

# Environmental Management of the Puget Sound

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Puget Sound is an extraordinary natural resource. Its deep waterways support international commerce, abundant commercial and recreational fisheries, and varied wildlife habitats. The region's residents enjoy boating, beachcombing, and other activities on the Sound's waters and shorelines.

Puget Sound shows a characteristic estuarine circulation pattern: fresh water is lighter than saltwater and tends to flow seaward on top of the saltwater; the saltwater in the lower layers tends to flow landward. The Sound's shallow sills--along with inlets, channels, and other local conditions--disrupt this general pattern. Strong mixing caused by the Sound's strong tides occurs at the sills, recirculating some of the outflowing surface water.

In the pattern of other waterways, the Sound is showing early symptoms of poor management. Factories and military bases, ships and sewage treatment plants, farms, forest practices, and the three million residents of the region all contribute to the growing amount of waste entering the waters of Puget Sound. A steadily increasing population in the region has led to expanding urbanization and development of many shoreline areas. Even the region's rural areas are experiencing unprecedented changes and increased development.

The Sound's urban bays show evidence of contamination from toxic chemicals: sediments forming toxic "hot spots," liver tumors in bottomfish, and contamination of the sea-surface microlayer. Increasing bacterial pollution throughout the Sound has forced closure of many commercial and recreational shellfish harvest areas, and shoreline development has eliminated more than half of the Sound's natural wetlands.

By the year 2010 it is estimated that population in the Puget Sound region will be almost 4.4 million people. This represents an increase of 1.2 million people, nearly 40 per cent more than the current number. The new population flooding into the region during the next 20 years will be more than the combined 1989 populations of the state's 10 largest cities: Seattle, Spokane, Tacoma, Bellevue, Everett, Federal Way, Yakima, Bellingham, Vancouver, and Renton. As this growth occurs, water quality problems associated with development, such as waste disposal, sewage, nonpoint source (surface runoff) pollution, and stormwater, will continue to mount. Success in protecting the Sound will require a costly, long-term, dedicated effort.

Historically, water quality management in the United States has been carried out by various levels of government through a series of separate, but often overlapping, programs. In many cases, this has resulted in a continuing decline in water quality, even though some programs regulate pollution from certain sources very strictly. Recently, emphasis has shifted from the permit by permit, source by source approach, to the implementation of overall water quality management plans for estuarine bodies of water. This paper describes one such management plan currently in operation.

In the past, water quality related programs have focused on the two main origins of water pollution: point sources and nonpoint sources. Point sources are those which discharge pollutants from specific points such as outfall pipes of sewage treatment plants and factories. Nonpoint sources, on the other hand, cannot be located with such precision. Runoff from city streets, construction sites, farms and mines are examples. The centerpiece of the United States' effort to improve water quality is the Federal Clean Water Act. This law requires the Environmental Protection Agency (EPA) and the states to focus

on technology-based controls (based on the results achieved by actual industry practices in limiting the amount of pollutants in their effluent) to limit pollutants discharged into bodies of water.

In addition to the Clean Water Act, there are numerous other programs designed to protect water quality. In Puget Sound, for example, it has been estimated that there are more than 450 public bodies that have responsibility for some aspect of the Sound's water quality.

The existing regulatory system has had both successes and failures. For example, some 90,000 dischargers in the United States are under permit. Over 5,000 wastewater treatment plants have been built. Over \$200 billion U.S. has been invested in water pollution control efforts.

However, in the past decade concerns have arisen about the health of the major estuaries of the United States. Studies revealed abnormalities such as liver lesions in bottom fish and other organisms, a degradation of benthic communities, chemically contaminated tissues in certain seafoods, bacterial contamination of shellfish, excessive algae blooms, fish kills, overall declining fish stocks and sporadic reproductive failures in certain marine mammals.

As a result of these findings, activities were undertaken on both a federal and state level to reevaluate existing environmental programs. This reevaluation concluded that many existing programs were not being effectively implemented, that local government could most effectively deal with nonpoint pollution, that water quality protection was discretionary with regard to many governmental decisions, that existing programs did not effectively coordinate with each other, and that the recommended course of action was to coordinate existing programs into a single overall water quality management plan for a given estuary.

In 1987, Congress implemented this recommendation as a part of amendments to the Clean Water Act. Under this program, federal support is available for development of a comprehensive management plan for a designated estuary. The plan is developed by a "management conference" made up of EPA and representatives of the affected state(s), interested federal agencies, local governments having jurisdiction over any land or water within the estuary, and affected industries, public and private educational institutions, and the general public. The management plan itself is to recommend priority corrective actions and compliance schedules addressing both point and nonpoint sources of pollution, and to coordinate implementation of the plan by state, federal and local governments.

With regard to Puget Sound, the national estuary program has been implemented through establishment of the Puget Sound Water Quality Authority. The Authority, composed of 11 members appointed by the Governor, adopts the management plan. EPA provides funding, carries out technical studies, and leads implementation by federal agencies. The Department of Ecology is the lead state agency for most of the plan programs.

The Puget Sound Water Quality Management Plan has 13 programs: municipal and industrial discharges, contaminated sediments and dredging, oil spill prevention and response, stormwater and combined sewer overflows, nonpoint source pollution control, shellfish protection, wetlands protection, laboratory support, household hazardous waste, monitoring, research, education and public involvement, and legal and personnel support. The Plan is designed to address comprehensively pollution from all sources and require all sources to share responsibility for improving water quality.

