

Washington

Wetland Resources

Washington's wetlands are remarkably diverse, each having a unique combination of ecological characteristics such as altitude, seasonality, chemistry, and species composition. Although wetlands cover only about 2 percent of the State, they are a valuable and important resource.

Wetlands perform many important hydrologic functions, such as maintaining streamflows, slowing and storing floodwaters, stabilizing streambanks, and reducing the erosion of shorelines. Although usually thought of as areas of ground-water discharge, some wetlands serve as areas of ground-water recharge (Washington State Department of Ecology, 1992a). Wetlands also improve water quality by filtering out sediments, excessive nutrients, and toxic chemicals. By serving these and other functions, wetlands can sometimes reduce or eliminate the need for the costly engineering and construction of control, treatment, and retention facilities (Puget Sound Water Quality Authority, 1990).

For a vast and diverse array of wildlife, including invertebrates, fish, amphibians, reptiles, birds, and mammals, wetlands are essential habitats for feeding, nesting, cover, or breeding. More than 315 species of wildlife use the State's wetlands as primary feeding or breeding habitat. Wetlands are vital nursery and feeding areas for anadromous fish such as salmon and steelhead trout (Washington State Department of Wildlife, undated). Wetlands are critical habitats for at least one-third of the State's threatened or endangered species of wildlife (Puget Sound Water Quality Authority, 1990).

Wetlands furnish many opportunities for education and scientific research. The numbers and diversity of plants and animals found in wetlands make these habitats excellent locations for teaching and research in biology, botany, ornithology, environmental science, and ecology.

Washington's wetlands provide many quality-of-life benefits. As scenic areas, wetlands present a visually pleasing contrast to upland areas, open water, and forests (fig. 1). In addition, the State's wetlands support a wide range of recreational activities, including

bird watching, nature appreciation, camping, boating, fishing, and hunting.

TYPES AND DISTRIBUTION

Wetlands are lands transitional between terrestrial and deep-water habitats where the water table usually is at or near the land surface or the land is covered by shallow water (Cowardin and others, 1979). The distribution of wetlands and deepwater habitats in Washington is shown in figure 2A; only wetlands are discussed herein.

Wetlands can be vegetated or nonvegetated and are classified on the basis of their hydrology, vegetation, and substrate. In this summary, wetlands are classified according to the system proposed by Cowardin and others (1979), which is used by the U.S. Fish and Wildlife Service (FWS) to map and inventory the Nation's wetlands. At the most general level of the classification system, wetlands are grouped into five ecological systems: Palustrine, Lacustrine, Riverine, Estuarine, and Marine. The Palustrine System includes only wetlands, whereas the other systems comprise wetlands and deepwater habitats. Wetlands of the systems that occur in Washington are described below.

System	Wetland description
Palustrine	Nontidal and tidal-freshwater wetlands in which vegetation is predominantly trees (forested wetlands); shrubs (scrub-shrub wetlands); persistent or nonpersistent emergent, erect, rooted herbaceous plants (persistent- and nonpersistent-emergent wetlands); or submersed and (or) floating plants (aquatic beds). Also, intermittently to permanently flooded open-water bodies of less than 20 acres in which water is less than 6.6 feet deep.
Lacustrine	Nontidal and tidal-freshwater wetlands within an intermittently to permanently flooded lake or reservoir larger than 20 acres and (or) deeper than 6.6 feet. Vegetation, when present, is predominantly nonpersistent emergent plants (nonpersistent-emergent wetlands), or submersed and (or) floating plants (aquatic beds), or both.
Riverine	Nontidal and tidal-freshwater wetlands within a channel. Vegetation, when present, is same as in the Lacustrine System.
Estuarine	Tidal wetlands in low-wave-energy environments where the salinity of the water is greater than 0.5 part per thousand (ppt) and is variable owing to evaporation and the mixing of seawater and freshwater.
Marine	Tidal wetlands that are exposed to waves and currents of the open ocean and to water having a salinity greater than 30 ppt.



