Oregon
Wetland Resources

Oregon's diverse wetlands are the result of climate and physiography that range from wet and mountainous to dry and flat. Wetlands can be found statewide, even in the deserts of the central and southeastern parts of the State (fig. 1).

Although wetlands cover little more than 2 percent of Oregon, their ecological and economic benefits make them valuable to the State. Among the beneficial hydrologic functions of wetlands are flood attenuation, erosion and storm-damage reduction, water-quality maintenance, and water supply. Coastal and inland wetlands provide stopover, feeding, and breeding habitat to migratory waterfowl and shorebirds; habitat for native fish and wildlife; and outdoor recreation. About one-half of commercially harvested Pacific Ocean fish and shellfish species depend on wetlands for food, spawning, or nursery habitat during some stage of life (Oregon Division of State Lands and Oregon State Parks and Recreation Division, 1989).

TYPES AND DISTRIBUTION

Wetlands are lands transitional between terrestrial and deepwater 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 Oregon is shown in figure 2*A*; 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 Oregon 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.

Oregon has between 1.2 and 1.5 million acres of wetlands (J.F. Watson, U.S. Fish and Wildlife Service, written commun., 1993). Palustrine, lacustrine, and estuarine wetlands constitute most of the State's wetland acreage. The area of marine and riverine wetlands is small relative to that in the other systems.

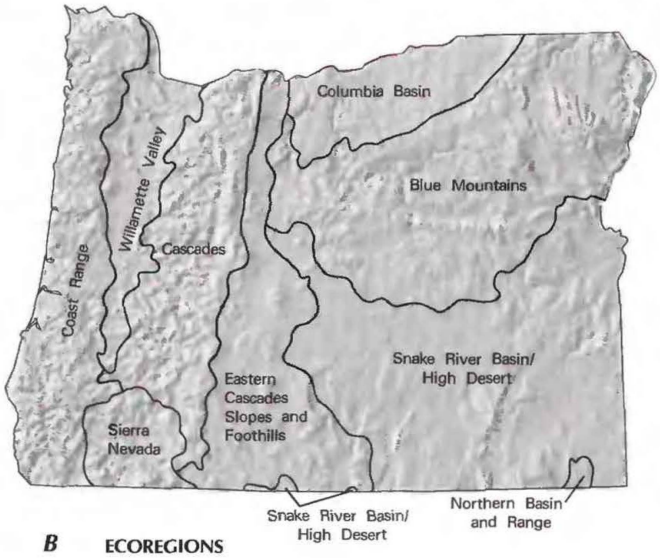
Coastal wetlands.—The steep slopes of Oregon's Coast Range mountains extend to the Pacific Ocean along much of the coast, leaving little area for wetland formation. Thus, coastal wetlands are confined mainly to areas of accumulated sediment near the mouths of rivers that have cut through the mountains and to the dune regions that have formed where the Coast Range front is distant from the ocean.

Estuarine wetlands have developed in the shallow, low-gradient reaches near the mouths of Oregon's coastal rivers and in their deltas. Estuarine wetlands cover about 55,600 acres, and there are about 10,000 acres of tidal fresh marsh, mostly in the Columbia River estuary (Oregon Division of State Lands and Oregon State Parks and Recreation Division, 1989). Akins and Jefferson (1973) identified three major types of estuarine wetlands in Oregon: tideflats, eelgrass beds, and salt marshes.

