Temporarily Flooded Wetlands

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Introduction

Wetlands are dynamic, highly productive systems. In fact, wetlands, as measured by the amount of plant material produced (net primary productivity), are one of the world's most productive ecosystems. High net primary productivity of wetland ecosystems is the result of rapid recycling of nutrients that occurs with changing water levels and breakdown of plant material. Dead plant material in aquatic systems is quickly broken down by microorganisms, which in turn are fed upon by aquatic invertebrates. This process creates the fuel that supports the abundance and diversity of wetland-associated wildlife. Many terrestrial organisms, such as mammals, birds, amphibians, reptiles, and insects rely on wetlands for at least some part of their life history and/or habitat requirements. Thus, wetlands are a critical element of the overall functioning of ecosystems.

The many different types of wetlands are a consequence of complex interactions between geological, climatic, biological, chemical, and anthropogenic factors. All wetlands have surface water or water present at or near the surface of the substrate all or part of a year. The presence of water and subsequent lack of oxygen may create hydric (anaerobic) soils in which plants adapted to flooding, ponding, or saturated conditions grow. Such plants that grow under these conditions are called hydrophytes and include cattails, sedges, smartweed, rushes, marsh marigolds, burreed, cypress, and willows.

The development of wetland conditions requires an intermittent to persistent source of water. The source of water may be precipitation which falls directly on the wetland; surface water runoff during rainfall or snowmelt events within the catchment area surrounding the wetland; periodic flooding caused by elevated water levels in nearby surface waterbodies; tidal action; ground water inflow to the wetland; or any combination of these sources. Water may be lost from a wetland by evaporation from standing water or saturated soils, transpiration from plants, or surface water or ground water outflow.

Leo Kinney

These photos show the same location in different seasons. Temporarily flooded wetlands, such as these vernal pools, are filled with water for part of the year and dry at other times.

The U.S. Environmental Protection Agency (EPA) defines ephemeral wetlands as depressional wetlands that temporarily hold water, usually in the spring and early summer or after heavy rains. Periodically, these wetlands dry, often in mid to late summer. They may be isolated without a permanent inlet or outlet, but may overflow during times of high water. Ephemeral wetlands are often free of fish, which allows for the successful breeding of certain amphibians and invertebrates. Temporarily flooded wetlands are com-

monly vegetated by plants that are tolerant of short-term ponding and brief growing seasons and/or plants that can persist over a range of hydrologic conditions. Because of their short-term flooding and generally shallow nature, temporarily flooded wetlands have been and continue to be easily converted for agricultural and other purposes. Consequently, losses of these important wetlands are especially severe.

This leaflet draws attention to the important ecological functions of temporarily flooded wetlands and why their preservation and restoration is necessary to maintain and re-establish healthy wetland ecosystems for the wildlife and people that depend on them. This leaflet describes ongoing threats and provides resources for restoring and enhancing temporarily flooded wetlands.

U.S. Environmental Protection Agency

Washington University of St. Louis

Playa lakes are shallow depressional wetlands. These lakes often fill up with a foot or two of water in spring (top) and are dry by fall (bottom).

Types of temporarily flooded wetlands

Playa lakes

Playa lakes are shallow, circular depressions that are seasonally or semi-permanently ponded by rain water and snowmelt. They occur in the Texas Panhandle, western Oklahoma, eastern New Mexico, southwestern Kansas, and southeastern Colorado. When ponded by winter precipitation, playa lakes may be used by up to 1,000,000 ducks, 500,000 geese, and more than 250,000 sandhill cranes. These wetland basins generally lose water over the summer and fall.

A major factor leading to the decline of playa lakes is the practice of pitting, a surface soil modification technique used to increase infiltration and surface storage, concentrating and conserving rainfall and irrigation tailwater. Structural modifications of playa lakes are widespread, severely altering their hydrology and affecting their suitability for waterfowl and shorebirds. To date, soil modification techniques used to increase infiltration are estimated to have impacted approximately 70 percent of basins that are 10 acres or more in size.