Figure 1. Wetland in the Nisqually National Wildlife Refuge, Washington. Mount Rainier is in the distance. (Photograph by James Lyles, U.S. Geological Survey.)

According to a 1988 FWS inventory, wetlands cover about 939,000 acres in Washington (D.D. Peters, U.S. Fish and Wildlife Service, unpub. data, 1990). That inventory, part of the FWS National Wetlands Inventory, used color-infrared aerial photographs taken from 1980 to 1984 combined with field inventories of selected wetlands. Owing to the limitations of this process, a small percentage of wetlands might not have been included in the acreages.

Palustrine wetlands cover about 709,000 acres, about 75 percent of the total wetland acreage in Washington (D.D. Peters, U.S. Fish and Wildlife Service, unpub. data, 1990). These wetlands ex-

ist throughout the State in coastal sand dunes; in lowlands adjacent to estuaries, rivers, and lakes; in the backwaters of reservoirs and irrigation wasteways; adjacent to springs or seeps; and in isolated depressions. Extensive tracts of palustrine wetlands cover the sand spits of Grays Harbor and Willapa Bay and the banks of the Columbia, Chehalis, Yakima, and Pend Oreille Rivers (Canning and Stevens, 1989; Washington State Department of Ecology, 1992b).

Palustrine forested wetlands commonly are referred to as swamps or coastal swamps. Their predominant vegetation includes red alder, thin-leaved alder, black cottonwood, western red cedar, Sitka spruce, and hemlock. Palustrine scrub-shrub wetlands commonly are referred to as swamps or bogs. Their predominant vegetation includes willows, red Osier dogwood, Douglas spiraea, snowberry, hawthorn, wild rose, and gooseberry. Palustrine emergent wetlands are also known as freshwater marshes, wet meadows, fens, bogs, prairies, potholes, vernal pools, and playas. Predominant emergent vegetation includes cattail, bulrush, and reed canary grass. Predominant aquatic-bed vegetation includes duckweed, water lilies, and water buttercup (Canning and Stevens, 1989).

Lacustrine wetland acreage in Washington is not addressed in this summary because the acreage has not yet been separated from the acreage for lacustrine deepwater habitat (D.D. Peters, U.S. Fish and Wildlife Service, unpub. data, 1990). Lacustrine emergent wetlands and aquatic beds exist in the shallows of lakes throughout Washington. Predominant emergent vegetation includes duckweed, water lilies, water buttercup, arrowhead, water plantain, smartweed, yellow water lily, common mare's tail, and pondweed. Predominant lacustrine aquatic-bed vegetation is the same as noted for palustrine aquatic beds (Canning and Stevens, 1989).

Riverine wetlands cover about 700 acres in Washington (D.D. Peters, U.S. Fish and Wildlife Service, unpub. data, 1990) and consist of the areas of river channels that are occasionally to permanently flooded. These areas can be nonvegetated or vegetated by submersed and nonpersistent emergent aquatic plants. Areas of the river channel that typically are exposed commonly are referred to as river bars, gravel bars, or unconsolidated shorelines. They commonly become vegetated by pioneering terrestrial species such as dandelion and fireweed during periods of low flow. Plant species commonly found in the flooded areas of the channel include true watercress, yellowcress, yellow water lily, arrowhead, water plantain, and smartweed (Canning and Stevens, 1989).

Estuarine wetlands cover about 202,000 acres, about 22 percent of the total wetland acreage in Washington (D.D. Peters, U.S. Fish and Wildlife Service, unpub. data, 1990). These wetlands are present on the deltas and in the lower reaches of most of the rivers in western Washington (the part of the State west of the crest of the Cascade Range [fig. 2B]). Broad expanses of estuarine wetlands exist around Grays Harbor and Willapa Bay on the coast, at the mouth of the Columbia River, and around Skagit and Padilla Bays on Puget Sound (Canning and Stevens, 1989; Washington State Department of Ecology, 1992b).

