

# Utah

## Wetland Resources

**W**etlands cover only a small part of Utah but provide critical aquatic habitat in an arid environment (fig. 1) as well as economic and other benefits. Utah's wetlands provide habitat for fish, fur-bearing wildlife, resident waterfowl, shorebirds, songbirds, and nearly 500 species of wetland plants (Reed, 1986). Wetlands also provide stopover and breeding habitat for migratory waterfowl, including an estimated 1 million ducks and 65,000 swans and geese that pass through the State during fall migration (Redelfs, 1980). Recreational activities associated with wetlands, such as hunting, bird watching, canoeing, fishing, and camping, provide considerable revenue to the State. Duck and goose hunting on wetlands adjacent to Great Salt Lake alone resulted in an estimated expenditure of \$6.4 million dollars by hunters in 1974 (Rawley, 1974).

About 30 percent of the ducks migrating along the Pacific Flyway stop at marshes around Great Salt Lake (Rawley, 1980), and 74 percent of the waterfowl harvested in the State comes from this area (Rawley, 1974). Because of the importance of Great Salt Lake and its associated wetlands to migratory birds, in 1991 the lake was designated a Hemispheric Reserve in the Western Hemisphere Shorebird Reserve Network. At least 33 species of shorebirds use Great Salt Lake and its wetlands at some point in their life cycle; typically, 500,000 Wilson's phalaropes (about 80 percent of the world's population) visit the lake in the summer. From 2 to 5 million shorebirds use the lake annually (Utah Division of Wildlife Resources, 1992).

Wetlands aid in flood control by slowing water velocity and providing ponding areas, which in some places can function as recharge basins for ground water. Wetland vegetation along streams and rivers stabilizes banks and reduces erosion. Wetlands improve water quality by settling particulates, producing oxygen, recycling nutrients, and degrading many harmful compounds found in water. Mountain wetlands can reduce the concentration of trace metals in mine drainage (Owen and others, 1992), lessening the impact on receiving streams. Because wetlands commonly are associated with rich soils and dependable water sources, Utah's wetlands also are important grazing areas for cattle and sheep.

### 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,

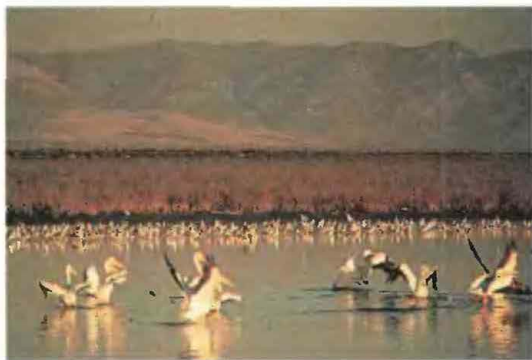
1979). The distribution of wetlands and deepwater habitats in Utah is shown in figure 2A; only wetlands are discussed herein.

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 Utah are described below.

System	Wetland description
Palustrine .....	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 .....	Wetlands within an intermittently to permanently flooded lake or reservoir. Vegetation, when present, is predominantly nonpersistent emergent plants (nonpersistent-emergent wetlands), or submersed and (or) floating plants (aquatic beds), or both.
Riverine .....	Wetlands within a channel. Vegetation, when present, is same as in the Lacustrine System.

Several studies of wetlands in Utah have determined wetland acreages and types throughout the State. An inventory done by the FWS in the 1950's (U.S. Fish and Wildlife Service, 1955) identified 1,200,000 acres of wetlands in Utah. Sixty-eight percent were salt flats (nonvegetated lacustrine and palustrine wetlands). In 1974, only 558,000 acres of wetlands were identified by Utah's Division of Wildlife Resources (Jensen, 1974). Wetlands were classified as first-, second-, and third-magnitude marshes, depending on their ability to support waterfowl. Because of the criteria for classification, many mountain wetlands and areas defined as "incidental waterfowl habitat," such as Sevier Lake, were not included in the total wetland acreage of the State. More recent National Wetlands Inventory data (Bob Freeman and Clark Johnson, U.S. Fish and Wildlife Service, written commun., 1993) indicate that there are 510,000 acres of emergent marshes and nonvegetated mud flats and salt flats along the eastern shore of Great Salt Lake, within an area that covers less than 2 percent of the State. (The inventory has not been completed for the rest of the State.) Wetland losses, naturally changing boundaries, different classification systems, changing ideas about functions and values of wetlands, and different study objectives are all partly responsible for the discrepancies in total acreage.