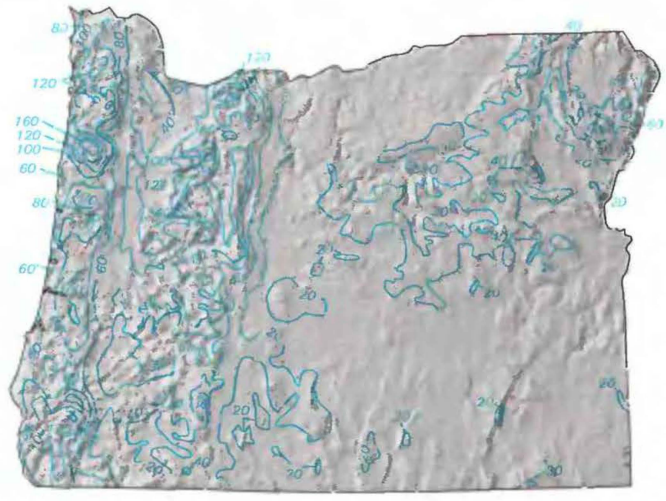
Tideflats (unconsolidated-shore wetlands) are mostly nonvegetated and exist where accumulations of sediment (sand, silt, clay, or gravel) are flooded and exposed daily by tides. Eelgrass-bed (aquatic-bed) wetlands are tideflats that have been extensively colonized by eelgrass, a plant that can tolerate high salinity and periods of exposure. Salt marshes (emergent wetlands) are regularly to irregularly flooded emergent wetlands vegetated by salt-tolerant plants such as rushes, sedges, glasswort, and arrowgrass. Most of Oregon's large estuaries also contain areas of diked marsh, former salt marshes that have been diked and drained. Diked wetlands are commonly used for cattle grazing.

Coastal nontidal fresh marshes, swamps, bogs, and ponds are palustrine wetlands that have formed around and in lakes and wind-scoured depressions among sand dunes (Akins and Jefferson, 1973). The areas containing most of the coastal nontidal wetlands are the Clatsop Plains, which extend from the Columbia River to Gearhart, the broad dune sheet that extends from Haceta Head to Coos Bay, and the low dunes between Bandon and Cape Blanco. Isolated dune areas containing wetlands are present between Tillamook Bay and Waldport.

Figure 1. Wetlands in the Malheur National Wildlife Refuge. *(Photograph courtesy of the U.S. Fish and Wildlife Service.)*

