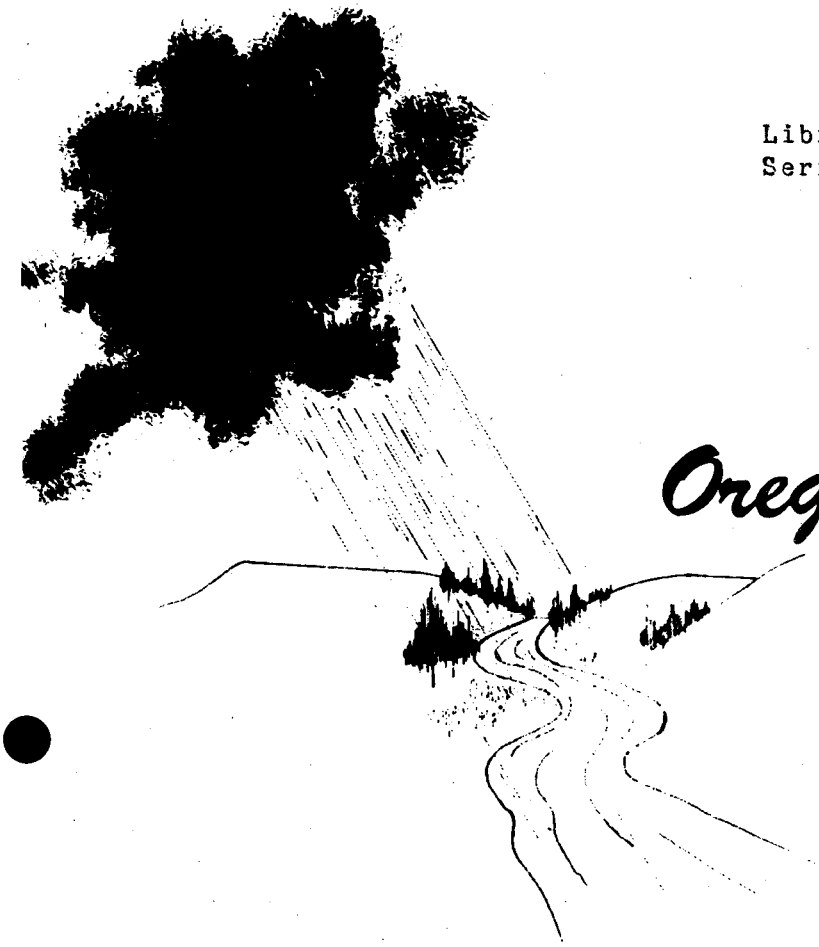
PRONG BINDER

Oregon State University
WATER RESOURCES RESEARCH INSTITUTE
Covell Hall 115
Corvallis, Oregon 97331



Oregon's Environment

March 1979
Number 37

LOCATING WELL SITES

A new technique of fracture-trace mapping has been developed at Pennsylvania State University that has proven to be an effective method for increasing the ratio of successful to unsuccessful water well drilling operations. The method is summarized in a capsule report published by the Office of Water Research and Technology. A limited number of copies are available at the Institute office.

Aerial photography is used to map zones of fracture concentration in the underlying bedrock. Hydrogeologists conduct a ground survey to determine the actual ground location of the fractures, and to pinpoint where the fractures intersect. Rock types are noted to ascertain if those on site are apt to contain profitable quantities of water. Limitations of the technique are also discussed. (From "Water Well Location by Fracture Trace Mapping", OWRT Water Research Capsule Report.)

IRRIGATION AND ENERGY USE

Increased energy efficiency in irrigation is under study by the U.S. Department of Energy (DOE). Battelle Memorial Institute has performed some preliminary analyses for DOE as an aid in the development of a program for energy conservation which would result in the judicious use of taxpayers' money. A recent publication reports on the results obtained.

