United States Geological Survey
Programs in Oregon

Fact Sheet

The USGS provides maps, reports, and information to help others meet their needs to manage, develop, and protect America's water, energy, mineral, and land resources. We help find natural resources needed to build tomorrow, and supply scientific understanding needed to help minimize or mitigate the effects of natural hazards and environmental damage caused by human activities. The results of our efforts touch the daily lives of almost every American.

Volcanic Hazards in Oregon

Seven volcanoes in the Cascade Range have erupted during the past few hundred years, two of them during this century (fig. 1). Future eruptions are virtually certain to pose hazards to communities, aviation, and interstate commerce in Washington, Oregon, and northern California. Recent coordination efforts by scientists and emergency planners have successfully demonstrated that losses from future eruptions can be reduced substantially through effective land-use planning and timely warnings of impending volcanic activity. The U.S. Geological Survey (USGS), in cooperation with the U.S. Forest Service, National Park Service, Bureau of Land Management, Federal Aviation Administration, Oregon Office of Emergency Management, Oregon Department of Geology and Mineral Industries, and other Federal, State, and county agencies, is working to identify and mitigate hazards from future eruptions in the western United States. USGS scientists are studying the effects of past eruptions, monitoring for signs of renewed activity, developing new monitoring tools, and exchanging information with concerned officials, agencies, and citizens.

Earthquake Potential Near Portland

The Portland-Vancouver metropolitan area of about 1.5 million people is at risk to significant damage to property and lives from earthquakes generated by local faults. At present (1995), it is not possible to assess the maximum magnitude of such earthquakes accurately, let alone determine earthquake recurrence intervals for these faults.

To help locate and understand these concealed hazards, the USGS conducted a high-resolution aeromagnetic survey by using its own aircraft and airborne instrumentation. The survey was done in cooperation with scientists from the Oregon Department of Geology and Mineral Industries and from Portland State University. This study confirmed the presence of a concealed fault in downtown Portland. The data indicate that this fault extends at least 30 miles, considerably beyond its previously mapped extent. If the fault is seismically active along this entire length, then it poses a significant hazard to the Portland-Vancouver area. This study is now being used by city, county, and State planners to assess the seismic-hazard potential in the area.

Index of Subjects

Mineral and Environmental Evaluation of Public Lands in Eastern Oregon

Recent discovery of a new gold district in southeastern Oregon heightened concern about the environmental impacts of mineral-resource extraction and increased urban growth along the Pendleton-Boise corridor. To assist the Bureau of Land Management in developing land management plans for the extensive Federal lands in southeastern Oregon, USGS is conducting mineral-resource assessments of the Malheur, Jordan, and Andrews Resource Areas, which total about 10 million acres. In the Malheur and Jordan areas, the project team has identified significant potential for undiscovered gold deposits. In addition to predicting mineral-resource potential, the scientific data can be used to assess environmental haz-