Prairie potholes

The region extending from southern Alberta, Saskatchewan, and Manitoba through eastern North and South Dakota and western Minnesota to north-central Iowa is characterized by numerous shallow depressional wetlands known as prairie potholes. Formed by a process during the last glaciation, prairie potholes fill with snowmelt and rain in the spring, with water levels generally receding through the summer and fall. The shallowest of these basins can be dry by early summer, whereas the deepest basins remain inundated except during extended drought. The prairie pothole region provides habitat for more than 200 species of migratory birds and is home to more than half of the North American waterfowl population.

Before European settlement of the prairies, the density of prairie potholes averaged 30 basins per square mile, and most basins were less than an acre in size. However, the prairies also contain some of the most productive farmland in the world. Conversion of native grassland habitat for agricultural purposes has contributed to the loss of more than 50 percent of the original prairie potholes. Less than 1 percent of these highly productive wetlands remain intact in portions of southern Minnesota and north-central Iowa where row crops are now intensively cultivated. The loss of the smallest and shallowest of these wetlands has been especially prominent in the region.

Vernal pools

Vernal pools are seasonally ponded, depressional wetlands found across the United States, including forested areas. Vernal pools are covered by shallow water for variable periods from winter to spring but may be completely dry for most of the summer and fall. The short duration of ponding is the defining feature of vernal pools. Beneath vernal pools lies either bedrock or a hard clay layer in the soil that helps keep water in the pool. Characteristics of a vernal pool, such as size, duration of ponding, substrate, and vegetation, are influenced by many factors including landscape setting, the geology of the surface, soil type, and surrounding vegetation. Furthermore, the size and duration of ponding for a particular pool may be quite different from year to year depending on local precipitation patterns.

The unique environment of vernal pools provides habitat for numerous species of rare plants and animals that are able to survive and thrive in these harsh conditions. Many of these plants and animals spend the dry season as drought-resistant seeds, eggs, or cysts, which grow and reproduce when the ponds are again filled with water. In addition, many species of birds, reptiles, and mammals opportunistically use vernal pools as a seasonal source of food and water.

Vernal pools are important features in the landscape. Groups of pools are preferred by wildlife that requires multiple sites or wetland types to complete their life cycle. If the wetland mosaic within a watershed is altered, wildlife populations may become isolated and vulnerable to changes in their surroundings.

Vernal pools are valuable and increasingly threatened ecosystems. For example, in California, more than 90 percent of vernal pools have already been lost.

Wet meadows

Wet meadows are a type of marsh that commonly occurs in poorly drained areas such as shallow lake basins, low-lying farmland and the land between shallow marshes and upland areas. Some wet meadows are found high in the mountains on poorly drained soil. Wet meadows, which often resemble grasslands, are typically drier than other marshes, except during periods of seasonal high water. For most of the year, wet meadows are without standing water, though the high water table allows the soil to remain saturated.

Wet meadows can act as a natural filter removing excess nutrients from runoff. This nutrient rich environment provides vital food and habitat for many insects, amphibians, reptiles, birds, and mammals. Wet meadows also serve key functions of attenuating storm flow runoff by providing short- and long-term water storage. This not only protects down-valley/slope areas from flooding but can extend the period of discharge, thereby supporting extended growing seasons of adjacent habitats. Wet meadows often occur in areas where farming is prevalent, historically leading to the draining and filling of these wetlands for agricultural uses.

U.S. Fish & Wildlife Service

Prairie potholes are depressional wetlands found in the Upper Midwest. These wetlands are extremely important for migrating birds and other wildlife.

William Hohman, NRCS

California vernal pool

Slope wetlands

Slope wetlands are found where there is a discharge of ground water to the land surface (springs) and characteristically occur on sloping land. Elevation gradients may range from steep hillsides to slight slopes. Principal water sources are usually ground water return flow and interflow from surrounding uplands, as well as precipitation. Hydrodynamics are dominated by downslope unidirectional water flow. Sloped wetlands can occur on nearly flat landscapes if ground water discharge is a dominant source to the wetland surface. These wetlands lose water primarily by subsurface and surface flows and through evaporation. Ditching and tilling of slope wetlands to expedite drainage has greatly reduced their extent in agricultural regions where row crops are grown.

