Introduction to the Willamette River

The Willamette River: A Brief Overview

The Willamette River has always played an important role in the lives of Oregonians, particularly those living in its watershed. Today, nearly 70 percent of Oregon's population lives within 20 miles of the river and an even greater percentage use it on a regular basis for food, recreation, transportation, and commerce. The Willamette Basin is a large watershed covering just over 11,000 square miles, or approximately 12 percent of the land area in Oregon.

These days, many people scoff at the Willamette as a polluted mess beyond hope of recovery; however, after spending only a short time on the river watching resident bald eagles north of Eugene or meandering through basalt outcroppings in Willamette Narrows, one realizes that this is a truly amazing body of water. While the river certainly faces a multitude of difficult and sometimes seemingly insurmountable challenges, it remains the lifeblood of Oregon in many ways. As one of our greatest public resources, it is our responsibility to ensure that the Willamette River is safe for fish and other wildlife as well as humans.

Looking Back: A Historical Perspective

The Willamette basin was home to Native Americans, primarily the Calapooians and the Chinook, for thousands of years before the arrival of the first Euro-Americans. The Calapooians occupied the inland valleys of the western tributaries, such as the Tualatin River, as well as the eastern tributaries and the shores of the Willamette above the falls. Below the falls, the Chinook traditionally occupied the tributaries and mainstem Willamette.

The arrival of fur-traders and settlers around the turn of the 19th Century wreaked havoc on the native populations living in the Willamette Valley. Before the arrival of Euro-Americans, there were estimated to be 5,000 Chinook living in the valley. Following the arrival of settlers, traders, missionaries, and other Euro-Americans, the majority of the native populations were wiped out by diseases such as measles, smallpox, and influenza to which they had no resistance. By 1910, the Calapooia and Multnomah tribal groups were all but extinct, and there were fewer than 50 surviving Chinookans -- remnants of the Clackamas, Santiam, and Yamel (Yam Hill) tribes. These survivors were sent to the Grand Ronde Reservation.

In addition to dramatically altering the cultural climate of the valley, Euro-Americans had a tremendous impact on the natural environment as well. By the 1830s, the Hudson Bay Company, who had been integral in establishing settlements and trading posts in the area, had trapped nearly all the beaver out of the valley. Land was cleared and fields were cultivated in order to support the growing populations. The introduction of agriculture to the area led to the narrowing or complete removal of riparian forest which once averaged one to seven miles wide.

From 1850 to 1900, the river was channelized and dredged for navigation. In the 1940s, the Army Corps of Engineers began to build dams and storage reservoirs in an attempt to control floods. In addition, they constructed wing dams and revetments and removed woody debris to protect navigation and establish farmland along the river. While these activities have helped reduce the impacts of flooding in the valley, they have also dramatically altered the hydrologic patterns of the river, disrupted, or destroyed salmon spawning runs and had a significant impact on the surrounding ecosystems.

Navigation, commerce, and agriculture led to the development of urban centers along the river as well. In the 1850s, 96 percent of Oregon's population resided in Portland. By the 1930s, Oregon's population was concentrated into 21 incorporated cities while the population density of the rest of the valley remained relatively low. Industry and agriculture lined the banks of the river, dumping toxic pollutants into the rivers at largely unregulated rates. The river became a sewer line for cities and a dumping ground for industries that included, among many others, a DDT manufacturer and a creosote wood treatment plant.

By the 1960s, the Willamette was one of the most polluted rivers in the country. Dams were contributing to dramatic declines in salmon populations on the Willamette and Columbia rivers. Changes in flow caused a decline in fish habitat. The removal of riparian forest, erosion, and sedimentation all led to increased temperatures in what used to be a cold-water river. Pesticides from nearby farms, stormwater and other runoff from urban areas, and industrial discharge led to a river so polluted there are questions as to whether or not resident fish are safe to eat in many areas. As a result, six miles of the Willamette in Portland Harbor have been designated a federal Superfund site, officially recognizing the river's deeply rooted problems.

Forests, Farms, and Cities: Current Land Use in the Watershed

While most Oregonians are familiar with the sections of the Willamette that wind through or near their cities, only eight percent of the land in the Watershed is urban. The major population concentrations include Portland, Salem, Corvallis, Albany, and Eugene and their surrounding suburban areas. Clearly these cities arose near the river because the waterway facilitated commerce, transportation and irrigation and provided easy access to excellent fishing areas.

Nearly 75 percent of the land in the Willamette River Watershed is forested and the basin houses 13 National Forests. Approximately 69 percent of the land is dedicated to forestry. As with most areas in Oregon, forestry is a significant component of the economy in this region. In 1995, 31% of the 4.3 billion board feet of timber harvested in Oregon originated in the Willamette basin (Hume, 1998).