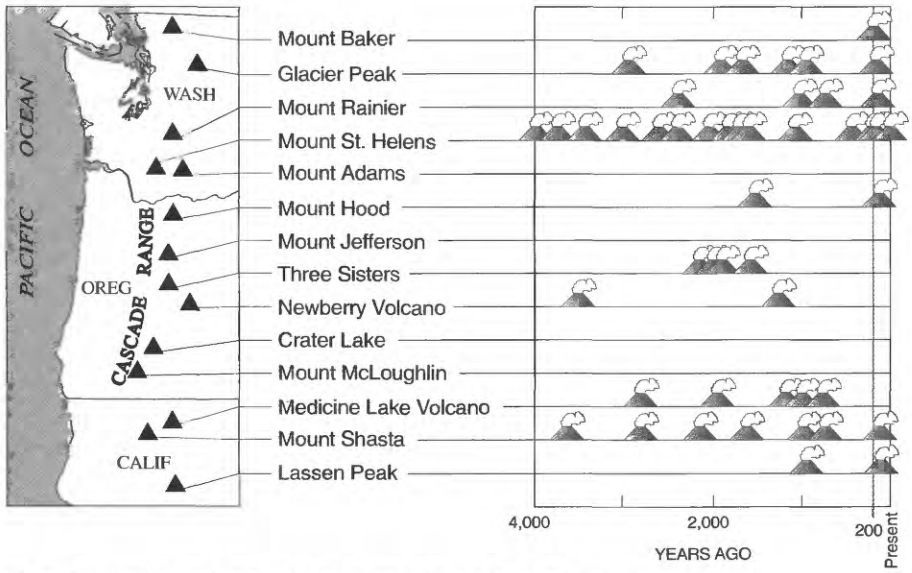

Figure 1. Volcanic eruptions in the Cascades during the last 4,000 years.

ards related to mineral occurrences and development, to assess the availability of groundwater, to identify seismic, landslide, and volcanic hazards and as the basis for preparation of soils maps. This study was made possible by extensive dialogue and cooperative investigations with geologists from the Oregon Department of Geology and Mineral Industries, the Idaho Geological Survey, Bureau of Land Management, U. S. Forest Service, and U. S. Bureau of Mines.

Mist Gas Field

Discovery of the Mist gas field in northwest Oregon in 1979 showed that Oregon has potential for significant reserves of natural gas and provided the growing population of the Portland metropolitan area with a new supply of clean energy. USGS scientists, in cooperation with state natural resource agencies, industry petroleum geologists, and university scientists, are using data from regional studies, information from exploration wells, and methods and concepts developed at the USGS to identify the most likely areas in Oregon where more gas might be found.

Trace Elements and Organic Compounds in Streams

Trace elements and organic compounds have been detected at elevated concentrations in water, fish, and sediment in major Oregon rivers. In the lower Columbia River, organic compounds including dioxin, pesticides, and PCBs have been detected at high concentrations in tissues of fish, otters, mink, and other wildlife. In the Willamette River, fish with deformities, such as missing eyes and malformed gills have raised concerns about contamination. Contaminants originate from both nonpoint sources, such as runoff from agricultural and urban areas, and point sources, such as pulp and paper mills, metal-refining mills, and sewage treatment plants. The effect of these contaminants on the environment and human health is an important issue in Oregon.

The Willamette River Basin (fig. 2) is one of more than 20 areas across the Nation being studied as part of the USGS National Water-Quality Assessment (NAWQA) program. In addition to studying the occurrence of trace-element and organic contamination, NAWQA program scientists are addressing the issues of habitat degradation, including the effects of reduced riparian-zone, water temperature, sedimentation, and reservoir operation on fish populations; excessive algal growth, high pH, and low dissolved oxygen concentrations caused by contamination from nutrients; erosion and sedimentation caused by changing land use; and the water-quality effects of interaction between ground water and surface water.

In 1990, the Governors of Oregon and Washington initiated a study of the lower Columbia River (fig. 2) to provide recommendations for improving and protecting water quality and beneficial uses in the Columbia River Basin. Some facets of the study have been accomplished by consulting firms; however, the Oregon Department of Environmental Quality (ODEQ) and the Washington State Department of Ecology are working with the USGS for the ambient monitoring portion of the study. The biggest benefit to State agencies has been the ability of the USGS to make accurate measurements of pesticides and trace elements at concentrations that are extremely low.

Nonpoint-Source Nutrients in Streams and Lakes

In aquatic environments, such as streams and lakes, phosphorous and nitrogen act as nutrients and can cause excessive algal growth and ammonia toxicity.

