Abstracts and Speakers
2014 Wetland Restoration Section Annual Symposium
Portland, OR

Establishing wetland plant communities on oil sands substrates: the role of peat, hydrology, and propagules.

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Abstract. The existence of oil sands mining is controversial and the post-mining reclamation of wetlands in these operational areas is problematic also. Strong manipulations must be taken to establish wetland plants and start successional sequences. We examined placement of organic matter (raw peat) and planting of Carex aquatilis rhizomes across a replicated elevational gradient to examine key drivers and barriers to early establishment. Rhizomes grew well where adequate moisture persisted. Peat amendments showed no significant contribution to survival, cover or shoot densities. Shallow flooding appeared to favor the robust rhizomatous expansion. Subsequent seasons with moisture shortages will be required to test longer term effects of peat's moisture-holding capacity on survival. Currently the planting of durable rhizomes appears to be a low-risk way to initiate wetland cover. Development of more complex and sustainable wetland flora is predicted once hydrology, organic matter and initial plant structure stabilize.

The role of wetland reclamation research in re-establishing functional ecosystems in the Oil Sands Region of Northeastern Alberta.

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Abstract. Oil sands mining in northeastern Alberta, Canada removes a large portion of the boreal landscape, which is predominantly composed of forests and wetlands, mainly peatlands, and a small proportion of lakes, rivers and streams. The total area of disturbance in the region is expected to increase in the coming decades, leaving behind salvaged soils, mine pits, tailings, and other waste streams that need to be treated and/or reclaimed. One of the fundamental goals of oil sands mine reclamation is the re-establishment of functional ecosystems on reconstructed landforms that have equivalent land capability to what existed before disturbance. Such re-establishment relies on the generation and refinement of knowledge on successful ecosystem development techniques. Knowledge development occurs collaboratively through various multi-stakeholder organizations with members from government, industry, environmental groups and Aboriginal groups. This presentation will review wetland reclamation research programs underway in the oil sands mining sector and explore emerging research opportunities in the context of developing recommendations to reclaim wetlands on mine sites. More detail will be provided on the large multidisciplinary studies underway on fen peatland and boreal swamp reclamation.

Adaptive management measures to promote significant wetlands restoration on a highly industrialized brownfield development site in New Jersey.

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Abstract. The New Jersey Gardens Mall is built on a former landfill in a highly industrialized area. Destruction of a former wetlands during construction required on-site mitigation. Established in 1994, most of the mitigation consists of a single tidally influenced wetland system abutting the Hackensack River to provide habitat for forage fish species and serve as a feeding area for wading birds. The existing shoreline was converted into a "barrier island" to buffer the mitigation sites from wave action and storm events while also providing additional habitat for a variety of wildlife. Until 2011, minimal wetlands growth was established, and fell far short of the 85% regulatory

requirement. However, recently implemented adaptive management measures helped achieve significant wetlands restoration. This included plantings downslope in areas near successfully colonized and more upslope plants, higher posts and fencing, a larger buffer between the protective fence line and the plants within the enclosure to reduce herbivore access, and removal of floatable debris trapped within the inter-tidal area to eliminate their potential for damaging and destroying both enclosures and wetlands plants during storm surges.

Integrating wetlands into the watershed restoration planning process to address water quality and quantity impairments.

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Abstract. Depending on their landscape position, wetlands provide a variety of important ecosystem services that can help address water quality and quantity impairments. Yet often it is not readily apparent which wetlands provide the desired ecosystem services. Nor which wetlands could be restored to help address water quality and quantity impairments. In Montana, this leads local conservation groups, landowners, local governments, and others to focus more on stream and riparian area restoration, and land-use practices to address water quality impairments than on adjacent wetlands that are an integral component of a healthy functioning watershed. Using landscape level functional assessments tools and wetland profiling we worked with two local watershed groups to identify and target wetland restoration projects that could address water quality and quantity impairments identified through the TMDL planning process. We demonstrated that targeting wetlands for restoration and incorporating them into local planning documents can be an effective means of improving water quality and quantity and increase protection of wetlands that fall outside of state or federal jurisdictions from further impacts.

Large-scale hydrological reconnection of wetlands on the Lower Columbia River and Estuary floodplain.

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Abstract. The Columbia Estuary Ecosystem Restoration Program on the 1468-km2 river floodplain was developed over the past decade to provide habitat for threatened and endangered salmon of the Columbia Basin during migration to the Pacific Ocean. The removal of barriers to fish passage and macrodetritus export by hydrological reconnection of floodplain habitats along 235 river kilometers catalyzed changes in physical and biological indicators, which we measured at >60 reference and >10 restoration sites. Key elements of the restoration program are a conceptual model, prioritization, status-and-trends monitoring, database development, adaptive management, and critical uncertainties and effectiveness research. Our recently completed programmatic evidence-based evaluation of effectiveness used 11 causal criteria to evaluate 10 analyses synthesized under 7 lines of evidence. We investigated and quantified ecosystem controlling factors on water surface elevation, channel morphology, and microtopography; biomass production and export; composition and distribution of plant communities (Populus balsamifera riparian forests, Picea sitchensis swamps, Salix and Cornus sericea wetlands, brackish and freshwater marshes); and dynamics of hydrologic connectivity, inundation and water temperature. The evaluation showed that large-scale wetland restoration benefits salmon through cumulative net ecosystem improvement.