Thousands of years of flooding have deposited rich alluvial soils on the floor of the Willamette Valley, making this area one of the most productive agricultural regions in

Oregon. Approximately 22 percent of the Willamette basin is dedicated to a wide variety of crop production including horticultural plants, vegetables, fruit, grass seed, wine grapes, Christmas trees, grain, and hay.

The remaining land is dedicated to other uses including parks and recreation, public and conservation lands, and rural residential areas.

Looking Ahead: What We Can Do

Pollution and the problems associated with it are not new to the Willamette. Many of us are familiar with the days of Governor Tom McCall when the Willamette received all kinds of attention for its dramatic turn from one of the most polluted rivers in America to one of the cleanest. The cover of National Geographic declared it "A River Restored," and most people thought the problems had been solved. Unfortunately, they were only beginning.

While the work that was done on the river during the 70s is certainly a model of dramatic action, we are faced with a much more complex set of issues than ever before. The McCall-era clean-up focused primarily on point source, end-of-pipe pollution with an identifiable source. Today's problems, which include point source pollution, are much more ambiguous with the additions of run-off from agricultural fields, poisoned sediments, and a whole slew of non-point source pollutants whose origins are nearly impossible to pin down.

Clearly those of us who are committed to this river have our work cut out for us. We hope that, through the River Guardian program, we can identify problems along the river and work to find solutions. With volunteers from throughout the basin, we hope to tap into the wealth of knowledge and dedication that exists in the communities up and down the river.

While the river is steeped in many complex issues, the River Guardian program will work to build a network of committed citizens on the river that demonstrate to agencies and elected officials that the health of our river matters to us. By preserving the culture and folklore of the river, we draw attention to the fact that this river is not purely a source of transportation and commerce. It is a place we love and are devoted to, a piece of this place we call home. Whether we eat its fish for subsistence or catch them for sport, paddle or powerboat on its diverse waters, or admire its amazing wildlife, we all deserve a clean river in our backyard. It is time to demand it, and the River Guardian Program works to do just that.

Among the key laws used by federal and state agencies, as well as citizens, to monitor, control and permit the discharge of toxic point source pollutants into the Willamette River are:

The Clean Water Act (CWA): Congress passed the CWA in 1972 to create national standards for point source discharges, a system of enforceable regulations, and provisions for citizen suits. It established the program to fund sewage treatment plants, also called Publicly Owned Treatment Works (POTWs), and to develop regulations for non-point source pollution. In Oregon, the CWA is implemented by the Oregon Department of Environmental Quality (DEQ). DEQ sets water quality standards which must meet or exceed federal criteria and are subject to review by the EPA. DEQ also issues stormwater permits and permits to industrial facilities that discharge regulated substances and regulates municipal wastewater and sewage treatment plants.

The CWA gives the EPA the authority to set standards for the discharges of pollutants and makes it illegal to release any listed pollutant from a point source without a permit from the National Pollutant Discharge Elimination System (NPDES) which is administered by the states. In Oregon, NPDES permits are administered by the DEQ. NPDES permits are dated, subject to approval, and may be renewed at five year intervals. Public hearings – at which citizens can voice their concerns about the effect of releases to be authorized by a particular permit – may be granted for an NPDES permit. NPDES permits are supposed to meet federally approved state water quality standards.

In Oregon, POTWs are regulated by the DEQ through the NPDES program, but the program does not directly monitor what is released by the POTWs. The EPA requires reporting of toxics transferred to POTWs, but not of toxics discharged by POTWs. Some municipalities in the Willamette River Basin require large industries to "pre-treat" what they transfer to POTWs and thereby attempt to control what goes into the wastewater system. Still, even with current technology, some the toxics going into a treatment plant will be discharged. Great volumes of toxics are transferred to POTWs in the Willamette River Basin and a portion of those ultimately make their way into the Willamette River and its tributaries.

In Oregon, the POTW program relies on self-reporting by the dischargers, and DEQ *reviews* rather than verifies this information. As a result, there is no comprehensive public record of exactly what is being discharged into the Willamette River by POTWs.

Under the CWA, states are required to develop a list of "impaired waters," or "Water Quality Limited Streams," known as the 303(d) list. These are bodies of water which, as a result of degraded physical, chemical, biological and other criteria, do not meet the state's water quality standards.

All states are required to set the amount of waste or degradation allowed to be discharged into, or imposed on bodies of water on its 303(d) list, through the Total Maximum Daily Load (TMDL) program. A TMDL for each pollutant must be established for

each water body on the 303(d) list. The Willamette is list for violations of water quality standards, including temperature, bacteria, and mercury.

