



Water Quality Issues in Snohomish County



Snohomish County Public Works
SURFACE WATER MANAGEMENT DIVISION

August 10, 2001

Summary

- The waters of Snohomish County are not yet severely degraded, but consistently fail to meet state and federal water quality standards
- The principal water quality challenge is controlling the nonpoint source pollution that results from dispersed urban and rural land uses and increasing population
- South County watersheds are affected by the high degree of urban development and the resulting water-quality impacts, which include high stormwater flows, low summer flows, and pollutants
- In the Snohomish watershed, rapid residential and commercial development are leading to local flooding, low baseflows, and increasing pollutants
- Water quality issues in the Stillaguamish watershed include elevated levels of bacteria and nutrients from agriculture, and erosion and sedimentation related to logging
- Lakes in the County are threatened by increasing development, which results in increased phosphorus and other nutrients, creating growth of undesirable plants and algae and reduced water clarity

Surface Water Management Priorities

- Surface Water Management's (SWM) fundamental water quality goal is for the County's streams and lakes to be "fishable and swimmable." To this end our priorities are to decrease pollutants related to human activities, to reduce water quality problems related to flooding, to increase stream base flows, to lower water temperatures, and to increase dissolved oxygen.
- SWM program efforts focus on public education; watershed planning and capital projects, including stream bank restoration and drainage improvements; monitoring; pollution investigations; regulatory support; and technical assistance to businesses.

Challenges

Protecting the County's streams and lakes from pollution resulting from rapid growth and extensive agricultural uses in our floodplains is a major challenge. A primary limitation on program effectiveness is a lack of resources. This is evident in several key areas:

- An outreach program that reaches only a small percentage of County residents and businesses
- Enforcement challenges
- Inadequate maintenance of detention facilities and bioswales

Current Water Quality Conditions

Historical and General Current Conditions

Snohomish County is rich in its network of natural streams, wetlands, lakes, and rivers. In general, these waters have not yet become severely degraded. However, with few exceptions the surface waters of Snohomish County consistently fail to meet water quality standards established by the State of Washington. At least 37 rivers, streams, and lakes in the County do not meet the goals of the federal Clean Water Act, which state that our waters should support fish and be healthy for swimming. Rivers, lakes, and streams in the County have widespread violations of water quality standards, and roadside ditches that carry stormwater runoff contain a range of pollutants. Parts of Port Susan and Possession Sound have serious water quality problems, and shellfish harvesting in Port Susan has been restricted. Many lakes in the County have problems such as excessive plant growth and some lakes violate water quality standards.

Pollution in stormwater runoff impairs the health of fish and other aquatic life that depend on clean water for survival. Stormwater pollution can also restrict use and enjoyment of lakes and beaches and can contribute to groundwater pollution, directly affecting drinking water. Stormwater pollution is evaluated in terms of nutrients (nitrogen, phosphorus), sediment, temperature (specifically, high temperatures), dissolved oxygen, petroleum products, and heavy metals (such as copper and lead). Low and high flows are also evaluated for their impact on aquatic habitat and groundwater.

In Snohomish County the main pollution problems are bacteria, high temperatures, and low dissolved oxygen. The principal sources of these pollutants are agricultural activities, residential and urban development, and forest practices. Sources of bacteria in surface waters are failing septic systems, improperly managed livestock waste, and pet waste. Bacteria in streams indicate the presence of disease-causing organisms. High water temperatures occur in areas where trees have been removed or urban growth has encroached on stream buffers, taking away shade. Low dissolved oxygen results from the input of organic waste, such as manure, and/or high temperatures.

Fish and invertebrates living in streams are threatened when water temperatures become very warm or when levels of



dissolved oxygen drop. In addition, periodic flushes of sediment and road runoff impact our streams during stormwater runoff from urban areas and new development. Sediment can smother fish eggs in stream gravel and can affect fish feeding and growth. Metals found in road runoff can be directly toxic to both humans and aquatic life. Exposure of salmon to polluted waters seldom kills them outright. However, studies have shown that exposure to polluted water reduces their ability to adapt to saltwater, lowers disease immunity, and lowers overall survival rates.

Since the 1960s substantial progress has been made toward controlling point source pollution from sewage treatment plants, pulp mills, and large industrial facilities. However, pollution from dispersed urban and rural land uses, known as nonpoint source pollution, continues to have significant cumulative impacts on the quality of water resources. Continued growth is expected to increase these impacts. Therefore, control of nonpoint source pollution from urban runoff, septic systems, fertilizers and pesticides, and agricultural runoff is a major challenge in Snohomish County and Puget Sound.