Wildlife benefits of temporarily flooded wetlands

Many species of wildlife are adapted to exploit temporarily flooded wetlands. Factors such as an abundance of invertebrates, absence of resident predators such as fish, and the availability of these habitats in early spring contribute to the attractiveness of these habitats for amphibians.

Temporarily flooded wetlands also play an important role in the life cycles of many species of migratory birds. In the northern Great Plains, temporarily flooded wetlands thaw earlier than other types of wetlands and hold water during spring migration. These wetlands provide migrating birds with resting areas and abundant food needed to complete migration. Early nesting waterfowl such as northern pintails rely on the protein-rich invertebrates that occur in temporarily flooded wetlands to meet the high nutritional demands of egg laying. Studies indicate that temporary and seasonal wetlands comprise about 35 percent of the wetland area in North Dakota, but support 57 percent of the breeding waterfowl population. Experts project that the loss of these wetlands would likely translate into a 20 to 60 percent decline in the number of waterfowl. Additionally, the loss of temporarily flooded wetlands has been a significant factor in the decline of many species of rails. These birds depend on the habitat provided by wetlands and their numbers have suffered recently due to the conversion of these areas for other uses.

Other benefits of temporarily flooded wetlands

Temporarily flooded wetlands provide numerous indirect benefits to wildlife. In addition to providing obvious wildlife habitat, temporarily flooded wetlands help to improve water quality, desynchronize floodwater, and facilitate ground water recharge.

Temporarily flooded wetlands improve water quality by removing sediments and excess nutrients from runoff. The low-oxygen wetland soils transform excess nitrogen into a harmless gas that enters the atmosphere. Studies have shown that a 1-acre wetland can effectively purify the nitrate runoff from approximately 100 acres of cropland.

NRCS

South Dakota slope wetland

U.S. Fish & Wildlife Service

The northern pintail is one of the many dabbling ducks that prefer to rest and feed at shallow, temporary wetlands.

Wetlands, including those that are temporary or seasonal, possess valuable flood control properties. During periods of high precipitation or snowmelt, they act like natural sponges that absorb surface water, rain, snowmelt, ground water, and floodwaters and help reduce flood frequency and peak flood levels on adjacent and downstream land. Over time, the retained floodwater is slowly released back into streams, rivers, the atmosphere, and/or ground water, contributing to the base flow of surface water systems during dry periods.

Threats to temporarily flooded wetlands

There are many threats to the temporarily flooded wetlands in the United States. The hydrology of temporarily flooded wetlands is frequently altered when these areas are drained for commercial purposes. Conversely, ongoing wetland drainage and changes in adjacent land uses may result in excessive flooding; for example, shallow basins that are flooded too deeply or for extended periods. Temporarily flooded wetlands may also be degraded by overgrazing (though controlled grazing in many circumstances can be beneficial), deepening of basins for livestock watering, excessive harvesting of vegetation for feed, and pollution by chemicals and sediments that enter the wetland through agricultural and urban runoff.

Wetland restoration and enhancement

Because the ecological values of temporarily flooded wetlands are becoming better understood, wetland restoration and enhancement projects are often undertaken to restore the ecological functions and values. Restoration refers to the return of a degraded or drained wetland to a pre-existing condition, or as close to that condition as possible. Enhancement refers to increasing one or more of the ecological functions performed by an existing wetland beyond what currently exists or previously existed in the wetland. Enhancing one of more ecological functions can result in decreasing other ecological functions provided by the wetland; a trade-off is often involved in enhancement.

Specific recommendations for wetland restoration and enhancement are beyond the scope of this leaflet. However, the EPA and the Natural Resources Conservation Service (NRCS) have developed a number of technical resources on this topic. These include the Interagency Workgroup on Wetland Restoration's "An Introduction and User's Guide to Wetland Restoration, Creation, and Enhancement" available at *http://www.epa.gov/owow/wetlands/pdf/restdocfinal.pdf*; Conservation Practice Standards 644 (Wetland Wildlife Habitat Management), 657 (Wetland Restoration) 659 (Wetland Enhancement), available at *http://www.wli.nrcs.usda.gov/restoration/* and the Shallow Water Development and Management Conservation Practice Standard, which can be found at *http://efotg.nrcs.usda.gov/references/public/IL/646.pdf*. Landowners should begin wetland restoration or enhancement projects by reviewing these documents and contacting natural resource professionals to discuss the development, implementation, and evaluation of a wetland restoration or enhancement project.