Safe Drinking Water Act: (1974) This law is also overseen by the EPA and administered by DEQ. It addresses the quality of all public water systems in the United States used for drinking, either from surface or underground sources. The SDWA grants the EPA the authority to establish standards of drinking water purity, with which all owners and operators of public water systems must comply. As the population grows in the Willamette River Valley, there is increasing pressure on existing sources of drinking water. Consequently, a few communities are already using the Willamette River for drinking water and a number of others are considering it.

The Emergency Planning and Community Right-to-Know Act (EPCRA): EPA requires annual reporting of toxic chemical releases to the environment. This information is compiled on the Toxics Release Inventory (TRI). Quantities of both routine and accidental releases of listed toxic chemicals, and of waste containing these chemicals transferred off-site must be reported annually. Search for toxic discharges in your neighborhood at www.epa.gov/tri/.

TRI reports are required only of owners and operators of industrial facilities who manufacture or process more than 25,000 pounds, or use more than 10,000 pounds of any listed chemical during the calendar year. Smaller amounts of toxics may be, and are, reported as well. Companies with less than ten full-time (or equivalent) employees are not required to report. As of January 2000, certain chemicals must be reported when used in amounts of 10-100 pounds.

TRI tracks toxics released as the result of industrial processes, but not those that make their way into the Willamette River by way of water running into a storm or wastewater pipe as a result of residential, agricultural or municipal use of pesticides. Oregon's new pesticide reporting law attempts to deal with this kind of pollution by requiring the use of such chemicals to be reported. It does not, however, monitor the toxic contents of any resulting discharge.

When stormwater enters the Willamette River from fixed pipes, DEQ calls it a point source discharge. This is also true of what's called "sheet run off" or "sheet wash," water coming off an open surface like a field, parking lot, or construction site. Permits are now required for sheet run-off on construction sites or areas of disturbed ground of 5 acres or more, and will soon be required for all sites of one acre or more.

Pollution Prevention Act of 1990: Administered by the DEQ, this Act encourages Oregon's businesses and institutions to make changes that will reduce or eliminate their use of toxic substances and the generation of hazardous waste.

The law requires those who use large volumes of toxic chemicals tracked by TRI and those who generate large amounts of hazardous waste to devise reduction and monitoring plans and report on their progress.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): Also known as Superfund, CERCLA gives the federal government authority to respond to releases, or threatened releases, of hazardous substances that they determine may endanger public health or the environment. CERCLA established a federal fund with taxes from chemical and petroleum industries to clean up abandoned or uncontrolled hazardous waste sites. The fund allows EPA to find those parties responsible

for releases of hazardous wastes at these sites, and to clean abandoned sites when potentially responsible parties cannot be found or fail to act. Enacting CERCLA re-authorized the National Contingency Plan which sets guidelines for responding to releases of hazardous substances and established the National Priorities List which determines where Superfund cleanups, either emergency or long-term, can be done.

Superfund is of particular interest to Oregonians concerned about the health of the Willamette. The five-and-a-half mile stretch of the Willamette River which extends through Portland Harbor has enough toxic sediment to be designated a Superfund site and planning for clean-up is underway.

Resource Conservation and Recovery Act (RCRA): Under this law, the EPA has the authority to control the generation, transportation, treatment, storage and disposal of hazardous waste. It also allows EPA to address environmental problems caused by underground tanks storing hazardous substances, including petroleum. RCRA does not deal with abandoned or historical sites and deals only with solid hazardous waste. In Oregon, the DEQ is responsible for the implementation of the RCRA.

The Endangered Species Act (ESA): Enacted in 1973, this law provides a means to conserve threatened and endangered species of plants and animals and the ecosystems on which they depend. The ESA prohibits actions that result in a "taking," the definition of which includes harassing or harming of a listed species, or adversely impacting its habitat. The National Marine Fisheries Service and the U.S. Fish and Wildlife Service share responsibility for administering the ESA. Because the Willamette River and its tributaries are home to wild salmon and steelhead listed as threatened under the ESA, the continuing release of toxic chemicals into the river directly affects these species' recovery.

The Pesticide Use Reporting Program: In 1999, the Oregon legislature passed House Bill 3602 which provides for the creation of a pesticide use reporting system in the State of Oregon. The Oregon Department of Agriculture (ODA) is responsible for administering the program and is currently working to develop a comprehensive and cost effective system for collecting data. A task force of industry representatives, environmentalists, public health professionals, and labor organizations, was designated by the Governor to make recommendations to ODA. In addition, ODA will implement a computer program that allows for accurate reporting of the collected data. The task force and ODA are working to outline what information will be made available to the public. Grower names will not be released and there is some debate about whether or not addresses of pesticide applications will be made available to the public. Without precise information about the location of pesticide use, there is some concern about the usefulness of the data. Full implementation of the program was required by January 1, 2002.

