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MESSAGE FROM THE PREMIER OF ALBERTA

On behalf of the Government of Alberta, it is my pleasure to send greetings to the annual general meeting of the Canadian Land Reclamation Association, Alberta Chapter.

This conference is an opportunity for networking, mentorship and the exchange of ideas, as well as to reflect on the essential role land reclamation plays in Alberta's environmental and energy industries. Reclamation and remediation represent responsible environmental stewardship while supporting energy, transportation, agriculture and other vital industries that keep Alberta strong.

Striking a balance between care for the planet and our province's economic prosperity is crucial, and I'm proud to know that Alberta is home to a strong chapter of the CLRA. Conferences like this one will equip the next generation of land reclamation specialists with the tools and information they will need to lead us into a sustainable future.

Best wishes for a successful conference!

Rachel Notley, Premier of Alberta

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April 1, 2017 – March 31, 2019

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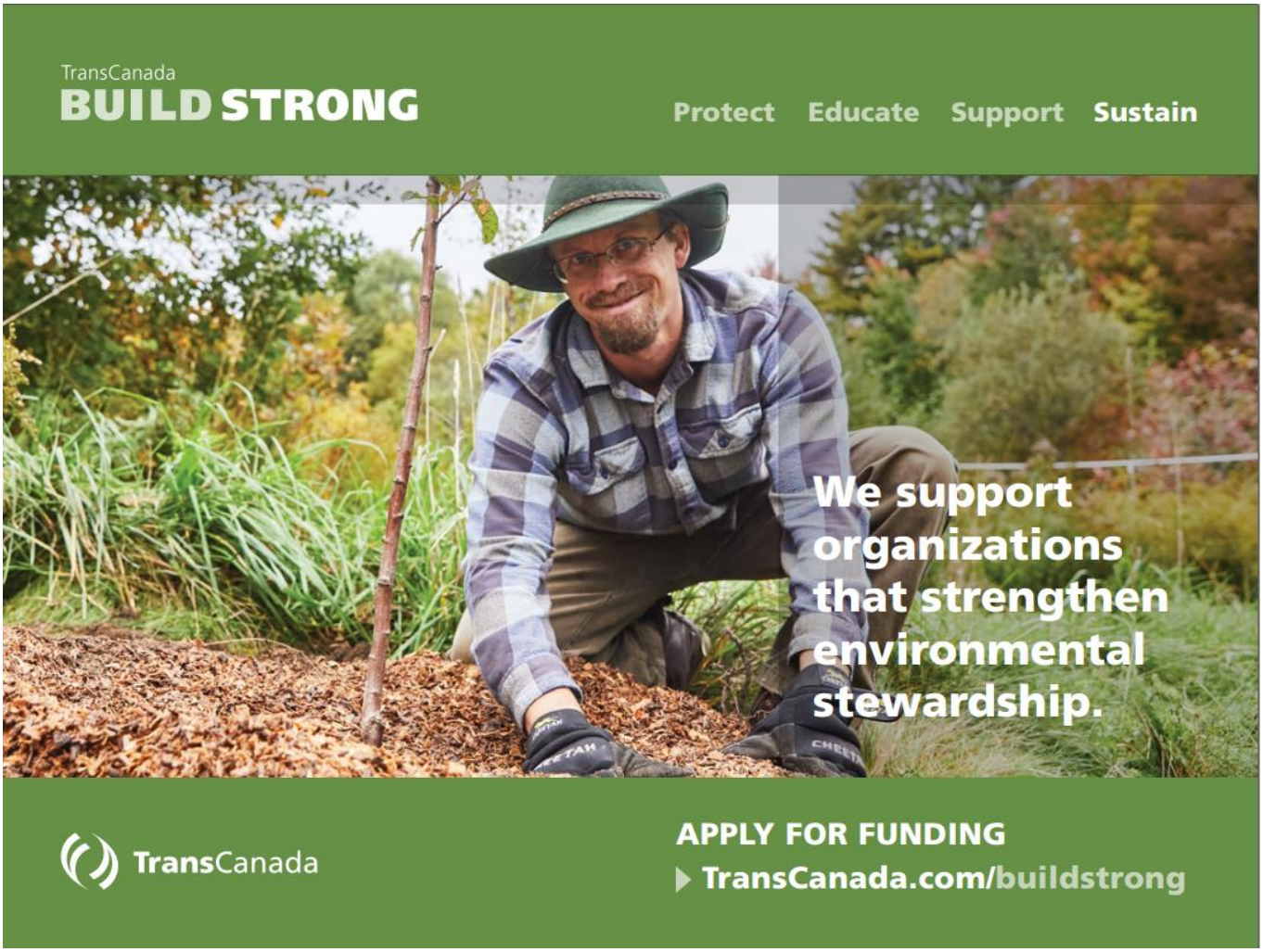