Planning, implementation, and evaluation

Restoration and enhancement projects are often complicated because the hydrology, climate, and current and historic plant and animal communities are commonly unknown and must be considered. Extensive planning must be done before a wetland restoration or enhancement project can be implemented.

The first step to any plan is for the landowner to recognize that there may be an opportunity to restore or enhance the wetland and to contact a natural resources professional, who can assist the landowner in identifying the problems (what wetland functions have been lost) and the specific opportunities (how can the lost functions can be restored) that exist. For wetland restoration or enhancement projects, the local landscape and historical factors that led to the creation and function of the wetland in the first place must be understood. These factors include land use, topography, climate, precipitation patterns, soil types, ground and surface water flows, and vegetation communities. The factors contributing to the wetland loss or deg-

William Hohman, NRCS

Restored temporary wetland

radation must also be understood, as well as possible opportunities to restore or enhance the wetland.

Maintaining or creating the specific hydrology of a temporary wetland is important and can be particularly challenging. Temporarily flooded wetlands should maintain their pattern of seasonal filling and drying and, therefore, cannot be too wet or too dry. Factors influencing hydrology should be considered; for example, if buffers are present or created, they should be of a size and configuration that will allow seasonal wetlands to fill with snowmelt and precipitation. If too large, the water is absorbed before reaching the wetland, and the ecological functions of the temporary wetland are never achieved.

Invasive species management must also be a consideration. Some undesirable plants, such as reed canarygrass, are aggressive and quick in establishing colonies in wetlands. A management plan for invasive plant species should be established. For more information on invasive plant species, please visit *http://www.invasivespeciesinfo.gov*.

Once the problems and opportunities are better understood, objectives for restoration must be outlined. Objectives might include planting riparian buffers, fencing livestock from wetland areas, increasing habitat for wildlife, or reducing point and nonpoint sources of pollution. The available resources required to undertake the restoration or enhancement project must be identified and organized to formulate a plan of action and any alternative plans that might be considered. Available resources might include wetland restoration expertise or financial resources. With this information, and in consultation with natural resource professionals, landowners will be equipped to make good decisions and decide on the proper plan of action for their wetland restoration or enhancement project.

Before implementing their plan, landowners and managers are strongly urged to discuss their wetland restoration or enhancement plans with experts from Federal, State or local government agencies or qualified personnel from conservation organizations. Evaluation of the plan throughout the planning process, as well as during and after its implementation, is vital to the success of the project, as well as future wetland restoration and enhancement projects.

Case study

In 2005, a study was conducted in California to assess the effect of cattle grazing on ephemeral wetlands. Across 72 vernal pools, the effect of different grazing treatments (ungrazed, continuously grazed, wet-season grazed, and dry-season grazed) on vernal-pool plant and aquatic faunal diversity was examined. The results indicated that when cattle are removed from grazed vernal pool grasslands, diversity declines and nonnative species abundance increases.

Most of the exotic grasses in this system cannot tolerate extended periods of inundation, so hydrology plays a major role in controlling grass encroachment into the pools. Results show, however, that prolonged inundation in the absence of grazing is not enough to keep exotics out of the pools. The edge and upland zones were the most negatively affected by eliminating grazing with marked declines in native species richness and relative cover of natives. The loss of native plant species diversity on the edge of the pool in particular may adversely affect other organisms such as specialist pollinators that depend on the pollen of the plants which grow only in that pool zone.

California grasslands have a long history of extensive grazing dating back to the Pleistocene, but they were most recently grazed by herds of tule elk and pronghorns before livestock introduction in the late 1800s. Vernal pool species, therefore, are adapted to some level of grazing. In addition, the plant species composition of California Central Valley grasslands has changed significantly since European settlement and is now dominated by exotic annual grasses. Thus, a long history of grazing, coupled with the altered plant community, yields a system that is now adapted to the changes brought about by cattle and one that becomes quickly degraded when cattle are removed.