In 2002 ODA developed the Pesticide Use Reporting System (PURS), a online reporting form and tracking system. Between January 2002 and April 2003, PURS accepted over 250,000 pesticide use reports. During that same period, nearly 4,000 parties registered on the system as pesticide users. Due to insufficient funding this program is not longer available. Although the law still requires it, no support is in place for ODA to continue collecting data. For more information check out the PURs website at www.oda.state.or.us/purs.

Agricultural Water Quality Management Act: Through the Agricultural Water Quality Management Act (AgWQM Act), the Oregon Department of Agriculture is authorized to develop and carry out a water quality management plan for any agricultural or rural land area whenever it is required by state or federal law. The act provides a framework for ODA to develop watershed based plans which identify measures and strategies necessary for landowners to prevent and control water pollution resulting from agricultural activities. The AgWQM Act watershed planning process is begun by ODA once water quality issues in a watershed have been identified and a watershed plan is required by state or federal law. One example of such a "trigger" for the planning process is a listing under section 303(d) of the federal Clean Water Act.

ODA works in consultation with other state agencies to determine priority watersheds for development of AgWQM Area Plans. Through its locally based planners, ODA assembles a Local Advisory Committee consisting of stakeholders residing in the watershed. The committee is responsible for developing a draft action plan to address water quality issues arising from agricultural activities and soil erosion on rural lands. Under the AgWQM Area Plan, local operators will be asked to deal with identified problems such as soil erosion, crop nutrient loss from fields, or degraded streamside areas. The AgWQM Act provides flexibility so that landowners in each watershed are able to develop their own approaches to local problems. Farmers and ranchers are allowed to choose their own ways of meeting established water quality goals.

Willamette Riverkeeper has been active in the Local Advisory Committee and the development of the AgWQM Area Plan for the Lower Willamette River. Plans for the upper, middle and lower river are available online ww.oda.state.or.us/nrd/water_quality. WRK will continue participating in advisory committee as they form to track the success of the implementation.

Understanding Point and Non-Point Source Pollution

Water pollution may be classified into two general groups:

Point Source Pollution is "end of pipe" pollution that can be identified as coming from a single source such as a factory, power plant, or sewage treatment facility. In the Willamette River Basin, the largest individual quantities of point source pollution are discharged by industries. These industries include high-technology metal production, semiconductor and related high-tech industries, paper mills and wood products, shipbuilding and repair and the manufacture of consumer metal products.

Until recently, point source pollution has been the focus of many of the environmental laws that are meant to improve and protect water quality. However, the focus is currently shifting to nonpoint source pollution which is much more ambiguous and difficult to regulate.

Nonpoint Source Pollution comes from dispersed sources making it very difficult to regulate and control. The examples below serve to illustrate only a few of the many types of nonpoint source pollutants that threaten the health of our waterways.

One of the worst forms of nonpoint source pollution is sedimentation caused by erosion from cleared areas. Soil exposed by construction, logging, mining, farming, or any other activity that disturbed the land can wash directly into streams. These particles of silt, clay, and sand sometimes carry with them toxic substances, destroy aquatic vegetation, clog the gills of fish, and inhibit sunlight from penetrating the water.

Storm water runoff from paved surfaces transports oil, grease, and other fluids leaking from cars, de-icing materials, and litter. This nonpoint source pollution flows into storm drains along roads and parking lots and then usually into the nearest stream. People who pour hazardous household materials such as motor oil, paint, and solvents down the drain or into storm drains are also contributing to nonpoint source pollution.

Runoff from lawns, gardens, golf courses, and parks carries pesticides, fertilizers, pet wastes, and other ambient nonpoint source pollutants. Pesticides can kill fish, aquatic insects, plants, and other organisms. Many pesticides are persistent and therefore are concentrated through bioaccumulation.

Pet wastes, livestock pastures, failing septic systems, and leaking sewers frequently contribute to fecal contamination in waterways. This type of contamination poses bacterial and viral health threats to humans as well as contributing to excess nutrients in the water.

Based on the "Watershed Owner's Manual" produced by the Community Watershed Network

Combined Sewer Overflows

What is a Combined Sewer?
When we dispose of household wastewater it travels through sanitary sewers to a sewage treatment plant. In some cities, storm water run-off from house roofs, parking lots, and streets empties into the same sewer system that carries sanitary wastes to sewage treatment plants. This system is referred to as a combined sewer.

If Combined Sewers are a problem, why do we have them?
Sewer systems built before the mid-20th century disposed of their sewage by simply allowing it to be directly discharged into rivers and streams. These sewer lines also carried storm water runoff to the river. But concern for water quality and the public health led cities to build sewage treatment plants whose wastewater was treated before discharge. New sewer lines were constructed to carry wastes to these treatment plants. Diversion dams were built in the old sewer lines to divert sewage into the new system and to prevent sewage from discharging into the river, except during rain storms.

