Meg Turville-Heitz, Madison, WI

Wetlands

Introduction

Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support (and that under normal circumstances do support) a prevalence of vegetation typically adapted for life in saturated soil conditions (Figure 5-1). Wetlands generally include swamps, marshes, bogs, and similar areas. This is the definition of wetlands as it appears in the regulations jointly issued by the Army Corps of Engineers (COE) and the U.S. EPA (33 CFR Part 328.3(b), 40 CFR Part 232.2 (r), and 40 CFR Part 230.3(t)).

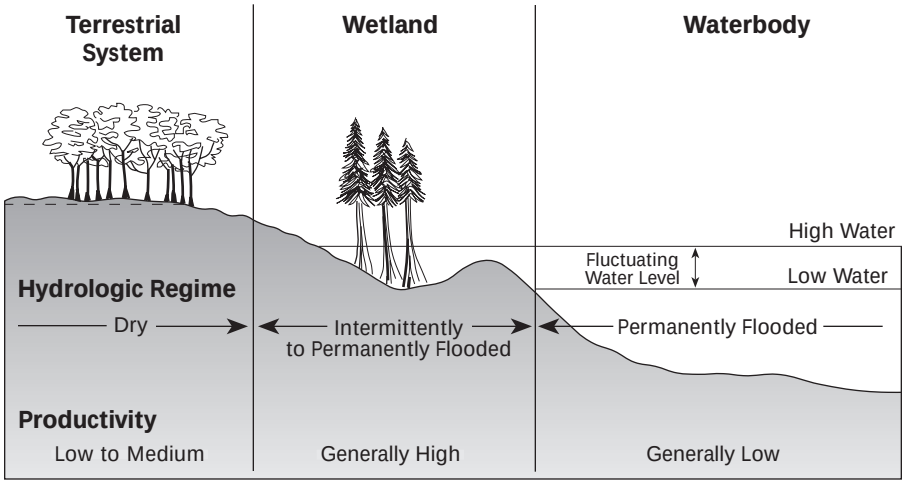
A wide variety of wetlands exists across the country because of regional and local differences in hydrology, vegetation, water chemistry, soils, topography, climate, and other factors. Wetlands type is determined primarily by local hydrology, the unique pattern of water flow through an area. In general, there are two broad categories of wetlands: coastal and inland wetlands.

With the exception of the Great Lakes coastal wetlands, coastal wetlands are closely linked to estuaries, where sea water mixes with fresh water to form an environment of varying salinity and fluctuating water levels due to tidal action. Coastal marshes dominated by grasses, sedges, and rushes and halophytic (salt-tolerant) plants are generally located along the Atlantic and Gulf coasts due to the gradual slope of the land. Mangrove swamps, which are dominated by halophytic shrubs and trees, are common in Hawaii, Puerto Rico, Louisiana, and southern Florida.

Inland wetlands are most common on floodplains along rivers and streams, in isolated depressions surrounded by dry land, and along the margins of lakes and ponds. Inland wetlands include marshes and wet meadows dominated by grasses, sedges, rushes, and herbs; shrub swamps; and wooded swamps dominated by trees, such as hardwood forests along

Figure 5-1

Depiction of Wetlands Adjacent to Waterbody



Wetlands are often found at the interface between dry terrestrial ecosystems, such as upland forests and grasslands, and permanently wet aquatic ecosystems, such as lakes, rivers, bays, estuaries, and oceans.

Reprinted with modifications, by permission, from Mitsch/Gosselink: *Wetlands 1986*, fig. 1-4, p. 10. ©1986, Van Nostrand Reinhold.

floodplains. Some regional wetlands types include the pocosins of North Carolina, bogs and fens of the northeastern and north central States and Alaska, inland saline and alkaline marshes and riparian wetlands of the arid and semiarid West, vernal pools of California, playa lakes of the Southwest, cypress gum swamps of the South, wet tundra of Alaska, the South Florida Everglades, and prairie potholes of Minnesota, Iowa, and the Dakotas.

Functions and Values of Wetlands

In their natural condition, wetlands provide many benefits, including food and habitat for fish and wildlife, water quality improvement, flood protection, shoreline erosion control, ground water exchange, as well as natural products for human use and opportunities for recreation, education, and research.

Wetlands are critical to the survival of a wide variety of animals and plants, including numerous rare and endangered species. Wetlands are also primary habitats for many species, such as the wood duck, muskrat, and swamp rose. For others, wetlands provide important seasonal habitats where food, water, and cover are plentiful.