It is interesting to note that energy is used for irrigation in each of the 50 states; acres irrigated range from about 2,000 in Vermont to almost 9,000,000 in Texas. Eleven states irrigate 79% of the irrigated acreage and utilize 87% of the total energy used for irrigation purposes. In order of energy use, these states are: Texas, Nebraska, Kansas, Arizona, New Mexico, California, Washington, Oklahoma, Idaho, Colorado, and Oregon. Energy sources and volumes for these seven states are shown in the table below.

Types of Fuels Used in Irrigation for the
Eleven Leading Energy Consuming States - 1974

	Gasoline 1000 gal	Diesel 1000 gal	LP Gas 1000 gal	Nat. Gas Mill. ft^3	Electricity Mill. kWh	TOTAL Bill. Btu
Texas	7,006	448	36,818	63,973	1,407	73,141
Nebraska	4,415	84,136	101,131	6,167	937	31,064
Kansas	1,938	8,021	17,389	19,383	133	22,816
Arizona				14,425	2,081	21,527
New Mexico	7,824	9,381	17,115	15,163	404	20,439
California	--	69	--	1,164	4,514	16,850
Washington	--	--	--	--	3,758	12,826
Oklahoma	2,228	3,921	13,387	5,940	108	8,381
Idaho	3,678	1,385	2,165	406	1,581	6,667
Colorado	301	1,176	1,839	4,692	339	6,223
Oregon	--	1,320	--	--	1,588	5,605
TOTAL	27,390	109,857	189,844	131,313	16,850	225,269
Percentage of National	39%	62%	80%	99%	87%	87%

Most of the energy consumed for irrigation is crop-specific. In the eleven high energy=consuming states, 62% of the energy consumed in irrigation is used in the production of: grain sorghum, cotton, winter wheat, corn for grain and silage, and alfalfa. Fifty-five percent of the energy used for irrigation nationally is consumed in the production of these crops. The energy used to irrigate these crops represents at least 30% of the total irrigation energy consumed by each of the eleven states in all cases except Idaho. (From "The Analysis to Develop a Program for Energy Conservation in Irrigated Agriculture", September 1978, Pacific Northwest Laboratory, Richland, Washington 99352.)

NON-POINT SOURCE POLLUTION INVENTORY

The results of Oregon's first statewide assessment of non-point source (NPS) water pollution was published in August 1978 by the Oregon Department of Environmental Quality (DEQ). It consists of a narrative document and a set of eight (8) maps or plates. The intended use is to provide an information base for DEQ planning and other resource agencies and planning jurisdictions.

Information in the inventory is based on recognition of the beneficial uses of Oregon's waters and covers the following three categories of NPS problems:

1. Introduction of materials from diffuse sources of land runoff into streams, lakes, reservoirs, or estuaries.

2. Physical alteration of a stream corridor, or the banks and adjacent areas of any water body.

3. Reduction in streamflow, due to consumptive use, which causes an interference with other beneficial uses.

Much of the information presented in the report pinpoints the types and locations of problems without making the judgement as to whether nature or man is responsible for the adverse condition.

The subjects covered by the eight plates are streambank erosion, sedimentation, excessive debris, water withdrawals causing stream-quality problems, elevated water temperatures, nuisance algal or aquatic plant growths, composite of non-point source problems, and erosion potential - sediment yield.

The text provides a brief synopsis of the inventory results by noting the regional hot spots for the several problems and the composite problem map. For purposes of the inventory, a regional hot spot is a large area of the State in which a considerable portion of the streams or water bodies on the map have severe NPS problems. The significance of regional hot spots is that these may be the areas where resource planners need to key on in the development of:

1) Detailed studies of the cause, impact, and control of the problem(s).

2) Remedial action programs.

In addition to noting the regional hot spots, map users are cautioned to note the locations of high concentrations of moderately severe problems and also the location of low densities of severe problems. Special attention to hot spots may be desirable, but proper use of the maps requires that users obtain the overall perspective of the information portrayed on each map.

