

# North Dakota

## Wetland Resources

**W**etlands covered nearly 11 percent of North Dakota, about 4.9 million acres, in predevelopment times (Dahl, 1990). By the 1980's, wetlands covered about 6 percent of the State, or about 2.7 million acres, which represents a 45 percent reduction from the predevelopment acreage (North Dakota Parks and Recreation Department, 1987).

Wetlands are ecologically and economically valuable to the State. Wetlands trap, remove, and transform waterborne constituents by processes such as sedimentation, plant uptake, microbial transformation, and soil adsorption. Attenuation of runoff from snowmelt and rainfall by wetlands reduces the magnitude of potential flooding downstream. Riparian vegetation along watercourses reduces the potential for bank and channel erosion by stabilizing the banks and channels. In some areas, the water held in a wetland recharges the local ground-water system.

Wetlands provide habitat for furbearers, game species, and many nongame-wildlife species. Probably the best known function of wetlands in North Dakota is waterfowl production. The Prairie Pothole Region, which extends across much of the State, contains only 10 percent of the waterfowl breeding area in North America, yet it accounts for 50 percent of the duck crop in an average year (Smith and others, 1964). The hunting industry in States all along the Central Flyway benefit from North Dakota's prairie pothole wetlands. Aside from their value as breeding areas, North Dakota wetlands also provide resting and feeding habitat for migratory waterfowl and wading birds.

### 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 North Dakota 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, Riv-

erine, 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 North Dakota 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   |

Currently (1993), no estimate of statewide wetland acreage in each of these ecological systems is available. Stewart and Kantrud (1973) estimated wetland acreages by using data collected in 1967; however, their classification system differed from that of Cowardin and others (1979). Stewart and Kantrud classified wetlands according to the following habitat types: natural basin wetlands, streams and oxbows, stock ponds and dugouts, and road ditches and drainage channels. Under the Cowardin and others (1979) classification system, natural basin wetlands would include wetlands classified mostly as palustrine and a small amount as lacustrine and are estimated to constitute about 91 percent, or about 2.5 million acres, of the wetlands in the State. Streams and oxbows would be classified as palustrine or riverine and constitute about 160,000 acres. Stock ponds and dugouts would be classified as palustrine or lacustrine and constitute about 50,000 acres. Road ditches and drainage channels would be classified as palustrine and constitute about 30,000 acres. The total acres of wetlands in Stewart and Kantrud's estimate for the late 1960's is about 2.7 million acres, slightly more than the 2.5 million acres estimated by the FWS using 1980's data (Dahl, 1990).

Stewart and Kantrud (1973) divided North Dakota into four biotic regions (fig. 2B). They estimated that 2.2 million acres of wetlands, or 81 percent of the wetlands in the State, are in the Prairie Pothole Region. Specific estimates were not available for the Agassiz Lake Plain, the Coteau Slope, or the Southwestern Slope Regions. The wetland types in the Prairie Pothole, Agassiz Lake Plain, and Coteau Slope Regions are similar; about 90 percent of the wetlands are in natural basins. The least amount of wetland acreage in the four regions is in the Southwestern Slope Region. About 95 percent of the wetlands in this region are riparian wetlands along streams and around stock ponds and dugouts.

More than 90 percent of the wetlands in the State are classified by Stewart and Kantrud (1973) as natural basin wetlands, commonly called prairie potholes. The prairie potholes primarily contain persistent-emergent wetlands, variously called wet meadows, marshes, and fens. The distinction among these different wetlands is based in part on vegetation. The species of plants found in a



**Figure 1.** Prairie pothole wetlands about 28 miles northwest of Jamestown. (Photograph by T.C. Winter, U.S. Geological Survey.)