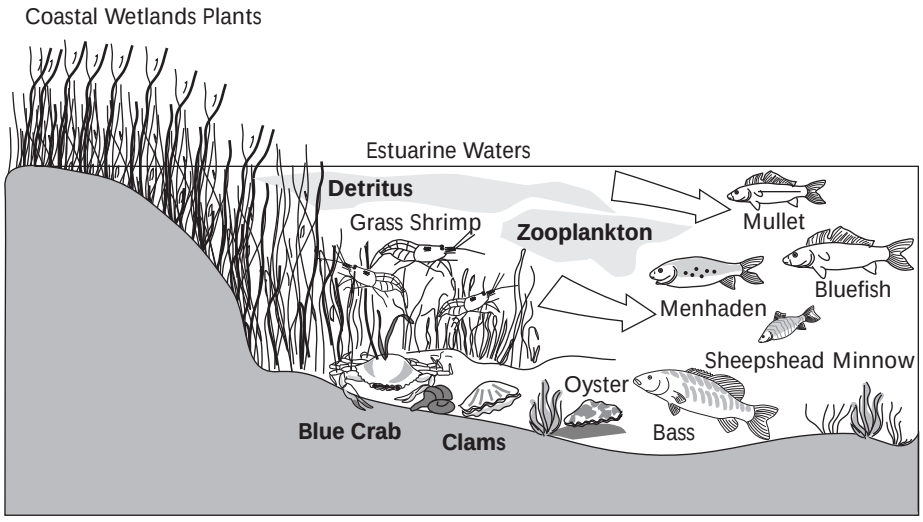
Wetlands are among the most productive natural ecosystems in the world. They produce great volumes of food, such as leaves and stems, that break down in the water to form detritus (Figure 5-2). This enriched material is the principal food for many aquatic invertebrates, various shellfish, and forage fish that are food for larger commercial and recreational fish species such as bluefish and striped bass.

Wetlands help maintain and improve water quality by intercepting surface water runoff before it reaches open water, removing or retaining nutrients, processing chemical and organic wastes, and reducing sediment loads to receiving waters (Figure 5-3). As water moves through a wetland, plants slow the water, allowing sediment and pollutants to settle out. Plant roots trap sediment and are then able to metabolize and detoxify pollutants and remove nutrients such as nitrogen and phosphorus.

Wetlands function like natural basins, storing either floodwater that overflows riverbanks or surface water that collects in isolated depressions. By doing so, wetlands help protect adjacent and downstream property from flood damage. Trees and other wetland

Figure 5-2

Coastal Wetlands Produce Detritus that Support Fish and Shellfish



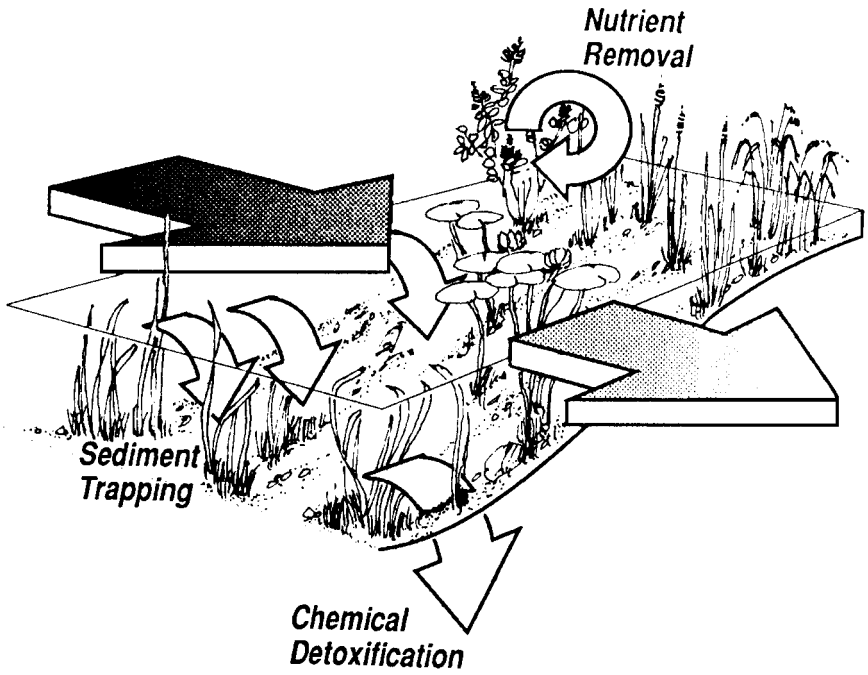
vegetation help slow the speed of flood waters. This action, combined with water storage, can lower flood heights and reduce the water's erosive potential (Figure 5-4). In agricultural areas, wetlands can help reduce the likelihood of flood damage to crops. Wetlands within and upstream of urban areas are especially valuable for flood protection, since urban development increases the rate and volume of surface water runoff, thereby increasing the risk of flood damage.

Wetlands are often located between rivers and high ground (called uplands) and are therefore able to store flood waters and reduce channel erosion. Wetlands bind soil, dampen wave action, and reduce current velocity through friction. These properties are very valuable for stabilizing shorelines (Figure 5-5).

Wetlands water storage capacity also allows recharge of ground water, which may be used as sources of water for drinking or agricultural uses (Figure 5-6). Elevated ground water tables and water stored in wetlands are also important for maintaining stream base-flows. Water entering wetlands during wet periods is released slowly through ground water or as runoff, moderating stream flow volumes necessary for the survival of fish, wildlife, and plants that rely on the stream (Figure 5-7).