Wetlands in Utah include the shallows of small lakes, reservoirs, ponds, and streams (emergent and aquatic-bed wetlands); riparian wetlands (forested, scrub-shrub, and emergent wetlands); marshes and wet meadows (emergent wetlands); nonvegetated mudflats and salt flats; and playas (unconsolidated-shore wetlands). In the mountains of Utah, wetlands occur as open bodies of water or near them,



**Figure 1.** Pelicans at Bear River Migratory Bird Refuge, northeast shore of Great Salt Lake. (Photograph courtesy of U.S. Fish and Wildlife Service.)



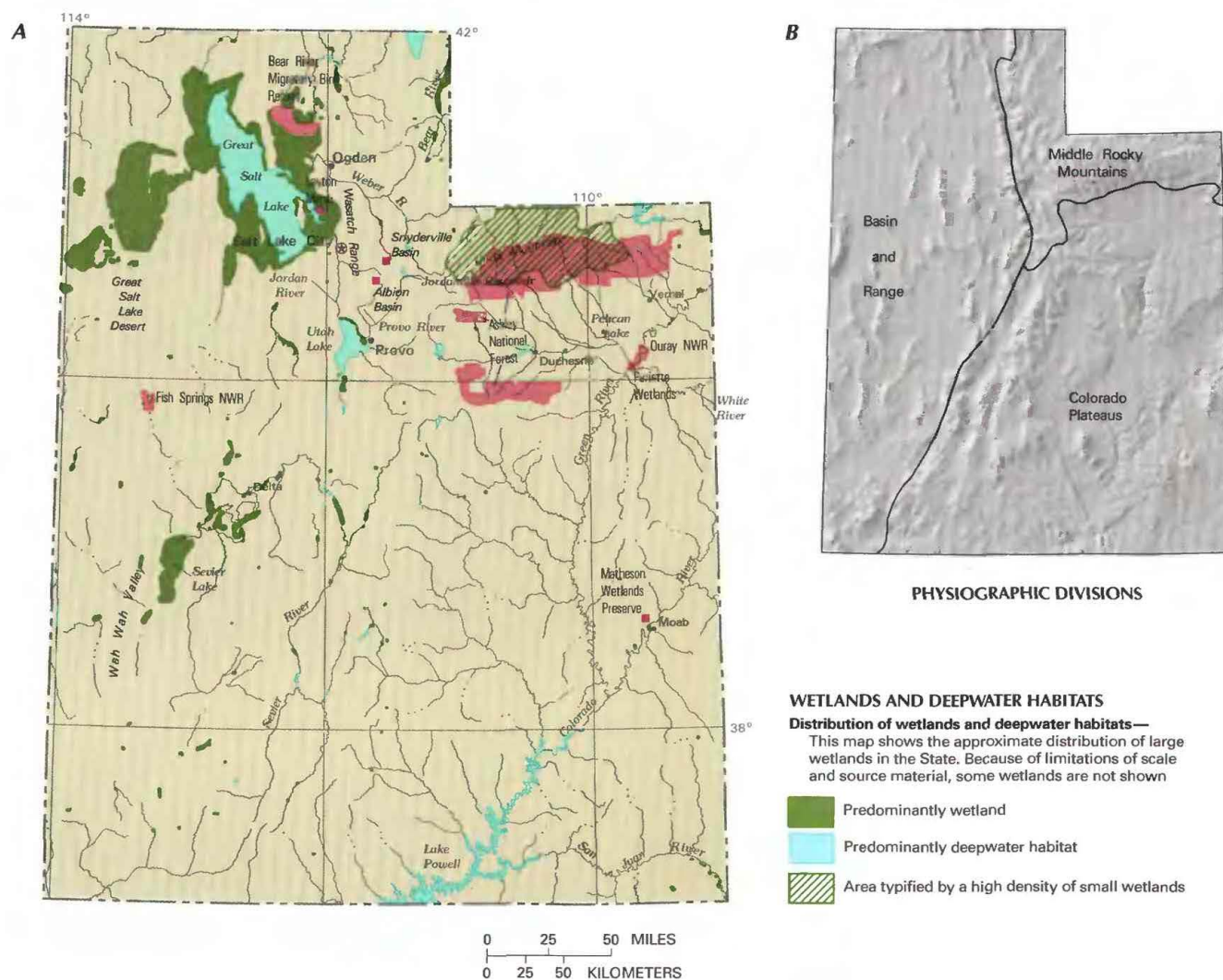
near springs, and where snowmelt collects. The largest and most notable wetlands in the State, however, occur in western Utah adjacent to Great Salt Lake, where much of the mountain runoff eventually discharges. Wetlands in western Utah also occur as playas, near springs in tectonically active areas, and near freshwater bodies. In eastern Utah, wetlands are sparse but are present in the flood plains of some streams and rivers.

