Alaska
Wetland Resources

Alaska has more area covered by wetlands—approximately 170 million of its 367 million acres—than the total area of wetlands in the other 49 States combined (Dahl, 1990). Alaska has a wide variety of topographic, geologic, climatic, and hydrologic conditions that contribute to the variety of wetland complexes in the State. Alaska's wetland complexes differ in size, function, and type, and they include types that are rare in other States, such as vast expanses of treeless tundra (fig. 1) in northern Alaska and extensive black spruce peatlands, or muskegs, elsewhere in the State.

Wetlands are sociologically, ecologically, and economically important to Alaska. Wetlands provide the resources for people in rural Alaskan villages to survive (Ellanna and Wheeler, 1990)—almost all subsistence hunting, fishing, trapping, and food gathering occurs on or adjacent to wetlands. Many mammals, fish, and birds within the State depend on some type of wetland for breeding, nesting, rearing young, or feeding. Alaska's wetlands provide recreational opportunities and support related businesses for people who hunt, observe, and photograph wildlife.

Alaska has seven wetland complexes that are important for their water-habitat value (Tiner, 1984): Yukon–Kuskokwim Delta, Izembek Lagoon, Yukon Flats, Teshekpuk Lake, upper Alaska Peninsula, Copper River Delta, and upper Cook Inlet. In general, wetlands in Alaska that have the highest value for waterfowl are coastal salt marshes and wetlands in and adjacent to lakes that have extensive periods of drawdown or that fluctuate with river flow (Lensink and Derksen, 1990).

During spring and fall migrations, huge flocks of waterfowl (ducks, geese, and swans) and shorebirds (dowitchers, godwits, plovers, turnstones, sandpipers, curlews, snipe, phalaropes, and yellowlegs) stop at wetland areas in Alaska. More than 70,000 swans, 1 million geese, 12 million ducks, and 100 million shorebirds depend on Alaskan wetlands for resting, feeding, or nesting (King and Lensink, 1971). During years of drought in prairie States and Provinces of Canada, birds displaced from their traditional breeding areas fly northward to wetlands in Alaska.

Alaska wetlands provide forage for large mammals such as caribou, moose, and musk oxen. They also provide food and habitat for beaver, muskrat, mink, and land otter. Rocky coastal beaches serve as rookeries (areas where breeding and pupping occur) and resting areas for marine mammals such as seal, sea lion, and walrus. Alaska wetlands sustain some of the world's richest commercial, sport, and subsistence fisheries. Almost 90 percent of wild salmon caught in the United States are caught in Alaskan waters. These fish rely on palustrine and riverine wetlands to provide food, cover, and spawning areas during their life in inland waters, and they pass through riverine, estuarine, and marine wetlands on their migration to and from the ocean. Resident freshwater and estuarine fish also depend on wetland habitat.

Wetlands in Alaska have important hydrologic and water-quality functions, including flow regulation, erosion control, sediment retention, nutrient uptake, and contaminant removal. Many wetlands have limited flood-control or water-storage functions during snowmelt because their soils are seasonally or perennially frozen, limiting absorption of runoff. However, several characteristics of wetlands help reduce peak flows, even when soils are frozen (Post, 1990). Water is detained behind hummocks and within depressions, ponds, and lakes, and the velocity of the water is slowed by vegetation. The mosses, peats, and mineral soils of wetlands can become dryer during winter, and during snowmelt these materials are able to absorb some meltwater. Following snowmelt, wetlands have a greater capacity for streamflow regulation because the capacity of the soils to store water increases: higher temperatures increase the thickness of unfrozen soils and increase evaporation and plant transpiration, which help lower the water table.

Wetland plants help control the erosion of mineral soils by decreasing wind and water velocities near the ground and by holding soil particles together with their roots. In permafrost areas, vegetation also reduces erosion by preventing the warming and thawing of ice-rich soils. In flood plains, wetland vegetation removes some suspended sediment from floodwaters by slowing water velocities.

Wetlands in Alaska transform and retain nutrients and toxic compounds. Nutrients and contaminants attach to the organic and fine mineral soils. Plants, phytoplankton, fungi, and bacteria use the nutrients and degrade some of the contaminants.

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 Alaska 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 Alaska are described on page 3.