Figure 5-3

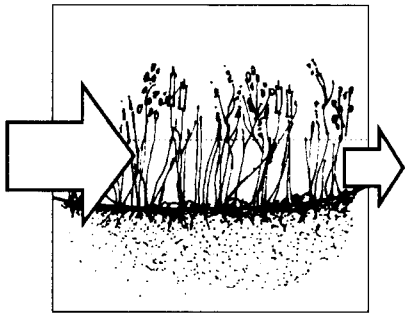
Water Quality Improvement Functions in Wetlands



Source: Washington State Department of Ecology.

Figure 5-4

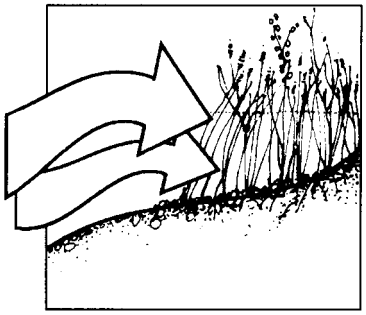
Flood Protection Functions in Wetlands



Source: Washington State Department of Ecology.

Figure 5-5

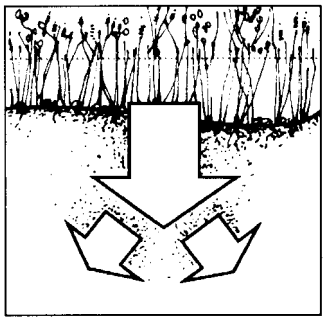
Shoreline Stabilization Functions in Wetlands



Source: Washington State Department of Ecology.

Figure 5-6

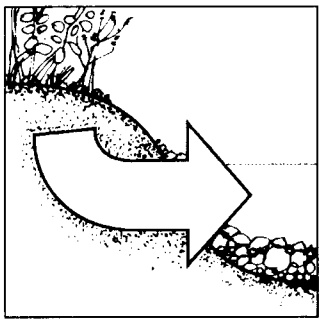
Ground Water Recharge Functions in Wetlands



Source: Washington State Department of Ecology.

Figure 5-7

Streamflow Maintenance Functions in Wetlands



Source: Washington State Department of Ecology.

Wetlands produce a wealth of natural products, including fish and shellfish, timber, wildlife, and wild rice. Much of the Nation's fishing and shellfishing industry harvests wetlands-dependent species. A national survey conducted by the U.S. Fish and Wildlife Service (FWS) in 1991 illustrates the economic value of some of the wetlands-dependent products. Over 9 billion pounds of fish and shellfish landed in the United States in 1991 had a direct dockside value of $3.3 billion. This served as the basis of a seafood processing and sales industry that generated total expenditures of $26.8 billion. In addition, 35.6 million anglers spent $24 billion on freshwater and saltwater fishing. It is estimated that 71% of commercially valuable fish and shellfish depend directly or indirectly on coastal wetlands.

The abundant wildlife in wetlands also attracts outdoor recreationists. Visits by outdoor recreationists to national wildlife refuges (NWR), which often protect extensive wetlands, bring millions of dollars and many jobs to adjacent communities. The FWS estimated that in 1994, bird watchers and other outdoor recreationists spent $636,000 in the communities around the Quivara NWR in Kansas, $3.1 million around the Salton Sea NWR in California, and over $14 million around the Santa Ana NWR in Texas.

Consequences of Wetlands Loss and Degradation

The loss or degradation of wetlands can lead to serious consequences, including increased flooding; species decline, deformity, or extinction; and declines in water quality. The following discussion describes several examples of the consequences of wetlands loss and degradation.

Floods continue to seriously damage the property and livelihoods of thousands of Americans despite expenditures of billions of local, State, and Federal dollars over the years to reduce flooding. Loss or degradation of wetlands intensifies flooding by eliminating their capacity to absorb peak flows and gradually release flood waters.

■ In Massachusetts, the U.S. Army Corps of Engineers estimated that over $17 million of annual flood damage would result from the destruction of 8,422 acres of wetlands in the Charles River Basin. For this reason, the COE decided to preserve wetlands rather than construct extensive flood control facilities along a stretch of the Charles River near Boston. Annual benefits of the preservation project average $2.1 million while annual costs average $617,000.

■ The Minnesota Department of Natural Resources estimated that it costs the public $300 to replace the water storage capacity lost by development of 1 acre of wetlands

that holds 12 inches of water. The cost of replacing 5,000 acres of wetlands would be $1.5 million, which exceeds the State's annual appropriation for flood control.

■ In 1988, DuPage County, Illinois, found that 80% of all flood damage reports came from owners whose houses were built in converted wetlands. The county spends $0.5 to $1.0 million annually to correct the problem.

Another consequence of wetlands loss or degradation is decline, deformity from toxic contamination, or extinction of wildlife and plant species. Forty-five percent of the threatened and endangered species listed by the Fish and Wildlife Service rely directly or indirectly on wetlands for their survival. The Nature Conservancy estimates that two-thirds of freshwater mussels and crayfishes are rare or imperiled and more than one-third of freshwater fishes and amphibians dependent on aquatic and wetlands habitats are at risk.