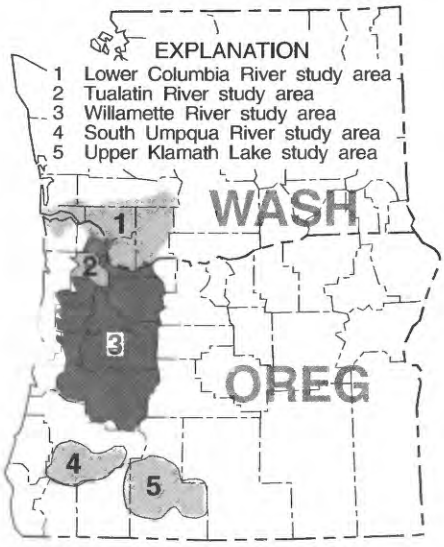

Figure 2. Locations of recent and ongoing water-quality studies.

Continued regulatory pressure and improved technologies to treat sewage effluent have reduced nutrient loads entering some of Oregon's streams and lakes from point sources. However, improvements in water quality have, in some cases, not been as dramatic as expected. The apparent reason is that nonpoint sources of nutrients are larger than previously thought. Some of the largest nonpoint sources are runoff from agricultural areas, animal feeding operations, urban runoff, and timber harvest areas. Ground water also accounts for large contributions in some areas of Oregon.

Large inputs of phosphorous to the Tualatin River (fig. 2) have created water-quality problems, including excessive growth of algae, large fluctuations in dissolved-oxygen concentrations, and excessively high pH. Efforts to remediate these effects through the control of point sources of phosphorous have been only moderately successful. Nonpoint sources are apparently supplying enough phosphorous to support algal blooms in the river. The USGS, through a cooperative study with the Unified Sewerage Agency of Washington County, has determined that the majority of nonpoint-source phosphorus entering the river during the critical summer months is introduced from ground water that is naturally enriched in phosphorous. Nutrient remediation plans for the Tualatin River, as well as other rivers in the area, now more fully address the ground-water contribution, ensuring that unrealistic restrictions are not imposed on farmers, foresters, and urban planners in the basin.

The USGS, in cooperation with the Bureau of Reclamation, is also working on a study of nutrient sources to Upper Klamath Lake in south-central Oregon (fig. 2), where abundant algal growth between mid-May and late October is thought to have contributed to the decline and endangerment of the Lost River sucker and shortnose sucker.

Emerging Stream-Temperature and Dissolved-Oxygen Issues

The problem of elevated stream temperatures caused by human activities has emerged as an important issue for the health of fish and aquatic ecosystems in general. The ODEQ is reviewing and updating dissolved-oxygen standards for Oregon lakes and rivers, and it is likely that the standards will become more restrictive. Development and implementation of new standards will require a bet-

ter understanding of the cause-and-effect relations so that proper remediation strategies are employed, knowledge of the frequency and timing of violations for the purpose of compliance monitoring, and calibration of stream-water-temperature models that can be used to test management alternatives. The USGS is involved in several studies that will provide information to support decisions by water-management agencies on appropriate standards, remediation strategies, and management alternatives.

Two studies of the Willamette River were started in 1994. On the upper and middle sections of the river, the focus is on determining the location and timing of daily dissolved-oxygen fluctuations resulting from algae growth; on the lower reaches of the river the focus is on determining the rate of sediment oxygen demand from decay of organic matter. Results from the study are being used to construct a water-quality model to understand and manage the Willamette River better.

Results of an ongoing study of the Tualatin River (fig. 2), will also help resource managers address new, more stringent water-temperature standards. The purpose of the study is to determine the relation between elevated water temperatures in the river and human-caused factors, such as removal of riparian vegetation, urban runoff, and discharge of warm effluent from wastewater-treatment plants. A simulation model of the river is being developed to predict water temperatures resulting from various management alternatives. The model will allow managers to compare alternatives on the basis of both cost and predicted benefits.