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MONDAY
FEBRUARY 11, 2019

PRE-CONFERENCE WORKSHOP
SESSION #1 09:00 – 12:00
SESSION #2 13:00 – 16:00

AER Corporate Office
201, 5002 – 55 Street, Red Deer, Alberta

(Separate Registration Required)

OneStop MapViewer Training

The AER is offering training sessions geared specifically for those who use the OneStop MapViewer and/or is interested to learn more about how to use this tool in the context of reclamation certification and Area Based Closure (ABC).

Due to high levels of interest, two sessions (morning and afternoon) are being offered. Please ensure you attend the session time for which you are registered.

Presenter Biography

Heather Seibel
Alberta Energy Regulator

Heather Seibel is the Practice Lead for Systems Training and Development at the Alberta Regulator. She has been with the AER for the past five years, and previously worked at two ERP software houses, Entero Corporation and Allegro. She has also trained SAP. Prior to working in the business world, Heather taught junior high school for 15 years. She enjoys working with technology, figuring out applications, and playing with new tech toys! Heather has a wide range of interests from music to photography to quilting. She will be presenting two sessions for us on using the Map Viewer tool, a component of the OneStop platform at the AER ".

Pre-Conference Workshop Sponsored By:

RAM RIVER Environmental Consultants

Ram River Environmental Consultants

TUESDAY
FEBRUARY 12, 2019

PLENARY SESSIONS: 08:00 – 9:45

Exhibition Hall

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Area-Based Closure – Learnings from an Early Adopter

James Agate, Manager, Reclamation, Canadian Natural Resources Limited &
Chris MacKay, P. Tech., Reclamation Specialist, Hemisphere Land & Resource Consulting Limited

Canadian Natural Resources is a strong proponent of coordinated, area-based abandonment and reclamation projects. Over the past 3 years they have proven that focused, coordinated site closure activities can be completed for 30+% lower costs while accelerating the scope and pace of reclamation, and ultimately meeting the regulator and land managers priority of final site closure. Through this time they worked with fellow CAPP members and the Alberta Energy Regulator on the development of the AER's Area Based Closure Program as a way to incentivize industry closure with similar initiatives being developed in British Columbia.

This presentation will focus on lessons learned by Canadian Natural and their reclamation site supervisors to help other Oil and Gas Operators and site supervisors maximize their abandonment and reclamation programming, avoid a few pitfalls, and benefit of the AER's ABC Program.

Presenter Biographies

James Agate
Manager, Reclamation - Canadian Natural Resources Ltd.

James Agate has over 20 years of environmental management experience, both in consulting and industry. He has been with Canadian Natural Resources Limited since 2002 and has been a Manager of Reclamation since 2014. James has been involved in a diverse portfolio of projects from conventional oil and gas assets through to oilsands mining reclamation. James' priority is to ensure reclamation strategies and outcomes are consistent across the Western Canadian sedimentary basin, regardless of operation type- mining, in situ, or conventional oil and gas operations..

Chris MacKay, P.Tech
Reclamation Specialist – Hemisphere Land & Resource Consulting Ltd.

Christopher MacKay has been working in remediation and reclamation consulting since fall of 2004. He has been involved with the Canadian Natural reclamation team since 2007. He comes from an agricultural background and was raised on a mixed farming operation near Irma, Alberta. Christopher graduated from the Geology (Hydrogeology) program at NAIT in the spring of 2004.