■ The destruction of wetlands around Merritt Island and St. John's Island in Florida has been identified as a major contributor to the extinction of the Dusky Seaside Sparrow. The sparrow's habitat was diked and flooded in an attempt to control mosquitos, then drained and burned to promote ranching. The last Dusky Seaside Sparrow died in captivity on June 16, 1987.

■ Overlogging of mature bottomland hardwood forests is believed to have caused the extinction of the Ivory Billed Woodpecker in the United States. The clearing of bottomland hardwood forests has also affected the Louisiana Black Bear, or swamp bear, by destroying the bear's habitat. With its population plummeting from the thousands to several hundred, the Fish and Wildlife Service recently listed the Louisiana Black Bear as "threatened" under the Endangered Species Act.

■ Populations of Mallard Ducks and Northern Pintail Ducks in North America declined continually between 1955 and the early 1990s. In 1990, the number of Mallard Ducks in the prairies of the United States declined 60% from the number counted in 1989 to the lowest population figures on record. The well-being of waterfowl populations is tied to the status and abundance of wetlands. As waterfowl populations are squeezed into the remaining wetlands, confined conditions favor outbreaks of avian cholera and other contagious diseases in waterfowl. In 1996, breeding duck populations reached their highest levels since 1979 because of consecutive years of abundant precipitation and continued public and private efforts to maintain and restore wetlands habitats.

■ The Arizona Game and Fish Department estimates that 75% or more of all of Arizona's native wildlife species depend on healthy riparian systems during some portion of their life cycle.

Wetlands loss and degradation also reduce water quality purification functions performed by wetlands.

STATES REPORT that residential development and urban growth are the leading sources of recent wetlands loss.

■ The Congaree Bottomland Hardwood Swamp in South Carolina provides valuable water quality services, such as removing and stabilizing sediment, nutrients, and toxic contaminants. The total cost of constructing, operating, and maintaining a tertiary treatment plant to perform the same functions would be $5 million.

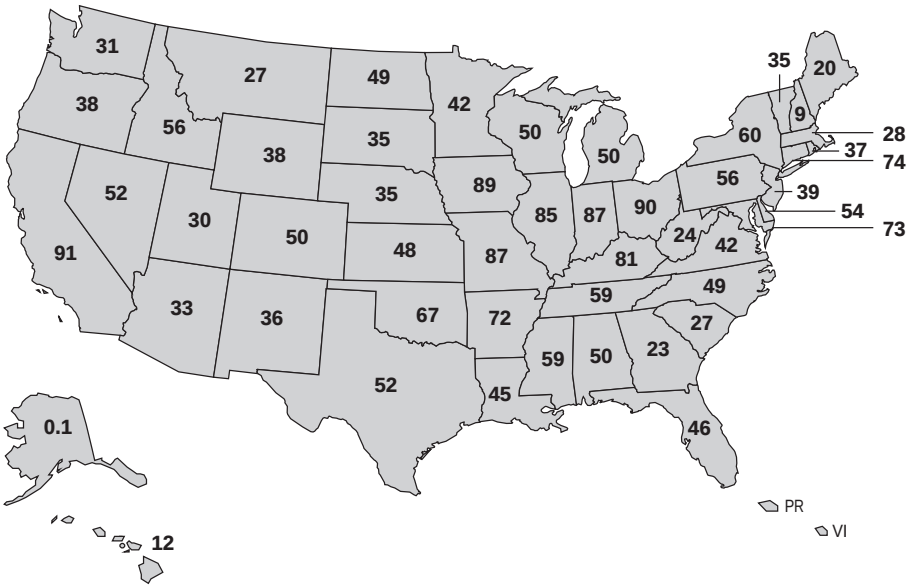
■ Forested riparian wetlands play an important role in reducing nutrient loads entering the Chesapeake Bay. In one study, a riparian forest in a predominantly agricultural watershed removed about 80% of the phosphorus and 89% of the nitrogen from the runoff water before it entered a tributary to the Bay. Destruction of such areas adversely affects the water quality of the Bay by increasing undesirable weed growth and algae blooms.

■ A study of two similar sites on the Hackensack River in New Jersey demonstrated the increase in erosion that results from the destruction of marshlands. In the study, marsh vegetation was cut at one site and left undisturbed at the other site. The bank at the cut site eroded nearly 2 meters (more than 6 feet) in 1 year while the uncut site exhibited negligible bank erosion.

These examples illustrate the integral role of wetlands in our ecosystems and how wetlands destruction and degradation can have expensive and permanent consequences. By preserving wetlands and their functions, wetlands will continue to provide many benefits to people and the environment.

Figure 5-8

Percentage of Wetlands Acreage Lost, 1780s-1980s



Twenty-two States have lost at least 50% of their original wetlands. Seven of these 22 (California, Indiana, Illinois, Iowa, Missouri, Kentucky, and Ohio) have lost more than 80% of their original wetlands.