Ground Water in the Upper Deschutes Basin

State and local officials in many areas of the State that have historically relied on water from streams for municipal, industrial, and agricultural water needs are now seeking new ways to develop ground-water resources to meet new demands for water. Because ground water sustains the flow of most streams during the dry season, development of ground water can have adverse effects on the flow and quality of streams that are already fully allocated. Determining the availability of ground water under these conditions is a key issue in several areas of Oregon. This issue has emerged most recently in the upper Deschutes River Basin (fig. 3) where the USGS is working with the Oregon Water Resources Department (OWRD) and local governments to complete a regional assessment of the basin's ground-water resources. The OWRD has stated that until better information is available on the ground-water resources, permit denials will become more common. In response to these issues and the need for more information, the USGS has begun a 3-year cooperative study of the upper Deschutes Basin with the primary goal of providing quantitative information to State and local agencies that can be used to manage the water resources.

Ground Water in the Portland Basin and Willamette Valley

The Portland Basin (fig. 3) is home to nearly 1.5 million people in Oregon and southern Washington. Most of the water needs in the Oregon part of the Basin are met by surface water from the Bull Run watershed; in Clark County, Washington, ground water supplies most water needs. In the late 1970's, however, ground water was identified as the source that would supply Portland's emergency needs if the Bull Run supply were ever interrupted. A well field was developed for this purpose, but its use has been hampered by the discovery of TCE and other organic contaminants in nearby wells. In Clark County, contamination, declining ground-water levels, and concerns over depletion of streamflow by wells also have underscored the need for a more quantitative understanding of the ground-water resource. The USGS, working with the City of Portland, Clark County, and OWRD, recently completed an extensive regional assessment of the ground-water resources of the basin that included collecting data on more than 15,000 wells and springs, mapping major aquifers, monitoring ground-water levels, estimating ground-water withdrawals, estimating recharge to aquifers, and developing a simulation model of the ground-water system. The model has been used by the city of Portland and its consultants to develop more detailed models of contaminant transport near the Columbia South Shore well field and by Clark County to assist with stormwater management and land-use planning as related to aquifer vulnerability and well-head protection.

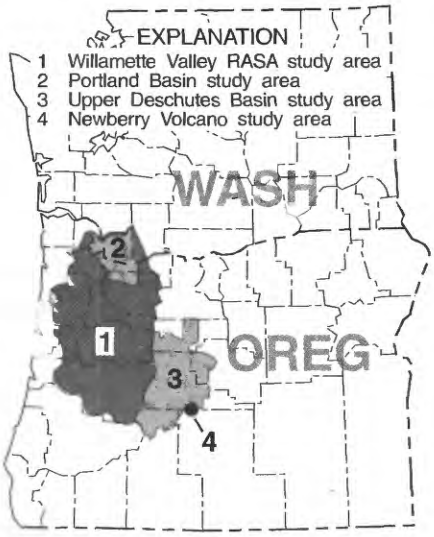

Figure 3. Locations of recent and ongoing ground-water studies.

The USGS also has completed a comprehensive hydrogeologic study of the Willamette Valley (fig. 3) as part of its national Regional Aquifer Systems Analysis Program. The maps and reports resulting from this work will be useful to homeowners, consultants, and State and local planners in assessing the availability of ground water in the valley.

Geothermal Development and Hydrologic Monitoring

The Newberry Volcano, located about 25 miles south of Bend (fig. 3), is the site of some of the most remarkable scenic, cultural, and geologic features in Oregon. Recognizing the need to protect the area, the Congress created the Newberry National Volcanic Monument in 1990. The volcano also is the site of what is potentially the largest geothermal resource in the State. As part of its efforts to reduce dependence on hydroelectric power in the Northwest, the Bonneville Power Administration (BPA) is working with a private geothermal development company and a local public utility to develop a 30-megawatt pilot power plant on the west flank of the volcano. In 1991, the USGS, in cooperation with the BPA, designed and implemented a program to collect hydrologic and water-quality data at Newberry Crater. The purpose of the ongoing program is to establish the baseline, or pre-geothermal development, hydrologic and water-quality conditions at the crater. If the power plant is developed, then monitoring will continue so that changes in the hydrologic or water-quality conditions of the crater can be detected before any irreversible effects on the environment can occur.

