

## **Oregon's Volunteer Monitoring Program**

### **Karen Font Williams**

Karen Williams received her undergraduate degree in geology from Smith College, Northampton, Massachusetts and her Master of Science degree in Hydrology/Hydrogeology from the University of Nevada, Reno. Her graduate work concentrated in aqueous geochemistry. She has six years of experience in environmental consulting, managing remedial investigation/feasibility study projects. She joined the Oregon Department of Environmental Quality in November 1998, as the Volunteer Monitoring Coordinator in the Laboratory Division.

**Abstract:** Success of the Oregon Plan, an initiative to restore and protect native fish populations and the state's water quality, depends on cooperation of agencies and citizens. Over 40 volunteer groups statewide are monitoring water quality and contributing valuable information through the Volunteer Monitoring Program at the Oregon Department of Environmental Quality (DEQ). Most volunteer groups are components of watershed councils, but DEQ also works with volunteers from Soil and Water Conservation Districts, schools, Native American tribes, and National Estuary Programs. Volunteers may participate in the program to educate their communities, to support or refute a stream's placement on the Clean Water Act 303(d) list, to choose restoration sites, or to identify problem sites.

The Volunteer Monitoring Program assists volunteer groups in collecting data of appropriate quality for regulatory use. The volunteer coordinator distributes high quality equipment, trains volunteers in its use and maintenance, reviews quality assurance project plans, and performs split sampling with volunteers. Volunteers follow parameter-specific protocols to maintain comparability among data collected statewide.

Since 1998, volunteer monitoring groups have tackled a wide range of projects. Volunteers have installed hundreds of continuous temperature monitors, measured riparian shade, and mapped stream habitats. Volunteers have observed the correlation of stream discharge to bacterial concentrations, and studied macroinvertebrate diversity to identify sites in need of intensive sampling. Information Oregon volunteers collect will be useful for DEQ's Total Maximum Daily Load development, as well as the completion of management plans for agricultural and forest land, and riparian restoration projects in urban communities.

## Introduction

The Volunteer Monitoring Program at the Oregon Department of Environmental Quality (DEQ) operates within the Water Quality Monitoring Section of the Laboratory Division in Portland, Oregon. Laboratory staff collect and analyze air, water, soil and biological samples for DEQ offices across the state. The Water Quality Monitoring Section manager oversees several monitoring coordinators, including the Volunteer Monitoring Coordinator.

The Volunteer Monitoring Coordinator is funded by the Oregon Plan, a 1997 initiative to restore and protect native fish populations and the quality of the state's waters. Coho, chinook, and chum salmon as well as steelhead and bull trout have been listed as endangered or threatened under the Endangered Species Act. A successful Oregon Plan depends on the cooperation of citizens, industry, municipalities, state and federal agencies, agriculture, forestry, and environmental groups. Volunteer monitoring fits well into the Oregon Plan as volunteers carry out public education and encourage local participation in watershed issues.

The Oregon Plan website emphasizes the importance of community-based action:

Government, alone, cannot conserve and restore salmon across the landscape. The Plan recognizes that actions to conserve and restore salmon must be worked out by communities and land owners, with local knowledge of problems and ownership in solutions. Watershed councils, soil and water conservation districts, and other grassroots efforts are vehicles for getting the work done. Government programs will provide regulatory and technical support to these efforts, but the bulk of the work to conserve and restore watersheds will be done by local people. Education is a fundamental part of community-based action. People must understand the needs of salmon in order to make informed decisions about how to make changes to their way of life that will accommodate the needs of the fish.

One goal of the volunteer monitoring program at DEQ is to facilitate the collection of data of sufficient quality to meet volunteers' needs. As well, DEQ attempts to integrate volunteer data collection into agency monitoring efforts. For example, volunteer data may be used in studies to develop Total Maximum Daily Loads (TMDL) for streams placed on the Clean Water Act 303(d) list. DEQ must complete TMDLs for 91 sub-basins by 2007, as illustrated by Figure 1. Hundreds of stream segments are listed for temperature exceedence because cold water aquatic life is one of the most sensitive beneficial uses of Oregon waters. Other common parameters for which water bodies are listed are sedimentation, habitat modification, dissolved oxygen, and bacteria.