Source: Dahl, T.E., 1990, Wetlands Losses in the United States 1780's to 1980's, U.S. Department of the Interior, Fish and Wildlife Service.

Extent of the Resource

Wetlands Loss in the United States

It is estimated that over 200 million acres of wetlands existed in the lower 48 States at the time of European settlement. Since then, extensive wetlands acreage has been lost, with many of the original wetlands drained and converted to farmland and urban development. Today, less than half of our original wetlands remain. The losses amount to an area equal to the size of California (see Figure 5-8). According to the U.S. Fish and Wildlife Service's *Wetlands Losses in the United States 1780's to 1980's*, the three States

that have sustained the greatest percentage of wetlands loss are California (91%), Ohio (90%), and Iowa (89%).

According to FWS status and trends reports, the average annual loss of wetlands has decreased over the past 40 years. The average annual loss from the mid-1950s to the mid-1970s was 458,000 acres, and from the mid-1970s to mid-1980s it was 290,000 acres. Agriculture was responsible for 87% of the loss from the mid-1950s to the mid-1970s and 54% of the loss from the mid-1970s to the mid-1980s. These estimates are based on aerial photographs.

A more recent estimate of wetlands losses from the National Resources Inventory (NRI), conducted by the Natural Resources Conservation Service (NRCS), indicates that 792,000 acres of wetlands were lost on non-Federal lands between 1982 and 1992 for a yearly loss estimate of 70,000 to 90,000 acres. This net loss is the result of gross losses of 1,561,300 acres of wetlands and gross gains of 768,700 acres of wetlands over the 10-year period. The NRI estimates, although they are based on hydric soils, are consistent with the trend of declining wetlands losses reported by FWS. Although losses have decreased, we still have to make progress toward our interim goal of no overall net loss of the Nation's remaining wetlands and the long-term goal of increasing the quantity and quality of the Nation's wetlands resource base.

The decline in wetlands losses is a result of the combined effect of several trends: (1) the decline in profitability in converting wetlands for agricultural production; (2) passage of Swampbuster in the 1985, 1990, and 1996 Farm Bills; (3) presence of the CWA Section 404 permit programs as well as development of State management programs (see Chapter 17); (4) greater public interest and support for wetlands protection; and (5) implementation of wetlands restoration programs at the Federal, State, and local level.

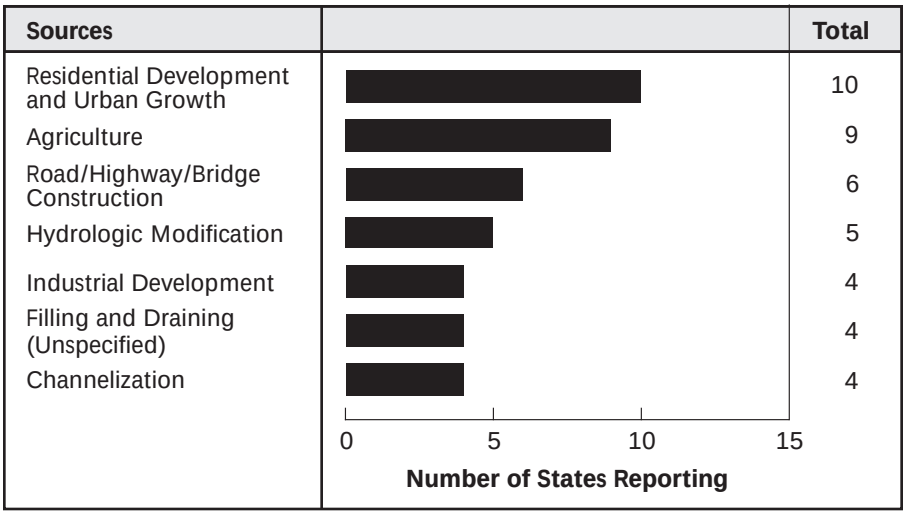
Twelve States listed sources of recent wetlands loss in their 1996 305(b) reports (Figure 5-9). Residential development and urban growth were cited as the leading sources of current losses (see Appendix D, Table D-1, for individual State information). Other losses were due to agriculture; construction of roads, highways, and bridges; hydrologic modifications; filling and/or draining; channelization; and industrial development.

Several States and the District of Columbia reported on efforts to

Figure 5-9

Sources of Recent Wetlands Losses

(12 States Reporting)



Based on data contained in Appendix D, Table D-4.

More States are monitoring unimpacted wetlands to define baseline conditions in healthy wetlands.

inventory wetlands. Some of the programs are designed to augment the FWS's National Wetlands Inventory (NWI), while others are designed to produce independent status and trend information. Some of the programs have already been completed and others have been authorized but not funded.

■ Alabama is evaluating and mapping wetlands habitats in a portion of the Lower Mobile-Tensaw River Delta and Mobile Bay. With funding from USEPA's Gulf of Mexico Program, Alabama is digitizing wetlands habitats based on aerial photography from 1955, 1979, and 1988, using the NWI methodology.

■ Delaware is currently mapping wetlands area in the State based on 1992 aerial photography.

