Wetland Vegetation Management

An example of a hemi-marsh and submersed aquatic vegetation wetland being heavily used by migratory waterbirds during fall migration. Photo by Illinois Natural History Survey, Forbes Biological Station staff.

Wetlands have several definitions, depending on who is defining them; different groups, agencies and users may each have a slightly different definition. Specifically wetlands refer to areas which are part land and part water in which water is the controlling environmental factor; land where the water table is at or near the surface, and water covers the land at least part of the year; land characterized by hydric soils and supporting hydrophytic vegetation. Despite differing definitions, wetlands are critically important for numerous plants and animals that depend on these habitats.

Managing wetland areas typically involves manipulating water levels which in turn alters vegetation communities, and wildlife respond differently to each vegetation community. Wetlands by their nature are dynamic and should be in a near constant state of change. This includes water levels rising and falling, vegetation thriving, dying back, and changing species composition and structure, and even bottom sediments or substrate changing with the length of time it has been inundated. All of these features influence the others, the makeup of the wetland, and what species of wildlife will inhabit it.

As wetland features vary so do the wetland types. These may include emergent marshes, seasonally flooded managed wetlands that may only contain a few inches of water for part of the year and are otherwise completely dry and grown up with grasses and other plants in summer, or even bottomland forests or shrublands that are only inundated during high water events on neighboring streams and rivers.

Each of these wetland types offer unique habitat characteristics that are essential to various wildlife species. The most beneficial scenario may be complexes, or groups of wetlands, where each wetland can be managed independently to produce multiple habitat types in close proximity to one another. Habitat value may be maximized in complexes to provide abundant food, preferred cover, and varying water depths and permanency to meet the needs of multiple target species or groups of species during all times of the year. In most cases, management actions are necessary to maintain productive wetlands and ensure a good diversity of habitat types and water depths.

Marsh

Emergent marsh wetlands might appear as the iconic cattail marsh that many people think of when they hear the term “wetland”. These wetlands typically feature persistent emergent vegetation such as cattail, bulrush, or other vegetation that reaches above the water surface ringing the outside of the wetland or forming a patchwork scattered throughout. This type of wetland is also often termed a “hemi-marsh” because it includes a mix of vegetated and water areas. This configuration is desirable and productive for many wildlife species.

A diverse marsh habitat with persistent emergent plants appearing dark green (cattail and soft-stem bulrush), moist-soil grasses appearing light green and submersed aquatic vegetation. Photo by Illinois Natural History Survey, Forbes Biological Station staff.

As with any wetland, natural or managed succession will cause the vegetation community to change. For instance, reducing water levels will usually cause emergent plants like cattails to become more numerous and grow in additional areas, decreasing the amount of visible water. Persistent low water levels may cause a wetland to become “choked” with vegetation and its overall value to wildlife may be reduced. Typically increasing water levels will return the wetland to more desirable hemi-marsh conditions. Similar to prolonged low water, prolonged high water may reduce wetland quality by causing vegetation to die back and the wetland to transition towards open water, with little to no vegetation. This stage of succession is also not desirable long-term, and a drawdown should be implemented. This common management practice may include a simple reduction of water level, or temporary complete drying to consolidate bottom sediments and reinvigorate wetland productivity through nutrient cycling.

Although densely vegetated and open water conditions are undesirable, these conditions represent the end points along a gradient of naturally occurring marsh conditions that are largely suitable for wildlife. A wetland may transition from “choked” to “open” in as little as a 2-3 growing seasons, or it may take much longer. Each end point should be targeted for management action to return marshes to more productive and desirable conditions, usually through water level manipulation.

In addition to emergent vegetation, submersed aquatic vegetation, or SAV, provide another very important component to marsh habitats. This is vegetation that primarily grows underwater, although small portions, such as flowers or seed heads may extend above the water surface, or leaves may float on the water surface. SAV include species such as coontail, numerous pondweeds, wild celery, bladderwort, and the invasive Eurasian water milfoil. Many portions of these plants may be eaten by wildlife, such as the seeds, leaves, stems and underground tubers. These plants also create an important habitat for water living invertebrates, many of which are very important foods for a variety of wildlife from waterfowl to amphibians.