Figure 1. Tundra on the Arctic coastal plain southwest of the Kavik River. Willow thickets are present along the meandering stream. *(Photograph by F.C. Golet, U.S. Fish and Wildlife Service.)*

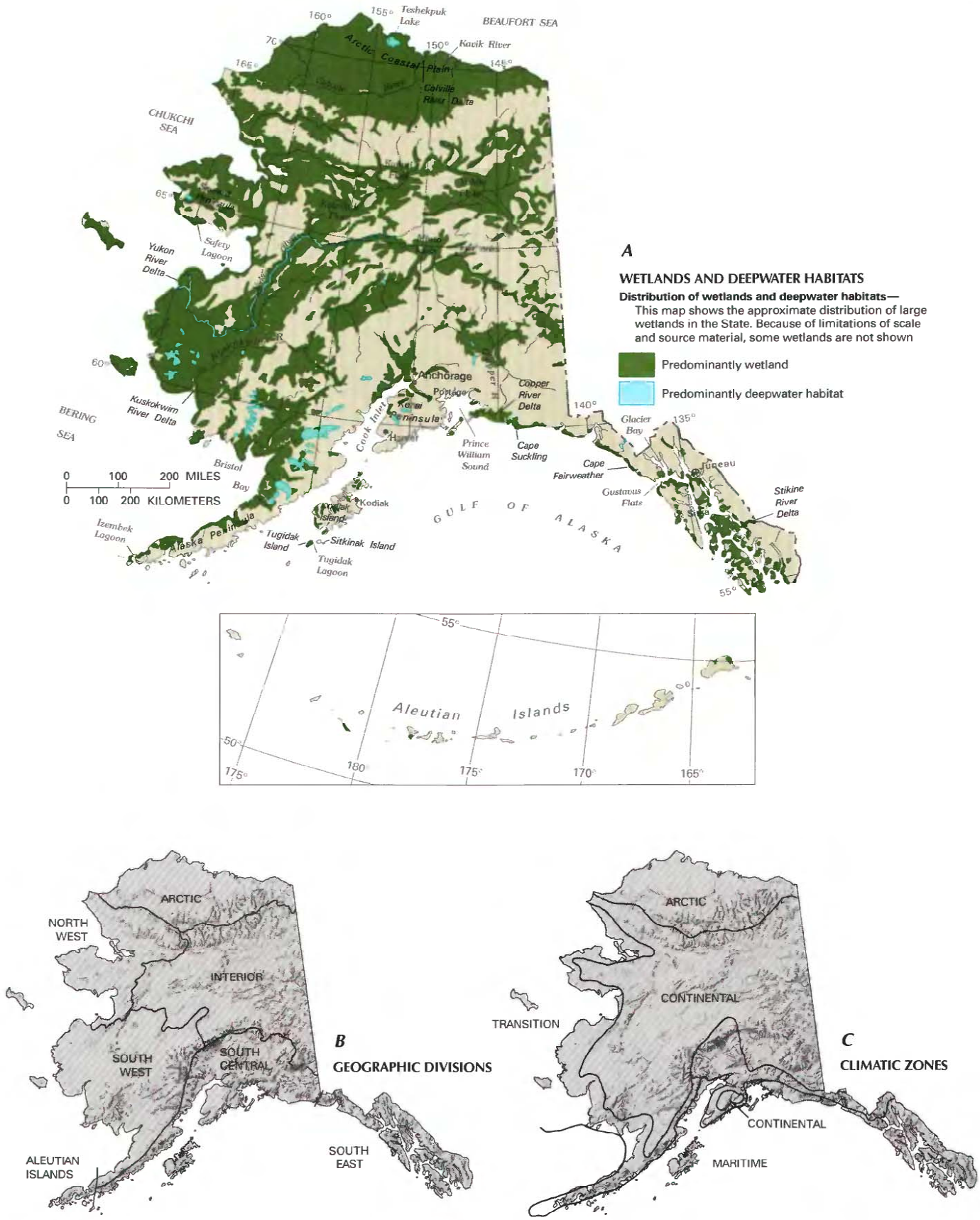

Figure 2. Wetland distribution in Alaska and physical and climatological features that control wetland distribution in the State. ***A***, Distribution of wetlands and deepwater habitats. ***B***, Geographic divisions. ***C***, Climatic zones. (*Sources: A, T.E. Dahl, U.S. Fish and Wildlife Service, unpub. data, 1991. B, Geographic divisions modified from Lamke, 1986; landforms data from EROS Data Center. C, Hartman and Johnson, 1978.)*

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); mosses and lichens (moss-lichen wetland); 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.