****

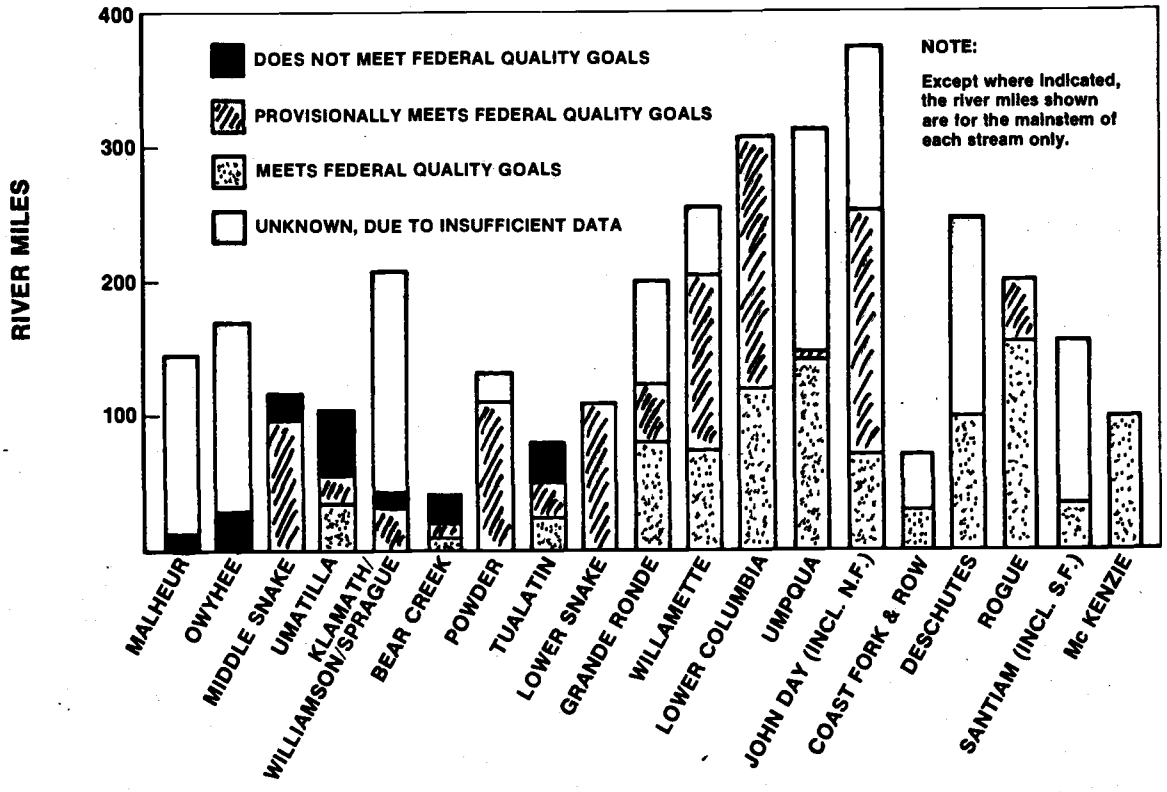
RECREATION GUIDE

A new Willamette River Recreation Guide has been published by the State Parks Branch and is available at the agency's offices in Salem and Portland and at Champoeg and Armitage State Parks.

"We hope the guide will help recreationists to enjoy the river, to locate landings and recreational facilities designated for public use, and to avoid trespassing on privately owned lands within the Greenway," said Wally Hibbard, River Programs manager.

The guide contains maps of 17 stretches of Willamette River Greenway. Each map shows in detail public accesses, public lands, boat ramps, camping facilities, and other recreational information.

WATER QUALITY STATUS OF PRINCIPAL RIVERS IN OREGON



Of 19 Oregon rivers, eight are partly polluted and another seven have some or all of their reaches only provisionally meeting Federal quality goals.