The old river discharge openings, or outfalls, were left in place to act as "relief valves" to prevent sewage from backing up into people's homes during storms. Since combined sewers also carry storm water, rain increases the volume of water in the system, which then overflows the diversion dams allowing raw sewage into the rivers. These overflows are referred to as Combined Sewer Overflows, or CSOs. In some cities this situation was made worse by streams that were permanently diverted into the system during the original construction of the sewer system.

What are the risks associated with the discharge of raw sewage?
Raw sewage can carry a variety of human bacteria and viruses, and depending on exposure and concentration, may cause illness unless certain precautions are taken. In addition, combined sewer overflows contain a variety of chemicals, oils and other wastes. Although sewage overflows are diluted by rain and river water, it still poses health and environmental hazards. Those most likely to be affected by this sewage include water skiers, swimmers, people who fish and other people involved in water contact sports.

The Oregon Department of Environmental Quality (DEQ) has water quality standards that limit how much fecal coliform bacteria may be present in water, particularly if high bacteria counts are the result of known human waste sources. When fecal coliform bacteria are from human sources, such as sewage, there is a particular concern from a human health standpoint.

Why are cities and towns allowed to have Combined Sewers?
In Oregon, DEQ has worked for many years with cities to improve water quality and to eliminate most combined sewer systems. This effort has been successful. In 1980, 31 Oregon communities had combined sewer systems. By 1989, this number had been reduced to only 4: Portland, Astoria, Corvallis and the Tri-City Service District serving Oregon City, Gladstone and West Linn. By 1995, only Portland, Corvallis, and Astoria will still have combined systems.

In 1989, the U.S. Environmental Protection Agency (EPA) adopted a Combined Sewer Overflow
Strategy designed to reduce and eliminate combined sewer overflows nationwide. States were required to develop strategies to reduce pollution from combined sewers and bring dischargers into compliance with the federal Clean Water Act. In the U.S., more than 1,000 cities had combined sewer systems. To comply with this strategy, DEQ redoubled its efforts. When Portland's wastewater discharge permit was renewed, DEQ required the city to correct its combined sewer overflow problem by the year 2011. Corvallis must have its overflow problem corrected by the year 2001, Astoria by 2021, and the Tri-City Service District by 1995.

How expensive is it to prevent Combined Sewer Overflows?
Preventing storm water runoff from entering sewers is an enormous and expensive project. Solutions and their expense depend on what percentage of a city's sewers are combined sewers. In some cases, only a portion of the sewer system is combined, while in other cities the entire sewer system receives stormwater runoff.

The solutions that a city chooses to pursue in order to comply with DEQ requirements depends on a variety of factors unique to the situation. However, any solution is probably going to be expensive and will disrupt the routines of citizens. To pay for major construction, the city may have to raise large amounts of money through the sale of bonds, loans and grants from government agencies, increases in residential sewer bills, and expenditures of general fund money. In some cases, a city may have the added expense of upgrading its sewage treatment plant.

Since sewer lines are often located below city streets, construction will often inconvenience citizens. Yet, even though the project is expensive and is often disruptive, the outcome is cleaner water for all of us to enjoy.

From the Oregon Department of Environmental Quality website.

Toxics
The EPA describes toxic chemicals as those that can cause – or are reasonably anticipated to cause- acute health or significant adverse environmental impacts. *Toxic pollutants* are polluting substances or disease-causing agents that might cause adverse effects or kill aquatic organisms or humans, either directly from the environment or indirectly through the food chain.

In the Willamette toxic pollutants come from many sources, the largest being industrial discharges. Prominent industries include high-technology metal production, semiconductor and related hi-tech industries, paper mills and wood products, shipbuilding and repair and the manufacture of consumer metal products. Many, but not all, of the toxins discharged by industry are regulated and tracked through CWA's TMDL and NPDES permit processes.

These processes do not track or limit the discharge of all toxics and they are criticized for overlooking issues of toxic sediments and bioaccumulation, which are of great concern in the Willamette. Examples of compounds detected in all fish tissue and sediments that exceeded DEQ and EPA criteria for trace elements in the Willamette include **arsenic, copper, selenium, cadmium, lead and mercury**. Human health effects of this toxics are often associated with fish consumption.

Information taken from Willlamette Riverkeeper's State of the Willamette 2000.

Bacteria
Other possible human health impacts are from contact with water contaminated with bacteria. Potential sources of bacteria pollution include leaking or overflowing sewage pipes, leachate from septic systems, stormwater run-off, poultry and livestock operations, illegal dumping and chemical spills.