Wetlands and deepwater habitats in Alaska are being inventoried by the FWS. As of December 1992, about 25 percent of the State had been mapped to determine acreage of the wetland types within the classification system of Cowardin and others (1979). Wetlands also have been inventoried in some of Alaska's urban areas by the U.S. Army Corps of Engineers (Corps). Maps showing wetland areas for parts of Anchorage, Fairbanks, Juneau, and the Kenai Peninsula are available. The Natural Resource Conservation Service and Alaska Department of Natural Resources Soil and Water Conservation Districts also have mapped wetlands in some parts of south-central and interior Alaska having agricultural and potentially agricultural lands. The FWS 170-million-acre estimate for wetland area in Alaska (Dahl, 1990) is based on soil surveys, land-cover maps, National Wetland Inventory maps, and preliminary results of statistical surveys conducted by the National Wetland Inventory.

The Joint Federal–State Land Use Planning Commission for Alaska (1973), Batten and Murray (1982), Lee and Hinckley (1982), Batten (1990), and Viereck and others (1992) describe Alaska's wetland vegetation. Many plants in Alaska grow well in a wide range of climate, soil, and water conditions. Some species dominate plant communities on both wet and dry soils, sometimes making it difficult to differentiate Alaska wetlands from uplands solely on the basis of vascular-plant communities.

Palustrine System.—Most of Alaska's wetlands are palustrine. Palustrine wetlands in Alaska include both peatlands (wetlands that have organic soils) and nonpeatlands. Peatlands, also known as mires, occur throughout Alaska and cover an estimated 27 to 110 million acres (Northern Technical Services and EKONO, Inc., 1980; Dachnowski-Stokes, 1941), depending on the peatland definition and inventory techniques used. In general, a peatland is a moss-lichen, emergent, scrub-shrub, or forested wetland containing more than 12 inches of a wet organic soil (peat) consisting of partly to well-decomposed plants. However, definitions of peatland differ in the thickness of peat required. Peat forms when the rate of plant production exceeds the rate of decomposition, usually under water-saturated conditions. Poor air circulation, low levels of oxygen, and cool ground water within the saturated soil inhibit the activity of soil bacteria and fungi, so dead plant material decomposes slowly. Some peatlands in Alaska are underlain by poorly permeable silt, clay, well-decomposed peat, or bedrock, which contribute to the water-holding capacity of those sites. Throughout Alaska, peat is commonly several feet thick in topographic depressions and in poorly drained lowlands.

Bogs and fens are peatlands that generally have a water table near the surface and ground-cover vegetation that is predominantly mosses. Sedges, heath shrubs, and trees commonly grow above the moss layer. In Alaska, sphagnum and feather mosses commonly dominate the ground cover in flat peatlands having rain and snow as the predominant sources of water (bogs), whereas brown mosses, grasses, and sedges are more prevalent on low-gradient slopes having some internal drainage or ground-water inflow (fens). A moss-floored peatland containing black spruce trees found primarily on cold, wet, poorly drained soils is commonly referred to as muskeg. A muskeg can be either a bog or a fen, depending on the source of water. Bogs and fens underlain by permafrost are extensive in wet, low-relief areas near the Yukon and Kuskokwim Rivers in interior Alaska, where they cover about 9 million acres (Joint Federal–State