## HYDROLOGIC SETTING

Wetlands form under conditions of continuous water supply at or near the land surface. The location and persistence of the water supply depends on physiographic features that control runoff and impoundment of water, climatic conditions such as precipitation and evaporation, and hydrologic factors such as location of the water table and discharge areas. Conditions in Utah differ greatly from one part of the State to another, but three principal physiographic provinces (fig. 2B) define areas with similarities. The Middle Rocky Mountains contain the Uinta Mountains and the Wasatch Range. The Basin and Range Province is characterized by a series of alternating north-south-trending ranges and valleys. The Colorado Plateaus consist of plateaus and mesas interspersed with deep canyons.

**Middle Rocky Mountains.**—Some of the highest mountain peaks in the Uinta Mountains and the Wasatch Range reach altitudes of 10,000 to 13,000 feet and receive more than 60 inches of precipitation per year (Cruft, 1986), mostly as snow. The large accumulation of snow in the mountains ultimately provides much of the water to wetlands throughout Utah. Mountain wetlands occur as small lakes (such as cirque and moraine lakes), reservoirs, ponds (such as beaver ponds), and streams; as marshes along flood plains; and as wet meadows below snow fields and dams, near springs, and along flood plains (fig. 3A). Some wetlands receive moisture only during periods of runoff, whereas others are recharged continuously by shallow ground water or by water impounded in lakes, rivers, and streams.

One of the few wetland studies conducted in Utah's mountains identified 200 acres of wetlands in Albion Basin (Jensen, 1993). Most of the wetlands are classified as scrub-shrub where willows predominate, but persistent-emergent and forested wetlands are also common where veratrum, sedges, and bluebells occur and where spruce and fir grow. These wetlands provide habitat for a diversity of wildlife including moose, beaver, and abundant nongame birds. Studies in a small part of the wetlands showed that, during runoff, 83 to 85 percent of the suspended solids and two trace metals were



**Figure 2.** Wetland distribution in Utah and physiography of the State. **A**, Distribution of wetlands and deepwater habitats. **B**, Physiography. (Sources: A, T.E. Dahl, U.S. Fish and Wildlife Service, unpub. data, 1991. B, Physiographic divisions from Fenneman, 1946; landforms data from EROS Data Center.)



retained by the wetlands (Jensen, 1993), reducing the potential for downstream contamination.

Much of the runoff in the Uinta Mountains and Wasatch Range leaves the Middle Rocky Mountains as surface water in streams and rivers or as seepage into the ground that recharges basin aquifers. Much of the runoff from the Middle Rocky Mountains eventually reaches Great Salt Lake in the Basin and Range Province by way of the Bear, Weber, and Jordan Rivers or as ground-water discharge along the eastern shore of the lake.