Assistance programs

Financial and technical assistance for wetland habitat projects are available from an array of government agencies and public and private organizations. Note that two options under the Conservation Reserve Program (Farmable Wetland Program and Conservation Practice 23–Wetland Restoration) specifically target temporarily flooded wetlands. Table 1 lists the contact information of organizations that can provide further information on wetland management, as well as other natural resource projects, and describes their associated conservation incentive programs.

Table 1 Technical and financial assistance to restore or preserve wetlands

Program	Land eligibility	Type of assistance	Wetland restoration or enhancement opportunities	Contact
Wetlands Reserve Program (WRP)	Previously degraded wetland and adjacent upland buffer, with limited amount of natural wetland and existing or restorable riparian areas	75% cost-share for wetland restoration under 10-year contracts and 30-year easements and 100% cost-share on restoration under permanent easements. Payments for purchase of 30-year or permanent conservation easements	Restore and protect wetlands and limited adjacent upland area; improve wetland wildlife habitat	NRCS State or local office
Conservation Reserve Program (CRP)	Highly erodible land, wetland, and certain other lands with cropping history, streamside areas in pasture land	50% cost-share for establishing permanent cover and conservation practices and annual rental payments for land enrolled in 10- to 15-year contracts. Additional financial incentives for some practices	Plant long-term, resource-conserving covers in wetland and upland areas to improve water quality, control erosion, and enhance wildlife habitat	NRCS or FSA State or local office
Waterways for Wildlife	Private land	Technical and program development assistance to coalesce habitat efforts of corporations and private landowners to meet common watershed level goals	Enhance wetland and adjacent upland habitats by planting buffers, creating habitat structures, and other activities	Wildlife Habitat Council
Wildlife at Work	Corporate lands	Technical assistance on developing habitat projects into programs that allow companies to involve employees and the community	Enhance wetland and adjacent upland habitats by planting buffers, creating habitat structures, and other activities	Wildlife Habitat Council
Partners for Fish and Wildlife Program (PFW)	Most degraded fish and/or wildlife habitat	Up to 100% financial and technical assistance to restore wildlife habitat under a minimum 10-year cooperative agreement	Restore wetland hydrology; plant native vegetation; install fencing and off-stream livestock watering facilities to allow for restoration of stream and riparian areas; remove nonnative plants and animals	U.S. Fish & Wildlife Service local office
Landowner Incentive Program (NFWS)	Most fish and/or wildlife habitat containing any species that is federally or state-listed as threatened or endangered or is a candidate for listing as threatened or endangered	Financial and technical assistance including advice, management plans, and funding to individuals and organizations throughout the State that qualify	Enhancing, protecting, or restoring habitat that benefits at-risk species on private lands	U.S. Fish & Wildlife Service local office

References

Online sources

Chesapeake Bay Program Office. 2003. Wetlands: general info. *http://www.chesapeakebay.net/info/wetlds1.cfm* [Accessed 14 June 2004].

Farm Service Agency. n.d. Eligible farms. *http://www.fsa.usda.gov/mt/farmable%20wetlands%20fact%20sheet04.htm* [Accessed 10 June 2004].

Farm Service Agency Online. 2003. Conservation Reserve Program. *http://www.fsa.usda.gov/pas/publications/facts/html/crp03.htm* [Accessed 10 June 2004].

Iowa Department of Natural Resources. 2001. Farmable Wetlands Program. *http://www.iowadnr.com/wildlife/files/farmablewet.html* [Accessed 10 January 2002].

Iowa State University College of Agriculture. IWRACP about wetlands. *http://www.ag.iastate.edu/centers/iawetlands/About.html* [Accessed 24 November 2004].

Minnesota Department of Natural Resources. 2006. Technical definition of wetlands types in Minnesota. *http://www.dnr.state.mn.us/wetlands/types_technical.html* [Accessed 17 February 2006].

Texas Coastal Wetlands. 2003. Texas coastal wetlands. *http://www.texaswetlands.org/* [Accessed 17 February 2006].

U.S. Army Corps of Engineers Sacramento District. 2000. Wetlands and agriculture: section 404 of the Clean Water Act and Swampbuster in the Food Security Act. *http://www.mvm.usace.army.mil/regulatory/regulations/clean_water.htm* [Accessed 9 June 2004].