Promoting more stable beaver dams to reduce incision and increase steelhead productivity in Bridge Creek, Oregon.

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Abstract. Much of Bridge Creek is confined within a narrow incision trench and high flows rarely access its former floodplain. Typically, incision results in a loss of both channel planform and bedform complexity, decreased flows and riparian vegetation, and increased stream temperatures. We initiated an experiment in 2005 to determine if reducing incision and increasing floodplain connection could lead to an increase in the productivity of threatened steelhead. We chose to restore Bridge Creek by assisting beaver to build dams that can survive high flows. We built 114 beaver dam support structures by driving wooden fence posts into the stream bottom perpendicular to the stream. Rapid geomorphic changes occurred after 30% of the structures were occupied by beavers including aggradation upstream of the dams, floodplain inundation, and increased habitat complexity. Changes in the stream lead to significant increases in the abundance, survival, and production of juvenile steelhead in restored compared to control areas. This inexpensive and ecologically sustainable approach to restoration is one of the few examples that demonstrate the effectiveness of restoration efforts at increasing productivity of threatened salmonids.

Restoration of wadeable streams with high-density, hand-installed large woody debris: a low impact, inexpensive approach.

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Abstract. Many streams have been slow to recover from the legacy effects of development activities, such as forest harvesting and road building, despite increased protection of riparian areas. A common example of a legacy effect on streams is historically low levels of large woody debris (LWD). Large wood in streams alters hydraulic conditions, resulting in greater diversity of geomorphic units (e.g., pools, bars, side channels) that are required by fish and other aquatic biota at various life-cycle stages. Typically, the short-term solution to low volumes of LWD is to use heavy equipment and highly engineered designs to add LWD over relatively short sections of a stream, often at great cost. We have developed a hand-installation method to add LWD, at low cost and high-density. We have built over 400 LWD structures in 8 km of stream at a cost of less than $100 per structure for materials and labor. We present preliminary results on the effectiveness of these structures at increasing habitat diversity and production of wild steelhead within the context of a watershed scale experiment located in southeast Washington, USA.

Responses of wetland bird communities to agricultural conversion: are there thresholds?

Beverly Julienne Morissette, Ducks Unlimited Canada, julienne.morissette@ualberta.ca

Abstract. We examine consequences of agricultural conversion at local, landscape and regional scale for the composition of bird assemblages associated with boreal wetlands, riparian areas and shoreline forests. Using a multivariate approach, Threshold Indicator Taxa Analysis (TITAN), we identified species-level change points to determine whether community-level thresholds occurred in response to an agricultural conversion gradient. We determined whether thresholds were consistent among spatial scales and across regions by comparing results from an insular study area in Manitoba to a relatively connected study area in northeastern Alberta. Both species-level change points and community-level thresholds tended to occur at lower levels of agricultural conversion in Manitoba particularly at the landscape scale. At the wetland scale, community- level changes appeared more gradual eventually reaching one single maximum while at the landscape scale 2-3 distinct community –level thresholds occurred. Species responding positively to agricultural conversion were species more typical of open country regions while many forest

dependent species responded negatively. For species common to both regions, direction of response (+ or -) was consistent, but specific change points differed. Preserving bird communities typical of intact boreal wetland riparian areas and adjacent forests will require policy changes that limit the growth of agriculture in the landscape matrix and eliminate wetland loss.

Trajectories of ecosystem recovery in oligohaline tidal wetland reconnection restoration projects.

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Abstract. The purpose of this study is to identify the rates of ecosystem service recovery in tidally reconnected oligohaline (salinity 0.5-5 ppt) wetlands on historically diked agricultural lands in the Columbia River Estuary. A 54-year chronosequence of tidal wetland restoration sites is being used to identify restoration trajectories and rates of ecosystem service recovery. In the first phase of this study, initiated summer of 2013, restoration projects monitored included sites breached in 1959, 1988, 2006, 2007, and 2012, a reference wetland and two diked pastures (pre-restoration). Data collection focused on plant community composition, biomass, biodiversity, soil bulk density and organic matter content, sediment accretion, erosion, and hydrology. Although the existence of restoration trajectories is highly debated, preliminary results from this study indicate that trajectories toward reference plant community and soil compositions were detectable within the study's 54 yr chronosequence. The inclusion of more restoration and reference sites and further monitoring are planned for 2014-2015. Understanding the development and delivery of tidal wetland ecosystem services during the restoration process is essential to successful restoration management.

Succession and success: a pre- and post-planting ecological analysis of a constructed mitigation wetland in the Adirondacks.

