G.2: Incorporation of Hydrologic and Geomorphic Variability in the Restoration of Natural Processes: The Foundation for Producing Sustainable Wetland Resources for Wetland Dependent Wildlife (Organizer: Leigh H. Fredrickson)

G.2.1: Fredrickson

Setting the Stage for Restoration and Management of Natural Processes

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Wetland management has evolved extensively over the past century as more management areas have come under public ownership and more information has been generated on wetland-dependent wildlife and their habitats. In the early years of wetland management there was limited information on annual cycle requirements of wetland-dependent wildlife, wetland plants, wetland soils, and the dynamics of wetland processes. In fact the term wetland was not widely used until the 1970s. Early objectives were often based upon opinion, results from poorly designed studies, and likely were linked to animal populations but disconnected from factors that a land manager may be able to influence. This lack of understanding resulted in many widely held misperceptions about the placement and design of infrastructures in a diversity of geomorphic settings. Over time managers began to ask questions that clearly required an understanding of the hydrogeomorphic setting in which management actions occurred. The importance of geomorphic surfaces, soil type and textures, highly variable climatic factors, surface and subsurface hydrological conditions, as well as physical and chemical conditions, gradually emerged as important considerations upon which appropriate objectives must be developed. Furthermore, the skills required to implement land management were typically compromised as urbanization became more widespread and few individuals had the opportunity to be exposed to the challenges of implementing ecologically based decisions in highly modified environments where the constraints associated with desired economic benefits, politics, policy, and legislation must all be considered. To be effective requires a 10,000 hour development over about a decade to achieve the skills and confidence to deal with typical land management challenges. This presentation is an attempt to capture this evolution and set the stage for a series of examples about how talented managers in a diversity of systems have developed successful programs to meet the mission of agencies and the objectives of their management site.

G.2.2: Tashjian

Historic Landform Process Models: A Key to Successful Wetland and Riverine Restoration

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Southwestern Riverine and Wetland Systems have witnessed an onslaught of engineering activities that have all but ruined historic processes and associated ecosystems in the name of flood safety, irrigation demand and efficient water delivery. As the awareness of the importance of our aquatic ecosystems has grown over the past decades, ecosystem needs have been placed alongside these conventional management purposes in an effort to more equitably manage our water resources. Our work demonstrates the critical importance of; 1) understanding "native" historic processes of a given aquatic system, 2) understanding the perturbations to these systems, 3) understanding the modern limitations on restoring key historic processes, and 4) formulating creative mechanisms for restoring key historic processes. In order to address these issues, the Southwest Region of the US Fish and Wildlife Service has modified the Missouri Wetland Review Process to incorporate data and exercises focusing on landforms and associated physical processes. An integral part of this approach to wetland management is the construction of a landform map and a landform directory that links landforms to conceptual models of how a given landform functioned in a native state and how native processes have been disrupted. Creating historic and modern landform maps requires expertise in geomorphology and photo interpretation. The mapper will interpret the historic and modern imagery classifying landforms based on landform nomenclature. Due to the variability in systems and available map products, the nomenclature for Southwestern US landforms has been loosely standardized based on seminal Middle Rio Grande mapping efforts of Lettis and Associates. Once a landform map has been compiled or created, the Landform Directory is created. This directory is a mechanism for hypothesizing how a given landform functioned historically and how these processes have been interrupted in the modern. Creating the Landform Directory is a starting point for constructing conceptual models and it needs to be emphasized that these models are iterative. The Landform Directory is best labeled as DRAFT and it helps to specifically state "The following directory is draft in perpetuity: these models are open to changes as more information becomes available". Through management experiences at applying this "lens" to wetland and river restoration at assorted wetland management areas in the Southwestern United States, we have witnessed successful restoration activities that have favored native species viability while maintaining or even improving conventional management purposes. A brief overview of products associated with wetland reviews in New Mexico is presented including Bosque del Apache NWR, Bitter Lake NWR, Brantley State Game Refuge, and the Armendaris Ranch.