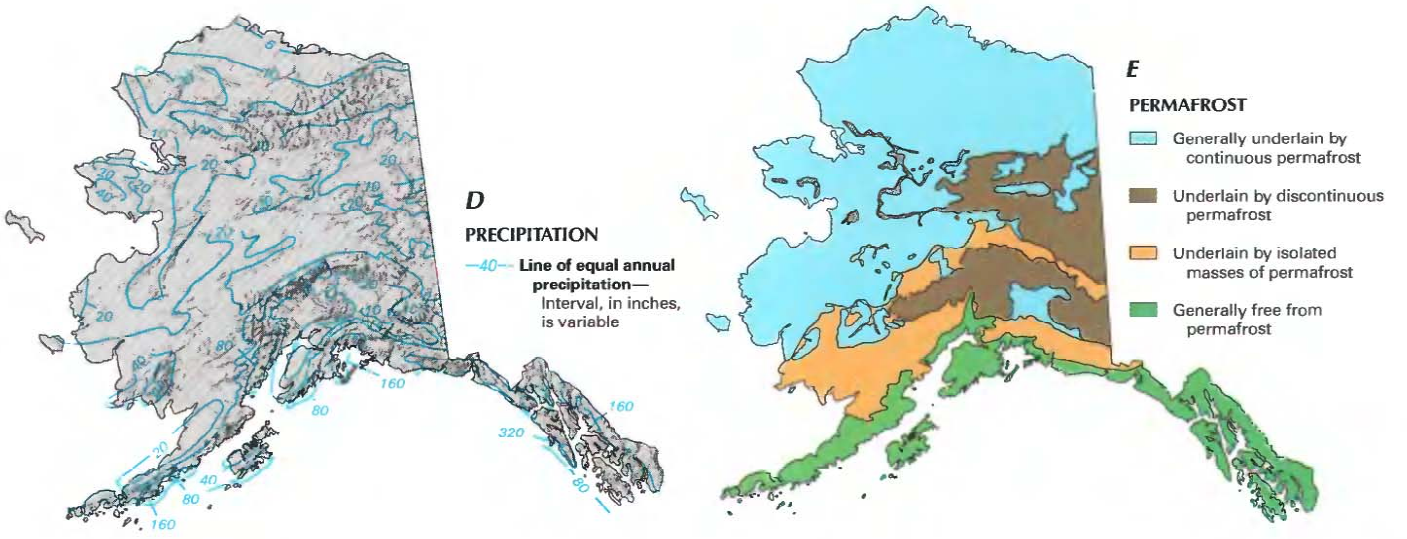

Figure 2. Continued. ***D***, Average annual precipitation. ***E***, Permafrost distribution. (*Sources: D, Lamke, 1986. E, Ferrians, 1965.*)

Land Use Planning Commission for Alaska, 1973). In southeastern Alaska, where the terrain is mountainous, fens are more abundant than bogs. Bogs and fens in southeastern Alaska form at the edges of mountain slopes and on adjacent lowlands. There, the wetlands are not underlain by permafrost but are commonly underlain by bedrock at a shallow depth.

Tundra, marshes, and meadows form in wet areas over mineral or organic soils. Tundra is characterized by treeless terrain covered by mosses, lichens, grasses, sedges, and low shrubs (mostly emergent, moss-lichen, or scrub-shrub wetland). Permafrost commonly is present at a shallow depth. Tundra occurs where summers are not warm enough for tree growth and is most extensive in northern Alaska and above treeline in mountains throughout the State. Three general types of tundra communities exist—wet, moist, and alpine. The Joint Federal–State Land Use Planning Commission for Alaska (1973) estimated that wet tundra covers about 33 million acres, moist tundra about 66 million acres, and alpine tundra about 85 million acres. Most lowland tundra remains wet or moist throughout the short thawing season because it is underlain by permafrost. However, only a small part of alpine tundra in higher mountain regions is considered wetland.

Freshwater marshes (emergent wetlands) are periodically inundated by standing or slowly moving water. Marshes in Alaska contain sedges, rushes, marestail, and other aquatic plants. The vegetation shows a distinct zonation according to water depth and frequency of exposure. Marshes are distinguished from bogs and fens by the general absence of moss, heath-type shrubs, and peat. Marshes are common around the margins of lakes, ponds, and rivers, in wet depressions and oxbows, on flood plains, in deltas, and on gently sloping benches receiving water from steeper slopes above. Wet meadows (emergent wetlands) occupy seasonally flooded sites that dry out late in the growing season, although soils typically remain saturated. Wet meadows are covered predominantly by herbaceous emergent plants, usually sedges, and are present on flood plains, lakeshores, and poorly drained lowlands throughout the State.

Palustrine wetlands within braided stream channels are commonly dominated by woody plants and perennial herbs. Willow and alder are the predominant plants in riparian scrub-shrub wetlands adjacent to Alaska's many rivers. Cottonwood predominates in riparian forested wetlands. Ponds commonly contain aquatic beds with water lilies, pondweeds, and submersed aquatic plants.

Lacustrine System.—Alaska has hundreds of thousands of lakes which together cover more than 5 million acres (Joint Federal–State Land Use Planning Commission for Alaska, 1973), but estimates of the area covered by wetlands within these lakes are not available. Lakes are abundant in lowlands underlain by permafrost, in oxbows along braided and meandering rivers, in depressions in glacial-drift deposits, and in mountain valleys dammed by glacial moraines. Many lakes in Alaska contain aquatic beds in deeper water and emergent aquatic plants in shallower water, commonly grading into surrounding palustrine and riverine wetlands.

