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Wetland Conservation in the United States: A Swinging Pendulum

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The Swinging Pendulum of Wetland Valuation

Over the course of time, people have both revered and demonized wetlands subject to historical context and the vicissitudes of politics. Prior to their displacement on the North American landscape, Native Americans relied on wetlands for food, animal fodder, water, and other less tangible resources, including aesthetic and spiritual sustenance (Vileisis 1997). Wetland plants, including wild rice, Indian potato, and water lily tubers, were valued food and medicinal sources. Other wetland plants such as cattails, brown ash, cordgrasses, and sweetgrass provided materials for weaving baskets and mats, thatching lodges, and spiritual ceremonies (Daigle et al. 2019). Native Americans had spiritual and religious beliefs associated with productive wetland areas. However, the European colonizers who displaced the Native Americans in the 1600s and 1700s brought with them a very different perspective toward wetlands.

To many European colonizers, wetlands were seen as a hindrance to crop production and animal husbandry. They worked to remove what were perceived as disease-ridden wastelands from the landscape and convert them into "useful" or "reclaimed" areas (Vileisis 1997). Technological advancements throughout the late 1800s and early 1900s expedited wetland conversions (figure 1). By the 1980s, approximately 53% of an estimated 89 million ha (220 million ac) of wetlands originally present in the conterminous United States

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Figure 1

The Bay City dragline at work "reclaiming" lands as part of the Everglades Drainage Project (photo courtesy of the State Archives of Florida, 1906 to 1926).

had been destroyed (Dahl and Johnson 1991). In addition to the loss of over half of the nation's wetlands, the quality of many *remaining* wetlands had been degraded. In a recent assessment of the nation's remaining wetlands, 48% were found to be in good condition, while 20% were in fair and 32% were in poor condition (USEPA 2016).

When the Soil and Water Conservation Society (SWCS) was founded in 1945, wetland drainage was rapidly converting "wasteland" to cultivated cropland. The US government facilitated these land "improvements" through cost-sharing and the coordination of extensive wetland drainage projects within drainage districts. The US Department of Agriculture considered both surface and tile drainage of wetlands to be *conservation* practices up until the mid-1970s. This perspective was reflected in the SWCS; throughout the first 20 volumes (1946 to 1965) of the Society's *Journal of Soil and Water Conservation*, wetlands are indexed to only nine articles (Soil Conservation Society of America 1968), each with a focus on how to make these "wet lands" more productive.

Yet, at the same time that some parts of the federal government were promoting wetland drainage for agriculture, other federal initiatives were beginning to embrace the importance of wetland ecosystems to people and wildlife (Heimlich et al. 1998). In 1934, Congress passed the Migratory Bird Hunting Stamp Act, 16 USC 718-718j, 48 Stat. 452, to facilitate the acquisition and restoration of wetlands for waterfowl. Throughout the 1960s and 1970s the push favoring wetland conservation was prevailing. Herman and McConnell (1983) described the political perspective related to wetlands as a swinging pendulum, swinging from drainage and destruction prior to the 1960s, towards protection and conservation in the 1960s and 1970s, and back toward a destructive view in the 1980s. This pendulum swing continued as wetland conservation again became a focus throughout the 1990s and early 2000s. Currently, the pendulum has begun a swing back in the direction of policies expediting development and the conversion of wetlands to what are perceived as more economically beneficial uses. Thus, the pendulum's swing continues. It is key to note that with any pendulum the majority of the time is spent in the swing, not at the extremes, with the pull always being toward a centralized position. The question is, can we modulate that swing so that loss of wetland resources remains recoverable?

Categorical Boundaries Cause Mental Roadblocks

Humans inherently categorize to understand the world around them, including its natural systems. We may categorize broadly or narrowly (i.e., be lumpers or splitters), but we all want control and try to impose predictability on our world. However, categories assigned for a good purpose can lead to unintended outcomes. For example, in religion and politics, divisions can become impermeable walls that divide communities, prevent the flow of ideas, and create misunderstanding. In the natural world, categories can lead to the misperception that different types of habitats or ecosystems, or geographically distant regions are discrete and independent of one another. This has led some to believe natural systems can be managed individually or as closed compartments with static boundaries. Just as the information age has opened global communication boundaries, human-induced climate change, rapidly expanding invasive species, rapidly declining native species, and other current conservation concerns have highlighted the interdependence of natural systems.