Additional questions can be directed to James at james.agate@cnrl.com or Chris at christopher.mackay@hlrc.ca

Weed Control in the Green Area: Using Empirical Evidence to Question Current Practices

Amanda Schoonmaker, Ph.D., Research Chair, Northern Alberta Institute of Technology (NAIT)

In Alberta, there are 75 prohibited noxious and noxious weed species listed in the Weed Control Regulation of the Weed Control Act that need to be destroyed or controlled as undesirable species. The concern with having weeds establish (predominantly in the White Area) is the expectation that they will (1) out-compete and displace local native forages, shrub and tree seedlings; (2) alter natural habitats and reduce local biological diversity; (3) hybridize with native species; and (4) change local nutrient cycling, water chemistry and hydrological regimes. Some of these concerns may be less of a risk for the Green Area. The issue with continuing to manage regulated weeds that may be of lower risk while aiming to achieve reclamation closure includes the following:

1. Increased time and money spent on weed management;
2. Increased herbicide application into the environment; and,
3. Unintentional mortality of desirable native species from accidental herbicide overspray.

Current regulations require operators to control noxious weeds. Presently, this is accomplished through the use of herbicides and manual labour (e.g., hand-pulling). This project aims to demonstrate whether, under certain site conditions, there is a third potential alternative for some weed species – utilizing successional processes and forest vegetation development to better address some of the issues raised above. This study will assess whether noxious weeds managed in the boreal forest are significantly impacting boreal succession. The assessment will be based on vegetation cover datasets from a variety of reclamation areas and regions of northern Alberta. This study will ask the question: Is there evidence that noxious weeds are precluding development of forest vegetation?

Presenter Biography

Amanda Schoomaker, Ph.D.,
Research Chair, Centre for Boreal Research, NAIT

Dr. Amanda Schoonmaker obtained a BSc in Forest Sciences from the University of British Columbia in 2006 and completed a PhD in Forest Biology and Management at the University of Alberta in 2013. She joined the NAIT Boreal Research Institute in 2011 as a Reclamation Field Research Coordinator. In 2015, she was awarded a 5-year renewal federal research chair grant by the National Sciences and Engineering Research Council (NSERC). Her research program is focused on methods and practices of reclamation and reforestation of upland landscapes. This includes testing methods of soil adjustment and preparation, developing appropriate sequencing of vegetation management options and testing suitability of herbaceous cover crops and deployment of woody species..

Co-Authors

Stefan Schreiber
EnviroStats Solutions

Bonnie Drozdowski
Innotech Alberta

Chris Powter
Enviro Q&A Services

Additional questions can be directed to Amanda at aschoonmaker@nait.ca

Polycyclic Aromatic Hydrocarbon (PAH) Urban Background Values and Soil Re-Use on a Municipal Capital Project

Paul Leong, Senior Technical Advisor, The City of Calgary

The City of Calgary (The City) improves and upgrades its operational facilities on an as needed basis. Two concurrent projects at a municipal waste water treatment plant presented an opportunity to re-use excavated soils from one project (source site) at another project (receiving site). A pre-construction environmental site assessment identified above criteria concentrations of a number of PAHs at the source site. Given the proximity of the receiving site to the Bow River, soils could not be typically re-used.

The use of urban background values for contaminants is a practice utilized in a few Canadian jurisdictions, but is not a formal practice in Alberta. As an alternative to the development of Tier 2 Remediation Guidelines, The City worked with Alberta Environment & Parks to establish acceptable urban background values for PAHs for the project area. When the source site soils were determined to be within the urban background values for the area, they were re-used at the receiving site.

Presenter Biographies

Paul Leong, M.Sc.
Senior Technical Advisor, The City of Calgary

Paul has been a part of The City of Calgary's Environmental & Safety Management (ESM) business unit for over 18 years. Prior to his time at The City of Calgary, Paul worked with Alberta Health Services (formerly Calgary Regional Health Authority) in their environmental health division for 10 years.