Lacustrine wetlands used extensively by waterfowl are characteristically in lakes having gradually sloping shorelines and extensive shallow areas; profuse growth of submersed aquatic plants; a border of palustrine wetlands vegetated by emergent plants such as sedges, cattails, and bulrush; an extensive band of grassland around the lake; an abundance of aquatic insects; and a lake bottom composed of mineral soil (Lensink and Derksen, 1990). Those characteristics are common in lakes that have long periods of gradually receding water levels or that are connected to a river. In the Yukon Flats, such lakes have the highest density of nesting waterfowl in interior Alaska, and they support a breeding population of more than 1 million ducks.

Riverine System.—Wetlands within river channels include bars and flats of mud, sand, or gravel. Alaska has tens of thousands of rivers, streams, and creeks, but estimates of riverine wetland acreage are not available. Riverine wetlands provide critical spawning and rearing habitat for resident fish and for fish that migrate from the ocean to spawn. Many riverine wetlands are subject to annual or periodic inundations caused by snowmelt, glacier melt, and summer rainfall. Vegetated wetlands in low-gradient channels include submersed and floating aquatic plants and nonpersistent emergent plants such as buckbean, pendent grass, and cinquefoil. Vegetated wetlands in high-gradient mountain streams are dominated by submersed aquatic mosses.

Estuarine System.—Estuarine wetlands cover about 2 million acres in Alaska (Hall, 1988). Nonvegetated estuarine wetlands include flats, beaches, and rocky shores, which cover about 1.7 million acres and are most abundant (about 874,000 acres) in northwestern and southwestern Alaska. Tidal flats are mud and sand shores that appear to lack vegetation; however, a rich layer of microscopic plants such as diatoms, blue-green algae, and dinoflagellates typically covers the sediments. Intertidal sand and mud flats bordering the Yukon–Kuskokwim Delta cover about 130,000 acres and in places are more than 6 miles wide. A series of barrier islands protects large areas of nonvegetated tidal flats in the Copper River Delta. More than 20,000 acres of tidal flats occur on the seaward edge of the Colville River Delta on the Beaufort Sea Coast. Extensive tidal flats not associated with major river deltas include Gustavus Flats near the mouth of Glacier Bay, intertidal lagoons of Tugidak and Sitkinak Islands south of Kodiak Island, and vast mudflats in upper Cook Inlet.

Vegetated estuarine wetlands cover about 345,000 acres in Alaska (Hall, 1988). The most common type of estuarine vegetated wetland is the salt marsh (emergent wetland). Salt marshes containing sedges and grasses occur in tidally flooded, low-energy areas, such as gently sloping shores close to the mouths of rivers or behind barrier islands and beaches. Large salt-marsh complexes occur along the 500-mile shoreline of the Yukon–Kuskokwim Delta (about 162,000 acres), on the outer edge of the Copper River Delta, and in the upper Cook Inlet area. Several million migrating shorebirds and waterfowl use these coastal salt marshes for feeding and resting.

Vegetated estuarine wetlands also include aquatic beds of algae and eelgrass. Rocky materials in tidal flats along the Aleutian Islands, in the western Gulf of Alaska, and in southeastern Alaska provide habitat for algae. During fall, nearly the entire world's population of Steller's eiders and emperor geese gather in aquatic-bed wetlands in lagoons along the upper Alaska Peninsula. Izembek Lagoon near the tip of the Alaska Peninsula contains one of the largest eelgrass beds in the world, more than 84,000 acres. This lagoon serves as an international crossroad for migratory waterfowl and shorebirds from Asia, the mid-Pacific, and North America. Safety Lagoon on Seward Peninsula and Tugidak Lagoon on Tugidak Island are other large eelgrass beds important to migrating waterfowl.

Marine System.—Marine wetlands, which border the open ocean and are exposed to high-energy waves, cover about 46,000 acres in Alaska (Hall, 1988). Nonvegetated marine wetlands are generally sand and cobble-gravel shores or rocky shores. Most of the 250-mile coastline between Cape Suckling and Cape Fairweather in the northern part of the Gulf of Alaska is sand beach, whereas most of the coast along the Aleutian Island chain is bedrock and boulder rocky shores. Vegetated marine wetlands occur primarily as algal aquatic beds colonizing rocky shores of the Alaska Peninsula and shores adjacent to the Gulf of Alaska.