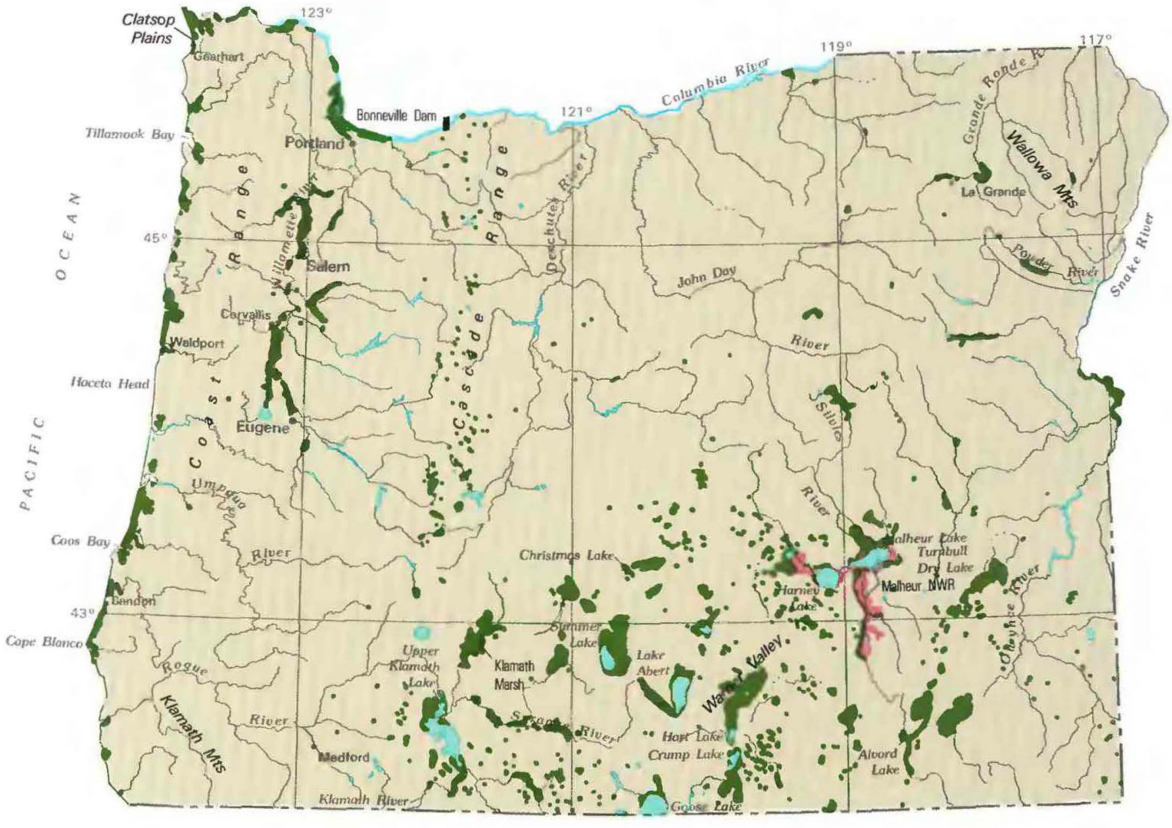


B **ECOREGIONS**



C **PRECIPITATION**

—80— **Line of equal annual precipitation—** Interval, in inches, is variable



A **WETLANDS AND DEEPWATER HABITATS**

Distribution of wetlands and deepwater habitats—
This map shows the approximate distribution of large wetlands in the State. Because of limitations of scale and source material, some wetlands are not shown

Predominantly wetland

Predominantly deepwater habitat

0 25 50 MILES
0 25 50 KILOMETERS

Figure 2. Wetland distribution, ecoregions, and precipitation in Oregon. ***A***, Distribution of wetlands and deepwater habitats. ***B***, Ecoregions. ***C***, Precipitation. *(Sources: A, T.E. Dahl, U.S. Fish and Wildlife Service, unpub. data, 1991. B, Ecoregions from Omernik, 1987; landforms data from EROS Data Center. C, Hubbard, 1986.)*

Coastal nontidal fresh marshes form in dune lake basins and along their tributary streams. Some shallow lakes are completely covered by marsh vegetation. Interdunal marshes form between dunes in wind-scoured depressions. Interdunal marshes are flooded seasonally or perennially and typically contain slough sedge, silver weed, bog St. Johnswort, creeping buttercup, and western lilaeopsis (Akins and Jefferson, 1973). Other coastal-zone freshwater wetlands—swamps, bogs, and ponds—constitute a small percentage of the coastal-zone wetland acreage, but they are of value to wildlife and also are of scientific interest.

Mountain wetlands.—The Coast Range and Klamath Mountains have few lakes, and the stream valleys (except near the coast) are steep sided and provide few places for wetlands to form; therefore, wetlands in the coastal mountains generally are small and scattered. However, glacial lakes are common in the Cascade Range and Wallowa Mountains. Such lakes can support marsh vegetation around their shores, and their shallow zones are themselves classified as wetlands. The wider mountain valleys in the Cascade Range also have areas of wetlands—predominantly marshes and wet meadows (emergent wetlands) vegetated by sedges and other herbaceous plants. Intermountain basins such as those on the Silvies, Powder, and Grande Ronde Rivers—all in the Blue Mountains Ecoregion (fig. 2*B*)—have or once had areas of marsh, wet prairie, and wet meadow.

Willamette River Valley wetlands.—The Willamette River Valley is an intermountain basin located between the Coast Range and the Cascade Range (fig. 2*B*). The flat valley floor once had vast areas of fresh marsh and wet prairie, and the flood plains of the Willamette River and the lower reaches of its tributaries contained extensive shrub swamps and swamp forests. However, drainage for agricultural and urban development and realignment of the river's main stem have eliminated much of the former wetland area. Although greatly reduced in area, valley wetlands provide stopover and overwintering habitat for thousands of migratory waterfowl (Loy, 1976).

Desert wetlands.—Oregon's desert wetlands are in the Snake River Basin/High Desert Ecoregion (fig. 2*B*). Many desert wetlands are valuable to wildlife because of the moisture they provide in an otherwise arid environment. Desert wetlands include saltwood and greasewood flats (scrub-shrub wetlands), shallow lakes (unconsolidated-shore wetlands), marshes, and riparian (streamside, typically scrub-shrub or emergent) wetlands.

