$280,000
Multnomah Building Green Roof	$75,600
Walla Walla WQ Monitoring and TMDL implementation	$33,200
Nestucca-Neskowin WQ monitoring and technical assistance	$34,380
Bear Ck. Watershed comprehensive NPS reduction: community planning, demonstration projects, education and source identification and elimination	$106,260
Tillamook urban/residential riparian enhancement assistance program	$28,710
School Mercury Reduction Pilot Project	$14,878
Rogue Basin Erosion Prevention / Sediment Control Workshops	$5,900
Willow creek demonstration and BMP implementation project (2 year)	$42,200
Umpqua Basin Watershed assessment and action plan, phase III	$106,850
Upper Willamette groundwater Management Community Outreach and Hydrogeologic Investigations	$118,108
Tillamook Bay watershed on-site sewage disposal system sanitary surveys	$42,700
Evaluation of toxics in sediment and water in the Columbia Slough using semi-permeable membrane devices	$27,200
Tillamook Buffer Strip Effectiveness Study	$39,451
Bay city storm water drainage master plan	$25,200
NPS Administration	$509,093
Columbia/Coastal Zone Nonpoint Source	$236,820
Long Term Monitoring Grande Ronde	$93,000
Calapooya Creek and Sutherlin Creek Mercury monitoring project	$34,726
Tillamook bay watershed long term trend volunteer monitoring	$29,800
John Day/Umatilla CAFO AFO demonstration project	$168,000
50 ways to love your river	$35,000
Trask river riparian restoration demonstration project – Fenk project	$14,376
Clover Ck Instream Riparian Plant	$17,318
Trask River riparian restoration demonstration project – Sanchez project	$17,660
Smith Creek Riparian restoration and culvert replacement	$10,000
Cavitt Creek Restoration – Phase II	$150,000
TMDL modelers	$193,776
Water quality assessment and improvement in tributaries to Coos Bay	$141,598
Regional Lake Management Planning for TMDL Development	$114,540
Total Funded	**$3,211,500**

Provide technical assistance and outreach/education.

- Review and approval of engineering plans and specifications, for wastewater conveyance and treatment facilities. Plan review engineers are located in the regions.

- Provide technical assistance to small communities, through the Environmental Partnerships for Oregon Communities (EPOC) program. This effort provides intensive technical assistance to very small communities facing multiple environmental issues. ODEQ works with small communities to develop a financially realistic schedule and priority order for resolving environmental problems. Communities that are currently involved in the EPOC program are listed in Table 6.

Table 6 - Municipalities Participating in the Environmental Partnerships for Oregon Communities (EPOC) Program 2002

Completed Mutual Agreement and Order	Using Local Resources Infrastructure Projects	Requested/Received Technical Assistance From EPOC
Monroe	Oak Hill Road	Gearhart
Rainier	Monument	Miles Crossing Sanitary District
Vernonia	Aurora	Charleston
Powers	Wamic	Port Orford
Oakland		Lakeside
Prairie City		Clatskanie
Henley School		Douglas County
Glendale		Sutherlin
Merrill		Sutherlin Water Control District
Lakeview		Windmaster Corner
Westfir		Modoc Point
Nyssa		Bonanza
Vale		Malin
Falls City		Waldport
Moro		Gates
Wasco		Century Meadows
Rufus		Mosier
Rockaway Beach		Paisley
Garibaldi		Detroit/Idanha
Amity		Jefferson
		North Santiam Drinking Water Protection
		Tillamook County
		Reith

Assessing water quality in surface waters and groundwater, to determine if standards are met for protection of public health, fish and other aquatic life, and other uses

An effective water quality management program that can restore and protect water quality to meet the beneficial use needs of both present and future citizens of the state, must be based upon an accurate and complete understanding of water quality conditions within the state. The ODEQ Water Quality Monitoring Strategy is designed to provide reliable, high quality information to answer basic questions such as:

- Is water quality changing? If so, by how much, and where?
- How does water quality vary spatially across the state?
- Does water quality meet standards?
- What pollutants are affecting water quality?

Is water quality changing? If so, by how much, and where?

In the past, "Number of river miles assessed meeting standards" had served as a benchmark of performance for water quality programs. This number was tied to the total amount of monitoring done, which was influenced by the number of special monitoring studies performed. These studies are typically concentrated, for good reason, in areas where water quality degradation is a concern. This created a benchmark weighted towards the impacted waters of our state and tends to give the impression that water quality is generally degrading despite our attempts to improve it. The Oregon Water Quality Index (OWQI) was designed to permit comparison of water quality among different stretches of the same river or between different watersheds. Use of the OWQI for benchmark measurement is tied to key indicator sites routinely monitored by the laboratory, representing the range of water quality found throughout the state. The OWQI can be used to communicate trends in water quality and factors affecting water quality. The Oregon Water Quality Index will more adequately measure the progress (or lack of progress) made by water quality management practices.

The OWQI relies on data generated from routine ambient water quality monitoring in order to analyze trends over long time periods. The ambient water quality monitoring network is designed to measure cumulative impacts from point and non-point sources in a variety of conditions. Locally, these conditions range from protected, pristine rivers such as the Sandy to significantly impacted rivers such as the Tualatin. Raw analytical results for eight carefully selected parameters (temperature, dissolved oxygen (percent saturation and concentration), biochemical oxygen demand, pH, total solids, ammonia and nitrate nitrogens, total phosphorus, and fecal coliforms) are converted into subindices of common units (10-100, worst case to ideal). The OWQI is calculated by combining these subindices. The nonparametric Seasonal-Kendall test (using WQHYDRO) is applied to OWQI results. This test takes into account seasonal variability of water quality, so any trend in water quality detected is significant. Confidence levels are computed for each trend. This trend analysis does not consider variations in meteorological or hydrological conditions or variations in sample time. It is important to remember that this trend analysis does not consider changes in toxics concentrations, habitat or biology.

In the following map (Figure 1) results were calculated on all samples taken in Water Years 1992- 2001. Each site, with sufficient data, is analyzed for the presence of significantly increasing or decreasing trends.

Of the 136 monitoring sites included in this report 129 had sufficient data to analyze for trends. Of these 129 sites, 66 had significant improvements in water quality and seven had a significant decrease in water quality, while the rest showed no significant trend in either direction.

Figure 1 includes sites demonstrating significant improvement in general water quality as well as sites demonstrating a decline in general water quality. Some of these sites are downstream of significant point sources, primarily wastewater treatment plants. There have been major efforts to reduce the quantity and improve the quality of discharge from point sources. OWQI results show that these efforts have been successful. Other sites showing significant improvement are not affected by point source discharges, so impacts to water quality are related to non-point source activity. Improvements at these sites may be attributed to reduced levels of non-point source activity, increased education about water quality impacts, and watershed restoration efforts. Underlying all of these factors is flow. As Oregon returns, in stages, from drought to the wet phase of the long-term cycle, flows and water quality improves.

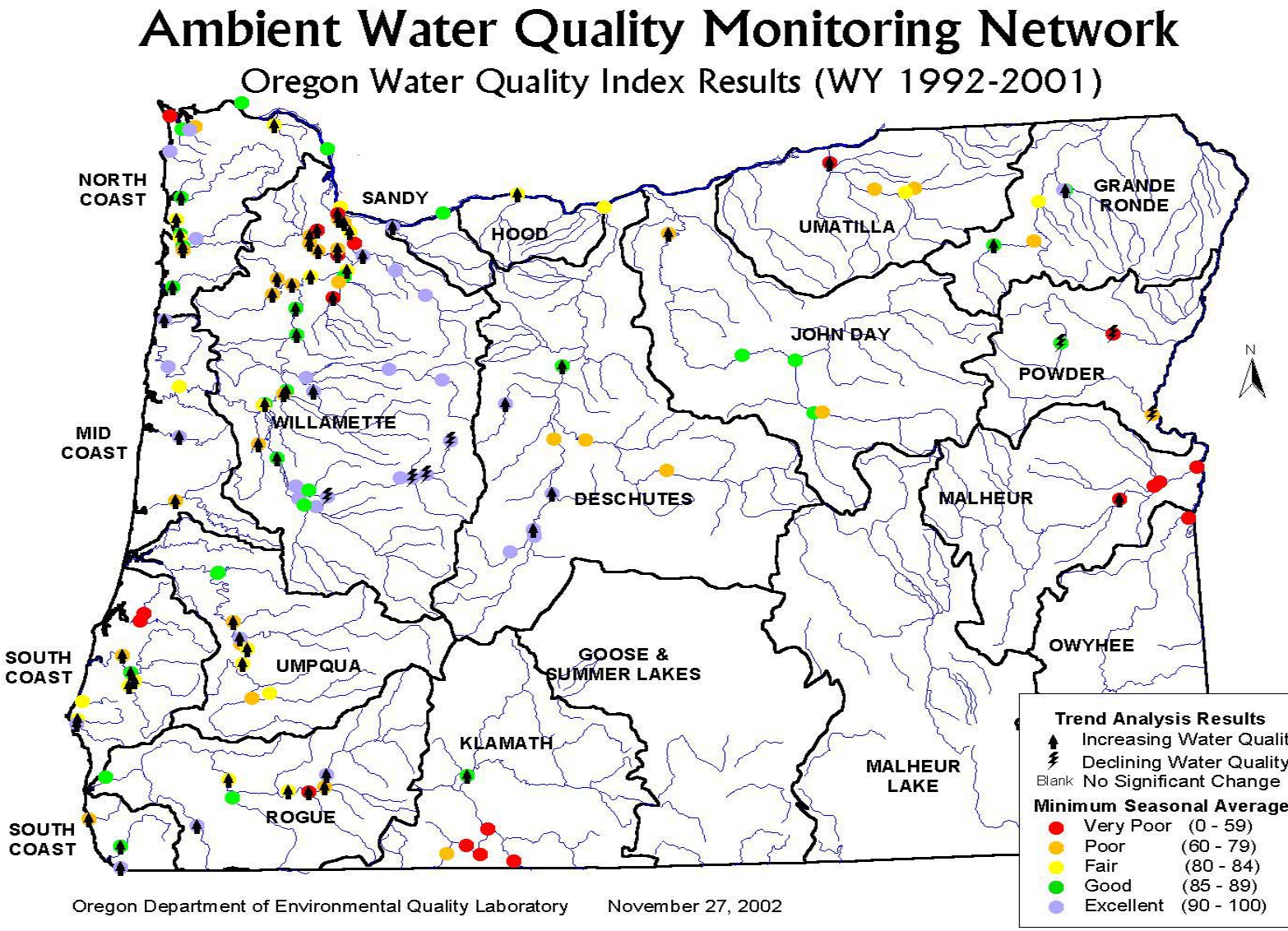


Figure 1: Oregon's Water Quality Index

How does water quality vary spatially across the state?

Probability-based Stream Surveys

Traditionally, most water quality monitoring conducted by ODEQ involves collecting chemical water quality samples at regular time intervals at the same locations on larger rivers over long periods of time. While this sort of sampling is very good for describing water quality trends over time on selected rivers, it is not very good for describing water quality on a regional basis. For example, sampling the dissolved oxygen concentration at the mouth of the Tillamook River at regular intervals for many years would give us a good idea of the trend in dissolved oxygen at that site over time. By sampling enough coastal streams we can infer something about trends in selected coastal rivers over time. However, these surveys do not give us a good idea of the percent of coastal stream kilometers with dissolved oxygen problems.

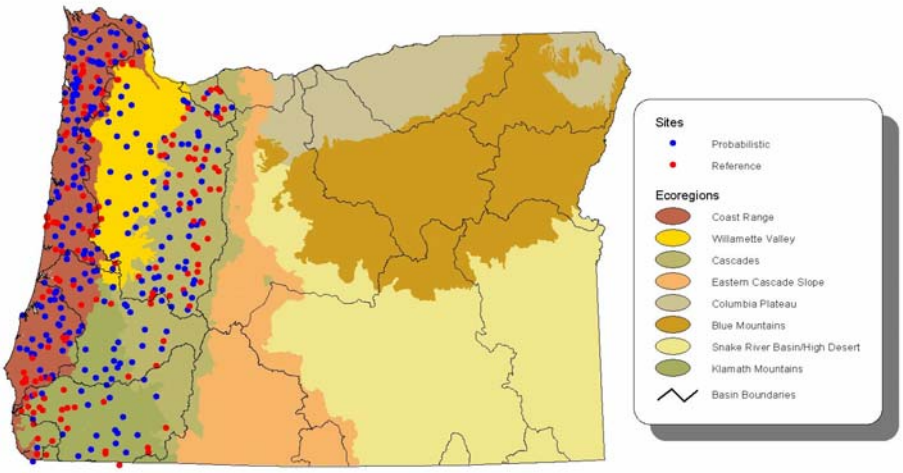
Probabilistic stream "polling" is an effective approach to describing regional stream conditions without the great expense of trying to "census" all the stream segments in a region of interest like the Oregon north coast. Since the condition of randomly selected streams sites is representative of the larger stream population regionally, the data from relatively few sites can be used to describe conditions regionally with known statistical precision and confidence.