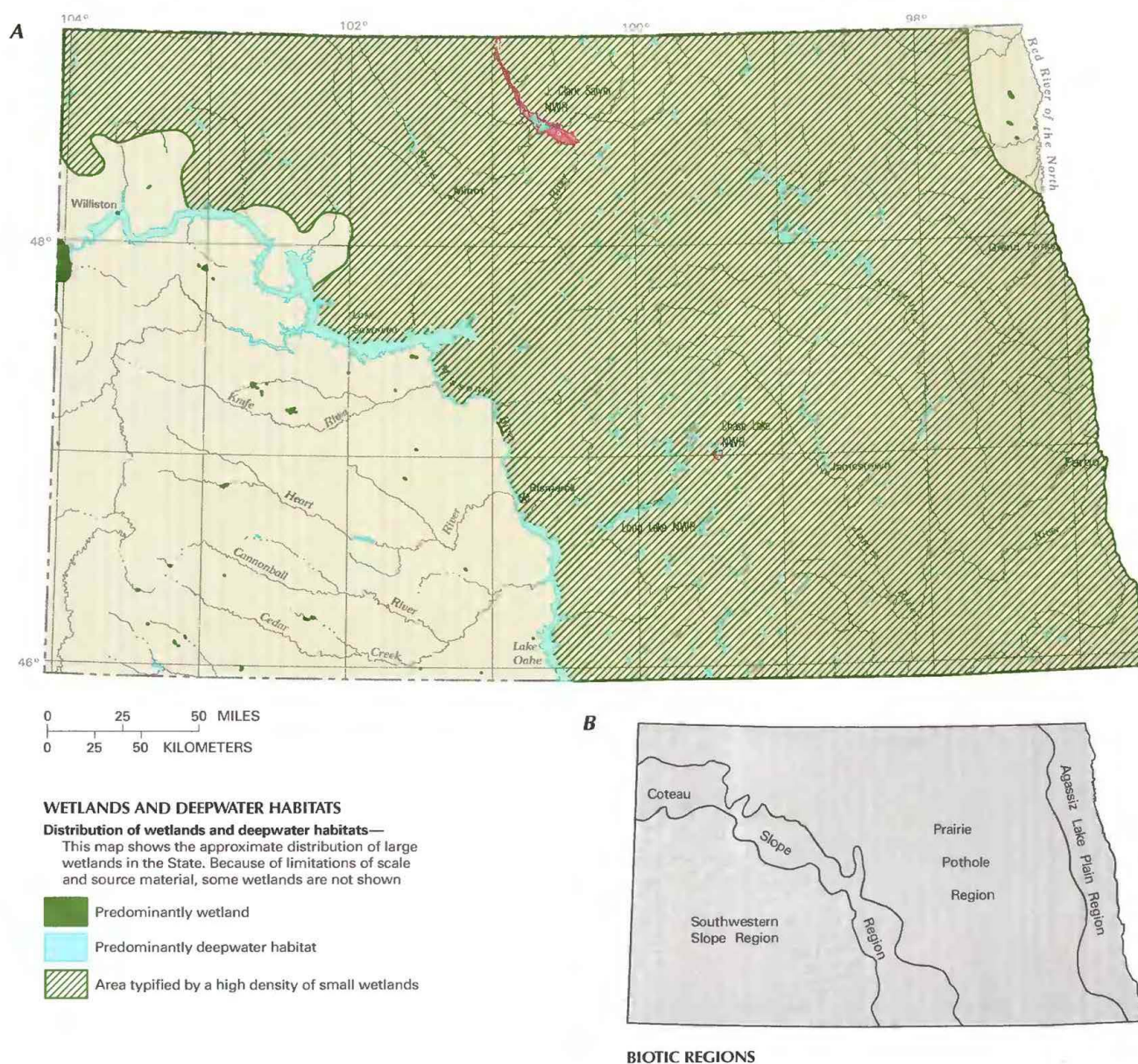


wetland is a function of water availability in each year. Climatic fluctuations can cause emergent wetlands to change or revert to an open-water phase in some years (Stewart and Kantrud, 1972). Wet meadows are present in the shallow pond basins and around the deeper ponds and lakes. Flooding persists in wet meadows for only a few weeks following spring snowmelt or a few days following heavy rainstorms. Plant species that characterize wet meadows are fine-textured grasses, rushes, and low sedges. Marshes form in pond basins where water either persists throughout the year or persists for long periods and then evaporates or is transpired in late summer and fall. Marsh vegetation consists of grasses or grasslike plants, such as sedges, bulrushes, and cattails, that are coarser and taller than the plants in the wet meadow. Fen wetlands are quagmires that have floating mats of emergent vegetation. Fen wetlands are a result of ground-water seepage on sloping terrain, usually adjacent to a pond or lake. Plant species in fen wetlands can be the same as those in wet meadows and marshes. Fen wetlands are not common in North Dakota.