Most of the area shown as wetland in figure 2*A* comprises shallow, slightly to very saline lakes that range from typically flooded to typically dry. Among lakes that contain water in many or most years are Malheur Lake (fig. 1), Harney Lake, Goose Lake, Lake Abert, Summer Lake, Crump Lake, and Hart Lake (Loy, 1976). These perennial lakes provide stopover and nesting habitat for migratory waterfowl. Lakes that are dry in most years include Alvord Lake, Christmas Lake, Turnbull Dry Lake, and the lakes north of Hart Lake in the Warner Valley. Vegetated areas of flooded desert lakes typically contain submersed and marsh vegetation.

Perennial or seasonal rivers that flow into desert lakes commonly have areas of riparian wetlands, which are vegetated predominantly by shrubs, trees, or herbaceous emergent vegetation. Riparian wetlands provide habitat for plants and animals that otherwise could not exist in the harsh desert environment.

Other wetlands.—The upper Klamath River Basin is in the Eastern Cascades Slopes and Foothills Ecoregion (fig. 2*B*). The basin contains vast areas of marsh—notably in Klamath Marsh, along the Sprague River, and in the upper part of Upper Klamath Lake—that supply stopover habitat for millions of ducks and geese migrating along the Pacific Flyway (Loy, 1976). Other wetlands important to waterfowl include marsh, scrub-shrub, and open-water wetlands on the Columbia and Snake Rivers. Croplands near those rivers contribute significantly to the birds' food supply.

HYDROLOGIC SETTING

Wetlands form where water persists at or near the land surface for extended periods. Depending on its hydrologic setting, a wetland receives moisture from direct precipitation; surface runoff; flooding from streams, rivers, or lakes; inundation by ocean tides; ground-water discharge; or a combination of those sources. The wide variety of hydrologic settings in Oregon has resulted in diverse wetland types statewide, but wetlands in each region have common hydrologic characteristics owing to common climatic, geologic, and topographic conditions.

Coastal wetlands.—Much of Oregon's coast is rocky, precipitous, and exposed to high-energy ocean waves. Wetlands in that environment are in the Marine System, as are ocean beaches. Those wetlands constitute only a small percentage of the State's wetland acreage. The most extensive coastal wetlands are estuarine or palustrine.

Estuarine wetlands develop where stream velocity and wave energy are low enough to permit sediment carried in streams to settle out of the water and accumulate to above the low-tide level, resulting in a tideflat (Akins and Jefferson, 1973). Tideflats are a transitional stage between deepwater habitat and salt marsh and thus are located between those areas. Tideflats typically are composed of silt and clay mixed with sand and gravel. Where they are sufficiently stable, tideflats are colonized by submersed vegetation, predominantly eelgrass and arrowgrass, which traps more sediment. As the tideflat becomes higher and more stable, marsh vegetation gradually becomes established, and the tideflat becomes a salt marsh.

Salt marshes are subject to a wide range of hydrologic conditions. For most of the year, tides alternately expose the marsh and then inundate it with brackish to very salty water. Winter flooding can inundate the marsh with freshwater. As sediment and dead vegetation accumulate, the substrate gradually rises until the marsh is subject to less frequent inundation by either tides or river flooding. In Oregon, such "high marsh" has commonly been altered by diking and draining to facilitate cattle grazing.

Tidal fresh marsh occurs inland from salt marshes in many estuaries. Some fresh marsh is present in coastal rivers upstream from the most upstream extent of saltwater at high tide. Other fresh marshes form in low-lying areas of flood plains that are flooded when rivers are, effectively, dammed by high tides.

Oregon's other major coastal wetlands have formed in the sand-dune regions that extend along about one-half the length of the coast. Inland marshes develop in and around dune lake basins and along the small, slow-flowing streams that feed the lakes. The lakes form when shifting sand dams the small coastal streams that are fed by ground water in the dunes. Flow in these streams is insufficient to wash away the sand dams, so most dune lakes are permanent. In shallow lakes, vegetation can extend from shore to shore.