**Basin and Range Province.**—Great Salt Lake is located at the base of the Wasatch Range and is a remnant of an ancient and much larger lake. It receives 66 percent of its annual water supply from surface runoff, 31 percent from direct precipitation, and 3 percent from ground-water inflow (Arnow and Stephens, 1990). Great Salt Lake is a terminal lake; that is, it has no outlets. It is the fourth largest lake of this type in the world (Arnow and Stephens, 1990). Because the lake is located in a discharge area (fig. 3B), where movement of confined ground water is upward (Clark and others, 1990), downward seepage of lake water is limited. Water remains in the lake until it evaporates or is used by plants. Wetlands adjacent to Great Salt Lake are abundant and include marshes, mud flats, and salt flats. Marshes occur where freshwater enters the lake along the eastern shore, including areas near springs and the mouths of rivers. Common vegetation includes cattails and bulrush. Mud and salt flats occur along flood plains, generally between upland or marshes and the lake itself. Mud and salt flats usually are barren, although emergent vegetation and plants adapted to alkali conditions, such as salt grass, grow nearby.

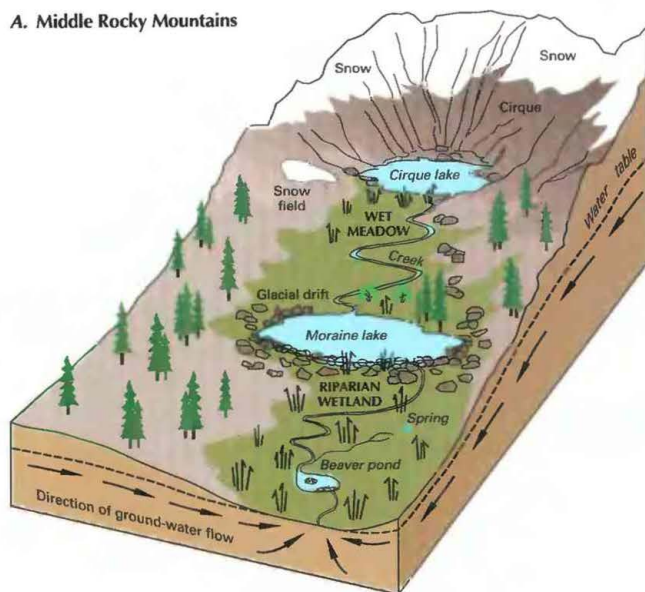
Above-average precipitation during the early 1980's resulted in flooding of rivers statewide, and Great Salt Lake reached its highest level on record. Transgression of the shorelines, inundation of areas that were normally dry, and the development of new wetlands served as a reminder of the functions of flood plains, which were slowly being developed. Sevier Lake, which covers 850 square miles near Delta, is a typical playa that flooded during the 1980's. It reached a depth of 13 feet (Wilberg, 1991).

"Playa" is a geologic term for very flat, and usually barren, areas of closed arid drainage basins that occasionally flood (Neal, 1975). Playas form in areas where evaporation exceeds precipitation, which is true of most of Utah. In western Utah, annual evaporation rates are as high as 65 inches per year (Farnsworth and others, 1982), and annual precipitation is as low as 5 inches (Cruff, 1986). Playa lakes like Great Salt Lake commonly are flooded by desert thunderstorms, receiving direct precipitation and runoff in washes and ephemeral stream channels from the ranges of western Utah.