Western Oregon Stream Surveys 1994-2001

Streams vary across Oregon and perspectives on regional stream condition can be different depending on the spatial context. ODEQ summarizes stream conditions using two spatial scales: basins and ecoregions. Basins are a typical and useful way of summarizing data. The major basins used were the North Coast, South Coast, Umpqua, Rogue, and Willamette basins. The second scale is by ecoregions. Ecoregions are areas of similar geology, climate, soils, vegetation and land use. This can also be a useful scheme for organizing data summaries since these are significant factors in determining stream characteristics. The ecoregions used in this section were the Coast Range, Klamath Mountains, Willamette Valley, and Western Cascades. Only data from basins and ecoregions west of the crest of the Cascades is summarized here.

The data presented in this section for selected biological, chemical and habitat conditions were gathered from several monitoring programs conducted by ODEQ in western Oregon from 1994 to 2001 that have used the same sampling design and protocols. The monitoring programs were the 1994-1996 Coast Range Regional Monitoring and Assessment Program (REMAP), 1999-2000 Western Cascades REMAP and, 1998-2001 Oregon Plan for Salmon and Watersheds. In total, approximately 340 randomly-selected stream segments were sampled to produce these data (Figure 2). By compiling compatible data sets from different studies over several years we can obtain enough sample sites to describe stream conditions regionally. Streams were surveyed during the mid-day between the end of June and the beginning of October.

Figure 2: Western Oregon Stream Survey Sites



The Stream Population

The data summarized here are from first, second, and third order streams. A first order stream has no perennial tributaries. The confluence of two first order streams forms a second order stream, the confluence of two second order streams forms a third order stream, and so on. In western Oregon, 85% of the total stream lengths are classified as first through third order streams. Most stream management and regulatory work done by ODEQ has been focused on larger rivers. However, smaller streams actually make up the vast majority of stream kilometers in a region. First through third order streams are critically important in determining the condition of larger streams and rivers, especially from the effects of land use activities.

Reference Condition
In order to evaluate the biology, chemistry and habitat of streams we need some estimate of the "normal" or "natural" baseline conditions of streams for comparison. To estimate baseline conditions we surveyed selected reference sites across the region. These reference sites represent stream segments with the least amount of human disturbance for a given region. The 25th percentile value of the reference site distribution was used as the threshold between good condition sites and fair condition sites. The 10th percentile of reference site distribution was used as the threshold between fair condition sites and poor condition streams.

Stream Condition Indicators
Table 7 contains indicator threshold values for designating good, fair, and poor condition streams for selected parameters.

Biological Condition: Macroinvertebrate Community
Stream macroinvertebrates are widely used as an indicator of stream health because they are sensitive to both water chemistry and habitat disturbance. Their high species diversity and wide distribution makes them useful indicators in all streams regardless of barriers to fish migration, fish stocking programs, and fishing pressure, factors that can interfere with using fish assemblage data.

The condition of the macroinvertebrate community was evaluated using a predictive model based on reference sites across western Oregon and Washington (Hawkins, unpublished manuscript). Sites with higher scores have macroinvertebrate communities that are more similar to reference conditions. Impairment thresholds were determined using the distribution of community scores found at reference sites.

Biological Condition: Fish and Amphibian Community
The aquatic vertebrate Index of Biotic Integrity (IBI) for western Oregon (Howlin, submitted) used here evaluates the health of the whole aquatic vertebrate community using the sensitivity or tolerance of the animals found at a site to produce a site IBI score. Higher scoring sites are more similar to what would be expected at reference sites. Index scoring and impairment thresholds are based on reference site data.

Fine Sediment
Excessive fine sediment in streams is an important factor effecting the spawning and survival of many stream organisms. Stream substrate particle size was measured at 55 locations on the stream bottoms along transects spread over a few hundred meters of stream length. The fine sediment values represent was the percent of those particles with a diameter of 2 millimeters or less. Impairment thresholds were determined using the distribution of fine sediment found at reference sites.

Shade
Shade or stream cover is the proportion of open sky over the mid channel of the stream that is obscured by vegetation or topography. It is important in determining stream water temperature through the amount of heat energy the stream receives as well as food energy and large woody debris inputs from riparian vegetation. Shade data presented here is an average of forty-four mid-channel measurements spread over a few hundred

meters of stream length. Impairment thresholds were determined using the distribution of shade results at reference sites.

Water Temperature

Water temperature is a critical water quality parameter that directly effects the survival of sensitive species such as salmon and trout. Temperature probes that record temperature every thirty minutes were installed in streams throughout the summer months in order to capture the seasonally highest water temperatures. The seasonal maximum seven-day moving average of the daily maximum temperature was calculated for each site. Since water temperature has a specific water quality standard, we used the attainment of the 17.8 C standard as the threshold between good quality streams not violating this standard and poor quality streams with temperatures warmer that than the temperature standard rather than the temperature distribution at reference sites. There was no fair condition category for temperature.

Water Chemistry

The chemical quality of water is critical to the survival fish and other stream organisms. Approximately 20 water chemistry parameters were collected at each stream. These data are summarized here using the Oregon Water Quality Index (OWQI) (Cude 2001). The OWQI is calculated by scoring 10 important water quality parameters individually based on the regionally expected value at an unimpaired stream and them summing the parameter scores for an overall site score. OWQI scores range from 0 to 100 with higher scores representing better water quality. OWQI scores are broken into three condition categories based on the range of water quality conditions found at least impaired reference condition sites.

Table 7: Category Thresholds

Indicator	Measure	Good	Fair	Poor	Category Basis
Aquatic Macroinvertebrate Community Score	Multivariate community predictive for western Oregon and Washington first through third order streams (Hawkins)	>0.85	0.85-0.75	<0.75	Based on 10th and 25th percentile of western Oregon reference site scores.
Aquatic Vertebrate Score	Vertebrate index of biotic integrity for western Oregon streams (Howlin, et. al.)	>60	60-50	<50	Based on 10th and 25th percentile of western Oregon reference site scores.
Fine Sediment	Percent of stream substrate <2 mm diameter (Peck, et. al.)	<22%	22-35%	>35%	Based on 10th and 25th percentile of western Oregon reference site scores.
Shade	Percent of mid channel stream cover (Peck, et. al.)	>50%	50-32%	<32%	Based on 10th and 25th percentile of western Oregon reference site scores.
Temperature	Seven-day moving average of daily temperature maximum	<17.8 C	-	>17.8 C	State water quality standard, OAR 340-41-(basins)(2)(b).
Water Quality	Oregon Water Quality Index (Cude, 2001)	>89	89-80	<80	Based on 10th and 25th percentile of western Oregon reference site scores.

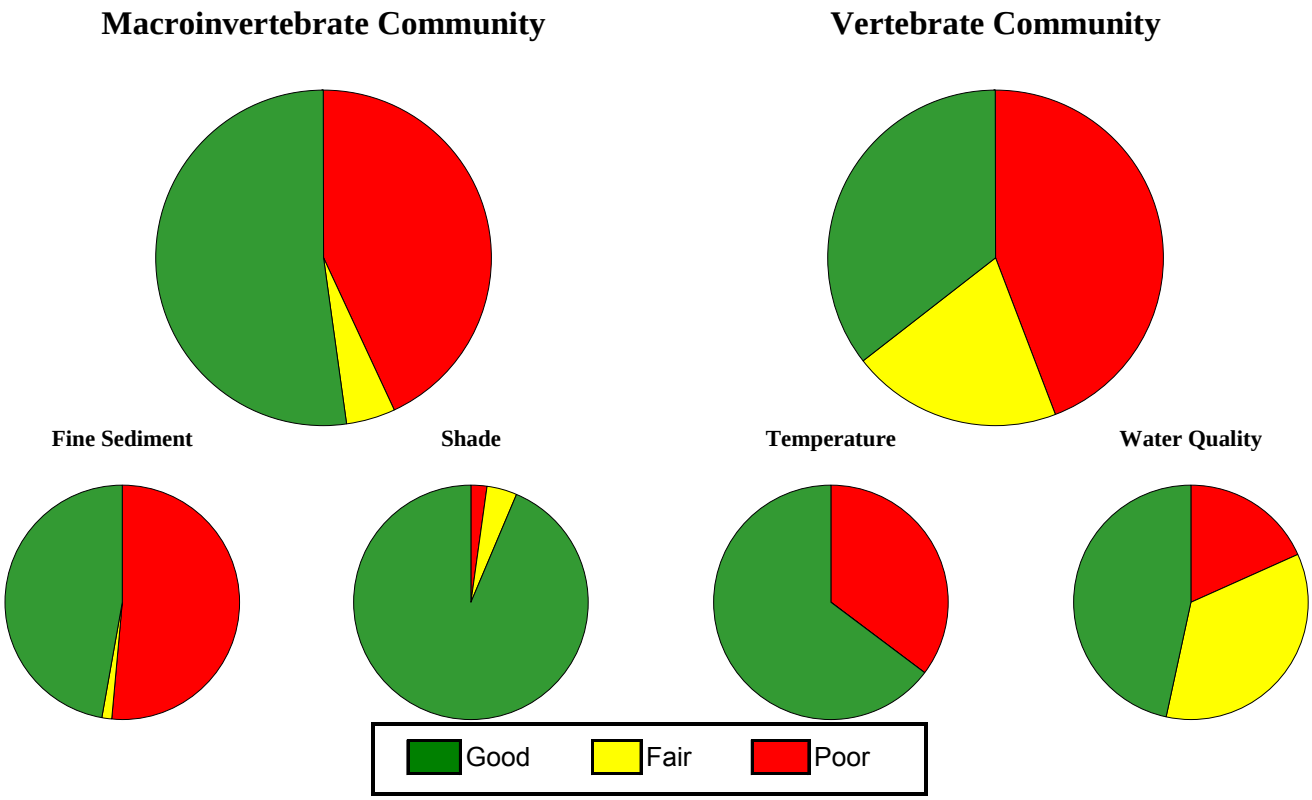
Basin Assessments

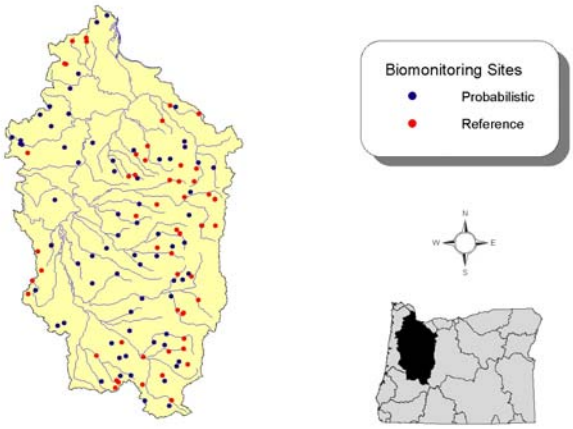
The five major western Oregon basins used were the North Coast, South Coast, Umpqua, Rogue, and Willamette basins. Because of the probability sampling approach, data are presented in terms of percent of all first through third order stream kilometers in the basin.

Overall, the Willamette basin had the highest proportion of biologically impaired streams with excessive fine sediment, warm water temperatures, and poor chemical water quality being the main stressor measured. The Umpqua basin had the greatest number of stream kilometers violating the water temperature standard.

Basins are presented in order of impairment from most to least impaired. Figures 3 to 7 and Tables 8 and 9 present basin condition data.