Possible health effects from swimming in or drinking contaminated waters:

Gastroenteritis:	Inflammation of the stomach and intestines causing intestinal discomfort, diarrhea, and dehydration.
Dysentery:	A severe intestinal infection, causing abdominal pain and diarrhea with blood or mucus.
Hepatitis A:	Inflammation of the liver.
Typhoid Fever:	An acute bacterial infection causing fever, headache, abdominal discomfort, and enlargement of the liver and spleen.
Giardiasis:	An intestinal infection with symptoms including diarrhea, abdominal cramps, nausea, vomiting, weight loss, and fatigue. The disease is more prevalent in children.
E. coli 0157:H7:	An infection causing bloody diarrhea and abdominal cramps.

Based on the "Watershed Owner's Manual" produced by the Community Watershed Network

OBSERVATIONAL MONITORING
Guide to Identifying River Issues

Water Appearance

Muddy water: Erosion of soil in upstream area, possibly from logging, agriculture, development or other clearing activities. Examine upstream areas for development activities with inadequate sediment control practices, streambank modifications, or severely undercut streambanks.
Oil slicks or spills: Indicated by a colored sheen on the surface of the water.
Foam or bubbles: Extensive white foam can indicate the presence of detergents, surfactants, or fertilizer leachate. Scattered patches of cream colored foam are probably natural.
Sewage: Can be indicated by a rotten egg or musky odor. Sewage and other organic pollution are also indicated by "sewage fungus," white cottony masses on the streambed.
Algae: Growth may exceed normal limits due to excessive amount of nutrients entering the water. Sources include fertilizers, pet waste, grass clippings, leaves, etc. Examine upstream areas for sources of nutrients such as sewage, heavily fertilized areas, car washes, livestock areas, or wash water discharges from food processing plants.

Odors

Chlorine smell: This may mean that a sewage treatment plant or chemical industry is over-chlorinating its effluent or that a chlorine spill has occurred. If the smell is strong, leave the area and report the problem.
Ammonia smell: Often indicates the presence of ammonia or an ammonia compound, frequently resulting from a leak in a cooling system. As with chlorine, if the smell is strong, leave the area and report the problem.
Acrid smell: May indicate the presence of industrial or pesticide pollution. Examine upstream areas for industrial or agricultural discharges.

Riverbank Conditions

New or ongoing clearings or development: Be aware of changes in vegetation or usage of the streambank and surrounding areas.
Erosion: Exposed soil or evidence of erosion.
Trash: Piles of trash thrown from above, washed up from river, or left by someone. Large or small debris.

Signs of pollution

Barrels or containers: Empty barrels and containers may contain traces of hazardous materials.
Leaking or overflowing sanitary sewers or manholes: White to gray musky smelling discharges from a joint or a crack in a pipe or a sewer manhole. Sewage may be seen gushing from a manhole top. Gray matty material draped on or deposited near a manhole may indicate past overflows.
Dead, deformed, or diseased fish: Could be natural causes or toxic pollutants. Note any concerns or evidence of toxics or pollution.
Outfalls/pipes: Water outfalls can often be a source of pollution and may be hidden in the bank.

RESOURCES – Guide to Responding to River Issues

The following is a list of public agencies and private organizations involved in the health of the Willamette River. We recommend that you also contact Willamette Riverkeeper if you notice a problem or an issue of concern.

Federal & State Agencies:

Department of Environmental Quality

The Oregon Department of Environmental Quality (DEQ) is a regulatory agency whose job is to protect the quality of Oregon's Environment. DEQ is responsible for protecting and enhancing Oregon's water and air quality, for cleaning up spills and releases of hazardous materials, and for managing the proper disposal of hazardous and solid wastes.

- Portland (503) 229-5696
- Salem (503) 378-8240
- Eugene (541) 686-7838

Environmental Protection Agency, Region 10

EPA leads the nation's environmental science, research, education and assessment efforts. EPA works to develop and enforce regulations that implement environmental laws enacted by Congress. EPA is responsible for researching and setting national standards for a variety of environmental programs, and delegates to states and tribes the responsibility for issuing permits and for monitoring and enforcing compliance. Where national standards are not met, EPA can issue sanctions and take other steps to assist the states and tribes in reaching the desired levels of environmental quality.

- For question on local issues call Oregon Operations Office at : 503-326-3250
- To report suspected violations within the states of Alaska, Idaho, Oregon, and Washington: (206) 553-4973 or (800) 424-4372

Environmental violations can include (but are not limited to):

- Smoke or other emissions from local industrial facilities;
- Improper treatment, storage, or disposal of hazardous wastes;
- Exceedances of pollutant limits at publicly-owned wastewater treatment plants;
- Unpermitted dredging or filling of waters and wetlands;
- Late night dumping

Oregon Emergency Response System

For environmental emergencies call 1-800-452-0311 or (503) 378-OERS (6377)

Examples of environmental emergencies include:

- Oil and chemical spills
- Radiological and biological discharges
- Accidents causing releases of pollutants

Oregon Department of Agriculture

The mission of the Oregon Department of Agriculture is 1) to ensure food safety and provide consumer protection; 2) to protect the natural resource base for present and future generations of farmers and ranchers, and 3) to promote economic development and expand market opportunities for Oregon agricultural products.