Technical support provided by the Volunteer Monitoring Coordinator includes assistance in developing quality assurance plans, training volunteers to use monitoring equipment, verifying their sampling techniques, and assisting them with data submission to DEQ. The Volunteer Monitoring Coordinator works closely with three regional monitoring coordinators in the Laboratory to coordinate volunteer efforts with DEQ data collection.

Volunteer monitors in Oregon usually work through watershed councils, organizations of stakeholders and citizens recognized by the Oregon Watershed Enhancement Board (OWEB). OWEB originated in 1988 to provide technical and financial support to stakeholders actively restoring Oregon waters. Several watershed councils secure funding from OWEB for a paid monitoring coordinator or receive interns from a program called Resource Assistance for Rural Environments (RARE). Technical groups such as soil and water conservation districts and other state and federal agencies work with the Volunteer Monitoring Coordinator to collect and store consistent water quality data.

DEQ purchased high quality monitoring equipment for volunteers with a grant from OWEB in 1998. Purchasing the equipment in bulk and distributing it to volunteers saved tens of thousands of dollars. As important as the financial savings is the consistency gained from having all volunteers using identical equipment capable of attaining the accuracy and precision criteria adopted by DEQ. Volunteers agree to submit a sampling plan, follow certain protocols, and share data with DEQ in exchange for the equipment.

## Methods of Volunteer Training

Established monitoring protocols are crucial for maintaining consistency among volunteers' techniques. The Oregon Plan monitoring team, comprising representatives from DEQ, and Oregon Departments of Agriculture, Fish and Wildlife, Forestry, and Water Resources, compiled water quality monitoring protocols in a guidebook. Volunteers using DEQ equipment agree to follow the Oregon Plan protocols for measuring pH, conductivity, temperature, dissolved oxygen, and turbidity, and collecting macroinvertebrates. The Technical Water Quality Monitoring Guidebook also has chapters to help volunteers design their study, choose sampling locations, and understand the importance of quality assurance and quality control.

Volunteers attend trainings in which they learn to calibrate, maintain, and use the equipment according to Oregon Plan protocols. Trainings also cover Quality Assurance plans, modeled after the EPA Volunteer Monitors Guide to Writing Quality Assurance Project Plans. DEQ provides an example plan on its website from which volunteers may develop their own plans.

Duplicates and split samples between DEQ and the volunteers serve to improve consistency of measurements and data quality. The Volunteer Monitoring Coordinator may duplicate field measurements with volunteers or bring samples back to the DEQ laboratory for analysis. This auditing bolsters volunteer confidence and validates their data to potential users.

DEQ asks that volunteers manage their own data and provide initial quality control checks like duplicate sample agreement or temperature audits of data loggers. Volunteers then assign a data quality level based on these factors as well as meeting the data quality objectives in their sampling plans. If volunteers want their data input into the DEQ Laboratory database, they must submit locational information, e.g. latitude and longitude, river basin, and hydrologic unit. DEQ provides a spreadsheet entitled Data Reporting Format on its website to assist volunteers in organizing their data. Table 1 contains the essential information that must accompany volunteer data.

DEQ attempts to maintain contact with approximately 40 volunteer groups throughout the year, recognizing that participants change, forget methods, and benefit from repeated instruction. The DEQ laboratory website posts copies of the Oregon Plan monitoring protocols and a volunteer monitoring newsletter. The newsletter is a combination of technical articles and those written by volunteer monitors about their projects.

## Volunteers' Motivation and Use of Data

Oregon volunteers begin monitoring for a variety of reasons, but most consider one of their highest priorities to educate their communities and increase public understanding of the link between land use and water quality. Many take pride in the ownership that comes from testing water quality in their own backyards, whether their interest lies with control of noxious weeds in a coastal lake or tracking the temperature increase in a stream from the forested headwaters to arid range lands. A completed monitoring season is a tangible accomplishment to bring back to the community and may be an element of a watershed council's Action Plan. One volunteer identified a goal of their program is to "be safe and have fun." Another group hasn't missed a monthly sampling since summer of 1998 because "we all feel the information has value, we enjoy getting out looking at our streams, and we enjoy each other's company. If one of us can't make it, we always request a re-schedule so we don't miss out!"

Water quality monitoring presents a unique opportunity to involve land owners. The Long Tom (Eugene, OR) and North Fork John Day (Monument, OR) watershed councils have focused on land owner involvement as a portion of their monitoring projects. The Long Tom council is assisting agricultural land owners in collecting samples of runoff from their property and evaluating whether or not land use changes (e.g. planting buffer strips, timing fertilizer application) are resulting in water quality improvements. The North Fork John Day volunteers include enthusiastic science students at Monument High School who serve as water quality ambassadors to land owners in this high desert environment.