Figure 3: Willamette Basin

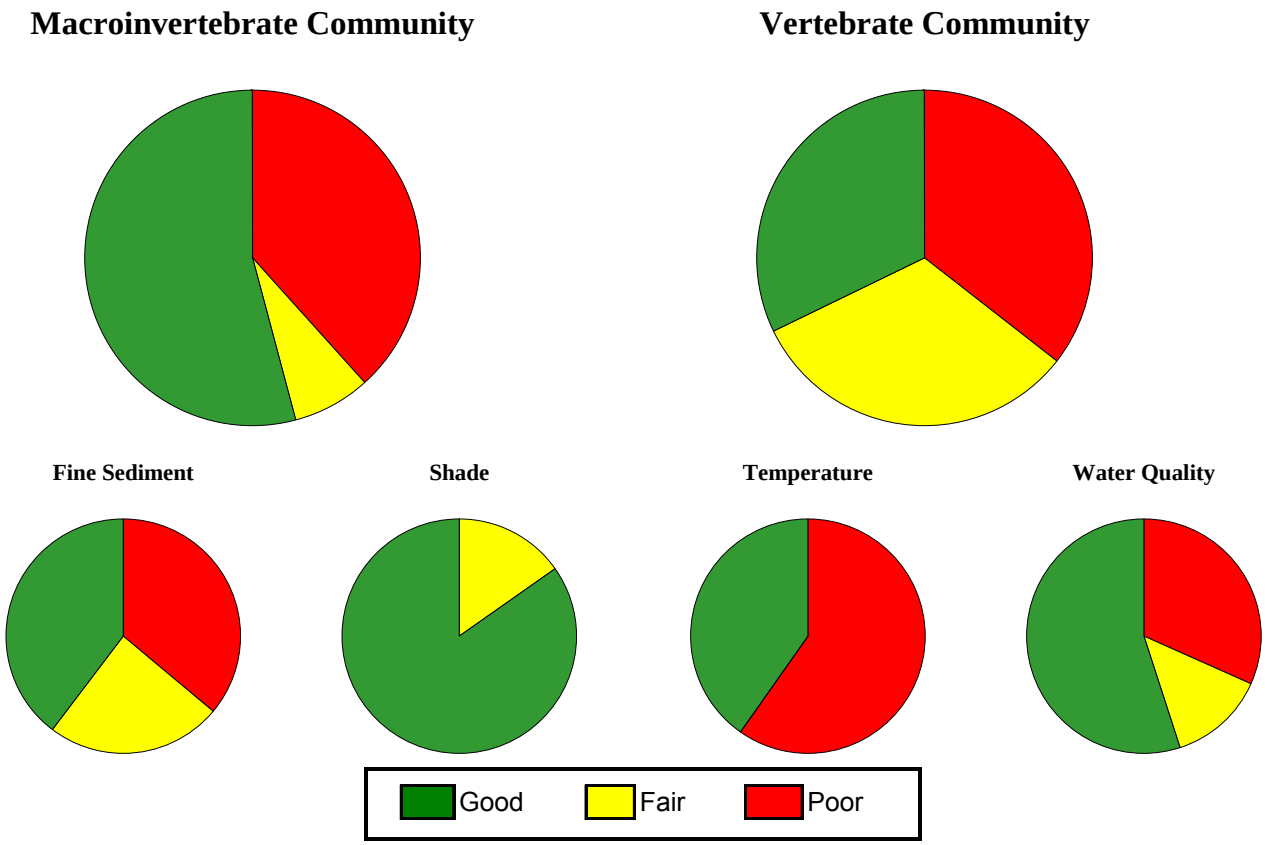


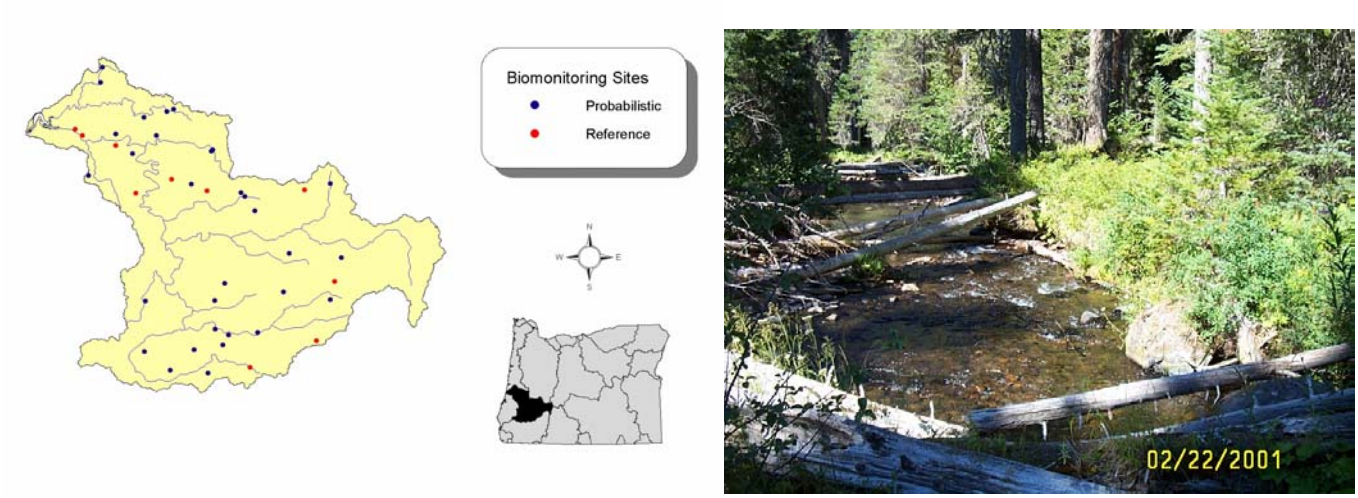


Willamette Basin

The Willamette basin had the highest number stream kilometers in poor condition for aquatic life use of any of the basins assessed: 43% of the stream kilometers had poor macroinvertebrate communities and 44% had poor vertebrate communities. The leading stressors in the Willamette basin were fine sediment (51%) and warm water temperature (35%). The stream kilometers with sediment impairment were higher in the Willamette basin than in any other basin assessed.

Figure 4: Umpqua Basin

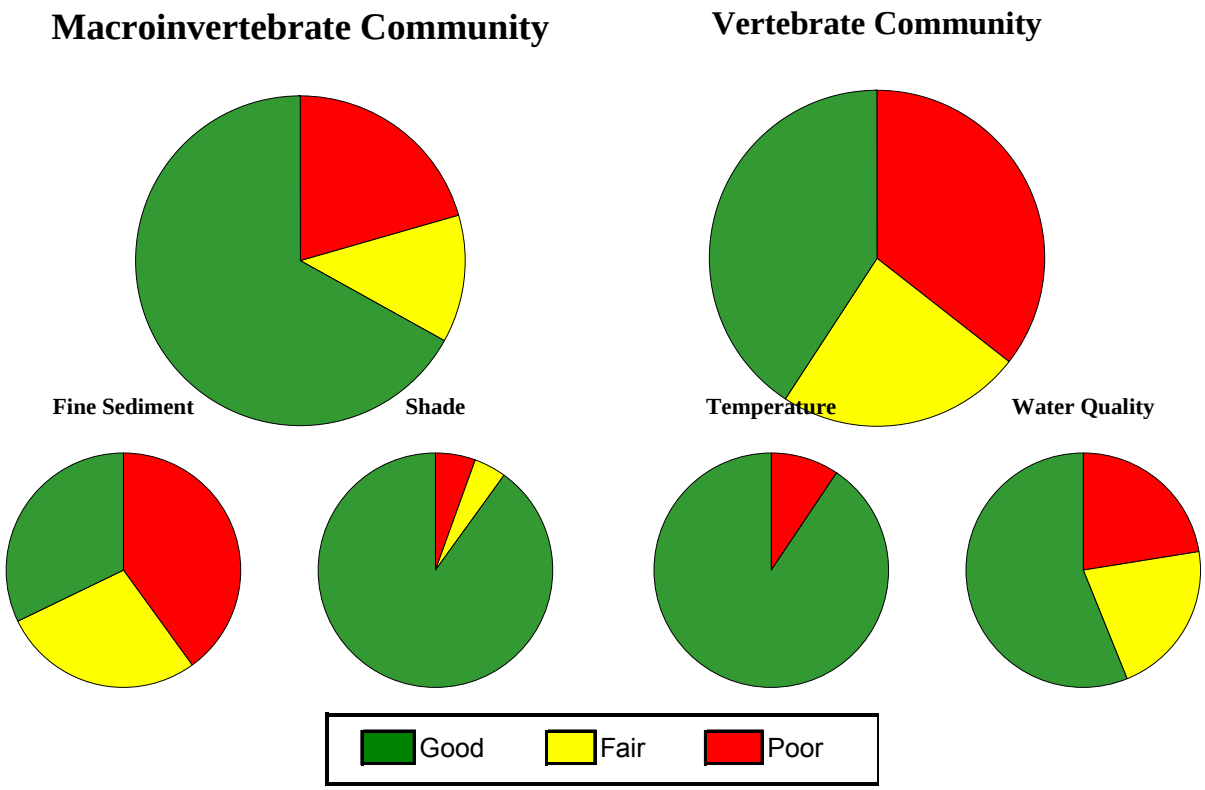


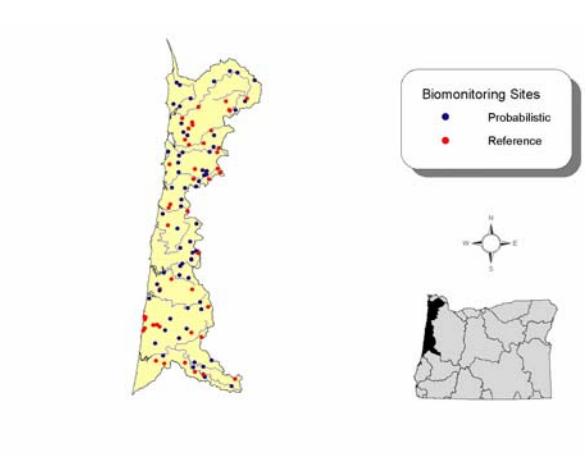


Umpqua Basin

38% of the stream kilometers in the Umpqua basin showed poor macroinvertebrate community condition, and 36% showed poor vertebrate community condition. Leading stressors in the Umpqua basin were warm water temperature (60%) and fine sediment (36%). Impairment by warm water temperature was higher in the Umpqua basin than any other basin assessed.

Figure 5: North Coast Basin

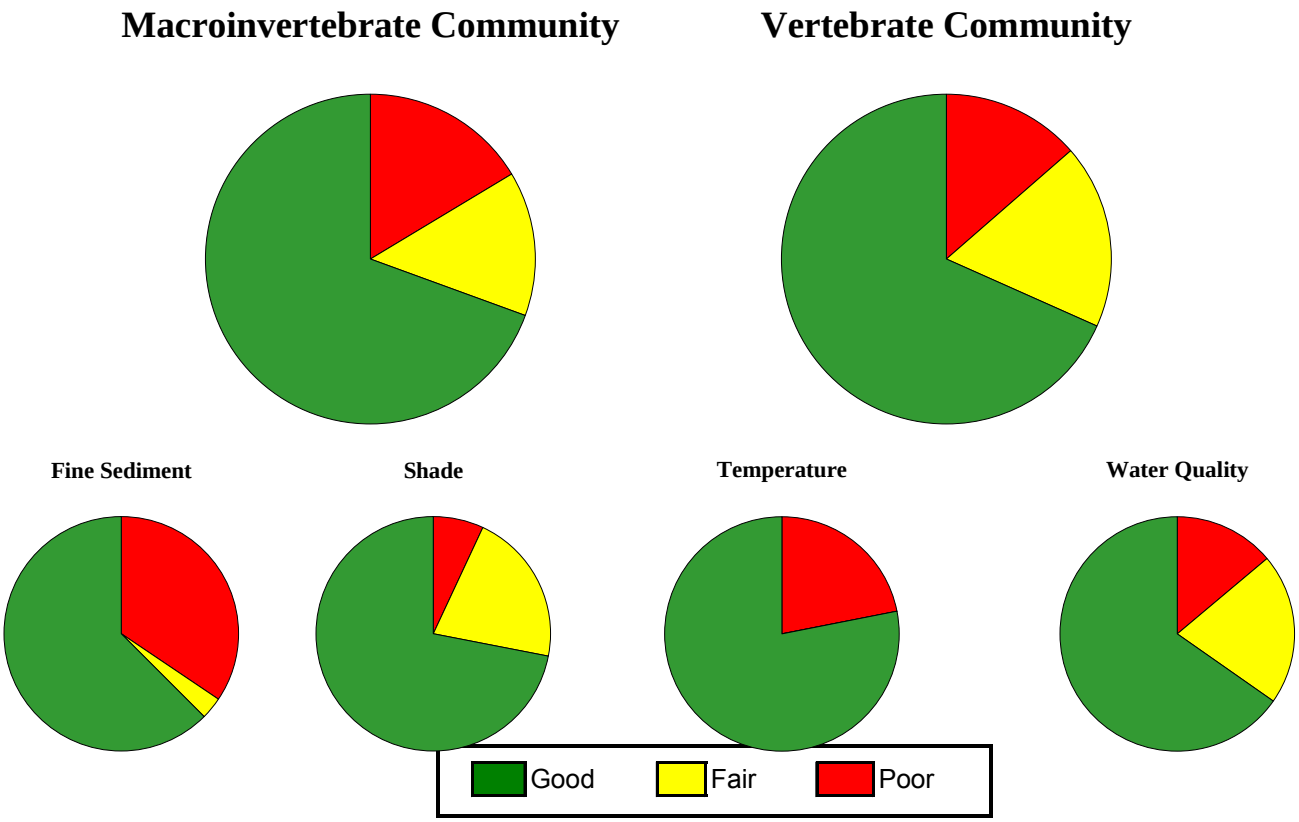


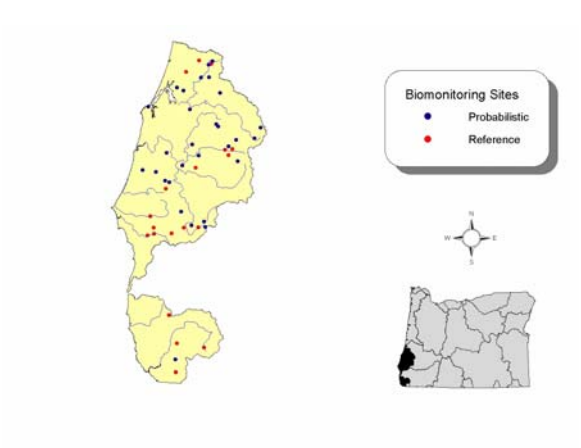


North Coast Basin

The North Coast basin had 20% of its stream kilometers indicating poor macroinvertebrate communities and 31% with poor vertebrate communities. The major stressors were fine sediment (40%) and overall poor water quality (22%). The North Coast was second only to the Willamette in the highest proportion of streams with fine sediment impairment (51% in poor condition for sediment). Water temperature impairment was low in the North Coast with only 9% of the stream kilometers exceeding the water temperature standard.