For each of the 13 action programs, the Plan sets forth specific action elements specifying the task to be accomplished, the agency responsible for implementation, a deadline for implementation, and a budget. The Authority then monitors implementation and consults with implementing agencies if problems arise.

The goal of the municipal and industrial discharge program, for example, is to improve control of toxic and other pollutants discharged by industrial and municipal discharges, eventually eliminating any harm that the discharge may be causing. The strategy for achieving this goal is (1) to require that discharge permits include appropriate monitoring requirements and limits on toxicants and other pollutants of

concern; and (2) to devote more resources to inspection and enforcement of waste discharge permits. Actual plan elements include such requirements as: state adoption and use of EPA numerical water quality criteria; development of sediment quality standards; development of criteria for setting dilution zones for wastewater discharges; establishment of a permit fee system; requirements for toxicant effluent limits in permits; and expanded monitoring requirements to include sediment, particulate fraction, bioassays, biota surveys and water quality monitoring.

The goal of the contaminated sediments and dredging program is to reduce and ultimately eliminate adverse effects from sediment contamination by reducing the source of contaminants and by capping, treating or removing the contaminated sediment. The strategy for achieving the goal is (1) to classify sediments that cause adverse biological effects; (2) to control the ongoing sources of contamination; (3) to provide rules and sites for disposal of dredged material; and (4) to provide for cleanup actions for existing contaminated sediment. Plan elements include: participation in the U.S. Army Corps of Engineers effort to site and develop rules for use of unconfined open water disposal sites; development of standards for reuse or disposal of dredged materials; development of guidelines for sediment cleanup decisions; and inventory and cleanup of contaminated sediments.

The oil spill prevention and response program is designed to enhance spill prevention and response capability and to ensure that spill response and prevention actions are coordinated among all levels of government. The strategy includes analyzing existing plans and upgrading them as necessary. Plan elements include: conducting a detailed oil spill response policy analysis; revisiting the existing state contingency plan for spills of oil and hazardous substances; formation of an interagency committee to coordinate contingency planning; and increased enforcement of requirements that facilities have updated spill prevention and response plans.

The stormwater and combined sewer overflow (CSO) program is to reduce pollution from these two sources by (1) developing stormwater programs in urbanized areas in a phased program starting with the largest cities; (2) requiring all cities and counties to develop operation and maintenance programs, adopt ordinances for new development and develop stormwater education programs; and (3) requiring all cities with CSOs to develop and implement plans providing for the greatest reasonable reduction of CSO events. Major plan elements include: counties and cities are to adopt comprehensive stormwater management plans; the state Department of Ecology is to develop rules, guidelines, manuals and model ordinances to assist the cities and counties; and each city or sewer jurisdiction with CSOs is to prepare a CSO reduction plan.

The nonpoint source pollution control program is one of the most ambitious in the plan. The goal of the program is to eliminate harm from nonpoint sources of pollution including pathogens, toxic contaminants, and sediment. The strategy for achieving this goal is (1) to target state and local resources on priority watersheds through a cooperative local watershed planning process; (2) to supplement the watershed plans with education and preventative programs; and (3) to develop or enhance state programs or regulations for those sources that are most effectively controlled at the state level. This program requires the development of watershed action plans in each of the 12 Puget Sound counties. In each county a watershed ranking committee has identified and ranked all watersheds in the county in order of need for corrective action. Now, each watershed management committee starts with the top-ranked watershed and prepares an action plan. Action plans must address all sources of pollution including agricultural practices, on-site sewage disposal (septic) systems, stormwater, erosion, forest practices and pollution from marinas and boats. Each watershed management plan will be adopted by and implementation coordinated by the county. Each county must carry out countywide education programs on nonpoint pollution. In addition, water quality considerations must be incorporated into land use decisions. Inspections, education and better design are used to eliminate pollution from septic systems. Dairy waste management plans are developed and implemented. Pollution caused by marinas and recreational boaters is addressed.

The shellfish protection program specifies that other programs, such as nonpoint source pollution control, stormwater and combined sewer overflows, and municipal and industrial discharges, are to insure

that shellfish beds are protected from contamination, closed beds are reopened, and contamination is reduced.

The major tasks of the wetlands protection program include a directive to the state Department of Ecology and Department of Natural Resources to adopt a wetland preservation program. This program is to establish criteria for the selection of wetlands to be preserved, evaluate techniques for preservation, and analyze which agency would be best to acquire and manage the wetlands. A formal process to identify and rank wetlands to be preserved is to be established. The Department of Ecology is to adopt minimum standards for local wetland management. Local governments are to have programs which meet these standards.

The laboratory support program includes a program for certifying laboratories and one for upgrading laboratory support for the Department of Ecology activities.

The household hazardous waste program involves public education about the hazards of certain household products and a request for funding for local collection points where people can drop off unused household products which are hazardous.

The goal of the monitoring program is to establish a comprehensive Puget Sound ambient monitoring program. This program is coordinating all existing data collection programs as well as instituting new data collection efforts. All data will be centralized, and a comprehensive report on the condition of Puget Sound will be issued each year.

The research program contemplates establishment of an independent Puget Sound research foundation. This foundation will establish research needs and priorities and will seek funding for that research.

The education and public involvement program is designed to educate the public about the need to preserve and protect water quality in Puget Sound. It sets up a local field agent for educational purposes in each county. It also creates an educational program for local schools and funds a number of activities designed to educate the public.

The legal and personnel support program provides legal and personnel support for the various plan activities.

It has been estimated that full implementation of this plan would cost about \$27 million U.S. per year. Available funding is currently around \$19 million U.S. per year. The planning effort costs about \$2 million U.S. per year.

#### References

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