Numerous classification systems have been developed to facilitate the management and regulation of wetlands, and the science of wetland delineation that maps boundaries between wetlands and terrestrial or aquatic ecosystems has flourished in response. However, the establishment of boundaries, while necessary, can reinforce the idea that different types of wetlands and neighboring ecosystems (either drier or more aquatic) are not integrated, and indeed, that there is a physical demarcation tied to a line on a map. It is well established that ecosystems are highly dynamic and responsive to both internal and external environmental drivers (Euliss et al. 2004). Wetlands can grow and shrink in size, or shift location, in response to changing environmental influences as a result of climate change or changes in land use. For example, in the Prairie Pothole Region, increases in the amount and timing of precipitation have resulted in the expansion of many wetlands (McKenna et al. 2017). However, the most commonly used maps of wetlands in the region were created using decades-old imagery and do not reflect these natural or human-caused changes. Thus, acknowledging and allowing for the dynamism of wetlands is a key consideration in their conservation.

Perhaps the issue of wetland boundaries is so contentious because the physical compartments we have established influence the way we think about ecosystem management: there is a tendency to manage wetlands as discrete landscape components rather than as interconnected systems. However, wetland ecosystems serve as dynamic interfaces that integrate aquatic and terrestrial ecosystems, and provide unique attributes owing to that interface. Additionally, it is at that interface between ecosystem types where biogeochemical functions are often enhanced (Cohen et al. 2016).

To date, wetland regulation has driven the need to delineate wetland boundaries, mapping these discrete polygons as management units. Yet battles continue, in court and out of court, regarding delineation techniques and wetland definitions. This in turn creates public disaffection and frustration. However, to effectively regulate wetlands, boundaries must be identified. Given the key roles of soil and water in determining what makes an area a wetland, it is not surprising that the SWCS and many of its members have played leading roles in defining hydric soils and identifying hydric soil indicators. Wetland delineation manuals, such as those developed by the US Army Corps of Engineers, rely heavily on these hydric soil indicators of wetlands, as well as listings of wetland plants, another key indicator of wetlands (Lichvar et al. 2016).

While physical boundaries are needed to define regulatory units, these physical boundaries may foster mental roadblocks by promoting thinking in terms of discrete, isolated wetland units. We need wetland boundaries, but we also need the recognition that wetlands are a dynamic part of landscapes where boundaries change and ecosystems are integrated through flows of energy. While humans tend to prefer a world in which the locations of landscape features such as wetlands are constant, this is not the nature of the world in which we live. Wetlands may expand or contract in response to changing precipitation, temperature regimes, and land uses. In coastal areas wetlands might move upgradient in response to rising sea levels driven by the same increases in global temperatures. For effective wetland conservation in the 21st century, thinking in terms of landscapes that function as an integrated organism will likely have the most beneficial outcomes.

In Other Words, Words Do Matter

As with the mapping of wetland boundaries, some of the terminology we use related to wetland conservation may have unintentional consequences. The commonly used term "temporary wetland" is a prime example. This term is a shortened version of the more accurate term "temporarily ponded wetland" that is used to denote wetlands that only contain ponded surface-water for a relatively brief period during any given year. By referring to these wetlands as "temporary wetlands" the perception can be that they are not valuable because they are only a “temporary” landscape feature, when in fact, it is only the ponded water in the wetland that is temporary in nature, not the wetland itself (van der Kamp et al. 2016).

As another example—one of our least favorite terms still commonly used in wetland conservation—is “isolated wetland” and its derivative, “geographically isolated wetland” (Mushet et al. 2015). If we view wetlands as transitional areas that integrate terrestrial and aquatic ecosystems, how can they be isolated, geographically or otherwise? All wetlands are intimately connected to their surrounding terrestrial and aquatic habitats in multiple ways. What happens in those surrounding lands greatly affects the wetlands. Additionally, even if a wetland has no direct surface water or groundwater connections, atmospheric water inputs and losses connect even the most widely separated wetlands. Acknowledging the role of wetlands in the water cycle clearly reveals their inclusion in an interconnected system; this and other important roles that wetlands play should not continue to be diminished by the terminology we use.