Predominant forest and scrub-shrub vegetation bordering estuaries includes western crabapple, Hooker's willow, Sitka willow, red Osier dogwood, Pacific ninebark, red alder, western red cedar, and Sitka spruce. Predominant herbaceous emergent vegetation includes pickleweed, salt grass, seaside arrowgrass, Jaumea, salt-marsh sandspurry, Olney's Three Square, Lyngby's sedge, redtop, hardstem bulrush, and cattail. Estuarine aquatic beds are vegetated

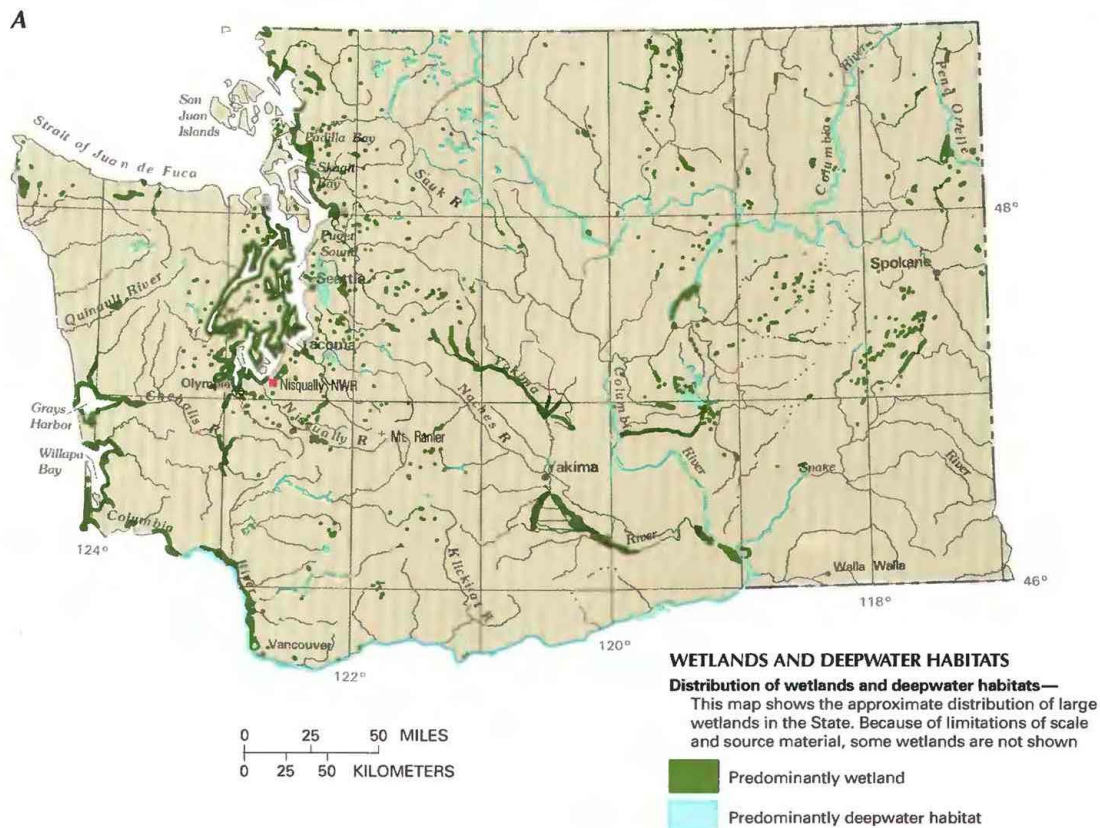


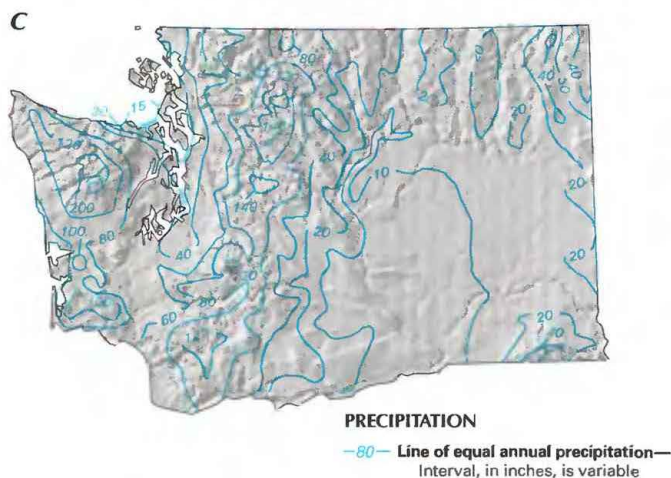
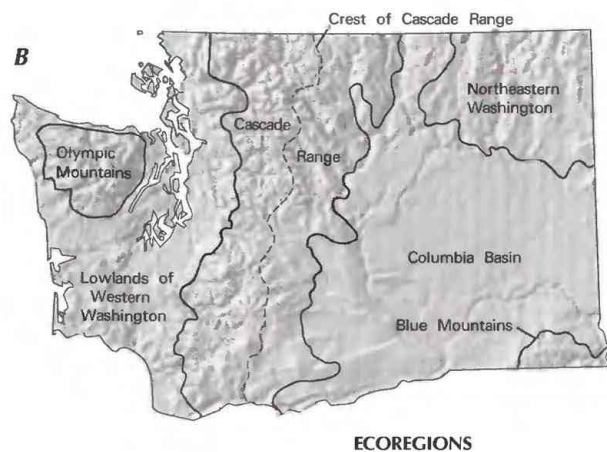
Figure 2. Wetland distribution in Washington and physical and climatological factors that control wetland distribution in the State. A, Distribution of wetlands and deepwater habitats. (Sources: A, T.E. Dahl, U.S. Fish and Wildlife Service, unpub. data, 1991.)

rocky, sandy, or muddy substrates adjacent to tidal zones. Predominant aquatic-bed vegetation includes eelgrass, kelp, and green algae. Estuarine unconsolidated shores consist of gravel, sand, or mud exposed by tides and commonly are known as tideflats or tidal flats. Large tidal fluctuations discourage most plant communities from colonizing these sites. However, extensive mats of green and blue-green algae can develop during the summer months (Canning and Stevens, 1989).