Prairie potholes that contain submerged or floating plants are called aquatic-bed wetlands. Aquatic-bed vegetation commonly grows in ponds and lakes that persist for weeks or longer. Most of the plant species are bottom-rooted plants, but free-floating plants also are common. The types of plant species present are closely correlated with water salinity. The plants that grow in fresh or slightly brackish ponds or lakes are not present in the saline waters of alkali ponds and lakes.

Other palustrine classes that exist but are not common in North Dakota are scrub-shrub wetlands and forested wetlands. Scrub-shrub wetlands contain willows, cottonwoods, and aspens. Forested wetlands have formed along rivers and contain mostly cottonwoods.

The distribution and abundance of wetlands in North Dakota are the result of the State's glacial history. The Coteau Slope, Prairie Pothole, and Agassiz Lake Plain Regions were glaciated during the most recent glacial period, whereas the Southwestern Slope Region was not. Wetlands in the glaciated regions formed in depressions resulting from glacial and postglacial activity. Permanently flooded



**Figure 2.** Wetland distribution in North Dakota and biotic regions of the State. **A**, Distribution of wetlands and deepwater habitats. **B**, Biotic regions. (Sources: **A**, T.E. Dahl, U.S. Fish and Wildlife Service, unpub. data, 1991. **B**, Modified from Stewart and Kantrud, 1973.)



to semipermanently flooded wetlands generally are in areas of end moraines and stagnation moraines, which are most common in the Coteau Slope Region. Seasonally flooded to intermittently flooded wetlands generally form in areas of ground moraine and lake plains, which are most common in the Prairie Pothole and Agassiz Lake Plain Regions. Wetlands in the unglaciated Southwestern Slope Region are few and are present as riparian wetlands along watercourses and as artificially flooded wetlands around reservoirs, stock ponds, and dugouts.

The FWS National Wetlands Inventory is mapping the Nation's wetlands. Wetlands are identified on U.S. Geological Survey 7.5-minute quadrangle topographic maps, many of which are stored in digital format. Currently (1993), paper maps are available for 79 percent of North Dakota, and digital-format maps are available for 31 percent of the State.

## HYDROLOGIC SETTING

Wetlands form where surface-water and ground-water flow patterns cause water to be near or above the soil surface for a significant period of time during the growing season. The location and persistence of the wetland is a function of climate, topography, ground-water flow patterns, surface-water flow patterns, and runoff characteristics in a basin.

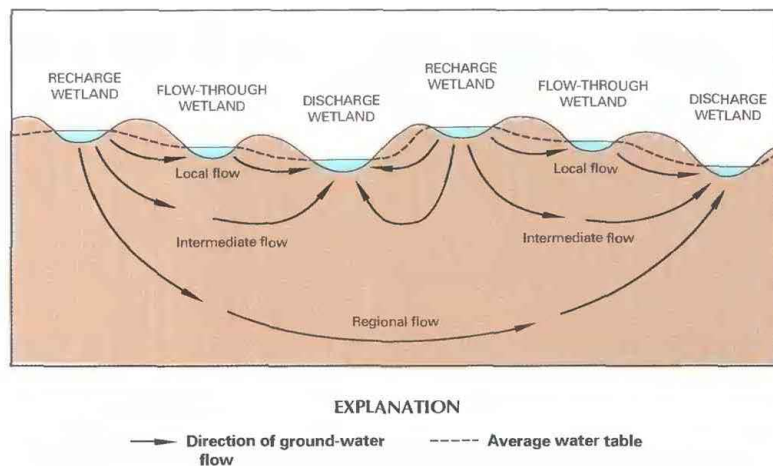
The most common wetlands in North Dakota are prairie potholes. These wetlands formed in glacial deposits such as end moraines, stagnation moraines, ground moraines, outwash plains, and lake plains. The glacial deposits generally consist of silt and clay through which water moves slowly. Outwash plains, however, mostly consist of sorted sand, which transmits water readily. In the morainal areas, no natural surface-drainage network has developed, so many depressions are not connected to an integrated drainage system (fig. 3).



**Figure 3.** Prairie pothole wetlands near Chase Lake National Wildlife Refuge. Note the absence of a surface-drainage system. (Photograph courtesy of U.S. Fish and Wildlife Service.)