The City of Calgary's Environmental & Safety Management (ESM) business unit provides corporate-wide leadership and support services to manage site contamination issues, risks and opportunities. These services include the identification, assessment, and management of The City's contaminated sites.

Additional questions can be directed to Paul at paul.leong@calgary.ca

CONCURRENT SESSIONS: 10:30 – 12:00

Monaco

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Reclamation of a Former Oil and Gas Refinery Applying Non-Traditional Methods

Kalina Noel, Senior Ecologist, SLR Consulting (Canada) Ltd.

Following the 2019 CLRA Conference theme: Fake News" – Debunking Myths with Science and Innovation, this presentation presents a project where restoration and reclamation of an historical refinery site is currently underway applying non-traditional methods. SLR Consulting (Canada) Ltd. (SLR), working with a Canadian oil and gas company has approached a historically impacted site with agricultural practices and use of onsite available vegetation to loosen and rebuild in-situ topsoil to allow for natural recovery and long-term stability of the site.

The refinery facilities were constructed on the property in the 1950s and were decommissioned in the late 1980s to 2010. A reclamation plan was previously developed for the former refinery property by another consulting firm. The plan was to treat all existing vegetation across the entire property with herbicide and re-seed with a simple agronomic seed mix. While portions of the plan were incorporated into on-going reclamation efforts, SLR determined that this typical method of short-term site reclamation was not suitable for the condition of the site as overall topsoil and soil health could not sustain seeding in the short term.

SLR will present how over the past 5 years spot treating with herbicide, mowing and discing has allowed for use of existing non-listed vegetation to be worked into the soil to develop a suitable growth medium over that time. We will also present how existing desirable vegetation has moved into recovering areas, reducing the need for an expensive seeding program to return the site to a self-sustaining, vegetated parcel of land.

Presenter Biography

Kalina Noel, P.Bio, R.P. Bio,
Senior Ecologist, SLR Consulting (Canada) Ltd.

Ms. Noel has Master of Environmental Design (Environmental Science) and is a professional biologist in the provinces of Alberta and British Columbia. She has been with SLR Consulting (Canada) Ltd. since 2010 but has over 12 years of experience in the environmental consulting industry within British Columbia, Alberta, Saskatchewan, Manitoba and Ontario as a Senior Ecologist. Her professional experience includes conducting wildlife and vegetation surveys, environmental inspection, watercourse assessments, species at risk surveys, wetlands area assessments, environmental protection plans, pre-site and post construction reclamation assessments, and environmental field reports. Ms. Noel has been the terrestrial ecologist on the project presented today since 2012 and has provided technical guidance on wildlife, vegetation including listed weedy species, and development of the topsoil.

Additional questions can be directed to Kalina at knoel@slrconsulting.com

Reclamation with Rare Plants: It's Possible and Happening

Darin Sherritt, Intermediate Ecologist, Tannas Conservation Services

Rare plants are rare for many reasons including: the habitat they grow in is rare, they are found at the fringe of their known range or they have a specific disturbance requirement. This presentation provides information to show that just because a plant species is rare does not mean it is impossible to propagate and that a rare species may be very useful in setting up appropriate reclamation pathways to achieve long term reclamation success. In this talk we will explore a number of rare vascular plants within western Canada (specifically Alberta) and how they may be ideal species to use as part of appropriate plant community trajectories to achieve reclamation success. We will also show case an ongoing field trial evaluating the potential for a rare species (*Lupinus nootkatensis*) in alpine reclamation, and provide examples of additional occasions where rare species have been conserved and how.

Our team has been propagating rare species for over 10 years and using rare species in a number of reclamation and bio-engineering applications around western Canada. Depending on the species, a number of techniques may be used to successfully establish or re-establish plants ranging from growing out from seed to transplanting during revegetation activities. The key to successful establishment is knowing what the individual species needs to be successful and being able to plan a project around those specifics. Examples of sites and application of the methods will be provided.