Marine wetlands cover about 27,000 acres, about 3 percent of the total wetland acreage in Washington (D.D. Peters, U.S. Fish and Wildlife Service, unpub. data, 1990) and consist of beaches and rocky shores. The high-energy tidal environment of these wetlands keeps them unvegetated except for algae. Marine wetlands exist along the Pacific coast and the Strait of Juan de Fuca, on some off-shore rocky islands, and in the San Juan Islands (Canning and Stevens, 1989).

HYDROLOGIC SETTING

Western Washington has a predominantly marine climate with cool, dry summers and mild, wet winters (Phillips, 1960). Precipitation ranges from less than 20 inches per year to about 200 inches per year (fig. 2C). Evaporation ranges from about 20 inches per year to about 25 inches per year (fig. 2D) and generally is less than annual precipitation.



Although many wetlands in western Washington are associated with ponds, lakes, estuaries, or rivers, many more are isolated from bodies of surface water and owe their existence to saturated soil conditions caused by precipitation or ground-water seepage (Canning and Stevens, 1989; Washington State Department of Ecology, 1992b,c). Wetlands that are isolated from bodies of surface water typically occupy depressions in the land surface that are of glacial origin. In the lowlands of western Washington, these depressions generally are elongated troughs cut by continental glaciers, circular kettles left by the melting of blocks of glacial ice embedded in glacial deposits, or simply shallow depressions on an irregular surface of glacial deposits. In the Olympic Mountains and the Cascade Range, the depressions generally have been cut into bedrock by local alpine glaciers (Dion, 1978).