Emergent vegetation (cattail) in background, with seed heads and floating leaves of submersed aquatic vegetation (longleaf pondweed) in foreground. Photo by Illinois Natural History Survey, Forbes Biological Station staff.

Clear water that allows sunlight to penetrate to the bottom of the wetland is needed for development of SAV communities. SAV also requires firm sediment that allows the plants' roots to take hold. Soft sediments may allow SAV to germinate, but they are often uprooted by wind and waves since the sediment is not strong enough to hold them. As with any vegetation, too little or too much may create undesirable conditions, whereas a patchwork with SAV, unvegetated open water and emergent vegetation may produce the most favorable conditions for wildlife.

Shallow or Seasonal Wetlands

Shallow wetlands are often managed more intensively than marsh wetlands. They should regularly undergo summer dry periods to maximize annual seed producing plant growth, and should be shallowly flooded (less than 18 inches deep) to maximize availability to wetland wildlife. These features often make shallow wetland habitats some of the most diverse, productive, and highly used habitats on a property. They may offer food and cover for a variety of wildlife species, but often target wetland dependent wildlife, specifically migratory waterfowl. Shallow wetlands typically require some management, but the goals and desired outcomes for the wetland and property may determine the intensity of that management.

Although management goals will vary, it is important to maintain water in most wetlands throughout critical time periods. For instance, maintaining water throughout spring migration will maximize wetlands values for many species, encouraging development of robust invertebrate populations and allowing use of invertebrates by spring migrants. Most shallow wetlands should go through a dry period in most years in order to maximize production of annual plant species which provide valuable food sources for wildlife. We refer to these wetlands as "seasonal" because they are usually not flooded for the entire year.

Vegetation communities, or the plant species present, should largely be annual grasses and forbs. The best plant communities will appear weedy and messy with a mix of grasses and other plants of different types and sizes. Diversity of plant communities is desirable, but caution should be used to avoid development of dominant stands of perennial vegetation such as phragmites, bulrush or cattail, or woody species such as willow, cottonwood or buttonbush. Depth and vegetation can be included in design features of constructed or rehabilitated wetlands, or manipulated through management actions.

These wetlands are often constructed by building a berm or levee that allows shallow water to be impounded over relatively flat ground behind it. The levee should feature a water control structure that allows water level manipulation, but occasionally pumps must be used to control water levels, adding cost to management.

Typical moist-soil management strategy of exposing mudflats, which are heavily used by migrating shorebirds, in late spring or early summer (1) to encourage seed producing moist-soil plant growth through summer and early fall (2), followed by reflooding and use by migratory waterfowl during fall, winter and spring (3). Photos by Illinois Natural History Survey, Forbes Biological Station staff.

Shallow wetlands will often be most beneficial when managed for "moist-soil plants". These species grow on mudflats as water levels are drawn down through slow draining or passive evaporation. A typical management strategy involves slowly dewatering or drawing down shallow wetlands in the late spring or summer to expose mudflats and encourage moist-soil plant growth. Once seeds have matured, wetlands can be slowly re-flooded to provide habitat for wetland dependent wildlife.

See the Shallow Wetland Habitat Management section for more information.

Wooded Wetlands

Wetlands with woody vegetation come in several forms. They may appear as scrub-shrub wetlands with short woody species growing in dense thickets. Or they may appear as bottomland forests along streams and rivers that are seasonally inundated during flood events. Similarly, managed impoundments in river bottomland forests, or "greentree reservoirs" occur where water can be managed and the duration of flooding, and thus, wildlife benefit, can be extended. Each of these wetland types provide valuable resources and habitat to various wildlife species.