Private Property versus the Commons

As their name implies, wetlands consist of both land and water. This combination has created a tension between cultural attitudes towards wetlands and wetland conservation efforts. This is because, in the United States, land is typically private property while water is typically viewed as a public or “common” resource. It is this commons component of wetlands that has stymied many conservation efforts since it can have both positive (e.g., providing flood protection) and negative (e.g., producing disease carrying mosquitos) influences. While the private property aspects of wetlands have long been accepted, a deeper recognition and appreciation of wetlands as part of the commons is needed to promote their conservation on the landscape (Vileisis 1997). This recognition and appreciation may come through the consideration of ecosystem services.

Ecosystem services are goods and services beneficial to society that are derived from ecosystems. As an example of an ecosystem service provided by wetlands, wetlands can reduce edge-of-field and drainage-water outputs of nutrients and thereby improve downstream water quality. Much research has been conducted to quantify these water quality improvement benefits (Woltemade 2000). Other examples of wetland ecosystem services include flood mitigation, recreation, habitat provisioning, timber production, food production, education, research, and aesthetics. While not all wetlands perform all of these services, their value as societal commons worthy of protection is clear.

Protecting Our Natural Capital

The swinging pendulum of public perceptions toward wetland conservation is reflected in our laws and regulations. For example, George Washington's Dismal Swamp Company, formed in 1763 for the sole purpose of draining the Great Dismal Swamp, reflected the colonial era sentiment of reclamation of wasteland. The shift to conservation in the 1960s and 1970s was exemplified by the 1978 enactment of the Federal Water Pollution Control Act, 33 USC §1251 *et. seq.*, generally referred to as the Clean Water Act (CWA), arguably one of the most significant steps forward in protecting the nation's wetlands (Downing et al. 2003). For the first 30 years of the CWA, most wetlands were considered to be within its jurisdictional scope, i.e., were waters of the United States. However, Supreme Court of the United States rulings in 2001 and 2006 (Solid Waste Agency of Northern Cook County [SWANCC] v. US Army Corps of Engineers, 531 US 159 [2001]; and Rapanos v. United States, 547 US 715 [2006]) called into question the types and extent of wetlands that could be regulated under this statute.

In order to clarify the definition of waters of the United States, and thereby the wetlands protected by the CWA, the US Army Corps of Engineers and US Environmental Protection Agency worked together to draft the Clean Water Rule, 80 FR 37053. The Clean Water Rule, finalized in 2015, considered case law and current scientific understanding of watersheds as systems (Alexander 2015) in its definition of waters of the United States. However, in 2019 and 2020, the two agencies issued a new series of rules, culminating in a finalized rule, the Navigable Waters Protection Rule, 85 FR 22250. The Navigable Waters Protection Rule depends entirely on a narrow legal interpretation of the CWA statute and the 2001 SWANCC and 2006 Rapanos Supreme Court decisions. Thus, a significant number of wetlands (39% in one study basin) are destined to lose CWA protections under the Navigable Waters Protection Rule (Walsh and Ward 2019).