Figure 6: South Coast Basin

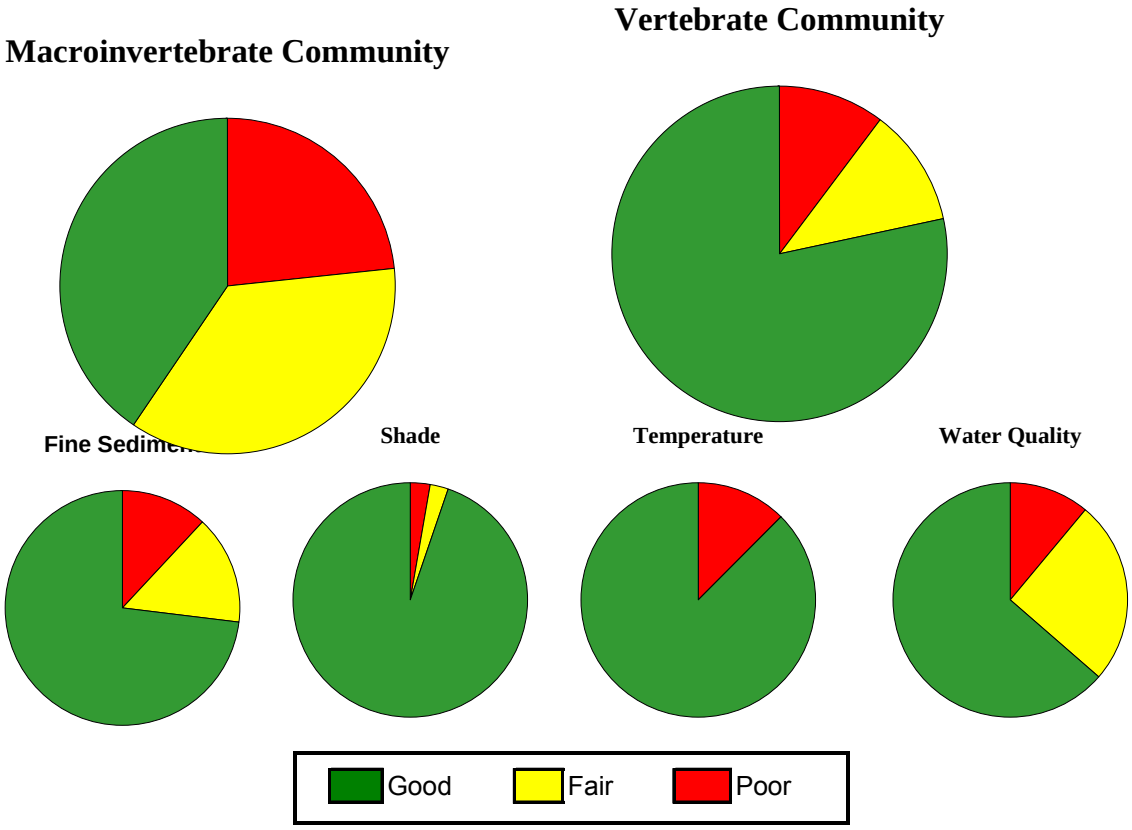


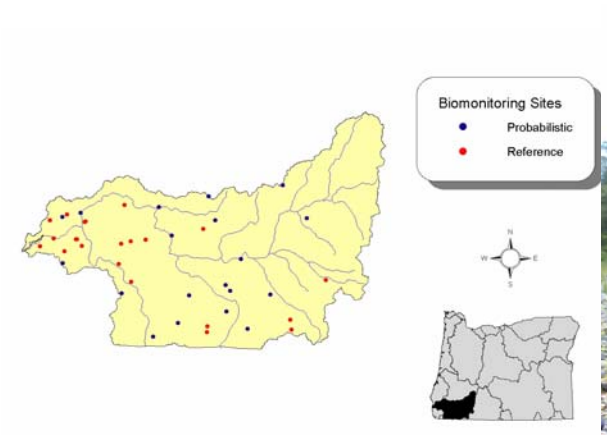


South Coast

The South Coast basin had a relatively low level of impairment compared to other assessed basins with 16% of the stream kilometers in poor condition for macroinvertebrates and 14% in poor condition for vertebrates. Fine sediment (35%) was the leading source of stream impairment.

Figure 7: Rogue Basin





Rogue Basin

The Rogue basin showed relatively unimpaired biotic conditions compared to the other basins with 23% of the macroinvertebrate community and 10% of the vertebrate community in poor condition. Water quality was the most significant stressor (36% in poor or fair condition) along with fine sediment (27% in fair or poor condition).

Ecoregion Assessment

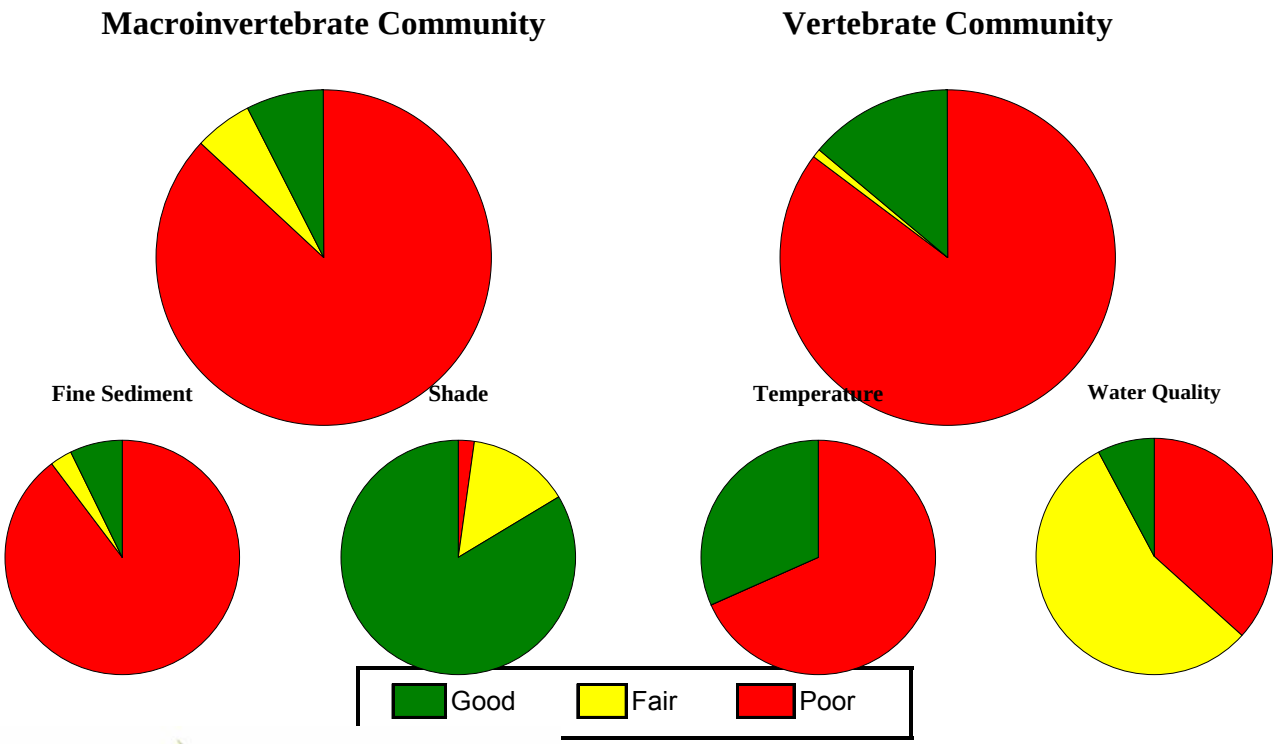
Drainage basins are a common and useful spatial framework for assessing and managing water resources. However, major drainage basins can contain very different

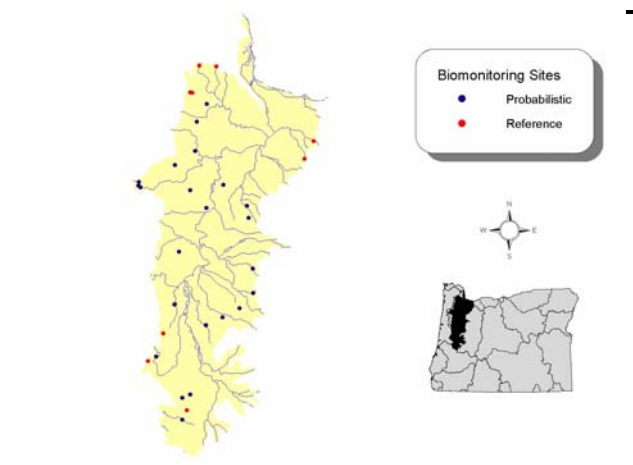
ecological regions with inherently different climate, geology, soils, and vegetation. For example, the Willamette basin spans three major ecologically distinct regions from the western Cascades, Willamette valley floor to the east slope of the Coast Range. The patterns of human land use, stressors, and stream condition are different in the three ecoregions. Looking only on a basin scale may not be the most appropriate way to summarize stream condition regionally.

In general, The Willamette Valley ecoregion had the highest proportion of stream kilometers in poor condition. Major stressors measured in this region were fine sediment, warm water temperatures and poor overall water quality. High water temperature was the leading source of impairment in the Klamath Mountains ecoregion and excessive fine sediment was the leading stressor measured in the Coast Range. The greatest proportion of streams with good biotic condition and low stressor levels was the Cascades ecoregion.

Stream Conditions were assessed for four western Oregon ecoregions: Willamette Valley, Coast Range, Klamath Mountains, and Cascades. Ecoregions are summarized in Figures 8 to 11 and Tables 10 and 11.

Figure 8: Willamette Valley Ecoregion



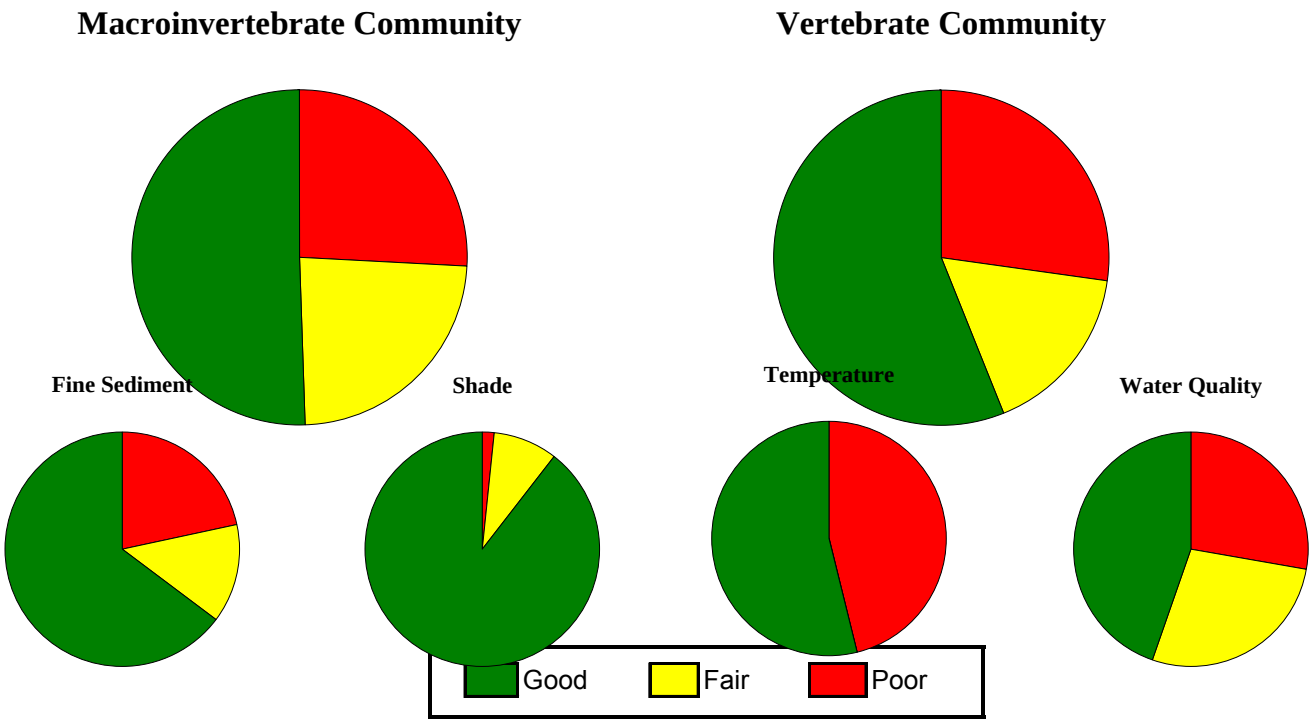


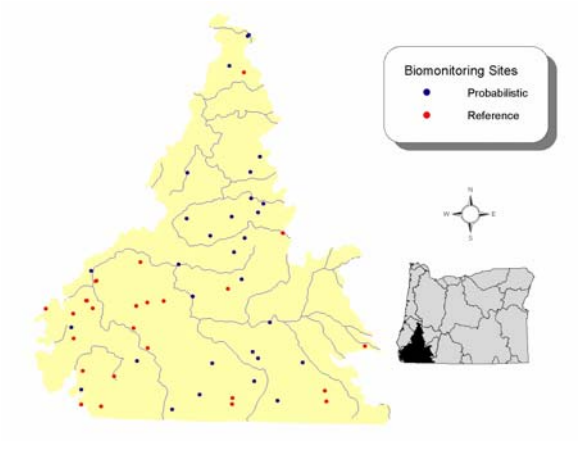
Willamette Valley Ecoregion

The Willamette Valley Ecoregion is different from the adjacent Coast Range and Cascades Ecoregions by its lower precipitation, less topographic relief and lower elevation. This ecoregion was originally characterized by rolling prairies, mixed deciduous and coniferous forest, and extensive wetlands. Today it is an extensive and productive agricultural area. It also contains Oregon's larger cities and most of the state's population.