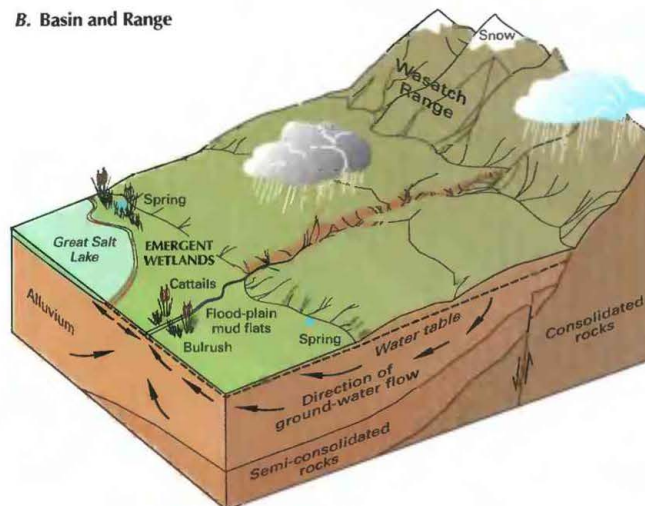
Playas in valleys where ground water is at or near land surface, such as the Great Salt Lake Desert, can become flooded by a rising water table during periods of minimal evaporation and can remain wet throughout the year. Evaporites accumulate as a result of dissolution of lakebed material during flooding that is followed by continued evaporation and by capillary rise of saline ground water. A layer of white salt crystals commonly develops at the surface over mud and other evaporites (Snyder, 1975). Although the playa is usually devoid of vegetation, salt grass is common near the edges, and Nuttall alkali-grass, sea blight, and pickleweed also can be found (Vice and Messmer, 1993). Playas in valleys where ground water never reaches the surface, such as Wah Wah Valley, become flooded only after rains. The ponded water dissipates more rapidly because of downward seepage. The playa surface is dry and hard most of the time and consists of fine sand, silt, and clay; evaporites are absent (Snyder, 1975). Any vegetation near a dry playa is adapted to long periods of extreme dryness.

Great Salt Lake and playas provide critical habitat for resident wildlife and migrating waterfowl in an arid environment, but ground-water discharge from springs and freshwater bodies also

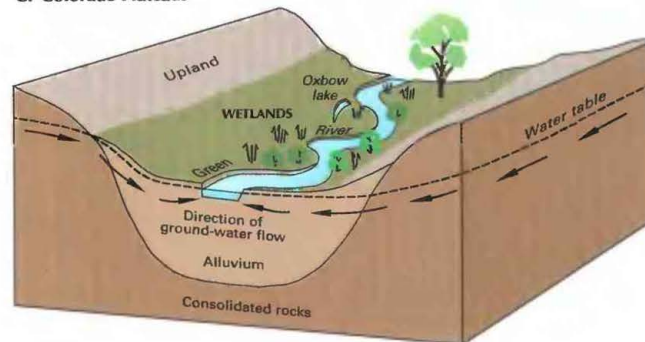
A. Middle Rocky Mountains



B. Basin and Range



C. Colorado Plateaus



**Figure 3.** Generalized hydrologic setting of wetlands in Utah. **A**, Middle Rocky Mountains. **B**, Basin and Range Province. **C**, Colorado Plateaus.

maintain wetlands in the Basin and Range Province. Fish Springs National Wildlife Refuge, in Utah's western desert, is an example of a spring-fed wetland. Discharge from 10 springs maintains 12,000 acres of ponds and marsh habitat. Marshes and mud flats also occur in western Utah along flood plains of streams and rivers, and adjacent to freshwater lakes and reservoirs. Utah Lake covers more surface area than any other natural freshwater body in Utah and wetlands dot its shores.

**Colorado Plateaus.**—The Colorado Plateaus, south of the Middle Rocky Mountains and east of the Basin and Range Province, receive about 10 to 20 inches of precipitation per year. Three major rivers, the Colorado, Green, and San Juan, flow through the Colorado Plateaus and gouge deep canyons that do not provide conditions for development of large wetlands. Some emergent wetlands occur on river and tributary flood plains where the canyons widen and the terrain becomes less steep (fig. 3C). These wetlands provide oases for migrating and resident waterfowl and backwater habitat for fish. Common vegetation in these areas includes boxelder and cottonwood trees, willows and tamarisk (an introduced species), cattails, bulrush, and a variety of grasses.

Ouray National Wildlife Refuge, near Vernal, is an example of an emergent wetland on the flood plain of the Green River. The Green River provides the principal source of water, which reaches the wetlands by flooding and managed pumping. Since its development, supplemental water from Pelican Lake and seeps in uplands to the north has been required to help support the 2,100 acres of wetland habitat.

