Abstracts and Speakers

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Wetland Restoration: Research Meets Practice (Parts 1 and 2)
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Priority Science-Based Training, Research and Information Needs of Wetland Program Managers

Jeanne Christie

The delivery of federal, state, tribal and local wetland programs should be based on sound science. However, needs often are identified first and then wetland programs are created in response to those needs. Frequently research and sound science follows. This is because while science may play a key role in identifying needs, the science to carry out solutions may be a new area of exploration. For example, the no net loss wetland policy adopted by the Georg H.W. Bush administration in 1989 was established in response to the recognition that the historic and ongoing losses of wetlands needed to be reversed. It set the stage for new government programs supporting wetland restoration and creation. However, the science of wetland restoration and creation was not well understood and a great deal of research into how to restore or create wetlands followed. A decade later state and federal wetland program staff began exploring ways to evaluate wetland health, i.e., condition and function, to support a variety of decisions necessary to carry out wetland programs. Most recently wetland programs managers are becoming interested in 1) holistic approaches to wetlands, streams and floodplain restoration, 2) the potential effects of changing climate on wetlands, 3) the impact of altered landscapes on wetland restoration and 4) evaluating the science available to support these challenges.

Scientifically Minded Practitioners and Practically Minded Scientists Working Together in Wetland Restoration

Daniel Larkin

Partnerships between scientifically minded practitioners and practically minded scientists can advance progress in wetland restoration. Ideally, both sides appreciate each other's perspectives and see gains from working together. I describe past, present, and future partnerships seeking to integrate research and management: (1) In Wisconsin, my research team collaborated with resource managers to evaluate influence of vegetation condition in natural and restored wetlands on occupancy by secretive marsh birds. As researchers, we benefited from a statewide infrastructure of managers, technicians, and volunteers who could survey birds on a scale far more extensive than we ever could. Our manager partners benefited from our sampling vegetation at a scale far more intensive than they would ever want to. (2) Through "PhragNet," my collaborators and I developed a learning network to understand patterns of invasion by non-native Phragmites australis. Fifty wetland managers overseeing 209 stands of Phragmites in 16 US states participated. We gained knowledge of factors associated with Phragmites invasion and management over a very large geographic scale. Participants received free genetic identifications of native vs. non-native Phragmites. (3) We are currently partnering with seed producers and restoration practitioners on restoration experiments in very dry wetlands (a.k.a., mesic prairies). We hypothesize that restoration mixes that are more diverse in their seed traits could foster complementarity among species, increasing restorations' diversity by allowing more species to coexist. Our collaborators' decades of practical experience have challenged (and strengthened) our ideas. For example, we learned that one reason restored prairie vegetation can be too patchy is that smaller seeds fall out of drill seeders more quickly---a pattern we would have been all too likely to attribute to a fundamental ecological process. (4) Finally, in a project being developed for extremely wet wetlands (a.k.a., lakes) in Minnesota, my colleagues and I are forming partnerships linking research, management, and citizen science. Through the "Trackers" program, we will train volunteers and host a centralized data management system, citizen scientists will monitor outcomes of invasive plant management, and manager partners will benefit from increased capacity to evaluate control effectiveness and post-control recovery of native plants.

Making Wetland Restoration More Effective
Susan Galatowitsch
The practice of wetland restoration has greatly advanced in the past few decades with increasingly more ambitious attempts to reverse human impacts to the environment. Yet a very high number of restorations still do not adequately replace lost natural ecosystems. For ecological restoration to be an effective environmental strategy further progress is clearly needed. In particular, significant advances are possible with attention to five aspects of restoration: 1) overcoming severe limitations to wetland seed and plants, 2) providing research support for stretch goals, 3) widespread adoption of adaptive management, 4) improved standards for goal-setting and planning (especially in non-regulatory contexts), and 5) assessment of organizational capacity and resilience of restoration groups to sustain wetland restoration and management. None of these can be achieved without collaboration among researchers, policy makers, and practitioners. Strategies for addressing these five critical needs will be explored.

The Trick of Mecone: Making the Unsuspecting Deliver Wetland Restoration for the Benefit of Mankind
Robert McInnes
In Greek mythology, Prometheus tricked Zeus into choosing a pile of ox bones for himself, rather than consuming the succulent and tasty flesh which was left for the delectation and benefit of mankind. Whilst Prometheus ultimately suffered for his actions, humans were the beneficiaries. This act is known as the trick at Mecone. A corporation or private company can be considered as a modern-day Zeus, representing a powerful entity driven by their own ambition and corporate objectives. Wetland restoration is not normally on the corporate agenda for many companies. However, through examples of projects in the United Kingdom, this presentation will describe how, like Prometheus, it can be possible to 'trick' major water companies into delivering wetland restoration. The examples will explain how it is possible to build alliances among large corporate water companies, local non-governmental practitioners, wetland specialists, researchers and landowners to deliver wetland restoration. The benefits of wetland restoration and how these are presented to different stakeholders will be discussed and the key lessons learnt will he highlighted in order to help others build future unlikely alliances.