■ In 1996, the District of Columbia completed mapping of its wetlands based on a 1994 estimate of total wetlands acreage generated by applying the Planogrid method to aerial NWI maps. The finer detail and resolution of the new methodology almost doubled previous estimates of wetlands acreage.

■ New Hampshire recently completed a wetlands mapping project that translated LANDSAT digital imagery into a geographic information system (GIS) format. The project included extensive field verification and soils mapping in 7 of the 10 counties. The GIS mapping system revealed many small wetlands that were overlooked by previous surveys. As a result, New Hampshire's estimate of total wetlands acreage climbed from 200,000 acres to between 400,000 and 600,000 acres of nontidal wetlands and 7,500 acres of tidal wetlands.

■ In 1996, New York completed county maps of fresh water wetlands for all counties outside of the Adirondack Park. In addition, New York has completed its tidal wetlands inventory that shows tidal wetlands on Long Island, in New York City, and in certain counties along the southern reaches of the Hudson River.

■ In 1996, Georgia finished an analysis of landcover based on LANDSAT TM imagery. Georgia reported acreage of 15 landcover classes for each county. Based on these data, Georgia estimates that 13% of its land area, nearly 5 million acres, is wetlands.

■ The Ohio Department of Natural Resources (DNR) is conducting a statewide inventory of wetlands as part of its Remote Sensing Program with cooperation from numerous agencies. The program utilizes digital data from the LANDSAT Thematic Mapper, digitized soils data, low level aerial photographs, and topographic maps to identify and map different types of wetlands, including farmed wetlands. DNR plans to update the maps every 5 years.

Monitoring Wetlands Functions and Values

Wetlands monitoring programs are critical to the achievement of important national goals, such as no overall net loss of wetlands functions and values. With States and

Tribes developing water quality standards for their wetlands, State and Tribal monitoring programs are critical for determining if wetlands are meeting their existing and designated uses. Monitoring programs are also needed to prioritize wetlands for protection and restoration and to develop performance standards for successful mitigation and restoration efforts.

Monitoring programs can provide the data needed to identify degradation of functions and values in wetlands and sources of that degradation, but specific wetlands monitoring programs are still in their infancy. Currently, no State is operating a statewide wetlands monitoring program, although several States include some wetlands in their ambient monitoring programs. A growing number of States are implementing monitoring projects at selected reference wetlands that are relatively free from impacts. These States will use the data collected from reference wetlands to define baseline conditions in healthy wetlands and to create standards to protect wetlands.

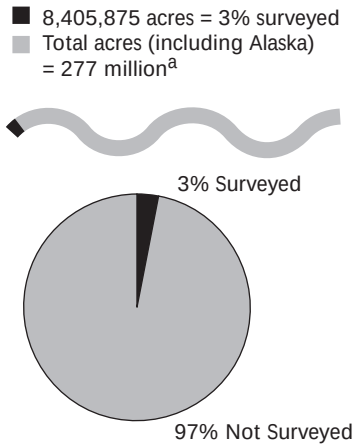
■ Minnesota initiated the Reference Wetlands Project in 1993 to develop a basis for assessing the biological and chemical integrity of wetlands. This project included 32 relatively undisturbed wetlands and three impacted wetlands to calibrate biological metrics. In 1995, Minnesota began a second wetlands project in depressional wetlands. In the Impacted Wetland Project, 20 known impacted wetlands and six least-disturbed wetlands were sampled. In the Impacted Wetland Project the focus was on calibrating biological metrics across a gradient of disturbance. The disturbance gradient was represented by two primary stressors, conventional agricultural practice and storm water discharges. Both projects characterized the invertebrate community, vegetation, amphibians, water, and sediment chemistry. This information will provide the basis for determining use support status and evaluating depressional wetlands health in Minnesota.

■ Montana sampled 80 wetlands throughout the State during 1993 and 1994 to develop bioassessment protocols. Wetlands were sampled for water column and sediment chemistry, macroinvertebrates, and diatoms. To partition natural variability between wetlands types, Montana developed a classification system to group reference wetlands by ecoregion and hydrogeomorphology. Montana used a multimetric approach to develop a macroinvertebrate index to assess wetlands water quality. Preliminary results indicate detection of impairments caused by metals, nutrients, salinity, sediment, and fluctuating water levels.

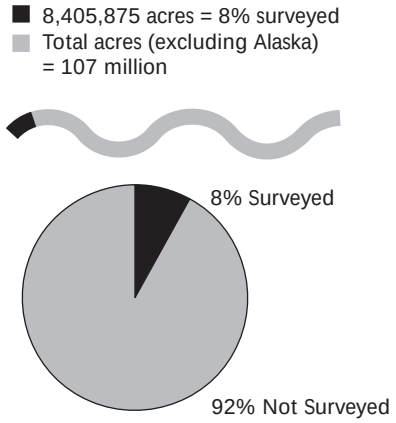
■ North Dakota initiated a project in 1995 to develop biocriteria and water quality standards for wetlands. North Dakota began sampling water chemistry, sediments, macroinvertebrates, phytoplankton, and vegetation in reference wetlands of the prairie pothole region. Based on continued field sampling, North Dakota plans to develop biological criteria for specific wetlands classes.