The Willamette Valley Ecoregion had the greatest percentage of biologically impaired stream kilometers of the ecoregions assessed with 87% of the streams showing poor biotic condition for macroinvertebrates and 85% for vertebrates. This region also had the highest proportion of stream kilometers impaired by fine sediment (90%), warm water temperatures (37%), and poor water quality (37%). This high level of impairment reflects the high level of human activity in this region.

Figure 9: Klamath Mountains Ecoregion



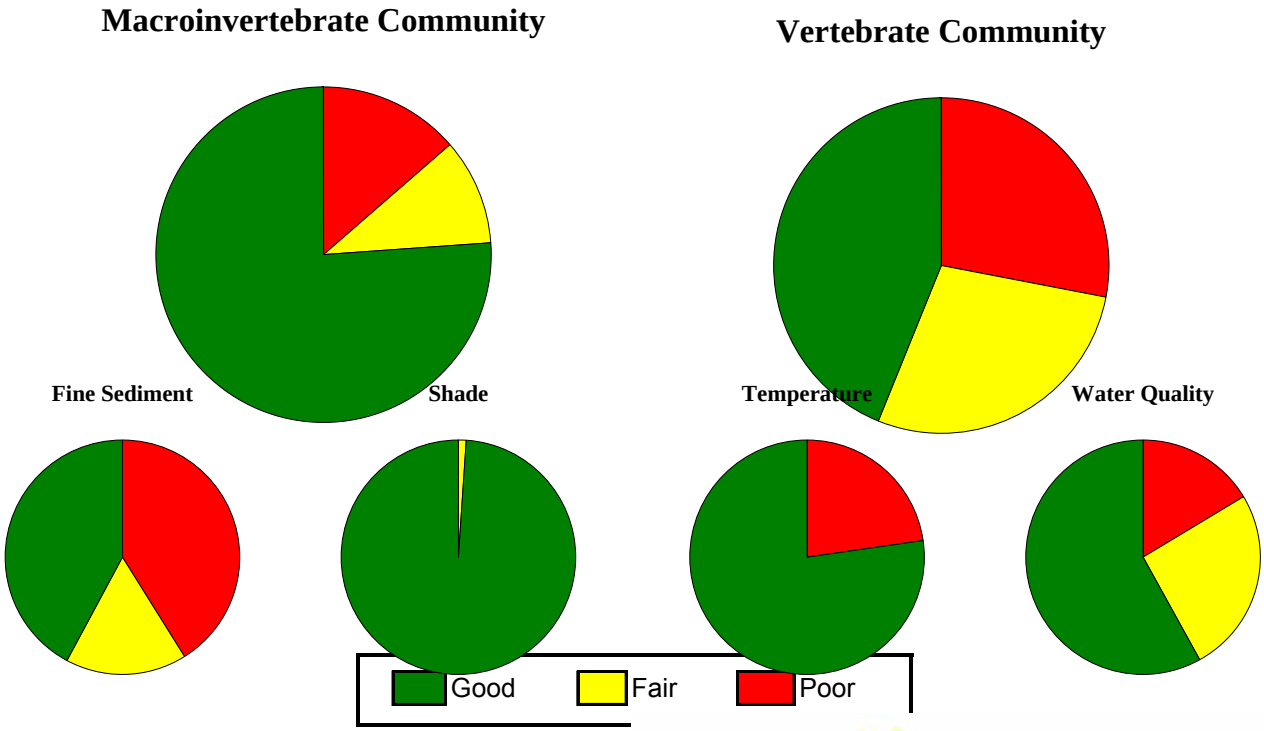


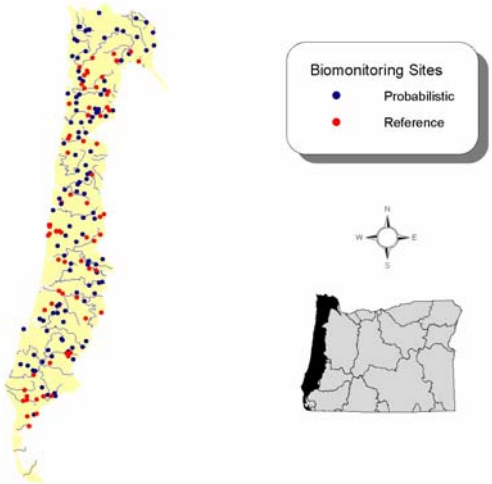
Klamath Mountains Ecoregion

This is a geologically and biologically diverse area. It has mild, moist winters and lengthy summer droughts compared to the Coast Range to the north. The predominant vegetation is a mixed coniferous forest.

The Klamath Mountains Ecoregion had 26% of its stream kilometers in poor condition for macroinvertebrate communities and 27% in poor condition for vertebrate communities. The major stressors were warm water temperatures (46%) and overall poor water quality (28%).

Figure 10: Coast Range Ecoregion



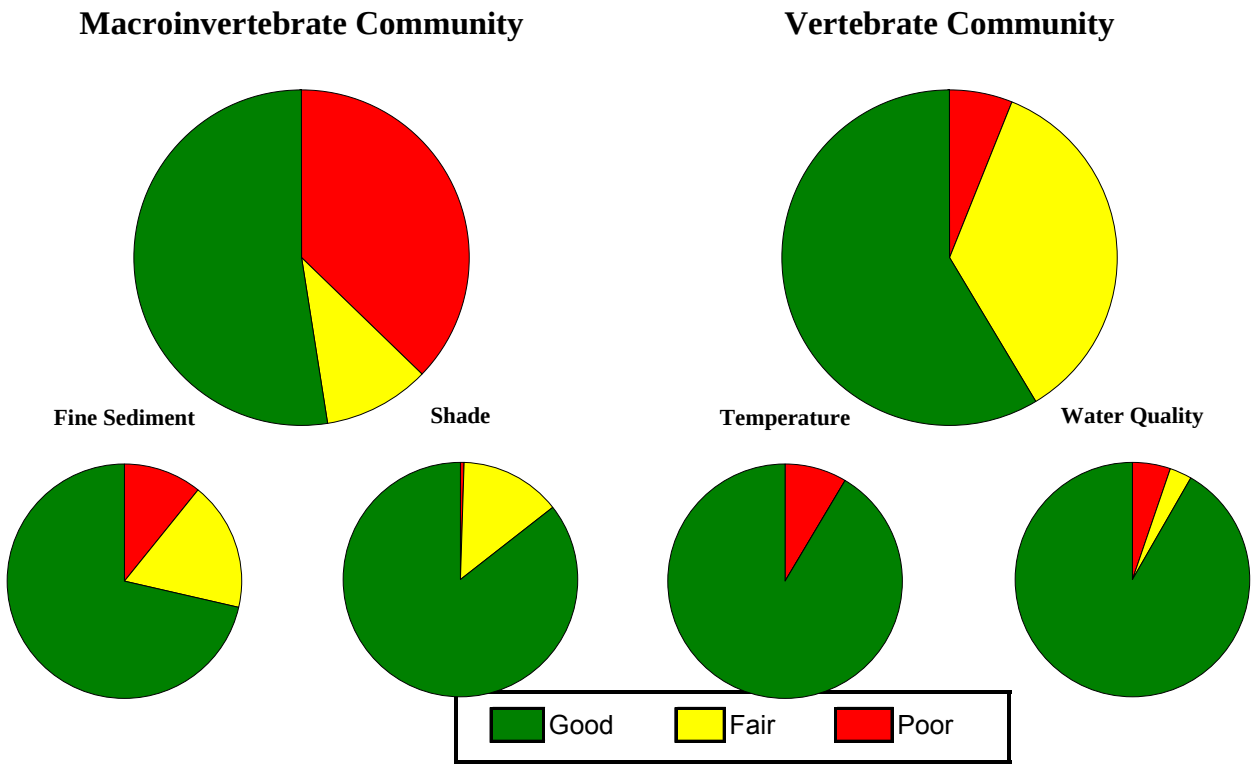


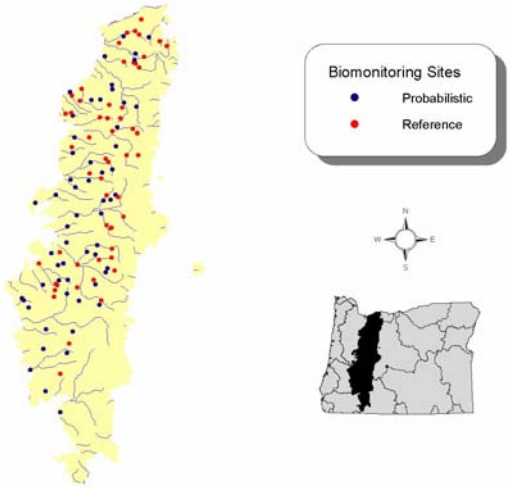
Coast Range Ecoregion

The Coast Range Ecoregion is a low mountain range with high rainfall and coniferous forest vegetation. The original vegetation was a mosaic of western red cedar, western hemlock and Douglas fir with Sitka spruce along the coast fog line. Logging and human management of this area has made Douglas fir prevalent today.

Biotic indicators show 28% of the stream kilometers in poor condition for vertebrate communities and 13% in poor condition for macroinvertebrate communities. Impairment from fine sediment was extensive (41%), second only to the Willamette Valley. Although the streams were highly shaded 23% of the stream kilometers violated the temperature standard.

Figure 11: Cascades Ecoregion





This mountainous, volcanic region is characterized by steep ridges and river valleys, high precipitation, and productive coniferous forests.

The macroinvertebrate community indicates that 37% of the stream kilometers are in poor condition. This ecoregion had the least impaired vertebrate community with only 6% of the stream kilometers in poor condition. The stressors measured showed the fewest stream kilometers in poor condition among the assessed ecoregions (sediment - 11% poor; shade - 0% poor; temperature - 9% poor; water quality - 5% poor).

Table 8: Basin Biotic Condition Indicators, ODEQ Probabilistic Stream Surveys, 1994-2001

All Basin Streams Third Order or Less	Total Stream Kilometers, third order and less	Assessment Type	Percent Good Condition	Percent Fair Condition	Percent Poor Condition	Precision	Confidence
North Coast Basin	5885	Macro-invertebrate Community Score	67%	13%	20%	95%	±13
		Aquatic Vertebrate Community Score	38%	31%	31%	95%	±10
South Coast Basin	4007	Macro-invertebrate Community Score	69%	14%	16%	95%	±16
		Aquatic Vertebrate Community Score	68%	18%	14%	95%	±13
Umpqua Basin	6070	Macro-invertebrate Community Score	54%	8%	38%	95%	±20
		Aquatic Vertebrate Community Score	32%	32%	36%	95%	±17
Rogue Basin	6218	Macro-invertebrate Community Score	41%	36%	23%	95%	±22
		Aquatic Vertebrate Community Score	78%	11%	10%	95%	±26
Willamette Basin	12469	Macro-invertebrate Community Score	53%	5%	43%	95%	±12
		Aquatic Vertebrate Community Score	36%	20%	44%	95%	±11

Table 9: Basin Stressors, ODEQ Probabilistic Stream Surveys, Third Order Streams and Less, 1994-2001

All Basin Streams Third Order or Less	Stressors	Percent Good Condition	Percent Fair Condition	Percent Poor Condition	Precision	Confidence
North Coast Basin	Fine Sediment	32%	28%	40%	95%	±10%
	Shade	90%	4%	6%	95%	±14%
	Temperature	91%	-	9%	95%	±14%
	Water Quality	56%	22%	22%	95%	±10%
South Coast Basin	Fine Sediment	63%	3%	35%	95%	±13%
	Shade	72%	21%	7%	95%	±16%
	Temperature	78%	-	22%	95%	±22%
	Water Quality	65%	21%	14%	95%	±13%
Umpqua Basin	Fine Sediment	40%	24%	36%	95%	±15%
	Shade	85%	15%	0%	95%	±20%
	Temperature	40%	-	60%	95%	±23%
	Water Quality	55%	13%	32%	95%	±19%
Rogue Basin	Fine Sediment	73%	15%	12%	95%	±19%
	Shade	95%	3%	3%	95%	±25%
	Temperature	87%	-	13%	95%	±24%
	Water Quality	64%	25%	11%	95%	±19%
Willamette Basin	Fine Sediment	47%	1%	51%	95%	±10%
	Shade	94%	4%	2%	95%	±16%
	Temperature	65%	-	35%	95%	±14%
	Water Quality	47%	35%	18%	95%	±10%