As with shallow water wetlands, forested wetlands should be flooded shallowly. A good maximum depth is around 18 inches. Deeper areas are fine if it facilitates flooding a greater area shallowly, but in general shallow water is greatly preferred over deeper water by most wetland wildlife species. For instance, 3 inches of water will receive far greater use than 3 feet of water. These depths should be considered in design and construction or rehabilitation of forested wetlands.

Scrub shrub habitat is often overlooked as high quality wetland habitat. This habitat type consists of short shrub species or young trees that are less than 20 feet tall. Typical species include buttonbush, swamp privet, and willow as well as other young bottomland tree species, usually silver maple or cottonwood. These areas often look messy, and occasionally impenetrable. However, when flooded, these habitats can provide important escape cover for broods of species like wood ducks and hooded mergansers, isolation habitat for a variety of waterfowl paired for breeding in spring, and are favored by some wading birds such as black-crowned night herons.

Examples of scrub shrub habitats, showing a small opening in a dense scrub shrub wetland (left) and a wetland with scattered patches of scrub shrub (right). Photos by Michael Sertle, Ducks Unlimited Inc.

A little scrub shrub habitat can go a long way. Extensive stands of this habitat type, or allowing marsh or moist-soil habitats to convert to scrub shrub may result in an overall decline in habitat quality and use. Natural succession will often transition towards scrub shrub if management action does not reset succession, and once established, these species require significant effort to revert to other more open habitats. This may require mechanical removal, chemical application or prolonged deep flooding, all of which are less desirable and far more costly than simple management of marsh or moist-soil habitats.

Scrub shrub is most useful in clumps and patches scattered throughout a wetland or ringing the outside of the wetland. As with other habitat types, not all species provide the same habitat value. Buttonbush may be most desirable as it does not grow tall or develop into a forested habitat, its seeds may also provide food for some wildlife species. Willow, cottonwood, swamp privet and other shrubby species may provide structural habitat, but do not provide food resources.

Bottomland forests often occur in the low areas adjacent to larger streams and rivers. This land is often regularly inundated, which may have prevented its conversion to other uses. In some areas bottomland forests will be comprised of high-quality mast producing hardwood species like oaks, hickories and pecan. Through time, and without management or disturbance, these forests may evolve into soft-mast species such as silver maple, green ash, willows and cottonwood. Soft-mast species are typically less desirable and not used as heavily by wildlife. This change in species composition may also be driven by unseasonable inundation, that is, growing season flooding that kills many species of hardwood trees that are not tolerant of flooding during the growing season.

Flooding in forests can begin as leaves begin to change in fall, signaling the onset of dormancy (left). This will provide excellent habitat for resident and early migrating species. Maintaining flooding throughout winter into early spring (right) may provide food, refuge, thermal cover, escape and pair habitat for overwintering and spring migrating species. Photos by Michael Sertle, Ducks Unlimited Inc.

Maintaining desirable tree species requires an understanding of their biology. For instance, many of the most beneficial tree species are not shade tolerant. That is, they require direct sunlight to grow and thrive, thus, they may require regular thinning of the forest to develop openings where saplings can survive. If natural regeneration is deficient, plantings may be necessary to maintain the timber stand long-term. Other precautions include avoiding prolonged growing season flooding which can damage or kill many species. Short duration flooding may stress trees, but usually will not cause permanent damage. This important management guideline to avoid flooding during the growing season may be easier to achieve in managed greentree reservoirs where levees used to impound water may also provide some protection against summer floods.

Duration of flooding is an important consideration in forested wetland management. Much like unexpected growing season floods, maintaining water on a greentree reservoir for too long can have detrimental effects. Some southern species that occur only regionally in Illinois withstand flooding, such as bald cypress and tupelo. However, these species are the exception. Typically flooding should not occur until leaves begin to change color in the fall, signaling the onset of dormancy. Greentree reservoirs have large amounts of important nutrients suspended in the water during spring, rapid drawdowns flush these from the reservoir preventing them from being retained in the forest, and can lead to decreased forest health and mast production. Water levels should be drawn down slowly during spring, after the peak of spring migration (e.g., March in Illinois), but well before the onset of the growing season. Shallow flooding or even saturated soils during the growing season can cause permanent damage to the timber stand. Flooding should last no more than 4 months to avoid negative impacts. If multiple impoundments exist, the timing of flooding can be manipulated to allow for some early flooding to provide habitat for early migrants, while other impoundments can be delayed to allow for water to accommodate spring migrants. Additionally, allowing an impoundment to remain dry or greatly reduce the amount of flooding every 5 to 7 years can offer forest health benefits. This treatment can be rotated among impoundments every few years where multiple impoundments are present.