Collection of Water-Resources Data

The collection and dissemination of basic hydrologic data is a primary function of the USGS. These data, acquired over periods of several decades, constitute a valuable data base for developing an improved understanding of the water resources of the State. To make these data readily available to interested parties outside the USGS, the data are published annually in a report series entitled "Water Resources Data in Oregon." The 1993 report contains discharge records for 199 stream-gaging stations and 242 partial-record stations, stage and content records for 31 lakes and reservoirs, and water-quality records for 53 streamflow-gaging stations and 217 ungaged stream sites. The USGS has collected water-quality data at more than 12,000 sites in Oregon (fig. 4).

National Mapping Program

Among the most popular and versatile products of the USGS are its topographic maps at the scale of 1:24,000 (one inch on the map represents 2,000 feet on the ground). These maps depict basic natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Contour lines are used to depict the elevation and shape of terrain. Oregon is covered by 1,925 maps at this scale, which is useful for civil engineering, land-use planning, natural resource monitoring, and other technical applications. These maps have long been favorites with the general public for outdoor uses, including hiking, camping, exploring, and back-country fishing expeditions.

The USGS is producing computerized (digital) cartographic and elevation data as part of a region-wide program for Federal, State, and local government agencies in California, Oregon, and Washington. The program will fill gaps in hydrographic, transportation, boundary, Public Land Survey System, and elevation data coverage needed to address current land- and water-use issues in the Pacific Northwest coastal forests and the Columbia River basin.

Figure 4. Water-quality data collection sites.

Earth Observation Data

Through its EROS Data Center near Sioux Falls, South Dakota, the USGS distributes a variety of aerial photographs and satellite image data products that cover the entire State. Mapping photographs of some sites go back about 40 years. Satellite images dating from 1972 can be used to study changes in regional landscapes.

Earthquake Information Center

The USGS National Earthquake Information Center in Golden, Colorado, collects, processes, and distributes information from more than 20,000 seismic events each year. This information is distributed in the form of alerts, bulletins, and routine catalogs to emergency management officials at the Federal and state levels, operators of critical facilities, news media, the general public, and the earthquake research community.

Cooperative Programs

The USGS cooperates with more than 40 local, State, and Federal agencies in Oregon. Cooperators include county and municipal public-works departments, public-health agencies, natural-resource agencies, water and sanitation districts, other Federal agencies, and many more. Cooperative activities include water-resources-data collection, interpretive water-availability and water-quality studies, mineral-resource assessments, and mapping. When local and State agencies are involved, activities typically are funded on a matching-funds basis. In addition to agencies already mentioned, the USGS cooperates with the U.S. Army Corps of Engineers; the Oregon Department of Transportation; Jackson and Lane counties; the cities of Eugene, Bend, and Albany; and the Warm Springs and the Umatilla Indian tribes, to name only a few.

The USGS provides support to the Oregon Water Resources Research Institute, which conducts a program of research, education, and information and technology transfer.

For more information contact any of the following:

For water information
District Chief
10615 SE Cherry Blossom Dr.
Portland, Oregon 97216
(503) 251-3200

For map information
Chief, Western Mapping Center
345 Middlefield Road, Mail Stop 531
Menlo Park, California 94025
(415) 329-4254

For geologic information
Assistant Chief Geologist
345 Middlefield Road, Mail Stop 919
Menlo Park, California 94025
(415) 329-5101

National Earthquake Information Center
Denver Federal Center, Mail Stop 967
Denver, Colorado 80225
(303) 273-8500

Cascades Volcano Observatory
5400 MacArthur Blvd.
Vancouver, Washington 98661
(206) 696-7693

Additional earth science information can be found by accessing the USGS "Home Page" on the World Wide Web at "http://www.usgs.gov".

For more information on all USGS reports and products (including maps, images, and computerized data), call 1-800-USA-MAPS.

U.S. GPO 647-311

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