## TRENDS

On the basis of unpublished U.S. Department of Agriculture records, Dahl (1990) estimated that 244,000 acres of Utah's wetlands had been lost from the 1780's to the 1980's, apparently from agricultural drainage alone. Large-scale water-development projects also have resulted in losses of wetland habitat. According to records filed with the Utah Division of Water Rights, at least 1,600 dams have been constructed in Utah since the mid-1800's. Of these dams, 445 impound 20 acre-feet of water or more (Joe Borgione, Utah Division of Water Rights, oral commun., 1993). Impounded water provides some wetland habitat but might not compensate for wetlands lost to dam construction, rising waters in reservoirs, or receding rivers. Because of dam construction, less than 10 percent of the original riparian area (uplands and wetlands associated with unimpounded water bodies) along the Colorado River still exists (Redelfs, 1980). The FWS has estimated that 50 to 60 percent of riparian wetlands in Utah have been lost (U.S. Fish and Wildlife Service, 1990). Expansion of agricultural areas, encroachment of residential developments, industrial growth, mining, ski-area development, and grazing also have resulted in wetland losses.

## CONSERVATION

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

**Federal wetland activities.**—Development activities in Utah 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; and the 1986 Emergency Wetlands Resources 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

**Table 1.** Selected wetland-related activities of government agencies and private organizations in Utah, 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
<b>FEDERAL</b>						
Department of Agriculture						
Consolidated Farm Service Agency .....	...	•	...	...	...	...
Forest Service .....	•	...	•	•	•	•
Natural Resources Conservation Service .....	•	•	•	•	•	•
Department of Defense						
Army Corps of Engineers .....	•	•	•	•	•	•
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 .....	•	•	•	•	•	•
<b>STATE</b>						
Department of Agriculture						
Environmental Quality Section .....	•	•	•	•	•	•
Department of Environmental Quality						
Division of Water Quality .....	•	•	•	•	•	•
Department of Natural Resources						
Division of Oil, Gas, and Mining .....	•	•	•	•	•	•
Division of Parks and Recreation .....	•	•	•	•	•	•
Division of State Lands and Forestry .....	•	•	•	•	•	•
Division of Water Resources .....	•	•	•	•	•	•
Division of Water Rights .....	•	•	•	•	•	•
Division of Wildlife Resources .....	•	•	•	•	•	•
Department of Transportation .....	•	•	•	•	•	•
University of Utah						
Department of Botany .....	•	•	•	•	•	•
Red Butte Garden and Arboretum .....	•	•	•	•	•	•
Utah State University						
Department of Fisheries and Wildlife .....	•	•	•	•	•	•
<b>SOME COUNTY AND LOCAL GOVERNMENTS</b> .....	•	•	•	•	•	•
<b>PRIVATE ORGANIZATIONS</b>						
National Audubon Society .....	•	•	•	•	•	•
Brigham Young University						
Department of Botany .....	•	•	•	•	•	•
Ducks Unlimited .....	•	•	•	•	•	•
The Nature Conservancy .....	•	•	•	•	•	•
Southern Utah Wilderness Alliance .....	•	•	•	•	•	•
Utah Riparian and Management Coalition .....	•	•	•	•	•	•
Utah Wetlands Foundation .....	•	•	•	•	•	•

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) (NRCS) 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 encourages wetland protection through funding incentives. The 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.

Federal land-management agencies provide for the protection and management of natural resources on land they administer, which includes wetlands. Most of the wetlands are not formally managed and are associated with riparian areas. Riparian acreages determined by agencies likely often include both uplands and wetlands. The Bureau of Land Management (BLM) manages 22,142,000 acres of land in Utah. An estimated 216,000 acres of this total are classified as riparian-wetland areas (Bureau of Land Management, 1991). Pariette Wetlands near Vernal is the largest wetland (3,000 acres) managed by the BLM.

The U.S. Forest Service manages 8,099,000 acres of land in six National Forests in Utah (Bruce Strom, U.S. Forest Service, oral commun., 1993). An estimated 250,000 acres of this total are riparian areas (Roland Leidy, Livia Crowley, Gil Garcia, Dennis Kelly, and Rick Patton, U.S. Forest Service, oral commun., 1993). The Ashley National Forest accounts for about 148,000 acres of the total, of which an estimated 70,000 acres have been identified as wet meadows (Roland Leidy, U.S. Forest Service, oral commun., 1993). The NPS manages 2,096,000 acres of land in Utah (Marty Ott, National Park Service, oral commun., 1993). Currently (1993), no estimates exist of wetland or riparian acres on land administered by the NPS.