Wetland Creation Using Engineering with Nature Principles: A Multi-Factor Approach to Ecological Assessment
Jacob Berkowitz with Lindsey Green, Christine VanZomerenl, John White and Burton Suedel
A multi-factor ecosystem assessment of a dredged material supported wetland was conducted within the Atchafalaya River, Louisiana. Results indicate that the innovative use of dredged materials in a riverine environment supports wetland formation and expansion while providing habitat, hydrologic, and biogeochemical functions. The strategic placement of dredged materials in locations that mimic natural process promotes additional ecological benefits, especially with regard to wading bird and infaunal habitat, thus adhering to Engineering with Nature principles. The multi-factor assessment improved wetland assessment outcomes by allowing for a comprehensive analysis of a diverse array of ecosystem components, trophic levels, and functions. We evaluated multiple ecosystem assessment factors including: 1) geomorphic evolution, 2) ecosystem classification and distribution, 2) floral communities, 3) avian communities, 4) aquatic invertebrates, 5) soils and biogeochemical activity, and 6) hydrodynamic and sediment transport processes. Results indicate inclusion of multiple factors in the assessment approach provides a comprehensive picture of the benefits resulting from wetland creation/restoration. Additionally, assessment results were compared with several other wetlands in the region, providing a context for the development of restoration success criteria.

Interdisciplinary Project Teams Create Better Wetland Restoration Outcomes

Metthea Yepsen with Jackie Jahn and Monica Chasten

An interdisciplinary wetland restoration project team that includes researchers, engineers, contractors, regulatory agencies, and landowners allows for an exchange of information that not only improves the efficiency and outcomes of current projects, but also allows for the lessons learned during the project to be documented and used to develop recommendations for future projects. This is especially beneficial for wetland restoration projects that may have non-traditional goals or use methods that are new in a region.

For a series of projects that pilot the use of dredged material for salt marsh restoration, The New Jersey Department of Environmental Protection brought together a team of environmental non-profits, researchers, regulatory personnel, engineers, navigation managers and dredgers. The diverse expertise of the group helped to select restoration sites, design projects to meet our ecological and social goals as well as permitting requirements, fund both restoration and monitoring, and collect lessons learned from each team member that will be used to develop holistic guidance for future projects. Beyond a literature review and synthesis of monitoring outcomes, the guidance document will address other factors that are important for restoration success such as, key permitting concerns, which construction methods worked and which did not, costs and timelines associated with the many steps of the project, and appropriate metrics and parameters for future site selection and monitoring.

This presentation will cover each team member's role in the project and give examples of how information exchange between the members has led to improved restoration outcomes.

Options for full restoration of Florida's Everglades

Joseph Gilio

Man made modifications to Everglades headwaters Kissimmee River and Lake Okeechobee (L.O.) have resulted in decades long reductions in water flows into and out of the Everglades. Instead 87% of L.O.'s 1.1 million ac-ft./yr. now outflow through channelized Caloosahatchee and St. Lucie Rivers rather than the partitioned and remaining Everglades. Everglades National Park now receives 13% of historical flow with similar reduced outflow into Florida Bay resulting in the Bay's hypersalininty rather than historical estuarine conditions.

Two major joint Federal/Florida programs –CEPP and CERP – projected at $13-$15 Billion by 2050 should result in a 21% increase in historical restoration of water volume into remnant Everglades. Since current remnant Everglades is half the original size, effective restoration would restore about 40% natural input.

Full restoration of functionality of remnant Everglades greater than CEPP/CERP program envisions several options presented here and not part of the federal/state plans. Water quantity, quality, hydroperiodicity and soak time are essential to full remnant Everglades restoration. Any reduction in man-made volume outflows to the two rivers means an equal increase in Everglades flow. The not to exceed 10 ppb TP limit on water quality entrance into remnant Everglades wetlands may be achieved in engineered storm water treatment (STA) areas at various L.O. water concentrations. At current L.O. in situ water at 120 ppb TP, lake input into an STA at 1000 ac-ft./yr. requires 0.2 acres, produces < 1 cm/day loading, 10 m/yr., % TP retention of 85% , mean water depth of 3.3 ft. and retention time of 200 days. Operations to reduce the TP in situ lake concentrations to between 40-60 ppbTP levels are summarized with cost estimates. Pro rated increases in treated lake volume inputs into remnant Everglades correlate with STA treatment size. Options for increased land use size for additional STA's are presented.