The interaction between ground water and a wetland affects the permanence and water quality of the wetland. Studies of the Prairie Pothole Region (Hubbard, 1988; Winter, 1989) indicate that ground-water flow among wetlands is complicated. Wetlands in the same area can discharge to different ground-water systems: one to a regional system, another to an intermediate system, and still another to a local system (fig. 4).

Generally, wetlands in the Prairie Pothole Region have three types of interaction with the ground-water system (Katrud and others, 1989). Some wetlands recharge the underlying ground-water system. These wetlands tend to hold water for only a few months



**Figure 4.** Generalized ground-water flow in the Prairie Pothole Region. (Source: Modified from Winter, 1989.)

a year, and the water generally has low dissolved-solids concentrations. Other wetlands are flow-through systems; that is, ground water flows into parts of the wetland while other parts of the wetland recharge the ground-water system. Flow-through wetlands tend to hold water for longer periods and generally have higher dissolved-solids concentrations. A third type of wetland serves only as a discharge area for ground water. These wetlands are permanently flooded and typically saline.

Climate has a major effect on wetland formation and permanence. Most of North Dakota is dry; average precipitation ranges from about 13 inches in the western part of the State to about 20 inches along the eastern border. Average annual free-water-surface evaporation ranges from 32 inches in the northeastern part of the State to about 40 inches in the southwestern part (Winter and others, 1984). Because average annual free-water-surface evaporation is greater than average annual precipitation, there is an annual moisture deficit that inhibits wetland formation and permanence.

North Dakota's harsh winters also affect the hydrology of wetlands in the State. About 25 percent of the annual precipitation occurs as snow, which generally falls between October and March (Winter and others, 1984). Snow is blown off the unsheltered farmland and accumulates in sheltered areas and depressions, such as wetlands. When the snow begins to melt in the spring, the ground is still frozen, so snowmelt and spring rains do not readily infiltrate into the soil. As a result, snowmelt runoff and spring rains are the major source of water to the prairie potholes (Shjeflo, 1968).

Annual variations in climate affect the permanence of wetlands. Stewart and Kantrud (1973) estimated that 67 percent of the wetlands (by area) in the Prairie Pothole Region are seasonally flooded or temporarily flooded wetlands. Because these wetlands are filled in the spring by snowmelt runoff, the amount of snowpack accumulated in the winter determines to what extent a wetland is filled. Temperature and windspeed determine how long the water remains in the wetland. Standing water is present from about a week in the temporarily flooded wetlands to about 2 months in the seasonally flooded wetlands. All of these wetlands go dry before the growing season is complete. Following a winter of little snowfall, many wetlands do not receive any water for that year, and some of them are tilled. About 29 percent of the wetlands in the Prairie Pothole Region have been tilled.

Forested and scrub-shrub wetlands are present along creeks and rivers and around most of the dugouts and small reservoirs in the State. During runoff periods, particularly following snowmelt runoff, parts of the creek and river flood plains are inundated for short periods of time. The runoff also fills the dugouts and small

reservoirs. During drier parts of the year, the existence of forested and scrub-shrub wetlands along the creeks and rivers and around dugouts and small reservoirs depends on ground water.

In some wildlife refuges, the FWS has attempted to stabilize the effects that climate has on the permanence of wetlands. An example is J. Clark Salyer National Wildlife Refuge. Five small dams that can maintain about 4 feet of water over parts of the flood plain were built on the Souris River. Water is regulated to sustain the desired emergent wetlands. If emergent vegetation, such as cattails, becomes too thick, the growth can be controlled by increasing the water level in the wetland or draining the wetland. Because the Souris River provides a reliable source of water, the variable climatic conditions will not greatly affect the management of the wetlands.

## TRENDS

Predevelopment wetland acreage in North Dakota has been estimated to be about 4.9 million acres (North Dakota Parks and Recreation Department, 1987; Dahl, 1990). When settlers moved into the State, they noted in their journals many wet meadows, particularly along the Red River of the North. Farmers drained some of these wetlands to grow crops. The most recent and complete published wetland inventory was done in 1982 by the Natural Resources Conservation Service (formerly the Soil Conservation Service) (NRCS), which estimated that 2.7 million acres of wetlands remained in the State (North Dakota Parks and Recreation Department, 1987). The most extensive drainage has occurred in the Agassiz Lake Plain Region, where about 1.2 million acres of wet soils have been drained (North Dakota Parks and Recreation Department, 1987). To a lesser extent, wetlands have been drained for road construction, urban development, and surface mining. In addition to the loss of many wetlands due to drainage, others have been degraded by siltation and chemical contamination.