In addition to providing examples of sites where various rare species have been conserved or used, we will explore a current reclamation trial where a rare species (*Lupinus nootkatensis*) is being evaluated for its potential as an early successional species for reclamation of disturbances within the alpine. Within the area, it appears that *L. nootkatensis* is rare due to the loss of their natural disturbance regime (fire). Due to its ability to respond positively to bare soil, this species has been identified as an ideal colonizer species for use in alpine reclamation. Using the soil as a seed bank, provided the starting point for the lupin trial. One year of data has been collected and a summary of the data for the first year of establishment will be presented.

Presenter Biography

Darin Sherritt, M.Sc., AIT,
Intermediate Ecologist, Tannas Conservation Services

Darin Sherritt, MSc, AIT, is an Intermediate Ecologist with Tannas Conservation Services, working out of St. Albert. His work focuses on vegetation, ecology, reclamation and rangeland management. Darin specializes in native grassland ecosystems and has extensive experience working throughout Alberta conducting everything from detailed site assessments and reclamation to range health assessment and range management planning across numerous ecoregions. His skillset includes site reclamation; revegetation; ecosite and wetland classification; various aspects of range management, as well as vegetation inventory, assessment and classification; rare species inventory and monitoring; weed, introduced and native plant species identification; and wetland, rangeland and riparian assessment. He has instructed various courses to students, colleagues and various other resource managers within industry and government.

Co-Author

Steven Tannas, Ph.D., P.Ag.
Senior Ecologist and Plant Propagation Specialist,
Tannas Conservation Services

Additional questions can be directed to Darin at d.sherritt@tannasenvironmental.com

Reclamation and Beneficial Use of Phosphogypsum Stacks in Alberta

Connie Nichol, Environmental Scientist, Nutrien (former Agrium)

Phosphogypsum (PG) is a gypsum byproduct of the phosphate fertilizer industry and is produced at a rate of five tonnes of PG per tonne of phosphate fertilizer. Over 48 million tonnes of gypsum covering approximately 325 ha are stacked near Nutrien facilities northeast of Edmonton, Alberta. Phosphogypsum is regarded by some as a waste and others as a useful product. Various myths abound regarding the chemistry and radiological properties of PG. The default reclamation scenario in Alberta is to cover the stacks with one meter of soil cover and seed to grass.

In 2005, Nutrien began conducting research into alternative methods of reclamation in collaboration with the University of Alberta and the Canadian Forest Service. It was discovered that instead of a barrier approach to reclamation, small amounts of soil should simply be incorporated into the PG. The PG stacks can then be used to grow concentrated woody biomass as well as other high value crops. Data indicates that an afforestation approach to PG stack reclamation is environmentally protective and results in increased carbon sequestration and biomass production, improved ecosystem diversity and sustainability while also reducing long term maintenance costs. Trees are also capable of phytoremediation of any excess nutrients and water within their rooting zone, thereby improving long term groundwater quality.

Tree plantations have already been established on 25 hectares of PG at the Nutrien facility in Fort Saskatchewan, Alberta. The use of this 'waste' land to combat climate change and create green energy can potentially be applied to many other industrial sites around the world. The project can be viewed as both an innovative approach to reclamation and a beneficial use of phosphogypsum in situ. It also provides valuable data for the concept of creating 'soil', especially in countries where agricultural resources are scarce. The Nutrien afforestation project is a key project supporting the development and publication of United Nations protocols for using PG for agriculture and forestry to enhance carbon sequestration, reduce soil loss and increase biodiversity.

Presenter Biography

Connie Nichol, Ph.D.
Environmental Scientist, Nutrien (former Agrium)

Connie Nichol began working at Agrium (now Nutrien) in 1995 as an Environmental Research Scientist. She has been working on aspects of phosphogypsum reuse and reclamation for over 20 years as well as developing other innovative reclamation and waste reuse programs for the fertilizer industry. She is part of an International Phosphogypsum Working Group and collaborates with other scientists around the world in developing beneficial use strategies for phosphogypsum. Connie has a BSc in Agriculture and a PhD in Soil Chemistry from the University of Alberta. She taught Waste Management and Utilization as a sessional lecturer at the University of Alberta from 2007 to 2014.