General Water Quality Trends

Beginning in the late 1980s, the County's Surface Water Management Division has monitored the health of numerous Snohomish County streams and lakes. Most of the data collected are chemical and physical parameters such as temperature or concentrations of copper. In the last several years biological monitoring, which evaluates the conditions of stream organisms (invertebrates), has also been performed in a number of streams. Together, these parameters give us a better understanding of the quality of our water, the impact of pollution on the streams and lakes, and what we can expect for the future.

Most streams and rivers are not meeting state water quality standards. Much of the damage was done prior to the early 1990s, as monitoring data for chemical parameters show no major deterioration in the quality of our waters since that time. Lead concentrations have declined in streams of the more urbanized watersheds, probably as a result of the use of unleaded fuels. Results of biological monitoring from 1997 to 2000 indicate that the aquatic life in our lowland streams and rivers is in fair or poor condition.

Snohomish County's population has grown by 25 percent since 1990. Urban and rural land uses are increasing, creating many pollutants. Surface Water Management's water quality investigations show problems that follow patterns of population and land use. Copper, lead, zinc, cadmium, and mercury have been found in streams in urban, commercial, and industrial areas. High levels of fecal coliform bacteria are a problem in many

streams; these bacteria can come from failing septic systems, manure, and pet waste. Many streams and lakes show high nutrient levels, originating in fertilizers, detergents, septic systems, and manure. High sediment loads from development, tree harvesting, and erosion are a problem in many County streams and rivers. Low dissolved oxygen levels and high temperatures, which are often related, are also problems.

Information on long-term water quality trends is limited, but rapid changes in land use patterns continue to pose challenges for maintaining water quality. Between 1992 and 1994, Surface Water Management initiated monitoring programs in many County watersheds. We are learning more about the current condition of our streams, but six to eight years of data are insufficient for most long-term trend analyses. One important trend that is widely observed but not well-quantified is the apparent reduction in summer baseflows in streams. Reduced stream flows in summer can create higher water temperatures and reduced dissolved oxygen, which are problems for fish.

Watershed-Specific Issues

Stillaguamish Watershed



The upper Stillaguamish watershed is characterized by low-density residential land use and small, non-commercial farms, with extensive tree harvesting occurring in the upper reaches and along some tributaries. The Stillaguamish floodplain, west of Arlington, is characterized by traditional agriculture with increasing pressures for higher-density rural development. Commercial agriculture, mainly dairy farms and croplands, occurs along the mainstem Stillaguamish and Portage Creek. Small, non-commercial farms with horses or cattle are common along the tributaries.

Bacteria and nutrients are major problems in the Stillaguamish watershed. These pollutants are probably contributed primarily by numerous commercial and small non-commercial farms as well as by septic system failures. Erosion and sedimentation are significant problems in this watershed, and are caused by clearing for tree harvesting, slides, unstable soils, and bank erosion from livestock. Residential and commercial development in the Stillaguamish watershed is less extensive than in most of the County. This is reflected in the lower number of local flooding problems and lower concentrations of typical urban runoff pollutants such as toxic metals.

Several water quality trends have been measured in the Stillaguamish watershed. Baseline monitoring in the Stillaguamish mainstem and tributaries has shown an increase in conductivity from 1994 to 1999. Conductivity is an indicator



of contaminants in streams from road runoff. This increase is likely a result of increased population in the watershed and the resulting increase in traffic on roads.

Fecal coliform bacteria data, which have been collected by several agencies in the Stillaguamish, show several important trends. The Department of Ecology found reductions in bacteria concentrations in both the North and South Forks since 1977, as well as a significant decrease in bacteria and ammonia in the lower mainstem. The decreases in the mainstem may be a result of recent upgrades at the Arlington Sewage Treatment Plant. Surface Water Management data also show an overall decrease in bacteria and an increase in dissolved oxygen at all sites in the lower watershed since 1994. However, monitoring data indicate that temperature, bacteria, nutrient, and sediment concentrations increase going downstream from the upper mainstem at Arlington to the lower mainstem at Marine Drive. In addition, bacteria concentrations still violate state standards on both the mainstem Stillaguamish and many of the tributaries. Although overall bacteria levels in the Stillaguamish are declining, continuing improvements are necessary to meet state standards in both the mainstem and the tributaries.

Glade Bekken, a small watershed in the Stillaguamish, where Surface Water Management has monitored intensively for several years, shows decreased bacteria levels since 1994. This decrease may be a response to the numerous best management practices implemented on small farms in the watershed as part of a pilot watershed restoration project. However, sediment levels show only a slight decrease and nitrate concentrations have not changed. The results in Glade Bekken show that improvements in water quality require a long-term commitment from both agencies and citizens working together.