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Abstract. Lake George, located in the Adirondack Mountains, has recently received a large influx of nutrients, suspended solids, and contaminants at its south end as a result of increased land use and wastewater treatment. This influx resulted in algal blooms, delta formation, and a significant threat to lake health. Consequently, in 2011, local organizations participated in the construction of a 1.8 hectare wetland to mitigate stormwater and groundwater. This study monitored 2 years of ecological succession of vegetation and macroinvertebrate communities, and the mitigation of aqueous chemical constituents at the wetland site. Vegetation surveys were conducted at the beginning and end of each growing season. Macroinvertebrates and water were sampled monthly. After a full year of natural succession in 2012, the wetland underwent additional succession following the artificial introduction of 85 plant species. Analyses including Shannon Diversity Index, Bray-Curtis Index, ANOVA, and PCA suggest that less may be more in the construction of mitigation wetlands, and that human interference after initial construction may be detrimental to the succession of organisms and the success of the ecosystem as a whole.

Expansion of clonal wetland plants on artificial floating rafts in early successional wetlands.

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Abstract. Restoring peat-forming wetland vegetation often proves difficult after prolonged periods of anthropogenic influence. Key species that may serve as ecosystem engineers for terrestrialization and peat formation are often absent and abiotic conditions may be insufficient for their establishment. In the Peatcap project we study the influence of trophic level and disturbance by herbivory on the development and clonal spread of introduced wetland plants that may serve as

ecosystem engineers for renewed peat formation. Artificial floating mats with different functional groups of emergent wetland plants were exposed to different nutrient availabilities in the water column. First results indicate that Potentilla palustris benefits most from high nutrient availabilities by showing fast clonal spread onto open water. Productive, clonally spreading wetland plants seem to benefit from the presence of multiple functional groups. However, herbivory by waterbirds may influence the effectiveness of introducing these floating mats. These results give first insight in the suitability of functional groups for the recovery of peat-forming wetlands.

A case study on the importance of enhanced wetland systems for the attenuation of Selenium.

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Abstract. The feasibility of utilizing constructed and naturally enhanced wetlands to remediate selenium-laden drainage water has been under study for quite some time. While constructed wetlands have been more intensely studied, naturally enhancing previously existing systems is not as common a practice. The use of such naturally occurring wetlands for selenium attenuation is a viable, low-impact, sustainable, and often more affordable treatment option than the construction of large wastewater facilities, especially when selenium concentrations are largely in response to pulses moving through the system, induced as a result of spring snowmelt. The effectiveness of existing siltation structures used for treating runoff can be measurably enhanced by routing effluent through a well-vegetated, dissipated, non-channelized system. Wetlands that have been degraded over time can be enhanced through non-structural methods to encourage further development of effective vegetative cover and subsequent biomass accumulation while minimizing channelization. Greater consideration should be given to the passive role of wetlands in the treatment of selenium sources. The source and fate of selenium within wetlands, as well as a case study from the western United States will be presented.

Increased ecosystem services through prairie pothole wetland restoration in an agriculture-dominated landscape.

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Abstract. Changes in land use, altered hydrology, increased non-point source pollution, and the invasion of exotic fish may partially explain the significant decline in ecological integrity of many prairie pothole shallow lakes (mean depth of <1.5 meters) and large wetland complexes in agriculture dominated landscapes. These landscape level changes have resulted in the severe decline of shallow water habitat conditions and foraging quality for waterfowl and other migratory birds. In an effort to reverse this damage, restoration activities (draw-down, fish removal and water control structure installation) were completed at several highly degraded shallow lakes and prairie pothole wetland complexes. Biological, chemical, and physical properties pre- restoration and post-restoration at 30 sites located within the Des Moines Lobe landform region were monitored from 2006-2013. Restored systems were positively correlated with improved Secchi disc depths, reduced total suspended solids and chlorophyll a concentrations, and reduced turbidity. Other ecosystem services were also observed in restored systems, with re-establishment of submerged and emergent vegetation, changes in the phytoplankton and zooplankton communities, and better foraging habitat for migratory waterfowl.

Zooming out to dig in: linking catchment dynamics to on-ground wetland remediation.

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Abstract. The coastal fringe of Australia is severely impacted by more than 5 million hectares of acid sulfate soils. The most common approach to remediate these soils is to encourage tidal buffering. This typically involves the removal of drainage infrastructure and the re-purposing of agricultural land to tidal wetlands. To date, wetland remediation studies have only focused on local site dynamics. This site based approach provides detailed information on acid contamination but provides limited understanding of the overall estuary. To overcome current limitations, a catchment wide estuarine dynamics approach has been developed and field tested. The catchment approach combines onsite investigations with large-scale studies of: (1) the fate/transport of acidic plumes, (2) the objective prioritization of impacted landscapes, and (3) the estuarine response dynamics to rainfall or flooding events. This paper provides a detailed description of the catchment approach supported by conceptual processes and a detailed case study. The 2000-hectare case study highlights the importance of local and catchment processes in guiding rehabilitation plans.