HYDROLOGIC SETTING

Wetlands are present wherever topographic, climatic, and hydrologic conditions favor the retention of water. Low relief, permafrost, a general abundance of precipitation relative to evaporation

and plant transpiration, short cool summers, poorly permeable rocks near the land surface, and large tidal fluctuations help form and maintain extensive wetlands in Alaska. Wetland characteristics continuously change with changes in climate, water supply, soil moisture, salinity, maturation of vegetation communities, tectonic activity, fire, ice scour, glacier advance and retreat, and human activities such as draining and filling.

Alaska has seven broad, generally recognized geographic regions (fig. 2*B*). These regions are Southeast, Aleutian Islands, South-central, Southwest, Northwest, Arctic, and Interior Alaska. Alaska has four climatic zones—Maritime, Transition, Continental, and Arctic (fig. 2*C*). The State's high mountain ranges, extensive coastline, vast size—one-sixth the total area of the United States—and long north-to-south distance are the principal causes for the great differences in climate. From the northern part of the Arctic Zone to the southern part of the Maritime Zone, average annual precipitation ranges from about 5 to 320 inches (fig. 2*D*), and average annual temperature ranges from 10 to 45 degrees Fahrenheit. Two-thirds of the annual precipitation occurs from September through March in the Maritime Zone and from June through November in the Continental and Arctic Zones. In the Transition Zone, seasonal precipitation patterns are not sharply defined, fluctuate from year to year, and can resemble those of either the Maritime or Continental Zones.

Spring snowmelt supplies the most input to the annual water budget in most Alaskan wetlands. Snowmelt is generally confined to a short time period during spring but produces considerable runoff because it can represent the precipitation accumulated for most of the year. During summer, local rain or the melting of snow and glacier ice in upland areas replenishes the water supply of many wetlands. In much of the Southeast and South-central regions of Alaska, precipitation greatly exceeds evaporation.

Many wetlands throughout Alaska are underlain by poorly permeable materials, such as decomposed peat, bedrock, silt, clay, seasonally frozen soils, or permafrost, that do not readily allow water from snowmelt or rain to pass through. Permafrost, soil having a temperature below freezing for 2 years or more, helps form and maintain wetlands in the Northwest, Arctic, and Interior regions. The extent and thickness of the permafrost decrease southward from a continuous layer as much as several hundred feet thick in the Arctic region to areas generally free of permafrost in the South-central and Southeast regions (fig. 2*E*). In the Arctic coastal plain, thawed soils in the summer commonly are no more than about 3-feet thick, limiting the rooting depth of plants and the infiltration of water. Long winters, cool summers, and the presence of permafrost maintain vast wet expanses under the same precipitation conditions that would produce only deserts in regions having temperate climates.

Alaska has about 34,000 miles of shoreline. Extremely large tidal fluctuations occur daily in southeastern Alaska, Prince William Sound, Cook Inlet, and Bristol Bay, forming expansive tidal flats and salt marshes. The diurnal fluctuation during spring tides is about 40 feet vertically in upper Cook Inlet near Anchorage. In coastal areas having little topographic relief, such as those in the Southwest, Northwest, and Arctic regions, storm surges push seawater inland several miles and affect the types and growth of plants.

Alaska's large rivers form extensive deltas. The Yukon–Kuskokwim Delta is one of the world's largest and supports more than 10 million acres of wetland. The deltas of the Colville, Copper, and Stikine Rivers also support vast wetlands. Expansive wetlands, such as the Yukon, Minto, Kanuti, and Koyukuk Flats, also occur adjacent to rivers flowing through large areas of low relief.

Tectonic activities affect the hydrology of Alaska's wetlands. During the 1964 earthquake, the Copper River Delta was uplifted 6 to 13 feet, and the Portage area, which is 40 miles southeast of Anchorage, subsided as much as 8 feet. In the Copper River Delta, some wetlands that were salt marshes before the earthquake have become freshwater systems. Also, in some areas, salt marshes have migrated seaward almost a mile. Kodiak Island and parts of southeastern Alaska are rising because glaciers whose weight had formerly caused land subsidence are melting. The relative fall in sea level is presumably modifying wetlands above the tidal zone and creating wetlands within the new tidal zone.

The productivity of many Alaska wetlands is affected by fires. Fires occur only infrequently in coastal areas, allowing as much as several tens of feet of peat to accumulate in some bogs and fens in southeastern Alaska. Fires, common in interior Alaska, rid marshes of dead grass, sedges, and shrubs and make new shoots available for waterfowl and mammals. Burning of vegetation and peat releases minerals and nutrients from organic litter, usually potassium, calcium, phosphorus, magnesium, chloride, and nitrogen. However, where permafrost is present, a severe fire may cause the relative abundance of plant species to change, especially if the fire removes the insulating organic layer, which in turn causes the top of the permafrost to lower. If the burned area remains undisturbed, wetland conditions will eventually return, but it can take 50 to 100 years to complete the cycle.