Eastern Washington (the part of the State east of the crest of the Cascade Range) has characteristics of both continental and marine climates with hot, dry summers and cold, wet winters (Phillips, 1960). Precipitation ranges from less than 10 inches per year to about 40 inches per year (fig. 2C). Evaporation ranges from about 25 inches per year to more than 45 inches per year (fig. 2D) and generally exceeds annual precipitation.

As in western Washington, most wetlands on the eastern slope of the Cascade Range and in Northeastern Washington (fig. 2B) are associated either with bodies of surface water or with depressions in the land surface that are of glacial origin (Dion, 1978; Washington State Department of Ecology, 1992b). Most wetlands in the Columbia Basin (fig. 2B) were created by human activities, such as large hydroelectric and irrigation projects, and typically owe their existence to shallow water tables caused by the importation and use of surface water for irrigation (Washington State Department of Ecology, 1992b). Almost 85 percent of the wetlands in the area are in isolated depressions in the land surface that were created by catastrophic floods resulting from the collapse of glacial ice dams and the ensuing rapid emptying of large glacial lakes in what is now Montana (Weis and Newman, 1989; Dion, 1978; Washington State Department of Ecology, 1992b). Many of the other wetlands in the Columbia River Basin are associated with reservoirs and irrigation wasteways (Canning and Stevens, 1989; Washington State Department of Ecology, 1992b).

TRENDS

Estimates of presettlement wetland acreage in Washington range from 1.17 to 1.53 million acres, depending on the historical

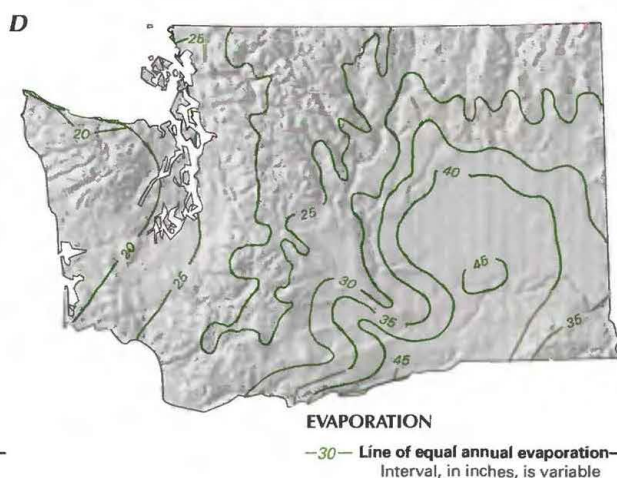


Figure 2. Continued. Wetland distribution in Washington and physical and climatological factors that control wetland distribution in the State. **B**, Generalized physiographic areas. **C**, Precipitation. **D**, Free-water-surface evaporation. (Sources: **B**, **C**, and **D**, Landforms data from EROS Data Center. **B**, Generalized physiographic areas modified from Dion, 1978. **C**, Williams, 1986. **D**, Farnsworth and others, 1982.)

information and research assumptions used (Canning and Stevens, 1989; Dahl, 1990; Washington State Department of Ecology, 1992b). Based on a 1988 estimate by the FWS, about 20 to 39 percent of Washington's wetlands, have been lost during the past two centuries. Other estimates place the total loss as great as 50 percent, and some urbanized areas of the Puget Sound area have experienced losses of from 70 to 100 percent. Estimates of continuing wetland loss range from 700 to 2,000 acres per year. In addition, most of the State's remaining wetlands have been significantly degraded (Washington State Department of Ecology, 1992b,d).

The principal historical causes of wetland loss and degradation are the expansion of agriculture and the siting of ports and industrial facilities. The major causes of continuing loss and degradation of wetlands are urban expansion, forestry and agricultural practices, and the invasion of exotic plants and animals (Canning and Stevens, 1989; Washington State Department of Ecology, 1992b,d).