The lower reaches of the Malheur River and Owyhee River are probably too polluted to meet Federal goals for water quality sufficient for propagation of salmonid fish and unrestricted recreational use. Ten streams, nearly one-half of those evaluated, provisionally meet Federal water quality goals. Portions of five of those streams, mainstem Middle Snake, Klamath, Bear Creek, Umatilla, and Tualatin Rivers, have poor water quality. However, better water quality throughout the remaining portions of these rivers gives a better overall value. The seven remaining rivers, mostly located in sparsely populated areas where the predominant land use is forestry, have the best water quality.

The most common cause of pollution in the Oregon rivers that were analyzed are high solids concentrations, low dissolved oxygen, and nutrient concentrations capable of causing nuisance growths of algae. These types of contamination are common to many of the rivers in the eastern, agriculturally oriented portion of the State where intensive land use for irrigation exists and low summer flows are prevalent. Organic toxicity from pesticides and inorganic toxicity in the form of heavy metals have a serious adverse affect on aquatic life. There is a lack of organic toxicity data on Oregon streams, even though pesticides are used in both agriculture and forestry activities throughout the State. (From "Oregon Environmental Quality Profile - 1978", dated December 1978, EPA, Region 10, 1200 Sixth Ave., Seattle, Washington 98101.)

PRINCIPAL OREGON LAKES AND RESERVOIRS IMPAIRMENT OF HIGHEST BENEFICIAL USES

Name	Surface Area (Acres)	Recreational Use Impaired[1]				Final Rating
		Swimming	Fishing	Boating	Aesthetics	
Upper Klamath Lake	59,000	2	2	1	2	7
McKay Creek Res.	1,200	1	2	1	2	6
Owyhee Reservoir	14,000	1	1	2	2	6
Fern Ridge Res.	10,000	1	1	1	2	5
Waldo Lake	5,500	1	1[2]	1	1	4
Crescent Lake	3,500	1	1	1	1	4
Chinook Lake	2,500	1	1	1	1	4
Crater Lake	13,000	1	1[2]	1	1	4
Diamond Lake	3,000	1	1	1	1	4
Siltcoos Lake	3,000	1	1	1	1	4
Detroit Res.	3,000	1	1	1	1	4
Green Peter Res.	3,700	1	1	1	1	4
Prineville Res.	3,000	1	1	1	1	4
Timothy Lake	850	1	1	1	1	4
Lake Paulina	1,400	1	1	1	1	4
East Lake	1,200	1	1	1	1	4
Crane Prairie Res.	1,500	1	1	1	1	4
Lake Wallowa	1,800	1	1	1	1	4
Ochoco Res.	1,100	1	1	1	1	4
Davis Lake	1,600	1	1	1	1	4
Wickiup Res.	11,000	1	1	1	1	4
Cultus Res.	1,300	1	1	1	1	4
Blue River Res.	1,000	1	1	1	1	4
Cottage Grove Res.	1,000	1	1	1	1	4
Dorena Reservoir	1,800	1	1	1	1	4
Foster Reservoir	1,200	1	1	1	1	4
Olallie Lake	800	1	1	1	1	4
Cougar Reservoir	1,200	1	1	1	1	4
Hill Creek Res.	2,700	1	1	1	1	4
Odell Lake	3,300	1	1	1	1	4

[1] Numbers in columns represent the degree of recreation impairment per category for each lake—minimum impairment per category is 1 and highest is 3; therefore, final rating ranges from 4 for little or no impairment to 12 for maximum impairment of all recreation categories.

[2] Does not support fish population because water is too soft to produce sufficient food. This condition is not pollution-related.

Of the 30 most-used Oregon recreation lakes and reservoirs, four have a significant or moderate degree of impairment. The remaining 26 lakes appear to be relatively pristine. Three of the four lakes and reservoirs classified as severely or moderately polluted are located in agricultural areas of the State. The other is Fern Ridge Reservoir, which experiences a moderate degree of impairment. It is located in a forested area of the State. The majority of more pristine lakes are deep and are located at high elevations in the less developed portions of the State. No treated domestic or industrial wastes are discharged to Oregon lakes.