Many watershed councils come from areas where the Oregon Department of Agriculture is developing water quality management plans to reduce agricultural non-point source pollution. Several councils are using volunteer data as baseline measurements. They will compare with measurements taken after certain agricultural practices are changed. The Yamhill watershed council, for example (McMinnville, OR), located in the fertile Willamette Valley, has monitored continuous temperature for two years at 20 sites. This data from agricultural lands supplements temperature data collected at the headwaters by the Bureau of Land Management.

Volunteers may begin monitoring because research indicates very little water quality data exist on which to base judgements. This prompted monitoring by the Clatsop watershed councils, located along the north coast, and the North Santiam council, located on a tributary from the Cascade Mountains to the Willamette River. Filling in data gaps can be useful in completing a watershed assessment and in building an understanding of seasonal fluctuations in water quality.

Watershed councils often use their data to identify areas in which riparian restoration is most needed and will bring the most benefit to the aquatic community. The Applegate watershed council (Jacksonville, OR) reviewed three years of field monitoring baseline information and determined that sedimentation, temperature and dissolved oxygen were the parameters of greatest concern. This year they are monitoring tributaries intensively for these parameters. Their priority is to identify, enhance, and protect cold water refugia for salmon.

Volunteers use traditional and electronic means to communicate information. Several councils maintain web pages and update them with current monitoring information. Newsletters circulated to the council and interested citizens are popular for highlighting monitoring as well as other accomplishments. Local newspapers are also an effective resource to recruit new volunteers, announce workshops, and report findings. Volunteer monitors make regular presentations to their watershed councils, speak at public meetings, and educate the next generation of water quality stewards through local schools.

#### Agency Use of Data

Watershed councils often intend that an agency use their data. Volunteers must adhere to strict quality assurance and overcome skepticism about volunteer data quality to accomplish this. Volunteer data are more likely to be used if the volunteers have met with DEQ at the beginning of the project to discuss their goals and proposed methods.

Though many volunteers' first contact is the Volunteer Monitoring Coordinator, councils may also work directly with the DEQ regional office near them. The South Coast/Lower Rogue watershed council and Curry Soil and Water Conservation District worked with the DEQ, Coos Bay office on an assessment of riparian conditions. This group supplemented interpretation of aerial photographs with measurements of stream channel characteristics and riparian vegetation. Their results were used to predict site potential for shade and consequently temperature reduction. They also completed inventories of forest logging roads, analyzing such sediment-contributing factors as undersized culverts, poor drainage, and excess erosion.

A volunteer with the Williamson watershed council (Chiloquin, OR) in south central Oregon installed 12 continuous temperature data loggers in the Williamson River and its tributaries. DEQ hired a remote sensing contractor that uses Forward-looking Infrared technology (FLIR) to detect heat given off by a stream and hence, its temperature. The data the volunteer collected is being used to verify the remote sensing information. Figure 3 presents a component of the volunteer-collected Williamson River data.

This season, DEQ will be working intensively in the Nehalem River watershed because the TMDL for this basin is due in 2001. DEQ is using at least two years of continuous temperature data collected by the Upper and Lower Nehalem watershed councils to decide which areas in the watershed need the most intensive sampling this summer. DEQ followed a similar process in 1999 with data collected by the Nestucca-Neskowin watershed council. This council has also provided valuable storm-related bacteria data, being able to respond quickly when storms occur.

## Conclusions

The Oregon DEQ Volunteer Monitoring Program is part of the Water Quality Monitoring Section of the Laboratory. A Volunteer Monitoring Coordinator provides technical resources and guidance to approximately 40 groups. Volunteers have access to high quality monitoring equipment and follow established protocols, which increases the precision of the data collected statewide.

Volunteer monitoring presents challenges to both DEQ and the volunteer participants. As with many volunteer activities, responsibilities often fall on a small group of people, or the watershed council coordinator. Leaders may struggle to maintain interest and commitment among volunteers. Combining monitoring with other watershed activities like tree planting or estuary clean-ups is often successful in keeping volunteers and communities engaged. Volunteer monitors are also occasionally called upon to build bridges with land owners that perceive their relationship to monitors and state agencies as adversarial.

