World Wetlands Day Symposium

World Wetlands Day
2 February 2023
It's time for wetland restoration

cosia with Pathways Alliance

Mount Royal University | Institute for Environmental Sustainability

United Nations Decade on Ecosystem Restoration 2021-2030

Alberta NAWMP Partnership

BOOK OF ABSTRACTS

Institute for Environmental Sustainability
Mount Royal University

2/2/2023

AGENDA FOR 2023 WORLD WETLANDS DAY SYMPOSIUM

8:30 -9:00	Registration of Participants
9:00 - 9:10	**Welcome and Opening Remarks by IES Director**
9:10 - 9:50	**Morning Keynote Paper Presentation by Professor Rodney A. Chimner** **Peatland Restoration as a Natural Climate Solution**
09:50 - 10:20	**Amanda Cooper** (AEPA) - Alberta's Wetland Replacement Program
10:20 - 10:40	**Jennifer Hird** - (ABMI) - Mapping Albertan Wetlands from Border to Border: the ABMI Alberta Wetland Inventory
10:40 - 11:00	**Kristen Andersen** (Associated Environmental Consultants Inc.) - Wetland Restoration Design Considerations
11:00 - 11:10	***AM Break: Coffee and Snacks Served***
11:10 - 11:30	**Graydon Garner** (DUC) - Wetland Values and DUC Wetland Restoration Programs
11:30 - 12:00	**Morning Session Panel Discussion**
12:00 - 13:00	***Lunch and Networking Session***
13:00 - 13:10	**Introduction of the Afternoon Session by Jack O'Neill (COSIA)**
13:10 - 13:50	**Afternoon Keynote Paper Presentation by Bin Xu (NAIT Center for Boreal Research)** **Fen Restoration of In-Situ Footprints in Alberta**
13:50 - 14:10	**Brent Phillips** - (Choice Environmental Consulting Group) - Wetland Restoration & Rewilding: A Practitioners Perspective"
14:10 -14:30	**Michael Wendlandt** - (UCalgary) - Predicting Permanence of Boreal Wetlands Forming on Post-mining Landscapes
14:30 - 14:40	***PM Break: Coffee and Snacks Served***
14:40 - 15:00	**Jim Davies** (InnoTech Alberta) - Tank Farm: Aquatic Mesocosms as Wetland Research Tools
15:00 - 15:20	**Steven Tannas** (Tannas Conservation Services Ltd.) - Remediating Wetland Water Quality using Native Plants
15:20 - 15:50	**Afternoon Session Panel Discussion**
15:50 - 16:00	Closing Remarks

Keynote Paper

Peatland Restoration as a Natural Climate Solution

Dr. Rod Chimner
Professor of Wetland Ecology
Michigan Technological University,
College of Forest Resources and Environmental Science.

To celebrate World Wetlands Day 2023, Dr. Chimner will discuss results from the recently released Global Peatlands Assessment, and the importance of peatland restoration. The new Global Peatland Assessment found that peatlands cover ~500 million hectares globally, or ~ 4% of the land area. About 12% of peatlands, globally, are degraded and are releasing at least 2,000 Mt CO2e of greenhouse gas emissions per year, or ~ 4% of total global anthropogenic emissions. In North America, peatlands cover 9% of the land area with ~ 2% of peatlands degraded, with high regional variability. Historically, drainage for agriculture has been the main threat to North American peatlands, but they are now also threatened by urbanization, oil and gas exploration, roads and other linear features, and forestry. The Global Peatlands Assessment aims to inform and inspire action in policy, research and practice that can help protect, sustainably manage and restore peatlands. Peatland restoration is a key strategy for climate change mitigation, watershed hydrology, sustainable land use, and biodiversity and restoration activities in peatlands are increasing worldwide.