Hydrology? Check! Plants? Check! Soil organic matter? Houston, we have a problem!
Andy Baldwin with Stephanie Yarwood, Martina Gonzalez Mateu, Amr Keshta, Eliza McFarland and Christine Prasse
Restoration efforts are often successful in establishing wetland hydrology and vegetation within a few years. However, soil organic matter accumulates slowly in restored wetlands, even in those with productive wetland vegetation. After decades many restorations contain less soil organic matter than their natural reference conditions. Where topsoil is removed to increase waterlogging or dredged material placed to reduce water depth, soil microflora are altered and organic matter is slow to develop. Why does this matter? Not only is organic matter accumulation important for plant growth, it is critical for valued microbial processes like denitrification that improve water quality and vital if wetland restoration is to be promoted as a means to sequester atmospheric carbon. Amendment of soils with compost has been shown to increase organic matter content for a few years, but this effect may be short-lived. Microbial function, soil texture, and aggregate formation may play underappreciated roles in organic matter accumulation. Currently we are testing a bioassay to evaluate carbon accumulation and loss across a range of natural and restored wetland habitats. Strategic collaboration between scientists and practitioners during restoration design, construction, and monitoring may lead to restoration practices that increase soil organic matter accumulation.

Successful Wetland Restoration Requires Both Research and Practice, But How Do We Get Both?
Andy Herb
Spending a career working as a private-sector ecologist has taught me many lessons. Most have come from very long days in the field delineating, assessing, and restoring wetlands. Although I have successfully restored many wetlands, I sometimes leave a site with more questions than answers. As a restoration practitioner who is typically on a tight budget and tighter schedule, I rarely get the opportunity to conduct the research necessary to resolve some of the perplexing issues that arise when assessing, designing, implementing, and monitoring restoration sites. Fortunately, there is a worldwide team of scientists working diligently every day to understand these issues! These researchers are working for colleges, universities, non-profits, government agencies, and other entities, and regularly publish their results in a myriad of scientific journals! So, what's the problem?

In this presentation, I will briefly highlight a few issues that have arisen on different restoration sites in the Rocky Mountain Region and discuss how these and others complications may be avoided by having better information exchange between the restoration research and applied communities. I'll provide some suggestions on bridging the great divide between the sectors, including enlisting the help of SWS and the Wetland Restoration Section.

Good Definitions and Basic Principles Lead to Better Wetland Restoration and Creation
William Mitsch
Wetland restoration refers to the return of a wetland from a disturbed or altered condition caused by human activity to a previously existing condition. The wetland may have been degraded or hydrologically altered and restoration then may involve reestablishing hydrologic conditions to re-establish previous vegetation communities. Wetland creation refers to the conversion of a persistent upland or shallow water area into a wetland by human activity. Wetland enhancement refers to a human activity that increases one or more functions of an existing wetland. One type of created wetland, a constructed wetland, refers to a wetland that has been developed for the primary purpose of contaminant or pollution removal from wastewater or runoff. This last type of wetland is also referred to as a treatment wetland. Some general principles of ecological engineering that apply to the creation and restoration of wetlands are: 1. Design the system for minimum maintenance and a general reliance on self-design. 2. Design a system that utilizes natural energies, such as the potential energy of streams as natural subsidies to the system. 3. Nutrients affect biodiversity recovery. Low- nutrient wetlands are often more difficult to create or restore but have higher biodiversity. High-nutrient wetlands go for power rather than of biodiversity. 4. Design the system with the hydrologic and ecological landscape and climate. 5. Restoring a specific hydrologic regime is crucial to restoring biodiversity and function. 6. Design the system to fulfill multiple goals but identify at least one major objective. 7. Give the system time. 8. Design

the system for function, not form. 9. Do not over-engineer wetland design with rectangular basins, rigid structures and channels, and regular morphology. 10. Understand the basic principles of succession-both Gleasonian and Clementsian principles apply to wetlands-and you will be a more successful wetland ecological engineer.

The Effects of Initial Planting Density and Sea-level Rise on Community Structure and Ecosystem Function in Restored Tidal Marshes

Julia Cherry with Eric Spark, Sara Martin, Just Cebrian and George Ramseur Jr.

Tidal marsh restoration is an effective strategy to recover ecosystem services that have been diminished due to habitat degradation or loss. Restoration projects in coastal wetlands should not only evaluate the recovery of community structure and ecosystem functions, but also their cost-effectiveness and likely success with continued threats from sea-level rise. To evaluate the effects of restoration technique and sea-level rise on marsh community structure and ecosystem function (i.e., mitigating nutrient loading), we restored three marshes at Weeks Bay National Estuarine Research Reserve and planted them with different densities (0%, 25%, 50%, 75%, and 100%) of Juncus roemerianus. We also simulated sea-level rise in half of the plots using passive weirs that increased the depth and duration of flooding during low tide. Species richness increased following restoration regardless of sea-level rise treatment, and plant percent cover was similar among the 50, 75, and 100% initial planting densities. In addition, porewater dissolved inorganic nitrogen (DIN) concentrations were similar among the 50%, 75%, and 100% planting densities, and significantly lower than concentrations in the 0% and 25% treatments. Furthermore, sea-level rise effects on DIN varied with location, but were minor and largely secondary to the effects of planting density. Consequently, we concluded that the 50% planting density was the most cost-effective design to restore plant community structure and achieve nutrient removal in these marshes. Taken together, these results suggest that intermediate initial planting density can recover much of the restored marsh's structure and function at relatively low cost, thereby allowing managers to maximize the outcomes of restoration projects.