Interdunal marshes form between sand dunes where wind has scoured the sand down to the water table. The process of wind scouring is known as deflation, and the scoured area is called a deflation plain. Interdunal marshes are sustained almost entirely by ground water. Because the water table declines to below the bottom of some deflation plains in the dry season (midsummer to early fall), some of these marshes are seasonal. Interdunal marshes are prone to filling by windblown sand and typically succeed to shrub swamp or upland habitat.

Willamette River Valley wetlands.—The physiography and climate of the Willamette River Valley are ideal for wetland formation. The wide valley floor, which is underlain primarily by alluvial deposits, is nearly flat, and the valley is surrounded by mountains that receive large amounts of precipitation (fig. 2*C*). Water from that precipitation, in the form of rainfall runoff or snowmelt, flows in streams and rivers into the valley, where it enters the ground-

water system or remains in stream channels. The valley's wetlands are sustained by ground-water discharge, stream flooding, or both.

Because there is little elevation change from the valley margins to the Willamette River, the water table is at or near the land surface over large areas. Before widespread drainage for agricultural development (fig. 3), the saturated or flooded valley soils from the base of the surrounding mountains to the river flood plain sustained extensive marshes and wet prairies. Until the mid-1800's, the prairie landscape was maintained by fires regularly set by Native American inhabitants of the valley for game and food-plant management and for defense (Johannessen and others, 1971).

Figure 3. Drained agricultural land in the Willamette River Valley near Salem. Formerly a lakebed, this cropland is now farmed for onions. *(Photograph by Dennis A. Wentz, U.S. Geological Survey.)*

Owing to the gentle south-north gradient of the valley, the Willamette River is slow-flowing and meandering and has a wide flood plain. At one time, winter and spring flooding and the water table sustained a nearly continuous expanse of forested and shrub wetlands in the flood plain. However, drainage and flood control to facilitate agricultural and urban development have greatly reduced the extent of those wetlands.

Mountain wetlands.—Oregon's mountain wetlands are near seeps and springs, in and along rivers, and in lakes and small depressions. The State's mountains, especially the Coast and Cascade Ranges, receive large amounts of precipitation (fig. 2*C*). However, steep mountain slopes are not conducive to the long-term retention of water, so larger wetlands generally are present in river flood plains and lakes, where runoff, mostly from snowmelt, can accumulate as ground or surface water.

Flood-plain wetlands form where river flood plains are wide enough to sustain a water table at or near the land surface, generally in wide valleys and intermountain basins. Mountain-lake wetlands can be found in lakes of several origins. Some mountain lakes were formed when lava flowed across the stream and water ponded behind the lava dam (Phillips and others, 1965). Landslides also have dammed streams with similar results. Beavers impound streams, forming ponds and small lakes behind the dams. Most of the State's mountain lakes that contain wetlands, however, were formed by glaciers. The most common of Oregon's glacial lakes are cirque lakes, small lakes that are also known as tarns, which formed when water filled depressions scoured by a glacier.

Desert wetlands.—Oregon's desert basins contain large expanses of flat terrain from which water does not readily drain. Most desert basins are internally drained; that is, water that enters them can leave only through evaporation, transpiration, or discharge to the ground-water system rather than by way of surface drainage. Deserts receive little direct precipitation because they are in the precipitation shadow of the Cascade Range. Basins collect snowmelt from the surrounding mountains, where precipitation amounts are higher than on the basin floor (fig. 2*C*). Water reaches the basin floor in streams or springs. The collected water forms shallow lakes, which can range in size from less than 1 acre to tens of thousands of acres and in wetness from flooded to nearly always dry, depending on climatic cycles and local hydrologic characteristics. Nonetheless, even a wetland that is temporarily dry probably will contain water at some time in the future unless the hydrologic setting is altered by human activities or long-term climate change. Some desert lakes, such as Lake Abert and the Warner Valley lakes, are the result of faulting; others, such as Malheur and Harney Lakes, are topographic depressions in the basin floor. Evaporation of water in the shallow lakes leaves mineral deposits in the lakebed sediments. These deposits make the lakebed less permeable, inhibiting infiltration into the subsurface.