CITIZEN PARTICIPATION

A Purdue University study focuses on how citizen participants perceive the effectiveness of their participation in natural resources decision making, comparing very, moderately and slightly active participants. Data are from personal interviews with 77 very and moderately active persons, and from mailed questionnaires to 106 moderately and slightly active participants from throughout Indiana. The operational measure of extent of participation used for data analysis was hours per week spent on environmental activities, which had a fairly strong relationship to other indicators of participation. These citizen participants generally ranked high on indicators of socio-economic status but the relationship between status and level of participation was not linear.

A goal of a majority of respondents was to influence environmental decisions and legislation. Participants generally viewed their participation as effective, on a series of measures. Very active citizens were more effective than slightly active participants; they also used more participation techniques more often than the slightly active participants. Most effective techniques involved direct contact with decision makers, the press and others, and knowledge of issues. Public hearings, advisory boards, courts, and lawyers, bumper stickers and buttons, and protest demonstrations were considered much less effective.

Although they felt governmental agencies are changing, and becoming more responsive, they indicated agencies do many things to discourage citizen participation, as well as other activities that encourage participation. Very active participants tended to have more positive views of agencies, particularly of state and federal agencies. Most participants saw no financial benefits associated with participation, although many saw losses, often associated with the costs of participation. (From "Perceptions of Effective Public Participation in Water Resources Decision Making and Their Relationship to Levels of Participation". Tech. Report #115, January 1979. Water Resources Research Center, Purdue University, West Lafayette, Indiana.)

****

FLOW CONTROL DEVICES

These are used to limit the rate of flow from shower heads and faucets. These devices are usually nothing more than orifice restrictors that fit into the supply lines for faucets or showers. Flow is usually limited to three gallons per minute for showers. Normal flow from showers is four gallons per minute and up. Water savings of up to 60 percent are claimed for flow-limited shower heads and up to 50 percent for faucets.

In addition, similar savings can be obtained for shower heads with built in flow controls. These shower heads eliminate any potential compatibility problems between the restrictor and the shower head. Inexpensive flow restrictors are available that restrict flow from two to 3.5 gallons per minute.

****

LANDSCAPE IRRIGATION

Faucet flow controls on outside taps used for landscape watering allow precise calculation of the water being applied. Drip irrigation emitters and sprinklers on electric time clocks can also reduce water use significantly. Soil moisture tensionmeters are expensive but they are useful in preventing unnecessary watering. Planting native vegetation with lower water requirements is the best method of reducing irrigation water use.

****

Pressure reducing valves, when installed at the home water supply inlet can effect condiserable water savings in high pressure service areas. Water pressure need not exceed 50 to 60 pounds per square inch in residences.

NATIONAL WATER ASSESSMENT

The second national water assessment by the U.S. Water Resources Council emphasizes the critical problems still facing the nation. Intensive use and competition for water to satisfy a wide variety of purposes pinpoint the need for further research and resource management. The problem areas are:

*Inadequate surface-water supply. Localized problems of inadequate surface-water supply have been identified in all 21 water resources regions. However 17 subregions have or will have a serious problem of inadequate surface-water supply by the year 2000.

*Overdraft of ground water. The most dramatic instances of ground-water overdraft are found in the High Plains area that extends from Texas to Nebraska. Central Arizona and parts of California also depend heavily on ground water. In some of those areas ground-water levels are declining from 7 to 10 feet per year. Extensive ground-water overdraft is occurring in 8 of the 106 subregions. Moderate ground-water overdraft is occurring in an additional 30 subregions.

*Pollution of surface water. Occurrences of surface-water pollution were reported in most of the 21 water resources regions. Dispersed agricultural sources, municipal and industrial wastes, acid mine drainage, and accelerated urban runoff are the significant sources.