Keynote Speaker's Brief Bio

Dr. Rod Chimner is a Professor of Wetland Ecology at Michigan Technological University, College of Forest Resources and Environmental Science. Dr. Chimner has published over 80 research papers and has been awarded over 65 grants. A few selected publications include being a co-coordinating author for the "*Regional Assessment for North America*" for the *UNEP Global Peatlands Assessment*, co-author for the "*Terrestrial wetlands*" chapter for the *Second State of the Carbon Cycle Report (SOCCR2*, and a contributing author of the IPCC Chapter 5 "*Inland Wetland Mineral Soils*" for the IPCC 2013 Supplement.

Dr. Chimner is an applied ecologist investigating how peatlands are affected by climate change and other perturbations, improve management and conservation of peatlands, and develop techniques to restore degraded peatlands. He received his M.S. in Forest Hydrology from Michigan State University and his Ph.D. at Colorado State University, both degrees studying applied peatland ecology. Dr. Chimner did his post-doctoral work as a Wetland Ecologist with the Institute of Pacific Islands Forestry, Hawaii, investigating carbon cycling of tropical peatlands in Hawaii and Micronesia. He presently has ongoing research in tropical peatlands in the Amazon, Andean peatlands in Colombia, Ecuador and Peru, and Indonesia. He also has several peatland restoration projects in the Rocky Mountains and throughout the Upper Great Lakes region of the USA.

Alberta's Wetland Replacement Program

Amanda Cooper
Team Lead, Alberta Environment and Protected Areas

Abstract

The Alberta Wetland Policy was implemented in the province in 2015. The goal of the policy is to conserve, restore, protect and manage Alberta's wetlands to sustain the benefits they provide to the environment, society, and economy. Where activities have the potential to impact wetlands, the wetland policy promotes avoidance and minimization, as the preferred courses of action. Where impacts cannot be avoided or minimized, and permanent wetland loss is incurred, wetland replacement is required. One replacement option is to pay an in-lieu wetland replacement fee to Alberta Environment and Protected Areas. These funds are used by the Alberta Wetland Replacement Program to replace wetlands that were lost due to activities. The Wetland Replacement Program was launched in 2020 and this presentation will share details on how the program operates, how to get involved and provide some project examples. Since the program was implemented, 366 hectares of wetland area have been restored, and over $11.4-million in funding has been provided.

Mapping Albertan Wetlands from Border to Border: the Alberta Biodiversity Monitoring Institute's Alberta Wetland Inventory

Jennifer Hird, Evan DeLancey, Fiona Gregory, Agatha Czekajlo, and Cynthia McClain

Alberta Biodiversity Monitoring Institute (ABMI)

Abstract

Reclaiming and restoring Alberta wetlands are important components of maintaining healthy and sustainable water supplies, and improving the function and resilience of the province's ecosystems in a changing climate. Accurate, up-to-date knowledge of wetland locations, extents, and type is critical to these efforts, but remains a challenge to acquire at large scales in a consistent manner. The Alberta Biodiversity Monitoring Institute (ABMI) has leveraged open-source satellite data sets, a cloud-computing environment, and machine learning algorithms to tackle this challenge, producing Alberta's first consistent, province-wide, and publicly-accessible wetland inventory. The product maps four broad classes of the Alberta and Canadian Wetland Classification Systems – bog, fen, marsh, and swamp – along with open water and upland. It contains over three million wetland polygons with overall accuracies of 80% and above. Mapping was divided into three distinct regions, which were each mapped separately using different data sources and methodologies: the boreal and foothills region, the prairie region, and the Rocky Mountain region. Satellite imagery and topographic inputs were key variables in each and were processed and extracted using Google's Earth Engine platform. Classification was performed using various machine-learning approaches. Here we describe the ABMI's Alberta Wetland Inventory product, our methods for producing it, and discuss some of its real-world applications, and its known limitations. We also provide a preview of current work on the next generation of wetland mapping in Alberta, undertaken in close partnership with the Government of Alberta, including Alberta's Wetland Replacement Program, and Ducks Unlimited Canada.