U.S. Department of Agriculture, Natural Resources Conservation Service. 2005. Backyard wetland. *http://www.nrcs.usda.gov/feature/backyard/bakwet.html* [Accessed 17 February 2006].

U.S. Department of Agriculture, Natural Resources Conservation Service. 2005. *Wetland restoration, enhancement, and management. http://www.wli.nrcs.usda.gov/restoration/* [Accessed 17 February 2006].

U.S. Environmental Protection Agency. 2005. Wetlands. *http://www.epa.gov/owow/wetlands/* [Accessed 17 February 2006].

Printed sources

Anderson, J.K., R.W. Spain, L.D. McKinney, and A. Sansom. 2000. Wetlands assistance guide to landowners. Texas Parks and Wildlife, Austin, TX.

Berry, C.R., Jr., and D.G. Buechler. 1993. Wetlands in the Northern Great Plains: a guide to values and management. U.S. Fish & Wildlife Service and the Agricultural Extension Service, South Dakota State University, Brookings, SD.

Brooks, R.T., and P.W.C. Paton. 2005. Introduction to the symposium: woodland vernal pools in northern temperate forests. Wetlands Ecology and Management 13: 211–212.

Dahl, T.E. 1990. Wetlands losses in the United States 1780s to 1980s. U.S. Fish & Wildlife Service. Washington, DC. Available at: *http://library.fws.gov/Wetlands/wetlands_1780s-1980s.pdf*.

Environmental Laboratory. 1987. U.S. Army Corps of Engineers Wetlands Delineation Manual. Wetlands Research Program Technical Report 7–87–1 (online edition).

Gibbons, J.W. 2003. Terrestrial habitat: a vital component for herpetofauna of isolated wetlands. Wetlands 23: 630–635.

Interagency Workgroup on Wetland Restoration. n.d. An introduction and user's guide to wetland restoration, creation, and enhancement. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; U.S. Environmental Protection Agency; U.S. Army Corps of Engineers; U.S. Fish & Wildlife Service; and U.S. Department of Agriculture, Natural Resources Conservation Service. Available at: *http://www.epa.gov/owow/wetlands/pdf/restdocfinal.pdf*.

Lehtinen, R.M., S.M. Galatowitsch, and J.R. Tester. 1999. Consequences of habitat loss and fragmentation for wetland amphibian assemblages. Wetlands 19:1–12.

Leibowitz, S.G. 2003. Isolated wetlands and their functions: an ecological perspective. Wetlands 23: 517–531.

Naugle, D.E., R.R. Johnson, M.E. Estey, and K.F. Higgins. 2001. A landscape approach to conserving wetland bird habitat in the prairie pothole region of eastern South Dakota. Wetlands 21: 1–17.

Petrie, M., J.P. Rochon, G. Tori, R. Pederson, and T. Moorman. 2001. The SWANCC decision: implications for wetlands and waterfowl. Ducks Unlimited, Memphis, TN. Available at: *http://www.ducks.org/conservation/404_report.asp*.

Reid, M.A., and G.P. Quinn. 2004. Hydrologic regime and macrophyte assemblages in temporary floodplain wetlands: implications for detecting responses to environmental water allocations. Wetlands 24: 586–599.

Seabloom, E.W. 2003. Plant diversity, composition, and invasion of restored and natural prairie pothole wetlands: implications for restoration. Wetlands 23: 1–12.

Tiner, R.W., H.C. Bergquist, G.P. DeAlessio, and M.J. Starr. 2002. Geographically isolated wetlands: a preliminary assessment of their characteristics and status in selected areas of the United States. U.S. Fish & Wildlife Service, Northeast Region, Hadley, MA. Available at: *http://wetlands.fws.gov/Pubs_Reports/isolated/report.htm*.

Winter, T.C., and J.W. LaBaugh. 2003. Hydrologic considerations in defining isolated wetlands. Wetlands 23: 532–540.

Zedler, P.H. 2003. Vernal pools and the concept of "isolated wetlands." Wetlands 23: 597–607.

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