Sea ice and glaciers also affect Alaska wetlands. Sea ice scours the coast and limits the establishment of vegetation in intertidal and subtidal areas of the Bering, Chukchi, and Beaufort Seas. Advancing glaciers can cover wetlands, whereas retreating glaciers provide new areas where wetlands can form.

TRENDS

Information on historical wetland gains and losses in Alaska is limited. Estimates of wetland losses for the entire State range from about 80,000 to 200,000 acres, or about 0.05 to 0.15 percent of the historic wetland area (Senner, 1989; Dahl, 1990). Senner (1989), using existing quantitative data and aerial photographic interpretation techniques, estimated the following wetland losses through 1986 by activity: petroleum-related development, about 30,000 acres; mining, about 13,000 acres; infrastructure (roads, harbors, airports, and railroads), about 13,000 acres; development (residential, recreational, and commercial), about 13,000 acres; agriculture, about 8,500 acres; construction of military facilities (mostly roads and airfields), about 2,400 acres; and timber, less than 2,000 acres. Wetland losses have generally occurred in urban areas (Anchorage, Juneau, Fairbanks), around villages and communities, and in large industrial developments such as oil fields, transportation corridors, and industrial sites. As much as 50 percent of the wetlands in low-lying areas of Anchorage have been filled since 1945 (Alaska Department of Natural Resources, 1992). Any additional industrial, commercial, and residential development within areas that are predominantly wetland, such as in the Southwest, Northwest, and Arctic regions, might result in further draining or filling of wetlands.

CONSERVATION

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

Federal wetland activities.—Development activities in Alaska 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 Corps authority to regulate certain activities in navigable waters. Regulated activities include diking, deepening, filling, excavating, and plac-

Table 1. Selected wetland-related activities of government agencies and private organizations in Alaska, 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 Mines	...	...	•	...	•	...
Fish and Wildlife Service	•	...	•	•	•	•
Geological Survey	...	...	...	...	•	...
Minerals Management Service	...	...	...	...	•	...
National Biological Service	...	...	...	...	•	...
National Park Service	•	...	•	•	•	•
Environmental Protection Agency	...	•	...	...	•	•
NATIVE ALASKAN REGIONAL AND VILLAGE CORPORATIONS	•	...	•	•	...	...
STATE						
Department of Environmental Conservation	...	•	...	...	...	...
Department of Fish and Game	•	•	•	•	•	•
Department of Natural Resouces	•	•	•	•	•	•
Department of Transportation and Public Facilities	...	...	•	...	...	...
University of Alaska	•	...	...	...	•	...
SOME BOROUGH AND LOCAL GOVERNMENTS	•	•	•	•	•	•
PRIVATE ORGANIZATIONS						
Ducks Unlimited	•	...	...	•	•	...
The Nature Conservancy	•	...	...	•	•	•

ing 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 (EPA), 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 Wetland 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 (NPS) 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.

Many large tracts of land in Alaska are managed by Federal agencies including the Bureau of Land Management (about 90 to 100 million acres), the FWS (16 wildlife refuges covering about 77 million acres), the NPS (parks and preserves covering about 50 million acres), the U.S. Forest Service (2 National Forests covering about 24 million acres), and the U.S. Department of Defense (about 2 million acres). Because wetlands in Alaska are widespread, almost all of these tracts contain some wetland. Thus, these agencies directly or indirectly manage, inventory, or collect data on wetlands. Many agencies are restoring and enhancing fish and wildlife habitats in wetlands that they manage. Reclamation of old mining sites, riverbanks trampled by fishermen, or other disturbed areas can include revegetation and wetland restoration. Some agencies also are acquiring new lands containing wetlands. Governmental and nongovernmental groups and individuals have input into the management plans for these Federal tracts.

Native Alaskan regional and village corporation wetland activities.—The Alaska Native Claims Settlement Act in 1971 allocated about 44 million acres to Native Alaskan regional and village corporations. Much of this land contains wetlands.