Table 10: Ecoregion Biotic Condition Indicators, ODEQ Probabilistic Stream Surveys, 1994-2001

All Ecoregion Streams Third Order or Less	Total Stream Kilometers, third order and less	Assessment Type	Percent Good Condition	Percent Fair Condition	Percent Poor Condition	Precision	Confidence
Coast Range	12120	Macro-invertebrate Community Score	76	10	13	95%	±10
		Aquatic Vertebrate Community Score	44	28	28	95%	±8
Willamette Valley	8660	Macro-invertebrate Community Score	8	5	87	95%	±32
		Aquatic Vertebrate Community Score	14	1	85	95%	±25
Klamath Mountains	8780	Macro-invertebrate Community Score	50	24	26	95%	±18
		Aquatic Vertebrate Community Score	56	17	27	95%	±17
Cascades	5090	Macro-invertebrate Community Score	53	10	37	95%	±12
		Aquatic Vertebrate Community Score	59	35	6	95%	±12

Table 11: Ecoregion Stressors, ODEQ Probabilistic Stream Surveys, Third Order Streams and Less, 1994-2001

All Ecoregion Streams Third Order or Less	Stressors	Percent Good Condition	Percent Fair Condition	Percent Poor Condition	Precision	Confidence
Coast Range	Fine Sediment	42	17	41	95%	±7
	Shade	99	1	0	95%	±10
	Temperature	77	0	23	95%	±11
	Water Quality	58	26	16	95%	±7
Willamette Valley	Fine Sediment	7	3	90	95%	±22
	Shade	84	14	2	95%	±32
	Temperature	32	0	68	95%	±35
	Water Quality	8	56	37	95%	±23
Klamath Mountain	Fine Sediment	65	14	22	95%	±14
	Shade	89	9	2	95%	+19
	Temperature	54	0	46	95%	±20
	Water Quality	45	27	28	95%	±14
Cascades	Fine Sediment	71	18	11	95%	±11
	Shade	85	14	0	95%	±16
	Temperature	91		9	95%	±14
	Water Quality	92	3	5	95%	±11

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Howlin, S., R. M. Hughes, and P. R. Kaufmann. Submitted. An Index of Biological Integrity for Coldwater Mountain Streams.

Peck, D. V., J. M. Lazorchak, and D. J. Klemm (editors). Unpublished draft. 2002. Environmental Monitoring and Assessment Program –Surface Waters: Western Pilot Study Field Operations manual for Wadeable Streams. EPA/XXX/X-XX/XXXX. U.S. Environmental Protection Agency, Washington D.C.

In 1999 ODEQ received funding from EPA to conduct monitoring as part of the Western Pilot Coastal Environmental Monitoring and Assessment Program. This 5 year program is designed to assess overall coastal environmental health. Under this program water column measurements are combined with information about sediment characteristics and chemistry, benthic organisms, and data from fish trawls to describe the current estuarine condition. Eighty sites from Oregon's estuaries as well as fifty sites from the Columbia River Estuary were sampled.

Seventeen of the Oregon sample locations are found in small estuaries that are part of the larger Columbia River Estuary. These include Youngs Bay (4 locations), Cathlamet Bay (6 locations), and smaller sloughs and tributaries such as Marsh Island Creek, Youngs River, Knappa Slough, Bradbury Slough, Wallace Slough, Clatskanie River, and Rinearson Slough. Samples outside the Columbia system were collected in Netarts Bay, Nestucca Bay, Little Nestucca River, Salmon River, Siletz Bay, Yaquina Bay, Yaquina River (2 locations), Alsea River, Yachats River, Siuslaw River (2 locations), Smith River (2 locations), Umpqua River (4 locations), Scholfield Creek, Coos Bay (6 locations), Coos River (2 locations), Catching Slough (2 locations), and Rogue River.