Wetlands Acres Surveyed by States and Tribes

Including Alaska's Wetlands



Excluding Alaska's Wetlands



[a]From Dahl, T.E. 1990. *Wetlands Losses in the United States 1780's to 1980's*. U.S. Department of the Interior, Fish and Wildlife Service.

Source: 1996 Section 305(b) reports submitted by States, Tribes, Territories, and Commissions.

■ Ohio initiated a project in 1994 to develop biocriteria for wetlands. Ohio is applying the same approach to wetlands that it used to develop its stream biocriteria program. Methodologies to assess vegetation, macroinvertebrates, and amphibian assemblages are under development. As with streams, Ohio is defining the biological integrity of wetlands based on a framework of least-impacted reference sites. Ohio will use wetland biocriteria to define the attainable condition for a class of wetlands in a given region.

■ Every 3 years, Kansas collects water quality samples from seven wetlands (covering 25,069 acres) owned by the State or the Federal government. The State monitors one station per wetland for nutrients, minerals, heavy metals, clarity, suspended solids, pesticides, bacteria, algae, temperature, and dissolved oxygen.

■ Kentucky added several wetlands to its reference reach monitoring program to characterize chemical water quality, sediment quality, fish tissue concentrations of contaminants, habitat conditions, and general biotic conditions in each physiographic region of the State. The information will be used to develop designated uses and biological criteria for wetlands.

Designated Use Support in Wetlands

The States, Tribes, and other jurisdictions are making progress in developing specific designated uses and water quality standards for wetlands, but many States and Tribes still lack specific water quality criteria and monitoring programs for wetlands. Without criteria and monitoring data, most States and Tribes cannot evaluate use support. To date, only nine States and Tribes reported the designated use support status for some of their wetlands (see Appendix D, Table D-1). Only Kansas used quantitative data as a basis for use support decisions.

■ California reported that 12% of the 124,178 acres of surveyed wetlands fully supports aquatic life use and 88% of the acres are impaired due to metals, nutrients, oxygen depletion, and salinity. Sources impacting wetlands include municipal wastewater treatment plants, urban runoff and storm sewers, and hydrologic and habitat modifications.

■ The Coyote Valley Band of Pomo Indians in northern California classified all 1.6 acres of their wetlands as partially supporting uses for wildlife and use as a riparian buffer. The use support analysis was based on reconnaissance surveys rather than monitoring in the wetlands. The wetlands are impaired by exotic species, filling and draining, and other habitat alterations.

■ The Hoopa Valley Tribe in northern California reported that all of its 3,200 acres of surveyed wetlands are impaired for aquatic life use, religious use, wildlife habitat use, and use as a riparian buffer. Filling and draining, flow alterations, other habitat alterations, and exotic species impair the wetlands.

Agriculture, forestry, construction, hydrologic modifications, and unknown sources have degraded wetlands on the Hoopa Valley Reservation.

■ Iowa used best professional judgment to determine the use support of 26,062 wetlands acres during 1994 and 1995. The State reported that 35% of the assessed wetlands fully supported designated uses, of which 32% are threatened for one or more uses. The nonsupporting acres are impaired by pesticides, ammonia, nutrients, siltation, and habitat alterations. Sources of impairment include agriculture, urban runoff and storm sewers, land disposal of wastes, and hydromodification.

■ Kansas assessed and determined the use support of 35,597 wetlands acres during this reporting cycle. Of the 35,597 acres, 10,458 acres were of unknown use support. Of the remaining 26,139 acres, 9% fully support uses now but are threatened and 91% are impaired and exceed chronic aquatic life support criteria. Kansas used monitoring data to determine use support in nine publicly owned wetlands (covering 25,069 acres) and qualitative information to assess one wetland (covering 70 acres).

■ Louisiana assessed use support in over 1 million acres of its 8.7 million total acres of wetlands. The State reported that 92% of the assessed wetland acres fully support uses and 8% are impaired because of bacteria, siltation and suspended solids, and hydrologic modifications. Sources of impairment include channelization, dredging, flow regulation, drainage and filling, recreational activities, upstream sources, and natural sources.

■ Michigan assessed use support for 10 acres of wetlands. All 10 acres are impaired and do not support designated uses because of nickel contamination.

■ Nevada surveyed use support in 19,326 acres (25%) of its 136,650 total acres of wetlands. Nevada reported that all of the surveyed wetlands fully supported designated uses.