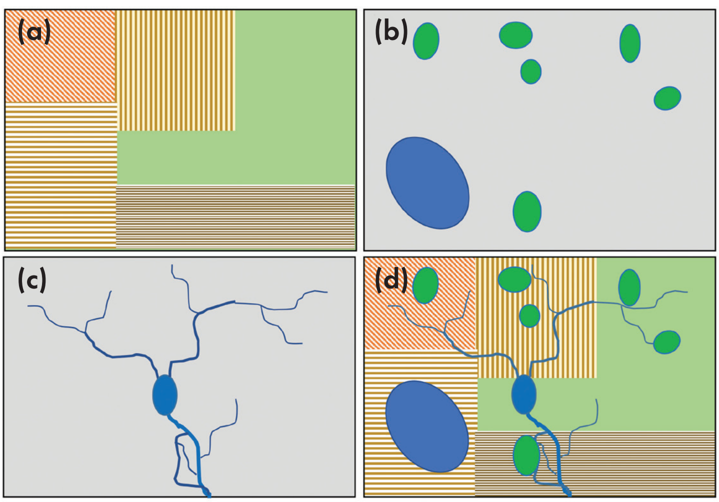
A View for the Future

While great advances in wetland conservation have been made during the preceding 75 years, much remains to be accomplished. This job will be made even more difficult due to the uncertainties wrought by ever-changing national politics and uncertainties associated with a globally changing climate and constantly changing land uses and priorities. As wetland conservation moves into the future, one key will be recognizing the fact that wetlands are complex ecosystems that necessarily change through time in response to changing land uses and environmental conditions. Accepting that neither the wetland-terrestrial edge nor the wetland-aquatic edge is static will add an increased level of complexity to the lives of conservationists, who will need to adopt a practical approach that allows for wetlands to naturally change, adjust, and adapt to changes in environmental drivers. In addition to acknowledging that not all wetlands are stable in terms of their size, location, or permanency of ponded water, future perspectives should take into account that wetland functions may also evolve for any given wetland (McKenna et al. 2017; Mushet et al. 2018b). Wetlands must be seen as the dynamic landscape features that they are, dynamic features that also are integral to the integrity of other ecosystems.

Here the authors provide two examples of ways to envision wetland conservation that recognize the practicality of traditional delineations but together provide a more holistic approach of wetland conservation through an integrated vision. Mushet et al. (2018a) provide a view of wetlands and their surrounding lands that they describe as a freshwater ecosystem mosaic (FEM). In a FEM, wetlands are viewed as being intimately connected to the terrestrial matrix in which they are embedded. The full mosaic is not realized by examining the individual pieces (figure 2). It is only through examining all of the components, and how they are arranged, connected, and bonded to each other, that a complete picture is revealed. Within this perspective, the value of networks is fully realized and

Figure 2

A (d) freshwater ecosystem mosaic is made up of (a) terrestrial ecosystems; (b) deep-water aquatic (blue) and shallow-water wetland (green) ecosystems; and (c) interconnected stream networks (Mushet et al. 2018a).



can be strategically incorporated into conservation and management efforts. Additionally, the lands between the wetlands are seen to be part of the picture that must be considered. Thus, interfaces and the need to consider all components of the mosaic are recognized.

Calhoun et al. (2014) describe a long-term, collaborative approach to vernal pool conservation in Maine. This collaborative approach led to development of a Vernal Pool Special Area Management Plan that has been adopted by the New England Army Corps of Engineers. This is an example of a FEM for vernal pools. Their incentive-based approach provides an alternative wetland mitigation tool developed and implemented locally to address vernal pool losses in municipal growth areas by using development fees to conserve vernal pools and amphibian postbreeding terrestrial habitat in rural areas of municipalities (Levesque et al. 2019). Economic development is fostered in growth areas and, in the very same towns, conservation of pools is funded by this growth when rural landowners are provided compensation for conservation.

For wetland conservation, the question at hand now is not how to stop the swing of the pendulum, but how we can modulate the intensity of those swings. Neither extreme, either 100% conservation or 100% development, is possible or even desirable. Can we embrace a broader perspective that sees conservation and economic development as inextricably intertwined? We posit that we can if we pay attention to both language and outcomes that stress interconnectivity and the organic relationship between socioeconomic progress and wetland conservation, between wetlands and uplands. Rather than fomenting the cultural artifacts that set wetland conservation and economic growth at opposite ends of a polar construct, let us welcome a new holistic paradigm for wetland conservation. Then perhaps the central tendency of all pendulums will be realized as the swings become less intense.

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Resources to Learn More

- USDA Natural Resources Conservation Service, Conservation Effects Assessment Project—Wetlands National Assessment. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/ceap/na/?cid=nrcs143_014155
- US Geological Survey: History of Wetlands in the Conterminous United States. https://water.usgs.gov/nwsum/WSP2425/history.html

- Why Are Wetlands So Important to Preserve? https://www.scientificamerican.com/article/why-are-wetlands-so-important-to-preserve/
- US Environmental Protection Agency, National Wetland Condition Assessment. https://www.epa.gov/national-aquatic-resource-surveys/nwca
- US Fish and Wildlife Service, Wetlands Status and Trends. https://www.fws.gov/wetlands/status-and-trends/index.html
- US Army Corps of Engineers, Vernal Pool Special Area Management Plan. https://www.nae.usace.army.mil/Missions/Regulatory/Vernal-Pools/
- Wetlands of Distinction. https://www.wetlandsofdistinction.org/

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