Desert wetlands form along streams, around springs, and around and in the shallow lakes. The wetness of a desert wetland is controlled by several interrelated factors, including local topography, the depth to the water table, and the balance between water input and evaporation. In some flats near streams and lakes, the water table is at or near the land surface, but water generally does not pond on the land surface because shallow standing water quickly evaporates during most of the year. Soil in these wetlands commonly is saline because evaporation removes water but not the dissolved salts. The saturated soils of these flats commonly support salt-tolerant emergent and scrub vegetation. Most desert lakes that are flooded but that cannot overflow also are saline—some more so than seawater—because of evaporation. Lakes that can overflow, such as Malheur Lake, are not saline in most years and support extensive marsh vegetation.

Other major wetlands.—The upper Klamath River Basin, although it receives little precipitation, contains large areas of wetlands. Wetlands are widespread because the basin floor has little topographic relief and the natural water table is at or near the land surface over wide areas. Basin wetlands receive water from snowmelt, which reaches the basin floor either in streams or as springs. Drainage to facilitate agricultural development has lowered the water table in many areas, resulting in widespread conversion of wetlands to upland (fig. 4).

Figure 4. Grazing land, formerly wetland, in the upper Klamath River Basin. Much of the grazing land in the basin was once wetland. Drainage systems, consisting of ditches, sluice gates, and pumps, keep ground-water levels sufficiently below the land surface to allow the development of pasture. *(Photograph by Daniel T. Snyder, U.S. Geological Survey.)*

The Columbia and Snake River wetlands developed in the few areas where the flood plains are wide enough for sediment to accumulate and support emergent vegetation. The wetlands are sustained by ground-water discharge and river flooding; near the coast, marshes in the Columbia River are regularly flooded by saltwater as well. Flow in the Columbia River is affected by tides as far upstream as the Bonneville Dam, and wetlands commonly are flooded during high tides. In the Snake River Valley, irrigation recharges aquifers and sustains ground-water discharge to streams and wetlands during the summer-fall dry season (Kjelstrom, 1992).

TRENDS

Wetlands covered as much as 2.3 million acres (about 3.6 percent) of what is now Oregon as of the late 1700's (Dahl, 1990). Since that time, wetland acreage has decreased by more than one-third, mostly owing to conversion of wetlands to agricultural uses by diking, draining, or both. Other causes of wetland loss or degradation have been urbanization, industrial development, flood-control projects, surface-water diversion and ground-water pumping for irrigation, stream snagging, land clearing, grazing, and beaver trapping. The greatest losses were of estuarine marshes, eastern Oregon riparian wetlands, Willamette River Valley wet prairies and riparian wetlands, and upper Klamath River Basin marshes (Oregon Division of State Lands and Oregon State Parks and Recreation Division, 1989).

Recent evidence suggests that losses of estuarine wetlands have slowed substantially since the mid-1900's (Oregon Division of State Lands and Oregon State Parks and Recreation Division, 1989). Most continuing losses are due to conversion of tidal land to urban use. More than 90 percent of remaining estuarine wetlands are protected, commonly through local planning and zoning. The State and Federal governments have identified coastal wetlands, Willamette River Valley wetlands, riparian wetlands in eastern Oregon, desert-lake wetlands, and upper Klamath River Basin wetlands as priority areas for conservation.

Table 1. *Selected wetland-related activities of government agencies and private organizations in Oregon, 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 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 Environmental Quality	..	•	..		•	
Department of Fish and Wildlife	•	•	•	•	•	•
Department of Forestry	•	•	•	•		•
Department of Land Conservation and Development	...	•	...	...		...
Division of State Lands	•	•	•	•		•
Parks and Recreation Department	•	...	•			
Water Resources Department	..	•		...		
SOME COUNTY AND LOCAL GOVERNMENTS	•	•		•		
PRIVATE ORGANIZATIONS						
Ducks Unlimited	•		•	•		
Pacific Coast Joint Venture	...		•	•		
The Nature Conservancy	•	...	•	•	...	...