Speaker's Brief Bio

Jen Hird leads the Earth Observation Insights Unit in the Geospatial Centre at the Alberta Biodiversity Monitoring Institute (ABMI). She has over 15 years of experience in satellite remote sensing applications, including land cover mapping, vegetation disturbance and recovery, and multi-temporal landscape dynamics.

Wetland Restoration Design Considerations

Kristen Andersen

Senior Environmental Scientist, Wetlands and Restoration

Associated Environmental Consultants Inc.

Abstract

This presentation focuses on wetland restoration and site factors considered in the design approach. Restoration techniques will be discussed in the context of example projects. Topics include grading, hydrology, planting, erosion control, and weed management.

Wetland Values and DUC Wetland Restoration Programs

Graydon Garner,

Tracy Scott and Darwin Chambers

Ducks Unlimited Canada

Abstract

This talk will feature the historical loss of wetlands and the impact it has had on the landscape, as well as the operational side of wetland restoration, describing what wetland restoration (WR) is (vs enhancement or construction), outlining DUC's wetland restoration process and landowner programs, and giving real world examples of the opportunities and challenges that wetland restoration presents. Our intent is to round out the content of the day and cover the "operational aspects of wetlands restoration in human-impacted landscapes" as per the conference theme."

Speaker's Brief Bio

Graydon lives on a mixed livestock and grain farm east of Strathmore where he and his family emphasize on raising their cattle, sheep, hay and grain in environmentally sustainable and economically viable methods. He has been working for Ducks Unlimited Canada for 2 years out of their Strathmore office delivering conservation programs at the farm gate. He recently shifted positions within DUC to the Agricultural Programs and Extension division, but brings operational experience of personally delivering the wetland restoration program to agricultural producers in southern Alberta.

Fen Restoration of In-Situ Footprints in Alberta

Bin Xu
NSERC Industrial Research Chair – **Peatland Restoration**
NAIT Centre for Boreal Research

Abstract

Resource exploration and extraction create numerous interconnected features across boreal Alberta, many in peatlands. Construction of padded well sites and roads in boreal peatlands requires the addition of mineral fill and geotextile to provide all-season access and long-term support for equipment. Vegetation is cleared or flattened before a geotextile is placed to prevent mixing mineral soil with buried peat. Seismic lines and winter access roads through peatland often exhibit a shift to fen vegetation and poor recovery of woody species due to surface compaction and increased wetness. These features have long-lasting impacts on a wide range of microclimatic, biogeochemical, and ecohydrological parameters, which can alter the ecosystem functions of natural peatlands.

In this presentation, we will provide an overview of field trials to promote fen vegetation initiation on reclaimed mineral features in peatlands, a process simulating the paludification pathway of peatland development in Alberta. A series of sites ranging in age from three to twelve years post-reclamation were investigated. Two sites were reclaimed by the complete removal of mineral fill followed by donor moss transfer. Six sites were reclaimed by removing a portion of the mineral fill to lower the ground surface elevation, followed by either moss donor transfer, planting, or natural ingress. We found that wet mineral substrate can support the development of fen vegetation (sedges and true mosses) over time. Moss donor transfer is critical to accelerating vegetation recovery compared to natural ingress alone, particularly when the surrounding areas are dry bogs/poor fens. Hydrological connectivity with the surrounding area and the overall substrate moisture conditions also influence the growth of fen vegetation. Sphagnum mosses developed best when all mineral fill was removed, and a saturated but not flooded peat surface was available to receive moss donor transfer.