Solutions to water quality problems in the Stillaguamish watershed include implementing livestock management programs to reduce sediment, bacteria, and nutrients, and repairing failing septic systems to reduce bacteria and nutrient levels. Revegetating riparian areas will reduce erosion, lower stream temperatures, and increase dissolved oxygen. Continued work in federal, state, and private forestlands to stabilize old logging roads will prevent erosion and landslides.

Snohomish Watershed



The Snohomish watershed includes three major rivers: the Skykomish, the Snoqualmie, and the Snohomish. This watershed is primarily rural or suburban in nature and contains land zoned for forestry, residential and commercial development, and agriculture. Agricultural land in the watershed is located mainly along the lower mainstem of the Snohomish and Snoqualmie and

their tributaries, with small non-commercial farms scattered throughout the residential areas. This watershed is experiencing rapid residential and commercial development. Consequently, stream problems include localized flooding, low summer flows, erosion, and sedimentation. High water temperatures, low dissolved oxygen, bacteria, and nutrients are also significant problems. Toxic contaminants such as metals are found in runoff from roads and commercial areas.

Washington Department of Ecology (DOE) is developing Water Cleanup Plans for the mainstem Snohomish River and its tributaries. Several wastewater treatment plants in the mainstem Snohomish River influence water quality. These plants are regulated by DOE discharge permits, as well as by nonpoint pollution along the mainstem and the tributaries. Quilceda Creek, Allen Creek, French Creek, and the Marshland tributaries are all impacted by runoff from agricultural land uses, as well as the typical urban pollutants. Pilchuck River and Woods Creek show impacts from forestry and hobby farms, primarily high sediment and nutrient loads.

Solutions to water quality problems in the Snohomish watershed include implementing livestock management programs to reduce sediment, bacteria, and nutrients, repairing failing septic systems, and properly disposing of pet waste. Revegetating riparian areas reduces erosion, lowers stream temperatures, and increases dissolved oxygen. Assessing and rehabilitating detention ponds and increasing storm sewer maintenance can reduce problems resulting from increased stormwater runoff. Public outreach programs are essential because of rapid residential growth and the potential impacts related to that growth.

South County Watersheds



The South County watersheds, including the Lake Washington/Sammamish and Puget Sound tributaries are the most densely developed areas in the County, and much of the development occurred before stormwater detention or water quality improvements were required. Consequently, water quality is generally poor, especially in Swamp and North creeks. High stormwater flows create extensive problems of erosion and sedimentation, and pollution from stormwater runoff flows directly into waterways. Conversely, low summer flows cause high temperatures and low dissolved oxygen. Concentrations of toxic metals and fecal coliform bacteria in the streams often exceed state water quality standards, and petroleum and detergents have been found in South County streams.

Concentrations of metals in Swamp Creek are some of the highest in the County. Problems in North and Swamps creeks include high levels of bacteria, copper, lead, and zinc (known



collectively as “heavy metals”) and low levels of dissolved oxygen. The Puget Sound tributaries consist primarily of residential development with bacteria, sediment, copper, lead, and zinc as the main water quality problems. All of these pollutants are typically found in runoff from the extensive impervious surfaces that come with urbanization. Alternatively, Little Bear Creek shows less impact from road runoff, likely due to less dense development, but levels of bacteria and nitrate indicate runoff from hobby farms or failing septic systems are polluting the waters.

Solutions to water quality problems in the South County watersheds include assessing and rehabilitating detention ponds and increasing storm sewer maintenance. Pollutants can be eliminated by identifying and removing illicit sewage discharges to storm sewers. Bacteria can also be reduced by proper disposal of pet wastes. Revegetation of sensitive areas and riparian corridors can reduce erosion, lower stream temperatures, and increase dissolved oxygen. Because many of the problems are related to residential growth and individual actions, public education and outreach are essential.

Snohomish County Lakes

There are about 60 lakes located in the populated portions of Snohomish County. These lakes are a valuable resource for the people of the County. However, the health of some lakes is threatened by nearby human activities, including lawn care, pet waste, and increasing development. Septic systems, fertilizers, detergents, animal waste, and soil erosion are sources of phosphorus, which is the main nutrient responsible for undesirable plant and algal growth. When these activities contribute too much phosphorus to a lake, the result can be nuisance algal blooms, reduced water clarity, too many aquatic plants, and low dissolved oxygen. In extreme cases, there are visual and odor problems that limit the use of a lake.