The Natural Resources Division's mission is to conserve, protect, and develop natural resources on public and private lands so agriculture will continue to be productive and economically viable in Oregon. Primary program areas include: water quality, confined animal feeding operations, smoke management, land use, soil & water conservation districts, and plant conservation biology.

- Oregon ODA Office (503)986-7700

Oregon Department of Fish and Wildlife

ODFW's mission is to protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations.

- North Willamette Watershed District Office
  (Regional Office in Clackamas) (503) 657-2000
- Salem Field Office (503) 378-6925
- Springfield Field Office (541) 726-3515
- South Willamette Watershed District Office Corvallis(541) 757-4186

Oregon Department of Forestry

ODF's mission is to serve the people of Oregon by protecting, managing, and promoting stewardship of Oregon's forests to enhance environmental, economic, and community sustainability.

- State Office 503-945-7200

Soil and Water Conservation Districts

Soil and Water Conservation Districts provide technical assistance to private land owners and managers. Help land owners develop management plans, control impacts on water quality like erosion.

- Benton: Corvallis (541) 753-7208
- Clackamas County: Oregon City (503) 656-3499
- East Lane: Eugene (541) 465-6436
- East Multnomah: Portland (503) 231-SOIL
- Linn County: Tangent (541) 926-2483
- Marion: Salem (503) 391-9927
- Polk: Dallas (503) 623-9680
- West Multnomah: Portland (503) 238-4775
- Yamhill: McMinnville (503) 472-6403

Local Contacts
Counties & Cities have responsibilities regarding land use codes, permits and enforcement, sewage treatment and drinking water facilities, stormwater outfalls, park management, environmental health, just to name a few. Contacting your local city or county is often the first step in responding to river related issues.

County Contacts:

- Washington County: Clean Water Services (503) 681-3600
- Clackamas County: Water Environment Services (503) 353-4567
- Yamhill County: Environmental Health Services (503) 434-7525
- Marion County: Environmental Services (503) 588-5169
- Polk County: Community Development (503) 623-9237
- Linn County: Environmental Health 1-800-304-7468
- Benton County: Environmental Health (541) 757-6841
- Lane County: Public Works (541) 682-6900

City Contacts:

- Portland:
  Bureau of Environmental Services (503) 823-7740
  - River Alert Hotline (CSO Information) (503)823-2479
  - Spill Response Hotline 503-823-7180
  - Erosion Control Hotline 503-823-0900

  Building Services
  - Erosion Hotline (503) 823-0900
- Milwaukie: Public Works Division (503) 786-7600
- Lake Oswego: Maintenance Services (503) 635-0280
- Gladstone: City Hall (503) 656-5225
- West Linn: Public Works Department (503) 557-4700
- Oregon City: General Information (503) 657-0891
- Wilsonville: Environmental Services (503) 570-1544
- Newberg: The Community Development Department (503) 537-1240
- Keizer: General Information (503) 393-9437
- Salem: Environmental Services
  - Office (503) 588-6063
  - 24 hour Hotline (503) 588-6333
- Independence: City Administration (503) 838-1212
- Albany: Public Works Department (541) 917-7600
- Corvallis: Public Works Department (541) 766-6916
- Eugene: Public Works
  - Maintenance Division & Spill Hotline (541) 682-4800
  - Wastewater Division (541) 682-8600
  - Parks & Open Spaces (541) 682-4800
- Springfield: Public Works (541) 726-3753

Glossary of Commonly Used Terms

303(d) List: Bodies of water that do not meet the state's water quality standards. Most of the Willamette River and many of its tributaries are on Oregon's current 303(d) list.

Best Management Practices: Methods adopted by resource users designed to mitigate harm to the environment that might result from their activities.

Buffer zone: Land adjacent to a sensitive area that separates it from surrounding land uses that may cause degradation.

Combined Sewer: A sewer system that carries both sewage and stormwater runoff. Normally, its entire flow goes to a wastewater treatment plant, but during a heavy storm, the volume of water may be so great as to cause overflows of untreated wastewater and sewage into receiving water bodies (known as a combined sewer overflow or CSO).

Culvert: A closed passageway under roads and embankments which drains surface water.

Dioxin: Dioxin is formed as an unintentional by-product of many industrial processes involving chlorine such as waste incineration, chemical and pesticide manufacturing and pulp and paper bleaching. Dioxin was the primary toxic component of Agent Orange, was found at Love Canal in Niagara Falls, NY and was the basis for evacuations at Times Beach, MO and Seveso Italy.