Agricultural drainage still poses the greatest threat to wetlands in the State. The wetlands that were the easiest and cheapest to drain already have been drained; therefore, economic factors limit current drainage trends. As small farms are consolidated into large commercial farms, drainage might not be as large a financial burden, and additional wetlands might be drained. Economists feel that if free-market prices remain low, Federal farm programs will have made wetland drainage unprofitable (North Dakota Parks and Recreation Department, 1987). However, if crop prices increase and Federal programs are eliminated, drainage will be profitable and political pressure could change the State's "no-net-loss" policy.

## CONSERVATION

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

*Federal wetland activities.*—Development activities in North Dakota 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 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.

**Table 1.** Selected wetland-related activities of government agencies and private organizations in North Dakota, 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 .....                | •   | •   | •   | •   | •   | •   |
| 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 .....        | •   | •   | •   | •   | •   | •   |
| <b>STATE</b>                                 |     |     |     |     |     |     |
| Department of Health and                     |     |     |     |     |     |     |
| Consolidated Laboratories .....              | •   | •   | •   | •   | •   | •   |
| Department of Transportation .....           | •   | •   | •   | •   | •   | •   |
| Forest Service .....                         | •   | •   | •   | •   | •   | •   |
| Game and Fish Department .....               | •   | •   | •   | •   | •   | •   |
| Parks and Tourism Department .....           | •   | •   | •   | •   | •   | •   |
| Water Commission .....                       | •   | •   | •   | •   | •   | •   |
| <b>PRIVATE</b>                               |     |     |     |     |     |     |
| Ducks Unlimited .....                        | •   | •   | •   | •   | •   | •   |
| The Nature Conservancy .....                 | •   | •   | •   | •   | •   | •   |

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 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 agencies are responsible for the proper management of wetlands on public land under their jurisdiction. In North Dakota, the FWS manages about 290,000 acres in 63 National Wildlife Refuges. The FWS manages about 240,000 acres in 1,000 Waterfowl Protection Units. In addition, the FWS has conservation easements to 700,000 acres of private wetlands. The Bureau of Land Management (BLM) manages about 6,800 acres of wetlands in 66,000 acres of BLM land. The U.S. Forest Service manages about 1.1 million acres of land in three National Grasslands that have an estimated riparian acreage of 16,000 acres. The NPS manages 71,000 acres in two National Historic Sites and one National Park but currently (1993) has no estimate of wetland acreage under its jurisdiction. The Bureau of Reclamation (BOR) has acquired land owing to mitigation of projects in the State. The BOR has transferred management responsibilities of about 17,000 acres to the FWS, of which 5,000 acres are wetlands. The BOR is still developing about 6,000 acres of mitigated land, of which 1,000 acres are wetlands. The BOR also is developing about 10,000 acres of land encompassed by its projects, of which 6,000 acres are wetlands. Eventually the management responsibilities of all land being developed by the BOR will be transferred to another Federal or State agency.

*State wetland activities.*—State programs for wetland protection are 80-acre drainage permits (North Dakota Century Code 61–01–22), Senate Bill No. 2035, and the State Water Bank Program. Since 1957, North Dakota has required landowners to obtain a permit to drain wetlands that have a drainage area larger than 80 acres. Permits are reviewed by the local Water Resources District and by the North Dakota State Water Commission State Engineer. Senate Bill No. 2035, commonly known as the “no-net-loss” bill, was passed in 1987. The bill maintains existing drainage regulations, but the bill also requires that the same acreage of wetlands will exist in the future as existed on January 1, 1987. The Water Commission State Engineer and the Game and Fish Department Director must jointly find that the wetland proposed to be destroyed will be replaced by an equal acreage of suitable wetland. A wetlands bank was established to keep track of the wetlands drained and restored. The wetlands bank is the responsibility of the Water Commission. Wetlands drained are reported as debits and wetlands created or restored are reported as credits. The “no-net-loss” bill mandates that the bank cannot carry a net debit greater than 2,500 acres. The State Water Bank Program was created in 1981 to give landowners financial incentive to set aside cropland to preserve the State’s wetlands. The program is administered at the State and county levels and uses private donations.