Many lakes in the County show signs of phosphorus enrichment and undesirable plant and algae growth, leading to reduced water clarity and low levels of dissolved oxygen, which is detrimental to both human enjoyment and aquatic life. As these lakes become more urbanized, there will be additional sources of nutrients. Unless steps are taken to control nonpoint source pollution from increasing development in lake watersheds, the water quality of many lakes is likely to continue to degrade. The costs of restoring a lake once the water quality has been degraded can be very high; the restoration costs at Lake Stevens, for example, have been greater than \$2 million.

County Response

Surface Water Management Program Priorities

Surface Water Management’s fundamental water quality goal is for all water bodies in the County to be “fishable and swimmable.” To this end our priorities are to decrease pollutants related to human activities, to reduce water quality problems related to flooding, to increase stream base flows, to lower water temperatures, and to increase dissolved oxygen.

Surface Water Management program efforts focus on public education, watershed planning and capital projects, which include stream bank restoration and drainage improvements; monitoring; pollution investigations; regulatory support; and technical assistance to businesses.

Areas of Existing Program Emphasis

Since 1995, Snohomish County has operated under a National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit, issued by the Washington Department of Ecology (DOE), as part of the federal Clean Water Act. The County’s NPDES permit requires specific regulations, programs, and projects that reduce pollution in stormwater. Most of Surface Water’s programs related to water quality, as discussed below, fall under the auspices of the NPDES permit.

Strategic Planning

Surface Water Management has developed a number of watershed plans to provide clear direction for enhancing water quality and habitat as well as minimizing flood and erosion damage. These plans provide recommendations that can be used to implement Water Cleanup Plans developed by the Department of Ecology to improve the water quality of our streams and rivers.

Surface Water Management also develops water quality plans and actions for specific sub-basins. Surface Water Management recently completed implementation of the Glade Bekken water quality plan, which included working with landowners to reduce water pollution and constructing projects to stabilize stream banks and reduce erosion. Surface Water Management is also developing a water quality assessment and implementation plan for Little Bear Creek.

Capital

Many capital improvement projects provide direct water quality benefits. Surface Water Management retrofits stormwater detention facilities to more effectively filter pollutants and



incorporates biofiltration swales into larger projects to produce cleaner runoff. Bank stabilization and stream restoration projects reduce the amount of sediment in streams and rivers and maintain cool water temperatures. Wetland restoration projects increase the capacity of a watershed to provide a buffer for stormwater runoff. Phosphorus in Lake Stevens, which causes algal blooms, has decreased since the installation of an aeration system.

Maintenance of stormwater detention facilities improves water quality by removing pollutants from the system and reducing downstream erosion by ensuring that stormwater flows are moderated. Maintenance of other construction projects ensure that facilities function properly and that plantings thrive.

Surface Water Management has also developed a Master Drainage Planning program to inventory constructed and natural drainage systems, assess surface water problems, and develop site-specific and regional surface water opportunities to reduce flooding, improve water quality, and preserve aquatic habitat. The current program, the Drainage Needs Report (DNR) addresses surface water issues in the County's Urban Growth Areas, with a focus on the highly urbanized watersheds, such as Swamp, North, and Quilceda creeks.

Outreach

Surface Water Management provides several public education and outreach services that are directed at maintaining and improving water quality. Surface Water Management staff provide classes to citizens about water quality, train citizens to be Watershed Keepers and Native Plant Stewards, and provide instruction and hands-on experiences to youth and teachers on watershed issues. Watershed stewards for the Stillaguamish, Snohomish, and South County watersheds work directly with local residents and businesses to improve water quality and fish habitat. The countywide lake management program provides citizens with resources to implement lake protection and restoration processes on their own.

The County assists citizens' groups that have special interests in watersheds. Examples include training citizens to monitor bacteria and stream flows in the Quilceda/Allen watershed and to evaluate sources of pollution and identify restoration projects in Cemetery Creek. Surface Water Management has also begun a monitoring and restoration project in the Little Bear Creek watershed in cooperation with citizens' groups and the City of Woodinville.

Surface Water Management contracts with the Snohomish Conservation District for water quality outreach to the agricultural community. This outreach effort focuses on educational

programs and resources and working directly with farm owners to implement best management practices.

Surface Water Management staff also work on public education ventures with other entities such as the Stilly-Snohomish Fisheries Enhancement Task Force, the Adopt-a-Stream Foundation, the Snohomish Conservation District, Cooperative Extension and the Snohomish Health District.

Monitoring/Regulatory Compliance

Surface Water Management monitors the health of numerous County streams and lakes. Each year staff measure physical and chemical data in 17 streams and rivers, and measure biological parameters in 20 to 40 streams. Staff and volunteers monitor conditions in approximately 27 lakes per year, and staff conduct 25 detailed lake studies annually. All of these data, combined with the results of stream channel and habitat surveys, are used to characterize the health of the watersheds, identify water quality trends, and develop a strategy for reducing pollution. Staff also monitor a selection of capital improvement projects yearly, to ensure that the newly constructed facilities work as designed and do not cause additional water quality problems. If problems arise, the data are used to modify the projects so that they function better and protect water quality.