Additional questions can be directed to Connie at connie.nichol@nutrien.com

Santano

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Innovating Our Way to Closure: Technology-Based Solutions

Simone Levy, Researcher, InnoTech Alberta

Taking an upstream oil and gas site, or a portfolio of sites, through the asset retirement process is a task of underestimated complexity. Due to multiple activities, steps, players, and stakeholders, finding ways to streamline the process can seem daunting. However, with over 400,000 wells drilled in the province and approximately 42% of them in some stage of the asset retirement process, innovation in technology and process will be crucial for addressing the current backlog and managing more effectively into the future.

In recent years, those focused on the environmental stages of asset retirement, including site assessment, remediation and reclamation (ARR), have been asked to 'do more with less', and more recently to coordinate activities in designated areas. This has been challenging but has spurred innovation in technology and process to address specific problems and enhance collaboration.

In a recent workshop led by InnoTech Alberta with support from Alberta Economic and Trade Ministry and the Environmental Services Association of Alberta, members of industry, government, reclamation practitioners and technology developers came together to identify challenges at the site- and system-level. Potential solutions were showcased that are being developed in the ARR space and beyond, many of which incorporate machine learning and advanced data analytics. With a push by the Federal Government for Canadian businesses to adopt digital technology, there is incentive to develop and utilize fit for purpose technology-based solutions.

The work presented in this talk will focus on the findings of a recent outreach program looking at innovative technologies and processes that are or could be revolutionizing the way that ARR activities are prioritized, data is managed, workflow is coordinated, tasks are streamlined, and communication is enhanced. Examples will be given to illustrate how specific problems were defined; how solutions were developed; and, what support was essential for success.

Presenter Biography

Simone Levy, P.Ag.
Researcher, InnoTech Alberta

As an applied researcher, Ms. Levy currently conducts research, development and innovation projects with a focus on novel technologies and processes in the area of site assessment, remediation and reclamation methods. Priorities include applied research needs in Alberta with potential to support ecological restoration and preservation, responsible development and management, and the management and prevention of contamination.

Additional questions can be directed to Simone at simone.levy@innotechalberta.ca

Site-Specific Liability for Complex Upstream Oil and Gas Contaminated Facilities in Saskatchewan

Todd Han, Senior Biologist, Matrix Solutions Inc.

Saskatchewan's Licensee Liability Rating (LLR) Program assesses the financial viability of an oil and gas licensee based on the ratio of its deemed assets to its deemed liabilities using estimated average abandonment and reclamation costs which assume minimal contamination at the site. A licensee with a potential environmental problem is required to conduct a site-specific liability assessment (SSLA) to quantify the cost of actual reclamation. Increasingly, the contaminant of concern triggering the SSLA is associated with salt impacted sites.

The presentation focuses on new computer based 3D contaminant quantification and visualization tools for rapid quantifications of salt impacted soil volumes, applicable remediation strategies to reduce the liabilities, and detail costs associated with carrying out the remediation; and the application of numerical modeling techniques and remediation criteria modification to derive remediation action plans that realize pathway elimination, receptor protection, and expedited site closures while delivering the best economic value.

Presenter Biography

Todd Han, B.Sc., P.Biol.
Senior Biologist, Matrix Solutions Inc.

Mr. Todd Han is a senior biologist with Matrix Solutions Inc. He has over 24 years of experience in developing and regulating environmental protection and public safety programs. Over 17 years of experience with Saskatchewan Government, with 8 years served as the Director of Petroleum Development Branch of Saskatchewan Energy and Resources leading a team of multi-disciplinary professionals to deliver provincial upstream regulatory and environmental protection programs including: Well and Facility Licensing; Orphan Wells and Facilities Liability Management; Spill Response and Cleanup; Contaminated Sites Remediation and Reclamation; Upstream Waste Management; Well Abandonment; and Field Inspections and Enforcement. Mr. Han has served as the Chair of Saskatchewan Orphan Well Fund Advisor Committee from 2008 to 2015.