We will then discuss current progress on restoring hundreds of thousands of seismic lines and similar linear features across boreal Alberta. In treed fens, seismic line creation often leads to ground surface compression and the removal of dry hummocks, raising the water table closer to the ground surface and causing a shift to sedge-dominated communities. Mechanical mounding is the most common technique to promote tree (and woody species) establishment on seismic lines through excavating, inverting, and placing mounds of peat to create microsites for tree planting. The inverted bare peat has poor substrate quality, enhanced decomposition, and reduced cover of mosses. Two alternative mounding approaches have been tested: Upright Mounding (UM) and the Hummock Transfer Technique (HTT). The goal is to avoid inversion of the peat profile, thus preserving the living vegetation while creating the dry microsites necessary for tree growth. The UM utilizes the same protocol of IM but without the inversion of peat profiles. The HTT collects and transfers a hummock from the adjacent peatland onto the line without inversion. Early field trials showed that both UM and HTT could facilitate tree regeneration by creating dry microsites while maintaining the understory communities, particularly the peat-forming bryophytes. However, systematic, long-term field studies are needed to ensure that early success is sustainable and can lead to measurable benefits over the mechanical mounding technique.

Wetland Restoration & Rewilding: A Practitioners Perspective

Brent Phillips, B.Sc. P.Ag.
Senior Environmental Consultant
Choice Environmental Consulting Group Inc.

Abstract

Between project design and completion, there is a period where the *'true magic happens.'*

Whether a project is for research, liability reduction, closure, or wetland replacement initiatives, what appears sound and grand on paper does not always translate well in actuality to the field. Many factors play a role in project success, bridging the gap between theoretical and practical can often leave proponents underwhelmed or unfulfilled due to unrealistic expectations or anticipated deliverables not being met.

The reality is a lot of what happens in the field is learned on the job and through experiences. How to setup and implement projects not only safely and legally, but also knowing equipment needs, where to source equipment, dealing with a myriad of environmental conditions, changing scopes, and moving targets can test even the most field hardened reclamation practitioners, researchers, or anyone undertaking wetland restoration.

Over the years, Choice has gained immense knowledge by collaborating on multiple wetland reclamation and research projects with both oil and gas operators and research teams. Project success seems expected as it appears to come effortlessly; however, there are a lot of decisions behind the scenes that often go unnoticed or are taken for granted. Working as a team to ensure all proponents are aligned is vital to the success of any wetland restoration project. Knowing limitations and leaning on other's experiences is integral to the completion of any project. I want to share with you, through a few examples and case studies, how projects are initiated and implemented in the field, the general steps required, trials and tribulations, and some challenges and learnings.

From pen to paper, to boots on the ground.

Can we predict permanence? The hydrology and water chemistry of boreal wetlands forming in landscapes reclaimed from oil sands mining.

Wendlandt, M., A. Mombourquette, E. Gillis, H. Porter, S.J. Birks, J.J.H. Ciborowski

Boreal Wetland Reclamation Assessment Program (BWRAP)
University of Calgary, Alberta

Abstract

Resource extraction and development in the Athabasca Oil Sands Region (AOSR) has dramatically transformed the landscape and the local area's hydrology. Landscape reclamation following bitumen mining is a critical element of companies' life-of-mine plans. Opportunistic Wetlands (OW) form within newly constructed or altered landscapes, sometimes covering almost 20% of areas designed as 'uplands.' Yet, the source of water and potential for permanence of these wetlands are not well understood. To answer these questions, we are examining hydrological and hydrogeochemical data collected from 80 opportunistic and constructed wetlands ranging in age from 3 to 40 years that have formed on both reclaimed landscapes and off-lease in less disturbed reference sites. Permanence in wetlands will be determined by the ratio of inflows (e.g. surface water runoff, groundwater) to outflows (e.g. evapotranspiration, surface water and groundwater outflows). Quantifying water balance components in these small wetlands is challenging, so permanence has often been predicted based on rates of evaporation rather than hydrological processes. Water quality in each wetland is controlled by the availability of solutes in the surficial material present on the landscape and inflow waters and will then be further modified by the degree of evaporative enrichment and flushing by inflow waters. We inferred the relative importance of evapotranspiration from wetlands by examining the enrichment of isotopes of hydrogen and oxygen and the concentrations of dissolved solutes in surface water. We also estimated groundwater contributions by comparing relative concentrations of radon in water from piezometers and from surface water. Finally, we examined continuous recordings of wetland water levels and specific conductance. The youngest opportunistic wetlands forming in reclaimed areas had higher concentrations of solutes (specific conductance) than similarly aged wetlands in reference areas. Although, solute concentrations varied greatly among wetlands (reflecting differences in volume), conductivity was reduced in older wetlands, and there was no difference between classes of wetlands aged 20 years or older. As these young wetlands age, hydrological inputs, succession in the surrounding landscape, and landform features will ultimately determine if sufficient hydrological sources are present to sustain wetlands and their plant communities and aid in mitigating the effects of high concentrations of solutes. Characterizing hydrological and hydrogeological sources will help us assess reclamation landscape practices and determine which ones can best promote development of wetland systems that will persist after mine closure.