CONSERVATION

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

Federal wetland activities.—Development activities in Oregon 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 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 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 are responsible for the proper management of wetlands on public land under their jurisdiction. The U.S. Forest Service (FS) manages 13 National Forests in Oregon and is developing a process to evaluate values and functions of wetlands in those forests. The Bureau of Land Management (BLM) manages about 16 million acres of rangeland, of which about 1.2 percent is riparian wetland (Bureau of Land Management, 1991). The BLM is assessing the status of riparian wetlands and has ongoing or planned projects to develop or enhance many of those wetlands. The FWS manages nine National Wildlife Refuges in Oregon that have extensive wetlands. The FWS funds wetland-restoration projects under the Partners for Wildlife Program. FWS National Wetlands Inventory maps are available for all of Oregon. The Corps manages wetlands within its project areas, researches ways to identify and enhance wetlands, and evaluates losses of wetland area and functions caused by filling and dredging. The Bureau of Reclamation conducts multipurpose wetland-restoration projects; all enhance waterfowl habitat in accordance with the 1986 North American Waterfowl Management Plan. The Environmental Protection Agency has awarded grants to State and local agencies to plan coordinated wetland-protection efforts, inventory wetlands, and conduct a watershed-protection pilot study. The BLM, Corps, FS, and FWS and several State agencies have developed a Memorandum of Understanding concerning the management and protection of Oregon's wetland resources on public lands (Oregon Division of State Lands, 1993).

State wetland activities.—To improve the effectiveness and efficiency of Oregon's efforts to conserve, restore, and protect wetlands, the State has developed a Wetland Conservation Strategy (Oregon Division of State Lands, 1993). The strategy provides the focus and framework for an integrated State wetland program designed to conserve, protect, and manage the State's wetland resources. The strategy is based on the recommendations of advisory committees representing Federal, State, and local agencies and interest groups.

In Oregon, the regulatory programs that are implemented at the State level are the State Removal-Fill Law, the Oregon Wetland Inventory and Wetland Conservation Plans, and the Clean Water Act Section 401 program. The Oregon Removal-Fill Law, administered by the Division of State Lands, is similar to section 404 of the Clean Water Act but in some respects is more comprehensive. Oregon has adopted the FWS National Wetlands Inventory as a basis for a State Wetland Inventory. The statewide inventory is being supplemented by detailed local information that is suitable for planning and regulatory purposes. The Wetland Conservation Plans program established a local planning process that provides local governments an opportunity to address wetland-resource decisions in a context with other land-use needs. Pursuant to section 401 of the Clean Water Act, the Department of Environmental Quality reviews Federal permits and licenses affecting wetlands for compliance with Oregon's water-quality standards. A section 404 permit is not issued by the Corps without certification of compliance by the Department.

Wetland mitigation is another important State regulatory function. The Division of State Lands has the authority to establish mitigation banks to be used when mitigation of unavoidable impacts caused by construction is not possible onsite; compensation may be made by the offsite creation, restoration, or enhancement of wetlands.

County and local wetland activities.—Oregon's Comprehensive Land Use Planning Act requires local governments to adopt planning and regulatory programs consistent with statewide planning goals. The State Wetland Conservation Plans program allows local governments to balance wetland protection with other land-use needs (Oregon Division of State Lands, 1993). Some county and city governments have regulatory or land-acquisition programs that provide additional wetland protection.

Private wetland activities.—The Oregon Coastal Wetlands Joint Venture, the State's part of the Pacific Coast Joint Venture of the North American Waterfowl Management Plan, is a cooperative effort of local citizens, conservation organizations, private companies, and State and Federal agencies. The primary goal of the joint venture is to reverse the downward trend in waterfowl populations in coastal areas and to address concerns about coastal wetlands. Land acquisition, wetland-habitat improvement, and small wetland-restoration projects are among the organization's activities. A concept plan for another joint venture that would include eastern Oregon has been prepared (Ratti and Kadlec, 1992).

The Nature Conservancy and Ducks Unlimited have participated in projects involving land acquisition and restoration of wetland habitat in Oregon. The Wetlands Conservancy owns and manages several small wetlands totaling about 60 acres, mainly in the Portland metropolitan area. These and many other conservation organizations provide information to the public on the values and functions of wetlands or promote wetland protection.

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