Under ideal conditions, wetland areas would include a mix of habitat types including feeding, resting, breeding and brood rearing habitats throughout all appropriate portions of the year. This lofty goal may be difficult to achieve within a single wetland. Therefore goals and desires for wetlands must be evaluated and management actions planned accordingly. Additionally, wetland complexes, or groups of wetlands, can provide a multitude of benefits when managed in a complimentary fashion. The types of habitat provided can be diversified and rotated among management units among years on a time scale that works with the natural transitions of vegetation from one habitat type to another. For instance, a hypothetical scenario might involve a managed shallow water or moist-soil wetland. After several years of similar management, the wetland may lose some vigor, requiring management. If this coincides with a wet year, the wetland could be allowed to stay wet (rather than conducting a drawdown), encouraging more marsh-like conditions. After a year or two, the wetland may be ready for a drawdown to reinvigorate it, at which time management for moist-soil plants may begin again. Ideally, more than one managed unit would be present, and each unit would be at a different point along this timeline to maximize habitat diversity and availability. Of course in the real world ideal conditions or scenarios rarely occur, thus, managers must be proactive to maintain wetlands in the best condition possible, while also reacting to changing conditions and using the natural conditions present to their advantage whenever possible.

Management Resources:

The following links provide in-depth discussion and detail of the subjects touched on here, including; marsh management, moist-soil management and wetland forest and greentree reservoir management.

<u>Marsh</u>

- Management and Control of Cattails. Richard Sojda and Kent Solberg. 1993. Waterfowl Management Handbook. Fish and Wildlife Leaflet 13.4.13. http://www.nwrc.usgs.gov/wdb/pub/wmh/13_4_13.pdf
- Preliminary Considerations for Manipulating Vegetation. Leigh Fredrickson and Fredric Reid. 1988. Waterfowl Management Handbook. Fish and Wildlife Leaflet 13.14.9. http://www.nwrc.usgs.gov/wdb/pub/wmh/13_4_9.pdf

<u>Shallow and Moist-soil Wetlands</u>

- Fredrickson, L. H. and T. S. Taylor. 1982. Management of seasonally flooded impoundments for wildlife. U.S. Fish and Wildlife Service Resource Publication 148. http://scholar.google.com/scholar_url?url=http://www.dtic.mil/cgi-bin/GetTRDoc%3FAD%3DADA323232&hl=en&sa=X&scisig=AAGBfm1zqGNpxHM5BHyAhpybFvd08m0FRg&nossl=1&oi=scholarr
- Fredrickson, L.H. 1991. Strategies for water level manipulations in moist-soil systems. Waterfowl Management Handbook. Fish and Wildlife Leaflet 13.4.6 http://www.nwrc.usgs.gov/wdb/pub/wmh/13_4_6.pdf

<u>Forested Wetlands and Greentree Reservoirs</u>

- Greentree Reservoir Management Handbook. Leigh Fredrickson and Donald Batema. 1993. Gaylord Memorial Laboratory, Wetland Management Series No. 1. University of Missouri-Columbia, Puxico, MO. http://fwf.ag.utk.edu/mgray/wfs340/PDF/GTR_Management_Handbook.pdf
- Greentree Reservoirs. Wilma Mitchell and Charles Newling. 1986. Section 5.5.3, US Army Corps of Engineers Wildlife Resources Management Manual. Waterways Experiment Station, Vicksburg, MS. http://fwf.ag.utk.edu/mgray/wfs340/PDF/GTR_Management_Handbook.pdf