Tank Farm: Aquatic Mesocosms as Wetland Research Tools

Jim Davies

Ryan Melnichuk, Zhongzhi Chen, Craig Aumann, and Brian Eaton

InnoTech Alberta

Abstract

In 2016, InnoTech Alberta, a subsidiary of Alberta Innovates, designed and constructed an aquatic mesocosm facility at its Vegreville site. Since the first study was commissioned in 2017, the facility has been used to investigate the relative effects of oil sands process affected water and tailings on model aquatic ecosystems. These studies, conducted in partnership with the COSIA Demonstration Pit Lake Joint Industry Project (DPL JIP), were intended to inform reclamation decisions in the Athabasca Oil Sands Region (AOSR) and are expected to be completed by late 2023. This presentation will provide an overview of the facility's design and construction, emphasizing those aspects which are uniquely valuable to researchers. Informed by lessons learned over the last 6 years, elements of experimental design and execution especially important to mesocosm-based experimentation will be discussed.

Leveraging native wetland plants in floating islands and constructed wetlands to remediate contaminated water

Steven Tannas, Ph.D, P.Ag, QWSP

Tannas Conservation Services

Abstract

Wetland creation is sometimes easy and in other cases very difficult. One challenge has been in utilizing storm water and water from other agricultural and industrial uses to create naturalized wetlands. To do this water must be cleaned prior to release. Floating islands have been used around the world for remediation of contaminated water (metals, nutrients, hydrocarbons…) with mixed results. In some cases, there have been fantastic success stories, but in other cases complete failures have occurred. Much of these successes and failures have to do with the island design and application of the appropriate vegetation to address the problem at hand. With a focus on biology as well as chemistry an innovative program was developed that has the potential of allowing industry to meet and exceed regulatory guidelines for water quality while enhancing biodiversity and saving significant money over the long term. In order to meet the remedial objectives of the client a research program was undertaken to provide a low-cost alternative to active remediation options that integrates the benefits of using native species, minimal infrastructure, and maintenance requirements. Our development of floating islands has occurred over the past 8 years. Our initial work started with a simple bench trial (2016-2017), Field testing of islands/ shoreline plantings (2015-2022), a second bench trial at Olds College (2017) and has grown since then to multiple mining projects across Canada, research into contaminated water in agriculture and implementation on storm water facilities. We have shown effective removal of selenium, nitrogen, phosphorus, potassium, and sulphur in water over multiple projects.

This presentation will provide an overview of the experimental design, results for the last 8 years (including statistics) and conclusions which can be drawn from both the bench scale and field application trials, as well as learnings for future trials or application uses. This will include the "best" species for selenium uptake, species remediation rates and whether it's possible to meet remediation guidelines using the floating island design.

Speaker's Brief Bio

Steven was born and raised in the world of plants and followed in his parents' footsteps becoming a vegetation specialist and ecologist. He has a particular passion for native species, their importance and their potential for restoration, bioengineering and bioremediation. He's been identifying, assessing and propagating native plants for nearly three decades and has been working with Olds College and clients to design and execute bench scale and field trials to determine the bioremediation potential of native plant species within wetland ecosystems for the past five years.