Other Federal agencies also manage Utah wetlands. The FWS manages three refuges. Bear River Migratory Bird Refuge is the largest federally managed refuge in the State and the largest managed wetland near Great Salt Lake. It includes 63,000 acres of wetlands, but expansion plans will increase that to 93,500 acres. The Bureau of Reclamation mitigates sites affected by dam and reservoir construction and is creating new wetlands downstream from Jordanelle Reservoir along the Provo River. The Utah office of the NRCS prepares resource-management plans, which often address management of wetlands for landowners engaging in agricultural activities.

*State wetland activities.*—The Utah Department of Natural Resources, Division of Wildlife Resources, in cooperation with other State agencies, is developing a State wetland policy and plan under the EPA's Wetland Protection Program. The plan will serve as a management guide for all State-owned lands and will provide for consistency in actions taken on Utah's wetlands. The Division also is conducting an inventory to identify, classify, and develop a base map of Utah wetlands. The Division administers 20 designated Waterfowl Management Areas (87,000 acres) throughout Utah that include 64,000 acres of wetlands. The Division also participates in many cooperative efforts with private organizations to acquire wetland areas by using funds from the sale of State waterfowl stamps and from Ducks Unlimited marsh funds.

The Utah Department of Natural Resources, Division of Parks and Recreation, manages 46 parks that total more than 95,000 acres. This acreage includes an estimated 5,800 acres of wetlands (Terry

Green, Utah Division of Parks and Recreation, written commun., 1993). In compliance with the requirements of the Emergency Wetlands Resources Act, Utah's 1992 Statewide Comprehensive Outdoor Recreation Plan (unpublished draft) identifies priority wetlands. The Division of Parks and Recreation also provides protection for wetlands by regulating development along the Jordan and Provo River corridors under the Utah River Enhancement Act. Other divisions of the Utah Department of Natural Resources participate in wetland-related activities: the Division of State Lands regulates wetlands through land-use permits; the Division of Oil, Gas, and Mining restores degraded habitat under the Abandoned Mine Reclamation Program; the Division of Water Resources addresses the State's future water needs and potential effects of proposed projects on water resources; and the Division of Water Rights issues some section 404 permits under the guidance of the Corps.

The Utah Department of Environmental Quality, Division of Water Quality, is responsible for Clean Water Act section 401 certification, which helps ensure that water quality will not be adversely affected by activities specified in a section 404 permit. The Division of Water Quality and the Environmental Quality Section of the Department of Agriculture evaluate riparian areas and potential nonpoint sources of pollution and develop plans for priority watersheds that include alternatives for water-quality improvement. The Utah Department of Transportation mitigates wetland loss when it cannot be avoided during construction of new highways or improvement of existing highways.

*County and local wetland activities.*—Several county and local agencies participate in the management of water resources. The EPA provides support and funding for Wetland Advance Identification Studies, which are usually collaborative efforts by local cooperating agencies. The data collected during these studies facilitate the section 404 permitting process. An Advance Identification of wetlands along the Jordan River was conducted by the Salt Lake City-County Health Department. Advance Identification Studies of wetlands also have been conducted in Albion and Snyderville Basins.

*Private wetland activities.*—The National Audubon Society promotes public awareness and educational programs concerning wetlands and provides physical assistance in wetland restoration and creation projects. Ducks Unlimited is dedicated to funding wetland acquisition. Seven wetland projects in Utah, funded cooperatively by Ducks Unlimited, have involved land acquisition and improved water-resource utilization. The Nature Conservancy seeks to protect plants and animals from extinction through acquisition of areas for critical habitat. They currently manage two notable wetlands in Utah: the Matheson Wetlands Preserve near Moab and the Layton Marsh near Ogden. Twenty-six private hunt clubs manage 46,000 acres of wetlands and uplands surrounding Great Salt Lake (Jensen, 1974). Other private organizations involved in wetland activities include the Utah Wetlands Foundation, the Southern Utah Wilderness Alliance, the Summit County Land Trust, and the Utah Riparian Management Coalition.

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