Additional questions can be directed to Todd at than@matrix-solutions.com

Optimized Approach for Minimizing Oil and Gas Asset and Remediation and Reclamation Liability Costs

Dr. Junye Wang, Professor, Athabasca University

Canada's abundant oil and gas reserves offer tremendous, long-term potential for economic growth and employment in Alberta and across Canada. However, the growing number of inactive and abandoned wells are creating significant environmental concerns. Optimal well site management in the oil and gas industry is a high priority for the Alberta Government as part of its on-going, foresight study of sustainable resource development and management of cumulative environmental effects. However, in the competitive oil and gas marketplace, it is challenging to improve remediation efficiency and reduce costs of environmental liability while ensuring adequate protection of the environment.

The current phased environmental site assessment (ESA) has been a challenge for oil and gas companies because it is affected by a number of factors, including site environment, stakeholders, finances, and regulations to determine their environmental remediation tasks. Given the large number of sites that have been abandoned and inactive for decades, and the dynamic nature of the environmental remediation process, the current system is too costly and inefficient for effective liability management.

In this presentation, we introduce an innovative approach of integrated life cycle assessment (LCA) and ecosystem modelling for life cycle management of oil and gas site remediation and their relevant waste streams. The pre-assessments in Phase I and sampling in Phase II are used for identifying key factors and remediation tasks. This approach divides the remediation plans and implementation in Phase III into two interconnected stages: direct cleanup of main contaminates; and follow-up phytoremediation or natural degradation of residual contaminants. Feasibility and costs of alternative cleanup technologies are evaluated using LCA, while their follow-up phytoremediation or natural degradation of the residual contaminants are simulated using a process-based ecosystem model. For the hybrid remediation plans, the total cost can be reduced by increasing a fraction of residual contaminants for low cost phytoremediation or natural degradation. Therefore, this integrated approach has potentials to improve the ESA for assessment of the impact of different remediation implementations on the environment and on costs in the phased ESA to help decision-making, while addressing environmental liabilities, controlling operational costs and improving transparency of the planning.

Presenter Biography

Dr. Junye Wang
Professor, Athabasca University

Dr. Junye Wang is a Professor and the Campus Alberta Innovation Program (CAIP) Research Chair in Computational Sustainability and Environmental Analytics at Athabasca University. Prior to this, he was a Principal Research Scientist in modelling of agroecosystems and renewable energy at Rothamsted Research in the UK. Dr. Wang has over 30 years experience in multi-scale and multidisciplinary modelling and is internationally recognized as a leader in this area. He looks to expand the capacity of ecosystem modelling and computational sustainability in order to develop an integrated framework for assessments of environmental impacts of unconventional oil and gas (oil sands and hydraulic fracturing) production on agroecosystems, and identify key factors of the cumulative effects for watershed management across Alberta and Canada. His current research program focuses on integrating life cycle assessment with phased environmental site assessment for minimizing oil and gas asset, remediation and reclamation liability costs, and identify key factors in liability costs. He has authored/co-authored more than 80 refereed journal papers, and serves as associate editor and editorial board member on several international journals. He is a reviewer of papers for about 70 journals.

Co-Authors

Dr. Nana Y. Amponsah
Athabasca University

Dr. Lian Zhao
CEPro Energy Group

Additional questions can be directed to Junye at junyew@athabascau.ca

Palermo

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Olds College

Road Salt Forensics: Using Cl-/Br- Ratios and Other Indicators to Assess and Differentiate Road Salt and Other Impacts in Groundwater

Terry Obal, Chief Science Advisor, Maxxam Analytics

Municipalities across Canada use sodium chloride (NaCl) based road salt, primarily “Rock Salt” or Halite, as an economical means of de-icing road surfaces. At the same time, sodium (Na+) and chloride (Cl-), as well as electrical conductivity, sodium adsorption ratio (SAR), salinity and sodicity (which can be significantly influenced by Na+ and Cl- concentrations), are monitored in many jurisdictions as parameters of environmental concern.