Funding is limited and councils may have to scale back their programs to match their budgets. DEQ has no budget for assisting watershed councils other than the Volunteer Monitoring Coordinator position. Financial support for equipment comes from OWEB each biennium. This requires that DEQ anticipate the needs of councils over the next two years or that councils secure their own funding for resupply or equipment replacement. The Volunteer Monitoring Coordinator works statewide and is not always successful in providing sufficient support and technical guidance to all watershed councils involved. One volunteer commented that "DEQ technical support is a bit nebulous," when the council needs help interpreting the data they collected.

DEQ's largest challenge lies with volunteer data management. Loading volunteer data into the agency database depends on the Volunteer Monitoring Coordinator preparing hundreds of sample locations for entry. Once data has been entered, this database, though containing public information, is not yet accessible via the Internet to the public.

The DEQ volunteer monitoring program begins its third year with the summer 2000 season. Each year brings increased participation and data submission. The potential benefits to communities, DEQ, Oregon's water quality, and ultimately endangered fish populations outweigh any temporary challenges.

## References

Oregon DEQ website: [www.deq.state.or.us](http://www.deq.state.or.us)

Oregon Watershed Enhancement Board Water Quality Monitoring Guidebook, July 1999. Order from OWEB, 255 Capitol St., NE, 3<sup>rd</sup> Floor, Salem, OR 97310-0203.

The Volunteer Monitor's Guide to Quality Assurance Project Plans, U.S. E.P.A., September 1996. Publication number EPA 841-B-96-003.