G.2.3: Henry

Incorporating Hydrologic and Geomorphic Variables into Wetland Management in the Intermountain West

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Managed wetlands in semi-arid and montane wetlands in the Intermountain West range from highly modified and actively managed to more passively managed depending on the degree of anthropogenic alterations. Identifying the geomorphic, hydrologic, and climatic settings at a management site are critical because these factors have a profound influence on the contemporary ecological conditions and form the foundation for producing and making resources available for waterfowl and other wetland-dependent wildlife. Several National Wildlife Refuges in the Intermountain West have incorporated hydrologic and geomorphic information into planning efforts to improve management and restoration of wetland habitats. The landscape setting, spatially and temporally variable hydrologic patterns, topography, and diverse soil characteristics that historically resulted in highly dynamic surface and groundwater inputs are key features that should be identified and used to understand processes that drive wetland productivity. By assessing hydrologic and other abiotic parameters managers recognize that conditions are constantly changing from those that are generally considered “valuable” or “ideal” to dry conditions. Incorporating management strategies that mimic seasonally and annually variable ecological processes can support abundant waterfowl and wetland-dependent wildlife during both short and long-term wetland cycles. Thus, we would encourage any manager to focus their efforts on continually expanding their understanding of the habitat conditions that result from the geomorphic, climatic, and hydrologic setting for which they are responsible.

G.2.4: Nelson

Missouri Public Waterfowl Hunting Area Wetland Renovation, Schell-Osage Conservation Area

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Schell-Osage Conservation Area (CA) is over 60 years old and one of Missouri Department of Conservation's public waterfowl hunting areas. It is the fifth and last area to be part of the Golden Anniversary Wetland Renovation Initiative, which has focused on addressing aging wetland infrastructure issues. This area lies within the Osage River Basin and is in the Truman Lake Reservoir flood easement, in west central Missouri. Like many historic wetland areas in the United States, there have been a many modifications to the floodplain and adjacent streams which have altered the flow, frequency, depth and duration of flooding on Schell-Osage CA. Some of the initial engineering from the early 1960's has also added to some of the area's management challenges and limitations. The proposed rehabilitation of Schell-Osage CA applies our current understanding of wetland restoration, built off the concepts that have been successfully applied at Duck Creek CA, and has been recalibrated for the Osage Basin. Through the planning process, LIDAR was used to examine landscape features and juxtaposition of engineered infrastructure. We are proposing to reconfigure impoundments to coincide with the historic drainages, facilitate independent water control, and allow waterfowl hunter access to the blinds. This process has also provided the opportunity to think about redistributing the waterfowl refuge so that it provides better habitat and less disturbance. While this work will definitely benefit waterfowl, this approach also has broader ecological implications by incorporating blocks of higher and drier floodplain habitats along with the low lying ponded areas, and extending into the adjacent streams. The wetland renovation will reduce some of the chronic management challenges that have plagued Schell-Osage CA and help the area handle the seasonal variability that comes with being in Truman Lake's footprint.

G.2.5: Cordell

Trash the Cookie Cutter and Pick Up the Puzzle Pieces

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Research and today's industrial society often try to reduce the noise and streamline variability to find general trends and simple solutions. On the flipside, management deals with making decisions amidst the complexity and often messy interactions within larger systems. As an alternative to the cookie cutter approach to wetland management, the argument will be made for continual learning of wetland functions, embracing natural variability, and recalibrating management decisions. Piecing together these puzzle pieces are the tools to provide habitat for migratory water birds along with a range of other wetland dependent species in this complex, variable world.

Duck Creek Conservation Area is a Missouri Department of Conservation wetland management area in southeast Missouri on an old terrace of the Mississippi Alluvial Plain that is over 65 years old and has received a major renovation over the last 5 years. This work attempted to integrate ecological considerations into the engineering design to accommodate hydrologic connectivity and habitat diversity. As construction has been completed, management of the reconfigured pools and the reality of our planning decisions have begun to emerge. This presentation will examine the annual cycle of wetland ecology and rationale behind management decisions made to promote diverse wetland community interactions for this unique conservation area. While seasonally migratory waterfowl and the public emphasis on fall waterfowl hunting are positive elements of area management, they are taken within context of the broader wetland community and cross seasonal effects. This approach embraces the uncertainty and variability that occurs in wetland systems, is proactive towards risk, and allows for greater flexibility in potential outcomes. Instead of maximization, this approach is centered on ecological context and understanding community interactions. The benefits of communicating this strategy has garnered wider public support and understanding for wetland conservation on Duck Creek, which is often a big gap in today's society.