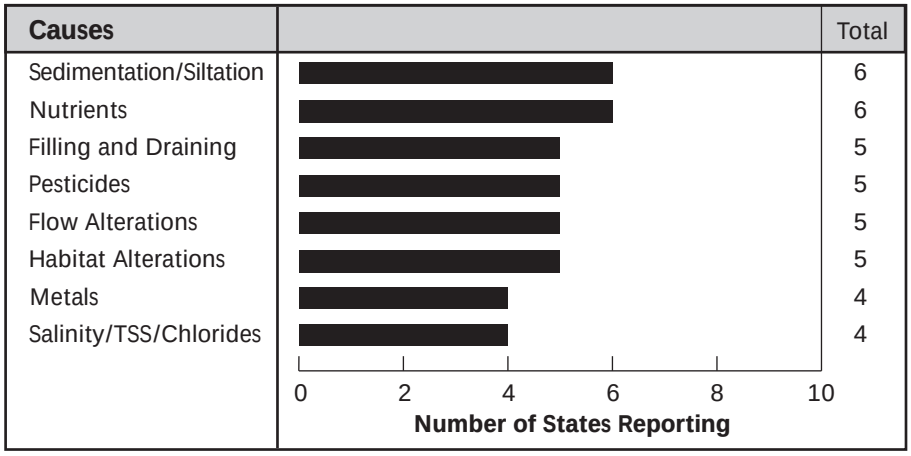
■ North Carolina used aerial photographs and soil information from a 1992-1993 survey to rate use support by current land use. North Carolina rated wetlands on hydric soils with natural tree cover as fully supporting uses. Partially supporting wetlands have modified

More information on wetlands can be obtained from EPA's Wetlands Hotline at 1-800-832-7828, between 9 a.m. and 5 p.m. Eastern Standard Time.

Figure 5-10

Causes Degrading Wetlands Integrity

(10 States Reporting)



Based on data contained in Appendix D, Table D-2.

cover and hydrology but still retain wetlands status and support most uses. For example, pine plantations still retain value for wildlife habitat, flood control, ground water recharge, nutrient removal, and aquatic habitat, although the modified wetlands support these uses less effectively than undisturbed wetlands. Wetlands converted to agriculture or urban land use are classified as not supporting original wetlands uses. The State used this methodology to survey use support in over 7 million acres of wetlands. The State reported that 66% of the surveyed wetlands fully support uses and 34% are impaired for one or more uses.

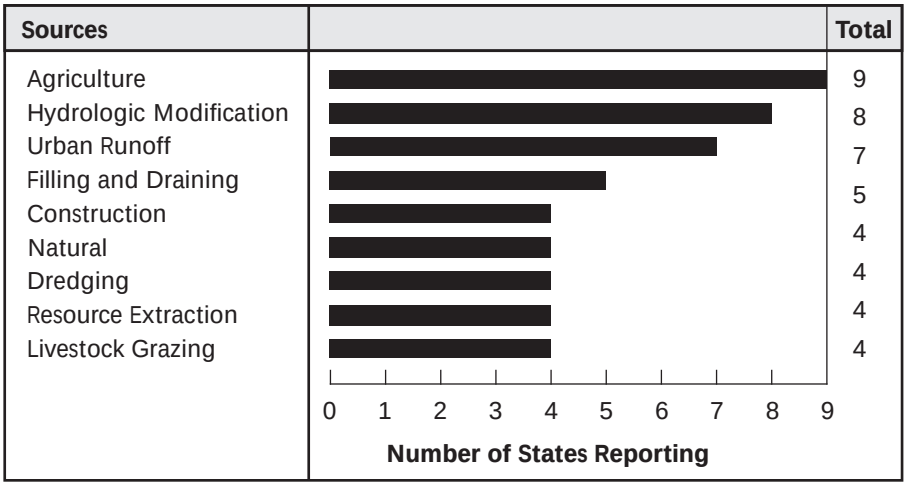
EPA cannot draw national conclusions about water quality conditions in all wetlands because the States used different methodologies to survey only 3% of the total wetlands in the Nation. Summarizing State wetlands data would also produce misleading results because two States (North Carolina and Louisiana) contain 98% of the surveyed wetlands acreage. More States and Tribes will assess use support in wetlands as they develop standards for wetlands. Many States are still in the process of developing wetlands water quality standards, which provide the baseline for determining beneficial use support (see Chapter 13). Improved standards will also provide a firmer foundation for assessing impairments in wetlands in those States already reporting use support in wetlands.

The States have even fewer data to quantify the extent of pollutants degrading wetlands and the sources of these pollutants. Although most States cannot quantify wetlands area impacted by individual causes and sources of degradation, nine States identified causes and sources known to degrade wetlands integrity to some extent (Figures 5-10 and 5-11). These States listed sediment and habitat alterations as the most widespread causes of degradation impacting wetlands, followed by draining and nutrients. Agriculture and hydrologic modifications topped the list of sources degrading wetlands, followed by urban runoff, construction, and draining (see Appendix D, Tables D-3 and D-4, for individual State information).

Figure 5-11

Sources Degrading Wetlands Integrity

(9 States Reporting)



Based on data contained in Appendix D, Table D-3.

Summary

Currently, most States are not equipped to report on the integrity of their wetlands. Only six States and Tribes reported attainment of designated uses for wetlands in 1996. National trends cannot be drawn from this limited information. This is expected to change, however, as States adopt wetlands water quality standards and enhance their existing monitoring programs to more accurately assess designated use support in their wetlands.