*Pollution of ground water. Ground-water pollution, whether existing or potential, natural or manmade, poses a significant health threat inasmuch as 40 percent of the population derives drinking water from ground-water sources. Areas of ground-water pollution have been recognized in practically all 21 regions.

*Quality of drinking water. Pollution of surface and ground sources of public water supplies has serious potential public-health consequences. For that reason, maintenance of both surface- and ground-water quality for drinking is of concern nationwide. At the community level, most surface water receives extensive monitoring and treatment, and ground water receives at least chlorination. In rural areas, however, where many people obtain drinking water from individual domestic wells, the water receives little or no treatment and the potential health hazard is significant.

*Flooding. In 1975, 107 people were killed by flood waters, and potential property damage was estimated to be $3.4 billion. By the year 2000, potential flood damage is expected to increase to $4.3 billion annually unless there is expansion of flood-plain management efforts and the regulation of flood plains.

*Erosion and sedimentation. The "1975" average cropland soil loss from erosion was nearly 9 tons per acre; in some areas the soil loss exceeded 25 tons per acre. In addition, forest and pasture lands sustain soil losses of about 1 ton per acre per year.

*Dredging and disposal of dredged material (dredge and fill). The large volume of sediment deposited each year in navigable stream channels, reservoirs, and harbors requires regular removal and disposal. In order to maintain the national navigation network, continued dredging is necessary. Disposal of the dredged material can disrupt or destroy aquatic life in adjacent wetlands that have important environmental and economic values. Between 1955 and 1975, a total of

Cont. →

6 million acres of wetlands was lost for use by aquatic life, from filling as a result of development, disposition of dredge material, or other causes.

*Wet-soils drainage and wetlands. Wet soils comprise an estimated 400 million acres, of which about 104 million acres is used for cropland, and 43 million of those acres need improved drainage. An additional 70 million acres of wet soils in forest, pasture, or other types of wetland could be converted to cropland, but it is estimated that by the year 2000 only 11 million additional acres will have been converted to cropland. This conversion will be offset to some degree by croplands that revert to wetlands and by the creation of new wetlands. Competition between agricultural and wildlife interests is particularly acute in some wetland areas.

*Degradation of bay, estuary, and coastal water. Much of the coastal-area water is being degraded by domestic and industrial waste, particularly in the densely populated New England, Mid-Atlantic, and Great Lakes Regions. These coastal waters provide major recreational opportunities for more than 80 percent of the population.

****

208 PLANNING

The General Accounting Office (GAO) recently prepared a report presenting its recommendations regarding water quality management planning (208 planning). In brief, the GAO feels that water quality management planning probably will not be effective for many years until

--cause and effect water quality data is obtained,
--planning efforts become more comprehensive, and
--public participation strategies are broadened.

Unless good cause and effect data is obtained to clearly support implementation actions needed, implementation of plans developed by planning agencies risks legal action and rejection. The Environmental Portection Agency (EPA) has proposed, and GAO agrees, that potential solutions to water quality problems should be tested in selected river basins before being applied on a nationwide basis.

In response, EPA generally agreed that 208 planning is not yet comprehensive but believes that many 208 planning agencies have successfully dealt with some complex issues and assisted citizens and local governments to implement regulatory programs to manage water quality. The Agency felt that the most effective way to use its limited resources was not to have 208 planning agencies consider all the requirements, but rather only the high-priority water problems. The agencies could then concentrate on developing and implementing fully some needed actions for water cleanup. EPA also agreed that, in many instances, sufficient cause and effect water quality data is lacking when decisions are being made on how best to clean up water. The Agency believes, however, that a fortune could be spent on data gathering alone without any attempts being made to develop and implement needed solutions to water quality problems.

In GAO's view a sufficient amount of data needs to be obtained before attempting to implement solutions of an experimental nature on a nationwide basis. If data collection is too costly to obtain, GAO believes that experimental approaches should be applied on a limited basis in order to minimize costly attempts that may not improve water quality.