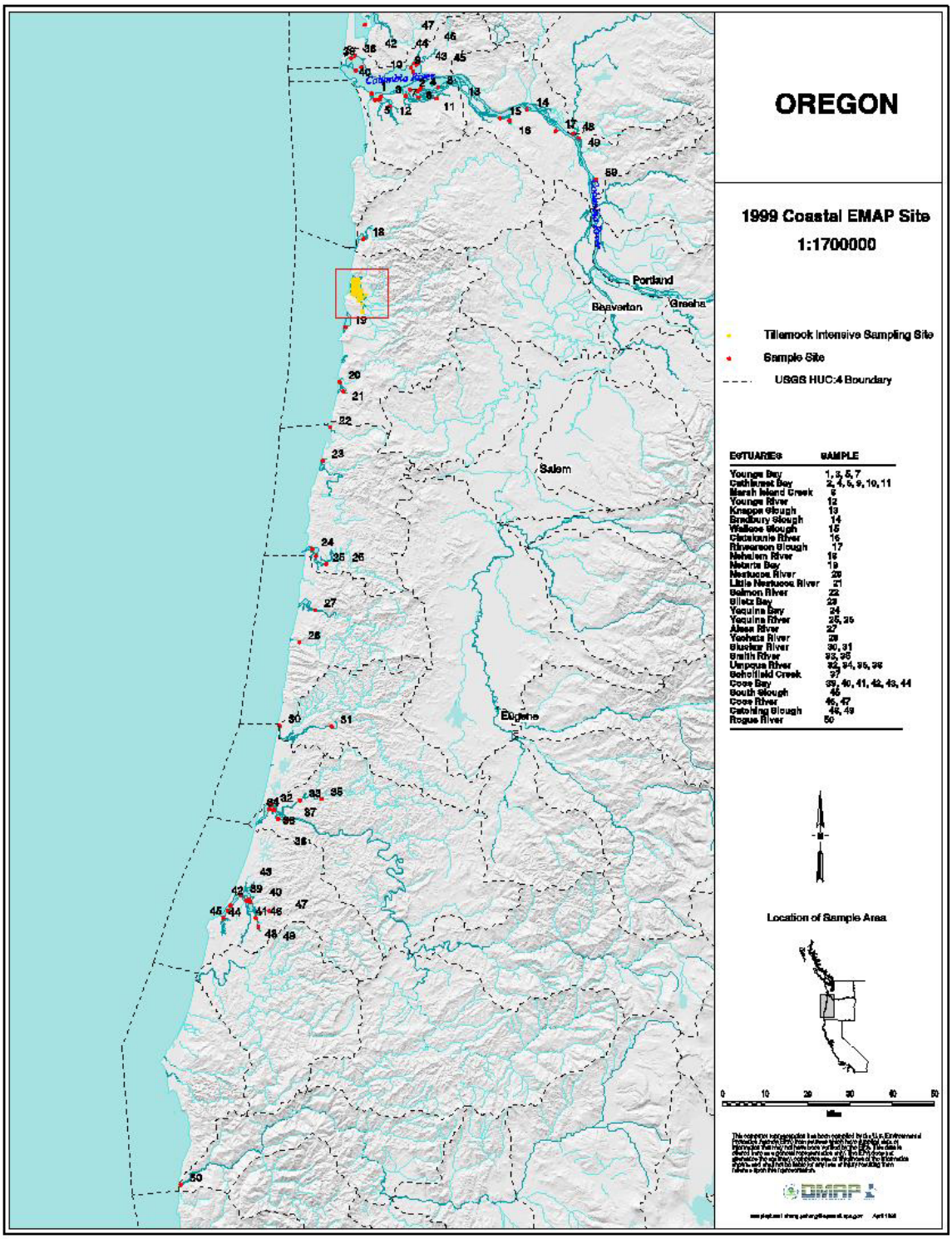


Figure 12: 1999 Coastal EMAP Sites

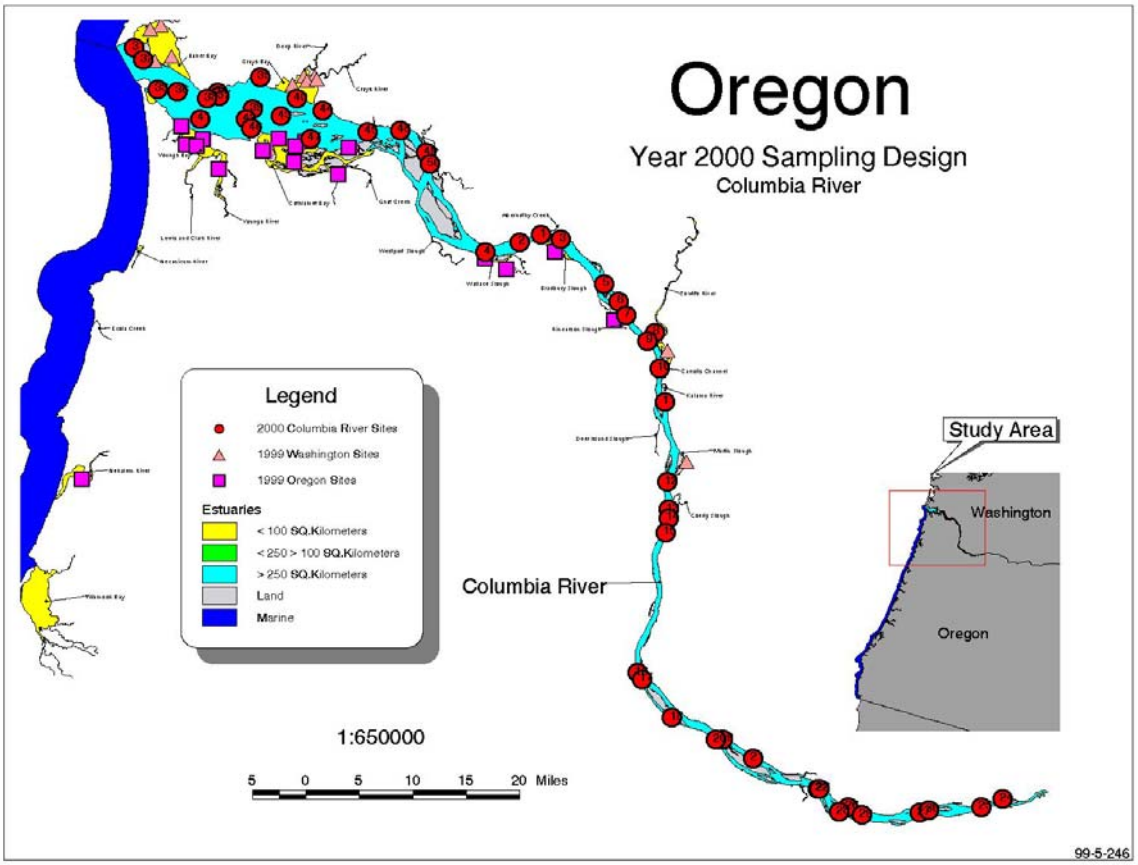


Figure 13: 2000 Coastal EMAP Sites

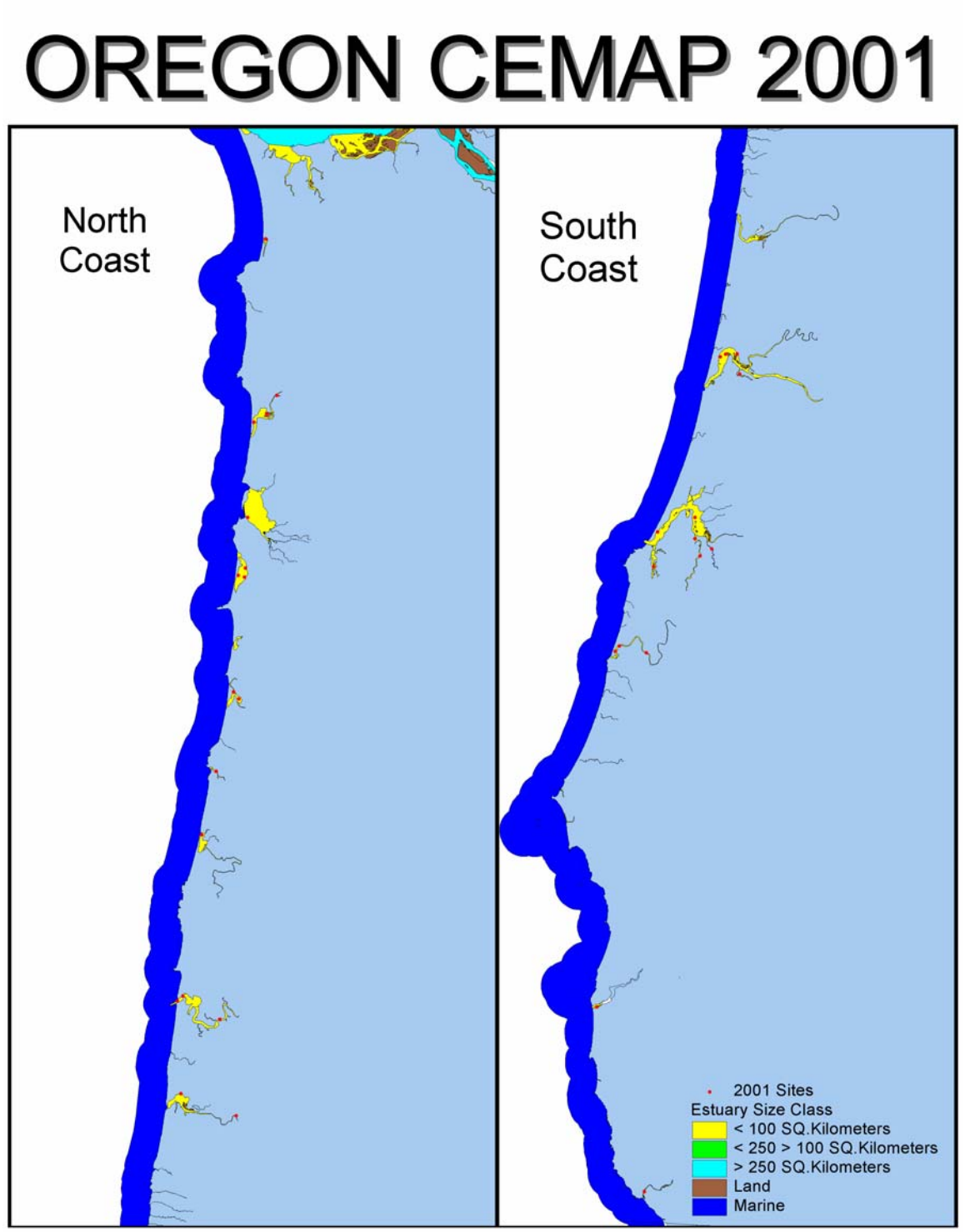


Figure 14: 2001 Coastal EMAP Sites

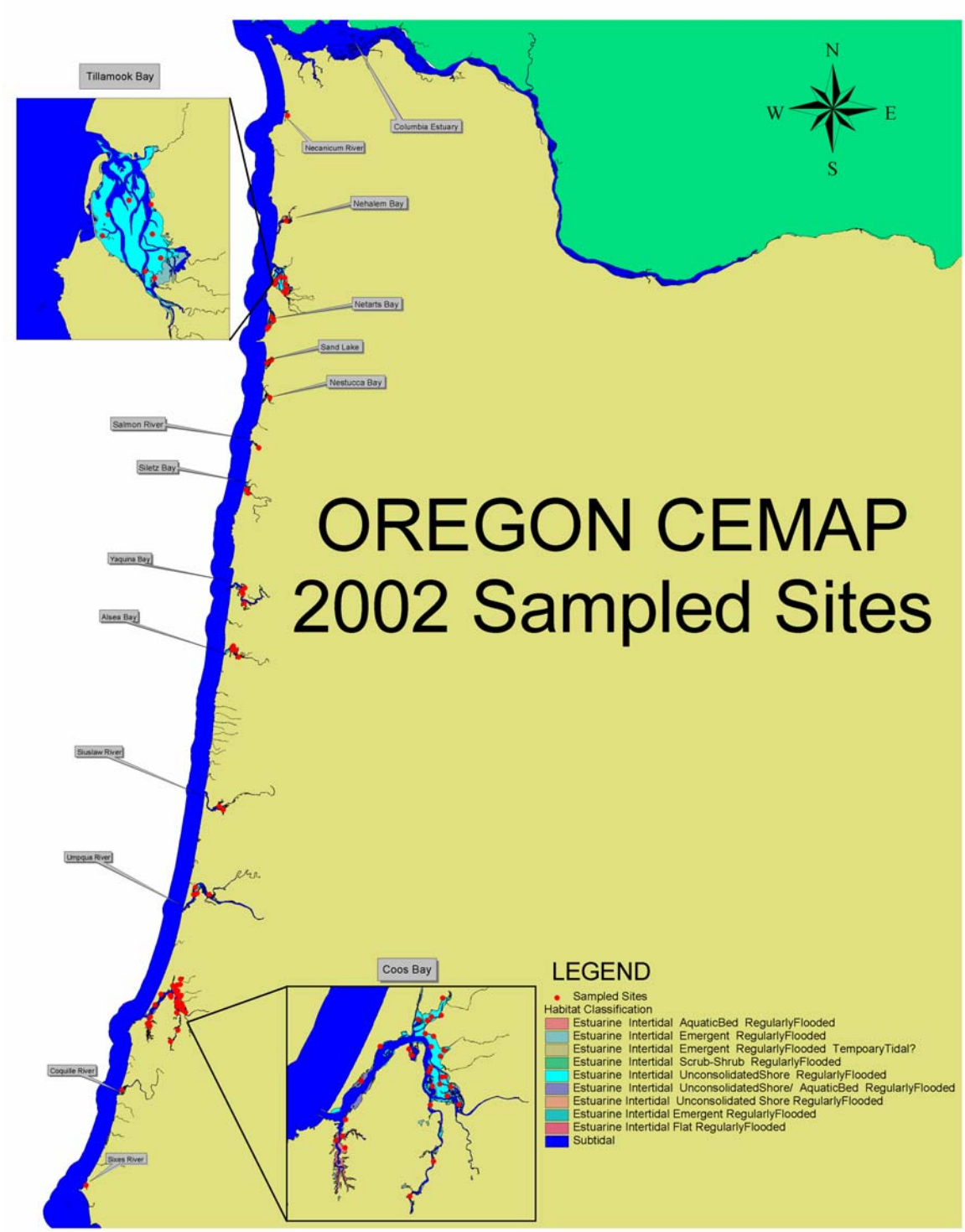


Figure 15: 2002 Coastal EMAP Sites

Does water quality meet standards?

ODEQ uses the results from both the ambient monitoring program and the random sampling programs to determine if water quality standards are met. ODEQ also designs a monitoring plan for the agency's "toxics" monitoring activities. Since 1999 toxics monitoring has concentrated on pesticides in the Hood River watershed. Several pesticides have been detected in the surface waters there, with methyl azinphos and chlorpyrifos detected at concentrations exceeding surface water toxics criteria. Follow-up monitoring of fish tissue for mercury continues in the Willamette basin where several fish consumption mercury advisories are posted.

ODEQ also uses third party data to evaluate water quality. Volunteer monitoring through watersheds groups and other organizations is a new and expanding element for the collection of water quality data. ODEQ provides monitoring equipment, training, technical assistance, and data management for volunteer monitoring groups. Through December 1999 equipment and training was provided for over 30 watershed groups. A data quality matrix has been developed to assign data quality levels and appropriate uses for volunteer monitoring data. A Volunteer Monitoring Coordinator provides full-time assistance to watershed councils and other volunteer monitoring groups.

ODEQ solicits and reviews water quality data every two years to develop a list of water bodies that do not meet water quality standards. This list, known as the 303(d) list, allows ODEQ to identify and prioritize water quality problems. The list also serves as a guide for developing and implementing watershed recovery plans to achieve state water quality standards. The 2002 303(d) list identifies approximately 15000 river miles in the State that are impaired by at least one pollutant, including elevated temperatures, low dissolved oxygen, elevated bacteria levels and metals and organics. ODEQ also identifies waters that are meeting water quality standards as well as "waters of concern" that require more monitoring to determine the water quality status.

What pollutants are affecting water quality?

ODEQ conducts extensive assessments to provide a detailed characterization of water quality conditions and to determine cause and affect relationships at the watershed level. Most source assessments are conducted for the purpose of developing Total Maximum Daily Loads (TMDLs) as required by the Clean Water Act for streams that do not meet water quality standards (water quality limited). Additional source information can be gleaned from the discharge monitoring reports (DMRs) submitted by facilities with NPDES permits.

Developing corrective actions

The process for establishing a plan to improve water quality begins when the water body appears on ODEQ's 303(d) list. TMDLs describe the amount of each pollutant a waterway can receive and still not violate water quality standards. In the past, rivers and streams may have had several different TMDLs, each one determining the limit for a different pollutant. With its new comprehensive approach, ODEQ takes into account all pollutants entering a water body and develops TMDLs that will control all pollutants in a particular geographic area, generally on a 4th field US Geological Survey basin scale.

When establishing TMDL limits, ODEQ:

- Reviews existing data and monitors to determine what pollutant is causing water quality problems and in what amounts it is entering the water. The review and monitoring also attempts to determine how much of the pollution comes from point sources, including discharges from industry and sewage treatment facilities; non-point source pollution, such as runoff from farms, forests and urban areas; and how much comes from natural sources such as decaying organic matter or nutrients in soil.
- Assesses the hydrological (flow), chemical, physical, and biological conditions of the watershed. The studies involve synoptic sampling surveys to characterize spatial variability and seasonal and diurnal studies to characterize seasonal and diurnal variability.
- Uses techniques such as computer models to determine what affect the pollution is having on the stream or river, and how much of the pollutant can be discharged without exceeding water quality standards in the watershed.
- Uses this information to establish permit limits on the amount of pollutant each pipe can discharge and limits on non-point sources that are controlled through various water quality management plans. This comprehensive approach focuses on watershed plans developed locally.
- Includes a margin of safety in the TMDL to account for uncertainty and growth that allows for future discharges to a river or stream without exceeding water quality standards.

Water quality management plans to restore streams and rivers to water quality standards are developed by government agencies in cooperation with landowners.

- If the land adjacent to a water body is agricultural, then the Oregon Department of Agriculture would work with the landowners in the watershed to devise and implement a management plan (as stipulated by Senate Bill 1010).
- If the land is private or state forest, the Oregon Department of Forestry implements the Forest Practices Act.
- Federal agencies (such the U.S. Forest Service or the Bureau of Land Management) would have responsibility to develop watershed management plans for federal lands.

In urban and rural areas not covered by other state or federal agencies, cities and counties would develop management plans, working closely with local watershed councils. These plans are sent to ODEQ for inclusion in an overall water quality management plan, which ODEQ then submits to the U.S. Environmental Protection Agency (EPA) along with the TMDL. EPA has approved several TMDLs since 2000. These TMDLs addressed: the Upper Grande Ronde basin, the Upper South Fork of the Coquille River, the Tillamook Bay basin, the Nestucca Bay basin, the Tualatin basin, the Upper Klamath Lake drainage, the Umatilla basin, the Western Hood River sub basin, the Little River sub basin, the Lower Sucker Creek sub basin, the Lobster Creek sub basin, and the Lower Columbia River (for total dissolved gas). Additional TMDLs are scheduled for completion in 2003, as described in Table 12.

The following maps provide information on the TMDL completion schedule and progress as of January 2003:

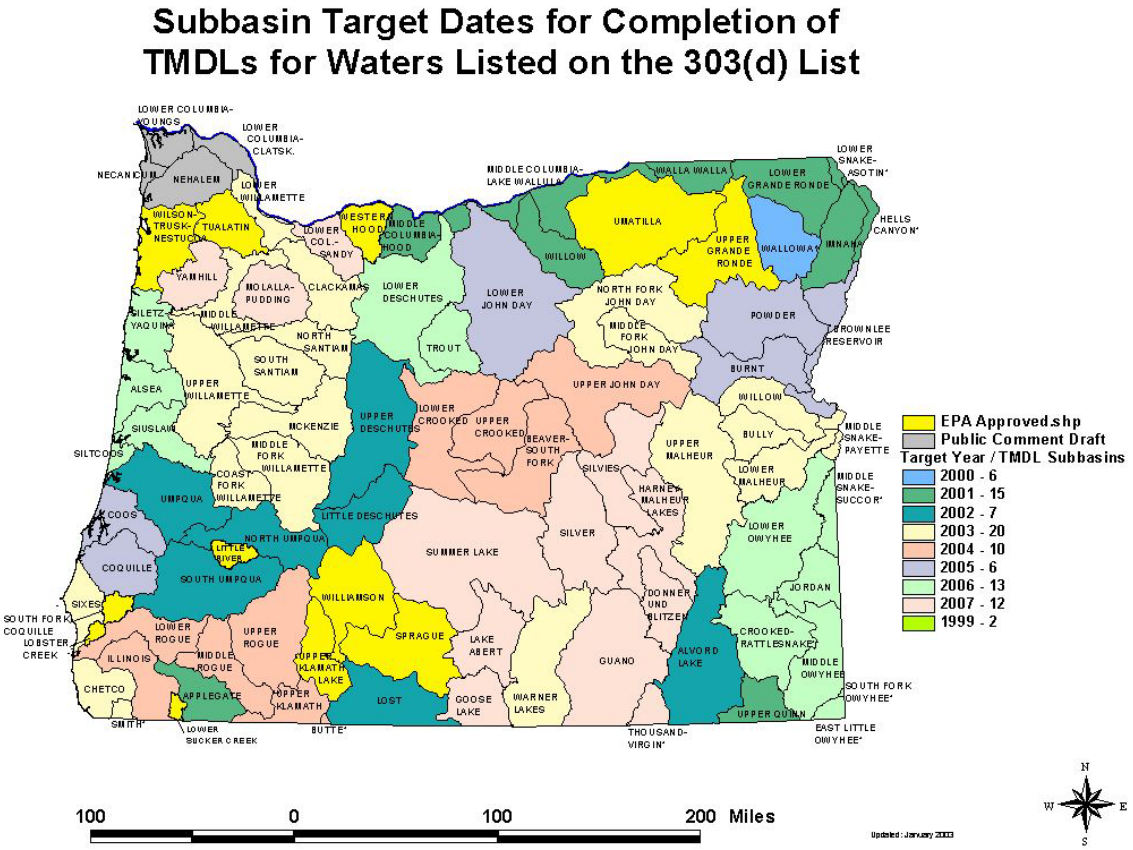


Figure 16: Status of TMDL Development

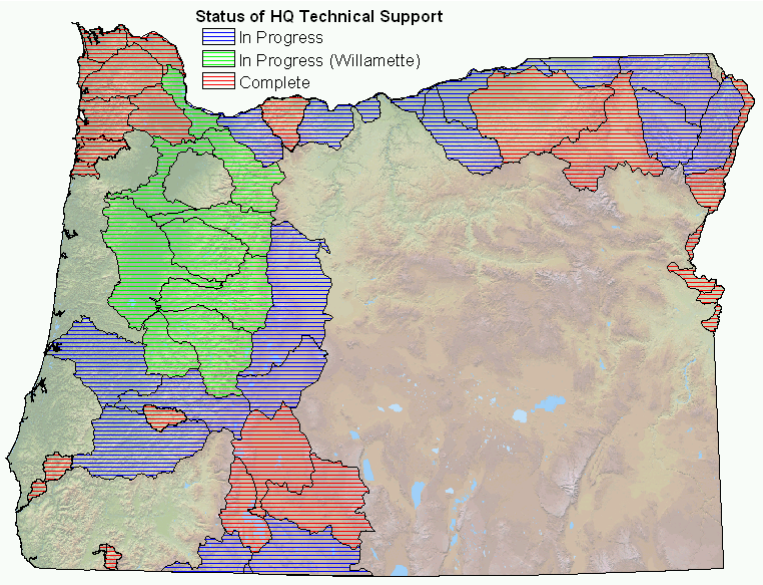


Figure 17: Status of Technical Support

TMD Ls Likely Completed in 2003 by Basin	Total Segments	Non Pollutant	Pollutant
Umpqua	247	61	186
NE Corner (Wallowa, L Grande Ronde, Imnaha)	52	14	38
Walla Walla	5	1	4
North Coast	7	0	7
Willamette	161	26	135
Alvord Lake	8	0	8
Sandy	3	0	3
Upper Quinn	3	0	3
Willow	3	0	3
Applegate	18	6	12
Total	**507**	**108**	**399**

Table 12: Draft Schedule for TMDL Development

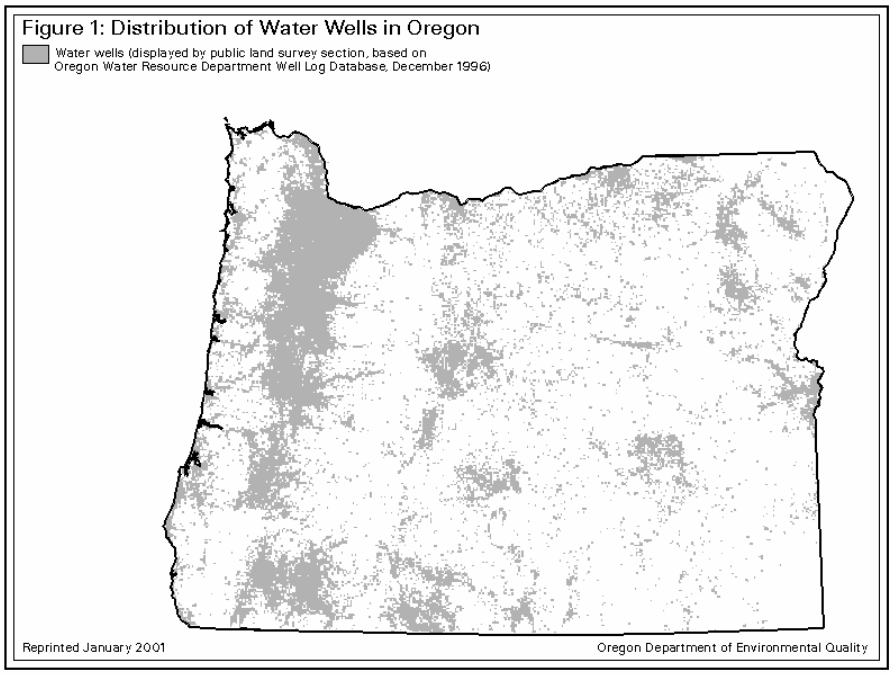
Oregon's Groundwater Protection Program

The Oregon Groundwater Quality Protection Act of 1989 (ORS 468B.150-190) sets a broad goal for the State of Oregon – to prevent groundwater contamination while striving to restore and maintain the high quality of Oregon's groundwater resources for present and future uses. This goal is to be implemented by all the natural resource agencies in the state.

The groundwater resources in Oregon have 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 over time. Approximately 70% of all state residents, and over 90% of rural residents, rely on groundwater for drinking water. Over 90% of the public water supply systems in (2,459) get their water exclusively from groundwater. In addition, 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 of wells in the state that tap groundwater resources.



Groundwater is vulnerable to contamination from both point and nonpoint source activities. 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 ODEQ has primary responsibility for implementing groundwater protection in Oregon. ODEQ uses a combination of programs 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. ODEQ implements these programs though partnerships with the Oregon Health Division, Oregon Water Resources Department, Oregon Department of Agriculture, Oregon State University, watershed councils, soil and water conservation districts and many other state, local, and private organizations, businesses, and individuals. Table 1 summarizes Oregon's groundwater protection programs and identifies the primary responsible state agency.

Table 1: Oregon Groundwater Protection Programs and Responsibilities

AGENCY	GROUNDWATER PROTECTION RESPONSIBILITIES
Department of Environmental Quality (ODEQ)	Establishes groundwater quality standards (division 40).
	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.
	Coordinates interagency management of groundwater to achieve state goal to prevent groundwater contamination.
	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

AGENCY	GROUNDWATER PROTECTION RESPONSIBILITIES
	public water supply systems.
	Administers federal Underground Injection Control program.
	Administers a federally funded (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.
Water Resources Department (WRD) (WRD – continued)	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.
	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

AGENCY	GROUNDWATER PROTECTION RESPONSIBILITIES
	drinking water source water assessment program with ODEQ
	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.
	Develops and implements a pesticide management program.
	Implements Confined Animal Feeding Operations program.
	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).

AGENCY	GROUNDWATER PROTECTION RESPONSIBILITIES
Oregon Department of Transportation (ODOT)	Ensures that the goals of the Groundwater Protection Act are incorporated in all aspects of highway and road design, construction and maintenance.
Department of Geology and Mineral Industries (DOGAMI)	Regulates drilling and permitting of geothermal wells.
	Ensures that the goals of the Groundwater Protection Act are incorporated.

One of the requirements of Oregon's Groundwater Protection Act is to conduct an on-going statewide groundwater monitoring and assessment program to identify and characterize the quality of the Oregon's groundwater resources. Data from these assessments may provide the basis for ODEQ to declare a groundwater management area. Table 2 summarizes current groundwater quality assessment projects.

Table 2: Groundwater Quality Assessment Projects

Basin	Project Name	No. of Sample Events	No. of Wells Sampled	GW Quality Rating[I]	Contaminants Of Concern	Contaminants Found [II]	Suspected Contaminant Sources	Date Last Monitored
Deschutes	La Pine	1	199	1	Nitrates	Nitrates	Septic	2000
Malheur	Northern Malheur County GWMA[III]	Ongoing	38 (213 in early assessment)	4	Nitrates, Pesticides	See Note [IV]	Agriculture	2002
Umatilla	Lower Umatilla Basin GWMA[III]	Ongoing	38 (198 synoptic)	3	Nitrates, Pesticides	Nitrates, EDB, Atrazine, Dacthal, Dicamba, Picloram	Agriculture, Industry	2002
Willamette	Southern Willamette Valley	2	480	2	Nitrates, Pesticides	Nitrates	Agriculture, Septic	2002
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

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 <u>any</u> 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

Groundwater Management Areas

The central component of State's groundwater program is the Groundwater Management Area (GWMA). 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 (ORS 468B.180). 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. ODEQ 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.

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 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, ODEQ 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. ODEQ 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 potential sources of nitrate loading to groundwater:

1. Irrigated agriculture,
2. Land application of food processing water,
3. Septic systems (rural residential areas),
4. Confined animal feeding operations, and
5. 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. 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 had been made to continue the voluntary nature of the Action Plan.

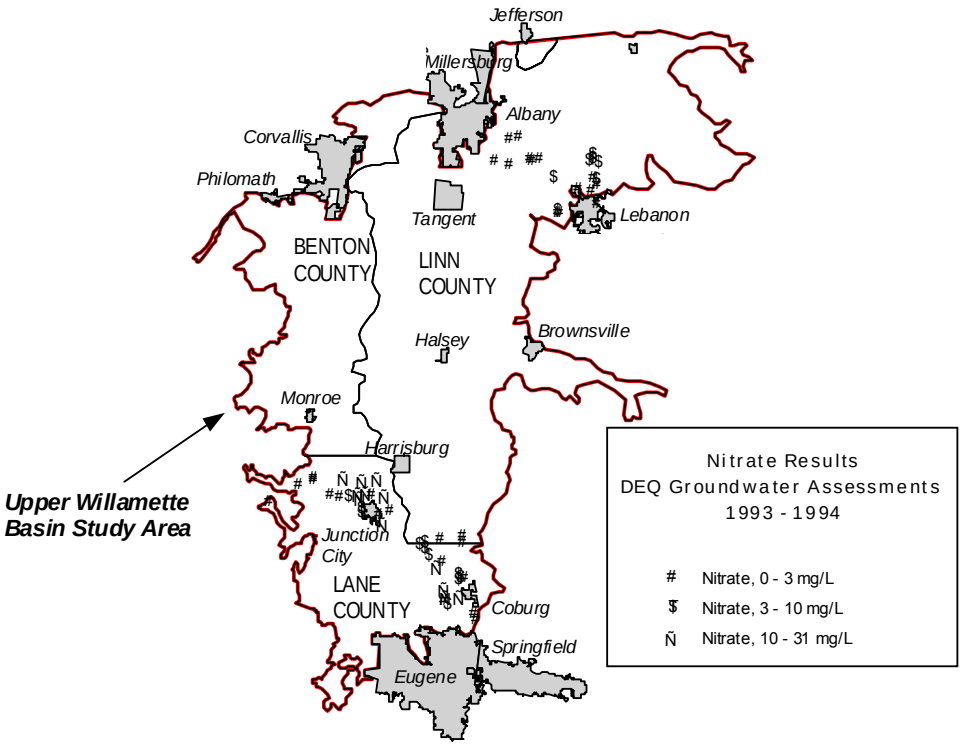
Similar to Northern Malheur County, ODEQ samples a network of approximately 38 wells every other month for analysis of nitrate. Approximately once a year, these wells are sampled for a larger list of contaminants including major ions, metals, and additional pesticides. These data are being used to evaluate 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.

Southern Willamette Valley Groundwater Assessment

Groundwater is the principal source of drinking and irrigation water for a large number of residents in the Southern Willamette Valley. Almost all rural residents rely on private wells for their water supply. Groundwater assessments conducted by ODEQ in 1993 and 1994 documented significant groundwater contamination from nitrate and other pollutants in the Southern 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 nonpoint source groundwater problems.

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



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. The assessment will provide information on the geographic extent of impaired groundwater and the likely sources for groundwater contaminants. This assessment will determine if a Groundwater Management Area declaration is needed in the area.

LaPine Groundwater Assessment and Demonstration Project

The La Pine region in central Oregon was platted in the 1960's and 1970's prior to passage of Oregon's land use planning laws. Within a 125 square mile corridor near the Deschutes and Little Deschutes Rivers, over 15,000 one-half to one acre lots were platted. The anticipated use of on-site systems on each lot creates a threat to shallow groundwater in found in rapidly draining soils. Groundwater is the main source of drinking water in this rural area with over 4,000 domestic water wells in use. In addition, there are about 100 community water supply wells serving small-scale subdivisions, schools and businesses in the region.

In the mid-1990s, Deschutes County and ODEQ 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 ODEQ and Deschutes County in an effort to protect La Pine's groundwater as part of the National Decentralized Wastewater Treatment and Disposal Demonstration Project. The La Pine region was selected to evaluate innovative nitrogen reducing technologies and to develop and use a three-dimensional groundwater flow and contaminant transport model as a planning tool.

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.

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, data has been collected to evaluate groundwater and surface water interaction along the Deschutes and Little Deschutes Rivers within the study area.

A baseline groundwater sampling of 199 domestic and public water supply wells was conducted in 2000. Results showed 10% of the samples 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.

Overview of Ground Water Contamination Sources

Other programs within DEQ conduct activities related to groundwater. Groundwater resources in Oregon may be adversely impacted from both point and non-point sources of contamination. Table 3 provides information on several potential sources of ground water contamination in Oregon, and, when data is available, identifies the numbers of sites or facilities that are currently known in each category.

Table 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	
ODEQ 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.
ODEQ Confirmed Release List (CRL)	June 2002	558		Hazardous substances	
ODEQ 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

Potential Source	Reporting Period	Number of Sites	Sites with Potential or Confirmed Groundwater Contamination	Contaminants	Notes
					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.	
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	2002	89			

Potential Source	Reporting Period	Number of Sites	Sites with Potential or Confirmed Groundwater Contamination	Contaminants	Notes
Effluent					
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					