G.2.6: Vradenburg

Wetland Restoration and Management in Arid Floodplains with High Agricultural and Urban Water Needs

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Historically only two-percent of the land area of the arid southwest supported wetland or riparian habitat; modifications to hydrology and land surface removed one third of this wetted habitat from the landscape. Social and political pressures to capture and use water for agriculture, urban and energy demands functionally altered the remaining lands and compromised their value and contribution to wildlife management. In this modified setting limited lands have been set aside for the management and benefit of wildlife. Additionally, these managed lands are often overlaid within irrigation companies, reclamation projects or other jurisdictional constraints. Pressures and complexity with larger jurisdictional factors such as water rights, water deliveries or endangered species requirements often cloud the direction and objective of wetland restoration or management. Restoration must begin with an evaluation of abiotic conditions to answer questions such as “How is native vegetation successful,” “What opportunities have invasive species capitalized on,” “How does current management overlay historic conditions,” and “How do current conditions mesh with appropriate wildlife values?” Restoration success is a function of understanding abiotic conditions, evaluating the degree of perturbation, and implementing techniques to recreate or reactivate historic processes.

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H.2.1: Papon

Assessing the Value of Sediment Removal in Restoring Prairie Pothole Wetlands

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The typical prairie pothole wetland restoration project conducted on public or private lands usually involves plugging or filling drainage ditches and/or breaking tile lines to restore a more natural hydrological cycle to drained wetland basins. However, some managers have noticed that not only are these degraded basins drained by ditches or tile, the physical integrity of the basin has been further compromised by sediment accumulation from cropped or tilled uplands. The accumulation may vary from several inches to several feet. These sediments bury native seed banks, carry excess nutrients (N & P), and modify soil surface characteristics (organic matter, density, etc.). Thus, to fully restore these drained basins, some restoration projects have involved sediment removal in wetlands but these efforts have not always been well documented or monitored. Sediment removal is costly and there are considerable uncertainties about whether this approach to restore drained wetland basins is appropriate to use in combination with a typical ditch fill and tile removal. Typically ditch fill restorations commonly used for the past 5 decades to restore seasonal wetland basins with past cropping history tend to be dominated by hybrid cattail. Managers want to know whether or not removing the upland sediment will minimize or delay colonization by invasive plants such as reed canary grass and hybrid cattail and instead promote a native wetland community much more beneficial to breeding and migrating waterfowl. As of December 2014, 105 wetland basins are part of the Wetland Sediment Project, with study basins located near six FWS field stations in western Minnesota and Iowa. This presentation summarizes results of the project to date, provides several examples of extreme sedimentation and post-restoration plant response, and discusses challenges in restoring and managing prairie pothole wetlands given the suite of invasive species commonly encountered in the Prairie Pothole Region. Discussion will focus on ways to restore and manage a seasonal pothole to encourage the establishment of native emergent and submergent vegetation before hybrid cattail and other invasives become established and aggressively compete with desirable wetland plants.

H.2.2: Pagan

Private Land Initiatives in the Bottomland Hardwood Region of Bayou Meto Arkansas