CONSERVATION

Many government agencies and private organizations participate in wetland conservation in Washington. The most active agencies and organizations and some of their activities are listed in table 1.

Federal wetland activities.—Development activities in Washington wetlands are regulated by several Federal statutory prohibitions and incentives that are intended to slow wetland losses. Some of the more important of these are contained in the 1899 Rivers and Harbors Act; the 1972 Clean Water Act and amendments; the 1985 Food Security Act; the 1990 Food, Agriculture, Conservation, and Trade Act; the 1986 Emergency Wetlands Resources Act; and the 1972 Coastal Zone Management Act.

Section 10 of the Rivers and Harbors Act gives the U.S. Army Corps of Engineers (Corps) authority to regulate certain activities in navigable waters. Regulated activities include diking, deepening, filling, excavating, and placing of structures. The related section 404 of the Clean Water Act is the most often-used Federal legislation protecting wetlands. Under section 404 provisions, the Corps issues permits regulating the discharge of dredged or fill material into wetlands. Permits are subject to review and possible veto by the U.S. Environmental Protection Agency, and the FWS has review and advisory roles. Section 401 of the Clean Water Act grants to States and eligible Indian Tribes the authority to approve, apply conditions to, or deny section 404 permit applications on the basis of a proposed activity's probable effects on the water quality of a wetland.

Most farming, ranching, and silviculture activities are not subject to section 404 regulation. However, the "Swampbuster" provision of the 1985 Food Security Act and amendments in the 1990 Food, Agriculture, Conservation, and Trade Act discourage (through financial disincentives) the draining, filling, or other alteration of wetlands for agricultural use. The law allows exemptions from penalties in some cases, especially if the farmer agrees to restore the altered wetland or other wetlands that have been converted to agricultural use. The Wetlands Reserve Program of the 1990 Food, Agriculture, Conservation, and Trade Act authorizes the Federal Government to purchase conservation easements from landowners who agree to protect or restore wetlands. The Consolidated Farm Service Agency (formerly the Agricultural Stabilization and Conservation Service) administers the Swampbuster provisions and Wetlands Reserve Program. The Natural Resources Conservation Service (formerly the Soil Conservation Service) determines compliance with Swampbuster provisions and assists farmers in the identification of wetlands and in the development of wetland protection, restoration, or creation plans.

The 1986 Emergency Wetlands Resources Act and the 1972

Table 1. Selected wetland-related activities of government agencies and private organizations in Washington, 1993

[Source: Classification of activities is generalized from information provided by agencies and organizations. •, agency or organization participates in wetland-related activity; ..., agency or organization does not participate in wetland-related activity. MAN, management; REG, regulation; R&C, restoration and creation; LAN, land acquisition; R&D, research and data collection; D&I, delineation and inventory]

Agency or organization	MAN	REG	R&C	LAN	R&D	D&I
FEDERAL						
Department of Agriculture						
Consolidated Farm Service Agency		•
Forest Service	•	...	•	•	•	•
Natural Resources Conservation Service		•	•		•	•
Department of Commerce						
National Oceanic and Atmospheric Administration	•	•			•	•
Department of Defense						
Army Corps of Engineers	•	•	•	•	•	•
Military reservations	•					
Department of the Interior						
Bureau of Land Management	•		•	•	•	•
Bureau of Reclamation		•	•
Fish and Wildlife Service	•		•	•	•	•
Geological Survey
National Biological Service	•				•	
National Park Service	•		•	•	•	•
Environmental Protection Agency		•			•	•
STATE						
Department of Agriculture	•	•		•	...
Department of Community Development	•	•	•
Department of Ecology	•	•	•	•	•	•
Department of Fisheries	•	•	•		...	•
Department of Health	•	•	•	...
Department of Natural Resources	•	•	•	•	•	•
Department of Parks and Recreation	•	•	•
Department of Transportation	•	...	•	•	•	•
Department of Wildlife	•	•	•	•	•	•
REGIONAL						
Puget Sound Water Quality Authority			•		•	•
COUNTY AND LOCAL						
All counties and local governments	•		•
Some counties and local governments	•	•	•	•	•	•
PRIVATE						
Local chapters of the National						
Audubon Society	•		...	•	•	•
Ducks Unlimited			•		•	•
Friends of the Earth	•	•
The Nature Conservancy	•		•	•	•	•
Trust for Public Lands	•	•	
Urban Wildlife Coalition			•		...	
Washington Environmental Council	•	...