State wetland activities.—Development activities in Alaska wetlands are regulated by several State agencies. If the wetland is in a coastal area, a section 404 permit application is submitted to the Corps and also to the Alaska Division of Governmental Coordination, which coordinates the review of permit applications by the Alaska Department of Environmental Conservation, Alaska Department of Fish and Game, and Alaska Department of Natural Resources. The Division of Governmental Coordination also determines whether a proposed coastal activity is consistent with the standards of the Alaska Coastal Management Program and with local management policies and plans. State-agency reviews of permit applications for activities outside of coastal areas are not coordinated by the Division.

The Department of Environmental Conservation certifies permit applications for compliance with State water-quality standards under section 401 of the Clean Water Act and compliance with other State laws and regulations. Pursuant to section 305(b) of the Clean Water Act, the Department submits to the EPA and the U.S. Congress a biennial assessment of the State's water quality, including that in wetlands (Alaska Department of Environmental Conservation, 1992).

Under Title 16 of the Alaska statutes, the Department of Fish and Game has discretion to approve, deny, or issue conditional permits for activities affecting fish and wildlife and their habitats within State critical-habitat areas (about 1.4 million acres), game refuges (about 1.3 million acres), and game sanctuaries (about 94,000 acres), many of which contain wetlands. Outside of such areas, The Department's role is limited to activities affecting anadromous-fish habitat.

The Department of Natural Resources Division of Parks and Outdoor Recreation is the lead agency developing State Comprehensive Outdoor Recreation Plans for Alaska. Pursuant to the re-

quirements of the Emergency Wetlands Resources Act of 1986, the plan (Alaska Department of Natural Resources, 1992) prioritizes wetland protection by wetland type and function and outlines criteria used for the selection of high-recreational-value wetlands for possible acquisition. The Department of Natural Resources Soil and Water Conservation Districts help private landowners determine whether the landowner's rural properties contain wetlands and whether a proposed activity requires permits from Federal and State agencies.

As a result of the 1959 Alaska Statehood Act, Alaska gained selection rights to about 105 million acres from the Federal Government. So far, the State has received title to about 85 million acres. The State also owns about 65 million acres of submersed lands that include the land between mean high tide and 3 miles offshore and the land under many large lakes and rivers. Most State lands are managed by the Department of Natural Resources, including about 3 million acres in State parks and about 2 million acres in State forests. The University of Alaska owns some wetlands and has several academic departments researching wetlands and fish and wildlife that use wetlands.

Regional, borough, and local wetland activities.—The Alaska Coastal Management Act established the Alaska Coastal Management Program, which is described by the Alaska Division of Governmental Coordination (1990, 1991) and Kyle (1982). The act allows local governments, rural regions, and the State to cooperatively protect and manage Alaska's coastal resources, including wetlands. The coastal zone includes all marine waters and submersed lands extending offshore to the 3-mile limit of State jurisdiction and inland areas affecting coastal waters and resources. Many communities are along the coast or along a major river within the coastal zone. Thirty-three coastal communities or regions have formed districts to work with the Alaska Coastal Policy Council and to prepare Coastal Management Plans that guide development in their local areas. These district plans influence local, State, and Federal decisions on development within the district, including the issuance of section 404 permits.

Anchorage, Juneau, Homer, Kodiak, and Sitka have wetland-management plans designating critical wetlands where little or no development is allowed, as well as less valuable wetlands that may be available for development. These plans aid project planning, decrease the number of permit applications, and expedite review of approvable projects.

General permits can be issued by the Corps to authorize specified activities within an area, such as a coastal district. They can be administered by a local government and eliminate the need for individual evaluation.

Private wetland activities.— Alaska has many private-interest groups that keep the public informed on wetland issues, organize citizen networks, and lobby either for or against wetland-protection measures. The Nature Conservancy helps government agencies and private landowners identify rare and important ecological communities, protects valuable habitats and natural systems through acquisition or purchase, and assists governmental agencies and other conservation organizations in their land-preservation efforts. Ducks Unlimited has helped government agencies acquire, enhance, and protect wetlands used by waterfowl in the Anchorage, Fairbanks, and the Copper River Delta areas. The Alaska Center for the Environment, Anchorage Waterways Council, National Audubon Society, National Wildlife Federation, Sierra Club, Southeast Alaska Conservation Association, and Trustees for Alaska are a few of the organizations engaged in activities to protect Alaska's wetlands, including programs to educate the public about wetland issues. The Alaska Wetlands Coalition opposes potential developmental constraints and is lobbying for the State to be exempt from portions of section 404 regulations because of the abundance of wetlands in the State.

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