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Green Tree reservoirs where originally developed in the bottomland hardwood forests of Arkansas to attract early arriving migrant dabbling ducks and especially mallards to feed in habitats early in the fall waterfowl hunting season before natural flooding typically occurred at this latitude. Migrant mallard response was exceptional in the early years after reservoir establishment but in the vast majority of cases the protocol established for management led to forest degradation or death and waterfowl use declined precipitously thereafter. Gradually over time the problems associated with the development and implementation of management were addressed and new strategies were formulated to address the complexities of managing wetland forests. This presentation will describe multiple forest management and flood regime practices used on degraded Greentree reservoirs over ten year period near Stuttgart AR. A seven step procedure has been formulated to assist landowners and managers when renovating degraded Greentree reservoirs. This planning process outlines all parameters critical to restore forest health and increase herbaceous vegetation in managed reservoirs. The presentation will describe the interconnectedness among geomorphic surfaces and vegetation communities because these factors dictate the type of flood regime most likely to lead to effective outcomes. This presentation is based on many years of field experience, multiple failed and successful attempts to renovate Greentree reservoirs across the Mississippi Alluvial Valley.

H.2.3: Smith

Restoration of Native Hawaiian Plant Communities to Benefit Five Endangered Waterbirds: Recognition of Geomorphic Surfaces, Hydrologic Conditions, Native Seed Banks, and Bugs as a Path To Success

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Over the last century as native Hawaiian wetland habitats were lost and degraded, five native wetland birds, the Hawaiian duck or Koloa maoli, Hawaiian stilt or Ae'o, Hawaiian moorhen or 'alae 'ula, Hawaiian coot or 'alae ke'oke'o and the nene or Hawaian goose were classified as endangered. As historic wetland processes were lost or compromised by agriculture and urbanization wetland habitats were besieged with invasive plants and animals and the five endangered waterbirds suffered steep population declines. Wetland agriculture was often embraced as successful management because such sites had open areas where waterbirds were visible but census numbers reflected decreasing population. Over the last two decades, much life history and habitat knowledge guided a path to provide more natural hydrological regimes and habitats dominated by native and naturalized plants. A management goal to restore native wetland plant communities tied to geomorphic surfaces associated with evolution of these species gradually evolved. Conversion to native plants was a daunting task because refuge lands were a sea of invasives after cultivation for rice, sugar cane, or taro production as well as cattle grazing. Little over a decade ago the present wetland units were completely dominated by invasive species, including thirty-foot tall hau bush and dense California grass. After years of intense management the invasives are now under control through precisely timed mowing, disking, tilling, and water manipulation strategies that have enhanced native seed banks and created conditions dominated by native plant communities. Currently an 18 to 24 month management regime has been developed for Hanalei and Huleia NWRs. Once native wetland plant communities were established, the avian response was immediate. At Hanalei NWR, Koloa increased from a long-term average of 125 birds across several decades to a 2013 total of 818 as measured by similar techniques. The other four endangered species experienced similar population increases on Hanalei NWR as wetland conditions improved in the last decade.

H.2.4: Vorland

Rehabilitation and Management of a Shallow Lake Complex in South Central Minnesota

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Conservationists and natural resource professionals have long recognized the value of Minnesota's shallow lakes to waterfowl and other wetland dependent wildlife. Despite their importance as natural resources, shallow lakes in south central Minnesota have been degraded by many factors and frequently devalued by society. In this agricultural landscape most wetlands including many shallow lakes have been lost to drainage. The surviving lakes are especially vulnerable to degradation from rough fishes, nutrient enrichment, altered hydrology and land use changes. While water is a public resource nearly all land is privately owned and the state has riparian rights on few basins. Effective management strategies to rehabilitate degraded lakes have been well known for decades; however, implementation can be fraught with difficulties. Public opposition to water level manipulations and restoration of macrophytes frequently stalls lake rehabilitation efforts. One must navigate the complexities of riparian and drainage rights, dams, the politics of multiple levels of government, diverse social expectations, environmental review and permitting. Public involvement including partnerships with area stakeholders, local governments and conservation organizations has reduced some of the acrimony that developed over lake management proposals. Adequate funding is helpful too. We use a combination of water level management and biomanipulation of fish communities to emulate natural processes to restore macrophytes and improve water clarity in a complex of shallow lakes. Waterfowl and other waterbirds have responded to management efforts, but without continued intervention these lakes quickly revert to turbid conditions. Examples of public involvement and management strategies adapted to the social, legal and ecological settings of individual basins will be presented.

H.2.5: Fredrickson

Discussion

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