Coastal Zone Management Act and amendments encourage wetland protection through funding incentives. The Emergency Wetlands Resources Act requires States to address wetland protection in their Statewide Comprehensive Outdoor Recreation Plans to qualify for Federal funding for State recreational land; the National Park Service provides guidance to States in developing the wetland component of their plans. Coastal and Great Lakes States that adopt coastal-zone management programs and plans approved by the National Oceanic and Atmospheric Administration are eligible for Federal funding and technical assistance through the Coastal Zone Management Act.

Federal agencies own about 1.3 million acres of land in Washington, 30 percent of the total land area of the State. However, there is no reliable estimate of the total acreage of wetlands owned by the Federal Government. The major causes of this situation are budget constraints; differences in the missions, goals, and needs of the

various agencies; and variations in the use and definitions of wetlands.

State wetland activities. — Wetland protection and management activities in Washington are almost as diverse as the State's wetlands. The State uses the FWS classification system (Cowardin and others, 1979) for inventory purposes but uses the Federal Clean Water Act definition of wetlands as vegetated sites for regulatory purposes. Nonvegetated wetlands are regulated as marine waters, lakes, or other special aquatic sites (Canning and Stevens, 1989; Perry Lund, Washington State Department of Ecology, written commun., 1993). The Washington State Department of Ecology is the lead agency for wetland activities in the State and has established a Wetlands Section to provide technical assistance and guidance to other Federal and State agencies and to local governments. In addition, all State agencies are required to exercise their authority to the maximum extent in order to achieve the goal of "no overall net loss of wetlands" in the State. The primary State regulations affecting wetlands include the Shoreline Management Act of 1971, the Hydraulic Procedures Act of 1949, the State Environmental Policy Act of 1983, the Growth Management Act of 1991, and the Floodplain Management Program. However, none of these regulations has the protection of the wetlands as its main purpose (Washington State Department of Ecology, 1988, 1990, 1991, 1992b, 1993).

Regional wetland activities. — The Puget Sound Water Quality Authority is charged with the development of a comprehensive plan for the protection of water quality in the Puget Sound Basin. The wetlands-protection element of the plan is designed to ensure that the most valuable wetlands in the basin are preserved in perpetuity and that degradation of other valuable wetlands is minimized (Puget Sound Water Quality Authority, 1990; Washington State Department of Ecology, 1988, 1992b,c).

County and local wetland activities. — The State's Growth Management Act requires counties and local governments to protect wetlands within each government's jurisdiction. The most common means of protecting wetlands is through Shoreline Master Programs developed under the State's Shoreline Management Act and the State Environmental Policy Act. Under these programs, policies and regulations limit certain disruptive activities such as dredging and filling. Other local ordinances may establish sensitivity areas, regulate clearing and grading practices, or require special analysis and review for projects affecting wetlands covered by the master program. In many cases, these programs and ordinances are more restrictive than, and include wetlands not covered by, Federal or State regulations. However, the degree to which programs and ordinances have been adopted and enforced varies greatly across the State (Washington State Department of Ecology, 1988; Granger, 1989).

Private wetland activities. — More than 400 private organizations are active in the preservation and protection of wetlands in Washington (Seattle Audubon Society, 1993). These organizations keep the public informed on wetland issues, organize citizen networks, and lobby for wetland-protection measures. Local chapters of the Audubon Society, The Nature Conservancy, and the Trust for Public Lands have purchased wetlands and associated buffer areas in the State for preservation.

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