The Department of Health and Consolidated Laboratories reviews section 404 permit applications to ensure compliance with water-quality regulations. Also, the Department submits a biennial assessment of the State’s surface-water quality, including wetlands, to the EPA and the U.S. Congress, according to Clean Water Act Section 305(b) requirements.

State agencies also are responsible for the proper management of wetlands on public land under their jurisdiction. The North Dakota Game and Fish Department manages 80,000 acres in fee or title ownership, and many of these acres are wetlands. The North Dakota Department of Transportation manages 195,000 acres of right-of-ways along the highways in the State and uses best-management practices to avoid unnecessary disturbances of wetlands while maintaining or constructing highways. Unavoidable filling of wetlands is mitigated through wetland restoration or creation. The State Parks

and Tourism Department manages 16,000 acres of land in State Parks but currently (1993) has no estimate of wetland acreage. The North Dakota Forest Service manages 13,000 acres of land in five State Forests but currently (1993) has no estimate of wetland acreage.

*Private wetland activities.*—Ducks Unlimited works with Federal, State, and private landowners to restore and enhance lands for wildlife production, with emphasis on waterfowl production. The Nature Conservancy manages about 4,000 acres of land on two preserves, and about one-half of the acreage is wetlands. The Nature Conservancy’s interest is to preserve habitat unique to endangered plant and animal species in the State, particularly species unique to alkali wetlands.

## References Cited

- Cowardin, L.M., Carter, Virginia, Golet, F.C., and LaRoe, E.T., 1979, Classification of wetlands and deepwater habitats of the United States: U.S. Fish and Wildlife Service Report FWS/OBS–79/31, 131 p.
- Dahl, T.E., 1990, Wetlands—Losses in the United States, 1780’s to 1980’s: Washington, D.C., U.S. Fish and Wildlife Service Report to Congress, 13 p.
- Hubbard, D.E., 1988, Glaciated prairie wetlands functions and values—A synthesis of the literature: U.S. Fish and Wildlife Service Biological Report 88(43), 50 p.
- Kantrud, H.A., Krapu, G.L., and Swanson, G.A., 1989, Prairie basin wetlands of the Dakotas—A community profile: U.S. Fish and Wildlife Service Biological Report 85(7.28), 111 p.
- North Dakota Parks and Recreation Department, 1987, North Dakota State comprehensive outdoor recreation plan addendum, wetlands priority plan: North Dakota Parks and Recreation Department, 82 p.
- Shjeflo, J.B., 1968, Evapotranspiration and the water budget of prairie potholes in North Dakota: U.S. Geological Survey Professional Paper 585–B, 49 p.
- Smith, A.G., Stoudt, J.H., and Gollop, J.B., 1964, Prairie potholes and marshes, in Linduska, J.P., ed., *Waterfowl tomorrow*: Washington D.C., U.S. Fish and Wildlife Service, p. 39–50.
- Stewart, R.E., and Kantrud, H.A., 1972, Vegetation of prairie potholes, North Dakota, in relation to quality of water and other environmental factors: U.S. Geological Survey Professional Paper 585–D, 36 p.
- , 1973, Ecological distribution of breeding water fowl populations in North Dakota: *Journal of Wildlife Management*, v. 37, no. 1, p. 39–50.
- Winter, T.C., 1989, Hydrologic studies of wetlands in the northern prairie, in Van Der Valk, A., ed., *Northern prairie wetlands*: Ames, Iowa State University Press, p. 16–54.
- Winter, T.C., Benson, R.D., Engberg, R.A., and others, 1984, Synopsis of ground-water and surface-water resources of North Dakota: U.S. Geological Survey Open-File Report 84–732, 127 p.

---

FOR ADDITIONAL INFORMATION: District Chief, U.S. Geological Survey, 821 East Interstate Avenue, Bismarck, ND 58501; Regional Wetland Coordinator, U.S. Fish and Wildlife Service, Fish and Wildlife Enhancement, P.O. Box 25486, Denver Federal Center, Denver, CO 80225

---

*Prepared by*  
Wayne R. Berkas,  
U.S. Geological Survey