Surface Water Management also helps citizens and business owners reduce pollution and comply with water quality regulations. Staff systematically investigate commercial areas that have a high potential for stormwater pollution sources and provide technical assistance to business owners to help them address water quality problems. Staff also investigate water pollution complaints, provide technical assistance to those causing problems, and work with other agencies if problems are not resolved. Evidence of violation of the County's water pollution control ordinance is transmitted to Planning and Development Services Code Enforcement Section in the event of significant problems or unwilling responsible parties.

Surface Water Management provides regulatory support and oversight for several important issues. Surface Water is responsible for administrative oversight of activities required by the County's NPDES municipal stormwater permit, issued under the federal Clean Water Act. Several County departments, including Public Works, Planning and Development Services, Airport, and the Prosecuting Attorney's Office, have significant levels of required actions under this permit. Surface Water Management coordinates compliance and resolves issues related to the permit. Surface Water Management staff play key roles in revising or developing water quality-related ordinances, such as the County's drainage and grading codes and the water pollution control ordinance.



Challenges and Opportunities

Protecting the County's streams and lakes from pollution resulting from rapid growth and extensive agricultural uses in our floodplains is a major challenge. A primary limitation on program effectiveness is a lack of resources. This is evident in several key areas:

- An outreach program that reaches only a small percentage of County residents and businesses
- Enforcement challenges
- Inadequate maintenance of detention facilities and bioswales

Additional opportunities for substantially improving water quality in the County's lakes and streams include the following:

Monitoring for Adaptive Management

The current monitoring program is designed to capture trends. However, there is an ongoing need to monitor facilities as they are constructed to gauge effectiveness and to provide a basis for or improvements in design and construction.

NPDES Water Quality Management Plans

The County's NPDES permit, to be issued in late 2001, will include a requirement to complete water quality management plans, implement them and monitor success. While the County's Drainage Needs Report will partly address this requirement, they are unlikely to fully identify the range of facilities and actions necessary to comply with the permit.

Facility Retrofits

Hundreds of detention facilities and hundreds of miles of ditches have the potential to provide water quality treatment with some modest adjustments. On average five detention facilities are currently retrofitted for this purpose each year. Through the completion of the inventory of stormwater facilities in the UGA, the County will be in position to provide a systematic analysis of the ditch network as a system for treating stormwater.

Riparian Land Acquisition

Preservation of remaining riparian corridors and restoration of previously damaged portions of the corridor allow streams to better accommodate land development impacts. The County currently invests about \$500,000 per year in ESA-related acquisitions. (This investment is leveraged through grants.) Currently over \$7 million in highest priority properties have

been identified through this program, most of the land containing chinook habitat in the Snohomish and Stillaguamish River systems. Through the DNR program, more (but not all) sites will be identified and prioritized both for preservation and potential mitigation. The latter affords the opportunity to partner with both public works and private projects requiring mitigation sites for project completion.

Dairy Waste Management

There is growing interest in the development of methane generation plants that use manure generated at dairies to produce energy and a cleaner final product for use as fertilizer or compost. The Solid Waste division is currently leading an initial investigation of the viability of this technology, with both Surface Water Management and Planning and Development Services as partners.

Livestock Management

The Snohomish Conservation District is able to work with dozens of farms each year and sees an increasingly positive record of best management practice implementation. The Cooperative Extension also provides education to the farming community. However, the demand for livestock management and education is high, while the subsequent implementation of site improvements is not yet at a level that will result in overall water quality improvements.

Stormwater Peak Flow and Volume Management

Erosion of ditches and streams is related to the maximum storm flows (peak flow) and the total amount of storm flows (volume). Related to this is the management of new and existing sites to reduce the amount of runoff (e.g., reduced imperviousness and use of infiltration where possible). Even with changed standards, it may be necessary to invest in significant infrastructure to reduce the stream impacts of stormwater and the water quality impacts of sediment from erosion.

In spite of these challenges, local governments in the Puget Sound region, including Snohomish County, have a national reputation for being on the forefront of water resource management and protection. This reputation is due mainly to several key factors. First, we have stated that we know the health of our water resources is linked to our economic, social, and biological well-being. Second, we have been willing to implement significant controls and programs before the resources are completely degraded. Third, and perhaps most important, we have demonstrated a willingness to try innovative solutions.