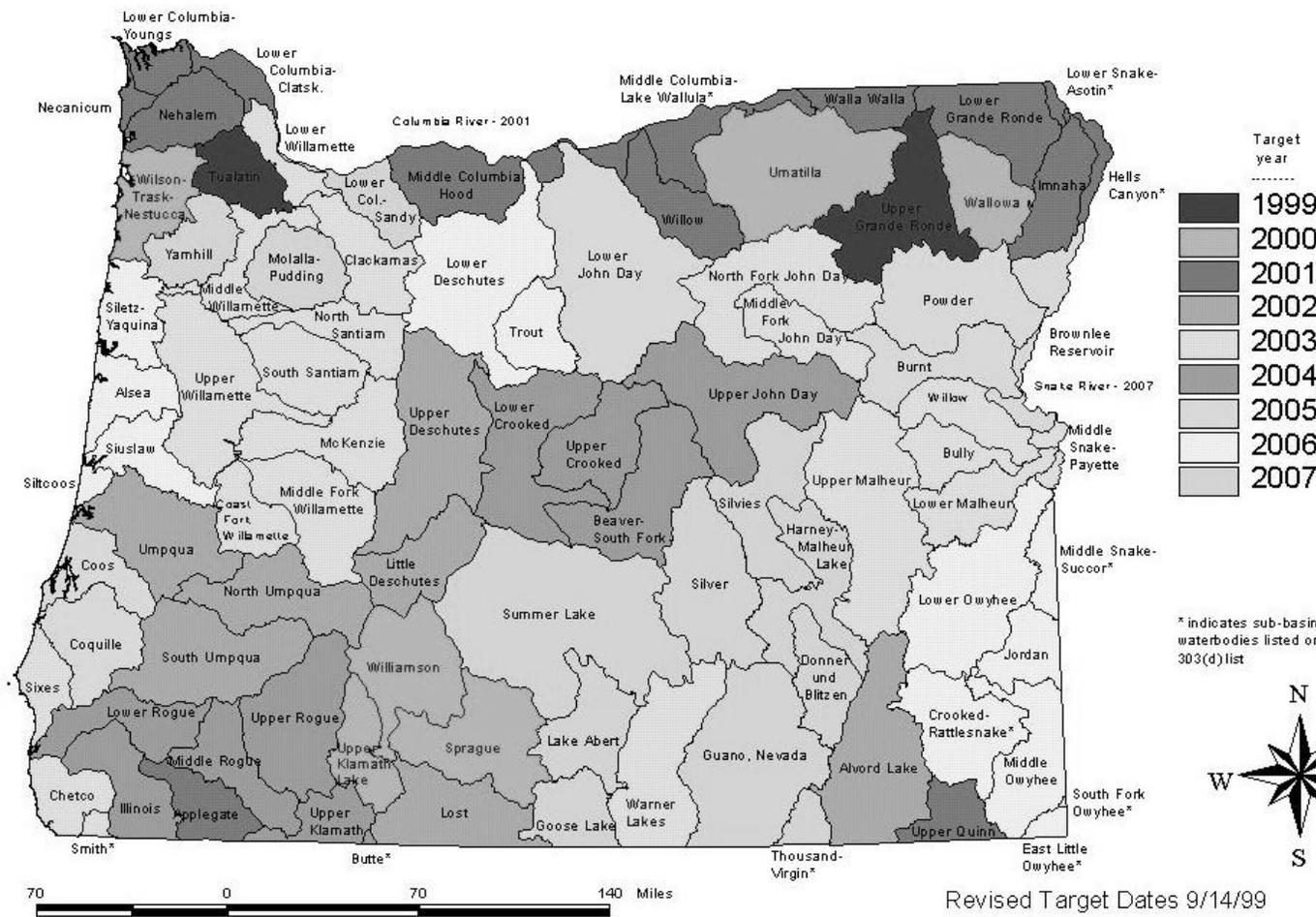


Figure 1: Sub-basin target dates for completion of total maximum daily loads for Oregon waters listed in the 1998 3

| ORGANIZATION                                  | SITE DESCRIPTION (Location)  | ELEVATION (ft.) | LATITUDE DEG.   | LAT MIN.   | LAT SEC.                          | LONGITUDE DEG. | LONG MIN. |
|---|------------------------------|-----------------|-----------------|------------|-----------------------------------|----------------|-----------|
| Volunteer Creek WSC                           | Volunteer Creek @ Highway 10 | 1500            | 45              | 15         | 7.7                               | 123            | 10        |
| LAT/LONG SOURCE                               | RIVER BASIN                  | SUB-BASIN       | HUC (4th field) | RIVER MILE | RIVER MILE SOURCE                 | STATION ID     | DATE      |
| USGS, Juniper Butte, OR, 7.5 " Quad, 1:24,000 | Willamette                   | Yamhill         | 17090008        | 25.5       | WRD, Hood Drainage Basin, Map 4.6 | VC-5           | 06/09/9   |

Table 1: An example of information that should accompany volunteer data submitted to Oregon DEQ. HUC = Hydrologic Unit Code. WRD = Oregon Water Resources Department.

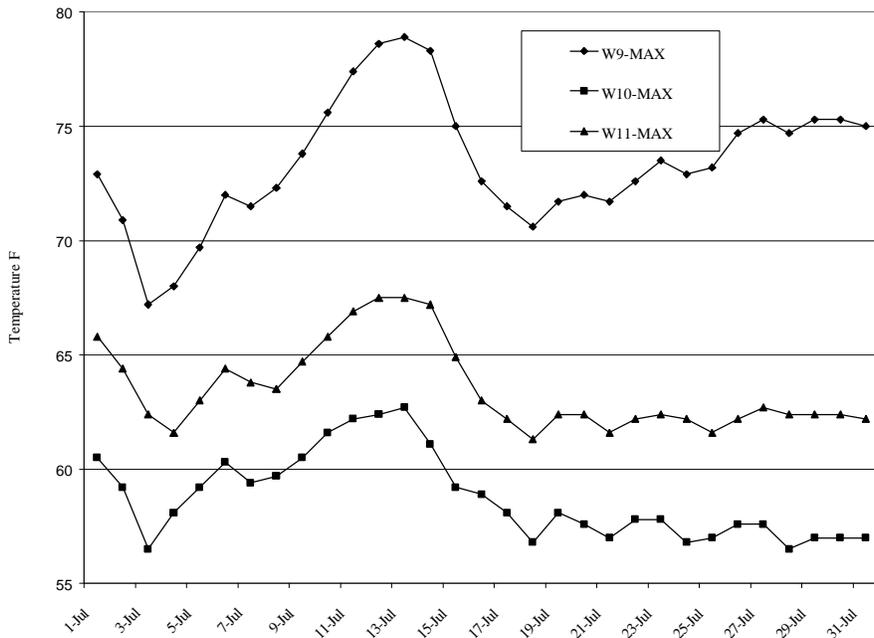


Figure 2: Maximum daily temperatures recorded on the Williamson River, 50 yards upstream (W10) and ¾ mile tributary, the Sprague River (W9). Data collected and processed by Jim Walthers, Williamson Watershed Council