Discharge: An outflow of water from a stream, pipe, groundwater system, or watershed.

Dissolved oxygen: Oxygen gas that has been dissolved in water. Dissolved oxygen decreases as temperature increases, thereby threatening aquatic life that depends on it.

Drawdown: The lowering of the water table as water is removed from an aquifer.

Dredging: Removal of sediment from the bottom of water bodies; can be disruptive to ecosystems and cause silting that can kill or harm aquatic life; can expose or disrupt contaminants.

Easement: A legal document that makes it possible to give, sell, or take certain land and/or water rights without transfer of title.

Effluent: Waste water, treated or untreated, that flows out of treatment plant, sewer, or industrial outfall.

Erosion: The wearing down and washing away of soil and land by the action of water, wind, and ice.

Eutrophication: Naturally occurring process by which organic matter and sediments accumulate to fill in a water body and cause oxygen deficient conditions; greatly

accelerated by high levels of organic matter from pollutants containing nitrates and phosphates.

Fish Kill: Sudden death of fish due to pollutants or low levels of dissolved oxygen.

Floodplain: Any normally dry land that is susceptible to being inundated by water from a natural source; usually associated with lowland areas close to streams and lakes.

Ground water: Water found in spaces between soil particles underground; stored in underground aquifers.

Hazardous waste: Solid, liquid, or gaseous wastes that can be harmful to humans, wildlife, and the environment.

Headwaters: The source of a stream or river.

Leachate: The solution formed when water percolates downward picking up soluble constituents from soil, landfills, etc.

Leaching: The process where materials in the soil are washed into lower layers of soil or are dissolved and carried away by water.

Native species: Species that live and thrive in a particular ecosystem without having been introduced by humans.

Non-native species: Any organism (plant or animal) that is not native to the area in which it occurs.

Non-point source pollution: Widespread overland runoff containing pollutants where the contamination does not originate from one specific location. Examples include agricultural run-off, erosion from clearings or developments, stormwater runoff from streets and other impervious surfaces.

pH: A classification of acid or base materials on a scale of 0 to 14, with 7 representing neutral. Numbers less than 7 indicate increasing acidity; numbers greater than 7 indicate increasing alkalinity (base).

Point source pollution: End of pipe pollution that can be traced back to a specific source.

Recharge: Re-supply of water to an aquifer.

Riparian: Land area directly influenced by a body of water.

Riprap: Large rocks placed along the bank of a waterway to prevent erosion.

Runoff: Precipitation that flows overland instead of being absorbed into the ground and eventually flows into surface streams, rivers, and lakes.

Sediment: Soil, sand and minerals washed from land into water, usually after rain; can accumulate in reservoirs, rivers and harbors destroying fish and wildlife habitat, and clouding the water so that sunlight cannot reach acquit plants; careless farming, mining

and building activities will expose sediment materials, allowing them to wash off the land after rainfall.

Storm Drain: Constructed opening in a road system through which runoff from the road surface flows into an underground sewer system.

Surface Water: Water above the surface of the land, including lakes, rivers, streams, wetlands, flood water, and runoff.

Thermal Pollution: Varying temperatures above or below the normal conditions.

Total Maximum Daily Load (TMDL): All states must set the amount of waste or degradation allowed to be discharged into or imposed on bodies of water on its 303(d) list. A TMDL for each pollutant (chemical, biological, physical or other) must be determined for each water body on the 303(d) list.

Toxics: Pollutants that kill or injure organisms through chemical, physical or biological action. Examples include pesticides, heavy metals, dioxin and others.

Tributaries: Streams that carry water to other bodies of water.

Turbidity: The presence of suspended solids in water, the cloudy condition caused by suspended solids in a liquid.

Undercutting: A type of erosion which occurs when fine soils are swept away by the action of the stream, especially around curves causing an unstable overhanging bank.

Upstream: Toward the source or upper part of a stream, against the current. With regard to water rights, refers to water uses or locations that affect water quality of quantity of downstream water uses or locations.

Water right: A legal right to use a specified amount of water for beneficial purposes.

Water table: The top of an unconfined aquifer; indicates the level below which soil and rock are saturated with water.

Watershed: The land area from which surface runoff drains into a stream channel, lake, reservoir, or other body of water; also called a drainage basin.

Watershed Council: A voluntary local organization designated by a local government group and convened by a county governing body to address the goal of sustaining natural resource and watershed protection and enhancement.

Waters of the State: Includes every natural or artificial watercourse, stream, river, wetland, pond, lake, coastal, ground, or surface water wholly or partially in the state that is not entirely confined and retained on the property of a single land owner.

Wetlands: Lands where water saturation is the dominant factor determining the nature of soil development and the types of plant and animal communities. Other common names are sloughs, ponds and marshes.