Because of their stability and conservative movement in aquifers bromide (Br-), chloride (Cl-) and iodide (I-) have proven to be valuable as tracers for groundwater movement. More recently, evaluation of the concentration ratios for these ions, particularly chloride and bromide (Cl-/Br-), has also been used to study potable groundwater systems, and to establish the origin and evolution of surface and subsurface salt waters and brines.

In the presentation, we will demonstrate, using case studies, the power of Cl-, Br- and I- concentrations as forensic tools for differentiating anthropogenic sources of contamination, notably road salt, from naturally occurring, background or other potential sources of impact. The presentation will highlight:

- Road salt: its background and use across Canada;
- Environmental impacts and the regulation of road salt;
- Analytical considerations when measuring Br-, Cl- and iodide I-; and
- The application of road salt forensics as a line of evidence in answering questions of responsibility for salt impacts.

Additional questions can be directed to Terry at tobal@maxxam.ca

Presenter Biography

Terry Obal, C.Chem.
Chief Science Advisor, Maxxam Analytics

Dr. Terry Obal is the Chief Science Advisor at Maxxam Analytics. Terry’s mandate is to ensure that Science@Maxxam and its value are fully available to our customers, regulators and the public. This mandate is achieved through the development and validation of new methods and processes at Maxxam, and providing technical representation, consultative support and expert opinions for Maxxam clients.

Terry has over 30 years of experience in analytical chemistry, laboratory management and environmental chemical consulting. He holds B.Sc., M.Sc. and Ph.D. degrees in chemistry. He is currently: the Vice-Chair of the Board of Directors of the Ontario Environmental Industry Association (ONEIA); Vice-Chair of the Federation of Canada’s Professional Chemists (FCPC); and is an Ontario Chartered Chemist (C.Chem.) through the Association of the Chemical Profession of Ontario (ACPO).

Co-Authors

Bryan Chubb B.Sc., C.Chem.
Vice President, Business Development Environmental Services, Maxxam Analytics

Virgil Guran, M.A.Sc., C.Chem.
Consulting Scientist, Maxxam Analytics

Heather Lord, Ph.D.,
Manager, Environmental Research and Development, Maxxam Analytics

Two-Step Reclamation of a Polluted Site with Surfactant and ISCO Treatment: Field Case Study North-West Italy

George Ivey, President & Senior Remediation Specialist, Ivey International and
Claudio Sandrone, President, BAW Environmental Engineering

The site in northwest Italy has been operating as a petroleum services station for several decades. Over that period, historical underground storage tank (UST) spills released total petroleum hydrocarbons (TPH) comprised of gasoline and diesel fuel into the soil and groundwater. These spills yielded groundwater impacts >100,000 ug/L TPH and free-phase LNAPL (light non-aqueous phase liquid) impacts over a 200 m2 area.

Surfactant enhanced flushing was used to remove LNAPL mass, and site reclamation was completed by ISCO treatment of the groundwater plume to remove TPH residuals. A total of 2,475 kg of Provect-OX® was applied via 10 points via direct-push technique (from 5 to 11 m bgs) throughout a 200 m2 area. Reagent distribution was verified by performing a geophysical campaign that monitored the variation in electrical resistivity of soil due to ferric oxide present in the reagent, highlighting a total decrease of about 30% between pre- and post-injection. Groundwater monitoring campaigns carried out at the end of the first phase of chemical oxidation and those conducted in the second phase of enhanced bioremediation (six months later), highlighted the effectiveness of the technology by achieving recovery targets of 350 ug/l (Threshold Limit Value).

Presenter Biographies

George Ivey. CESA, CES, P.Chem, EP
Project Manager, Vertex Environmental Inc.

George (Bud) Ivey is the President and Senior Remediation Specialist with Ivey International Inc. of Vancouver, Canada. He has over 29 years of environmental remediation experience, and has worked on more than 2000 environmental projects internationally. His multi-disciplinary education background includes: Organic Chemistry, Geological Engineering, and a Master's Certification in Project Management.

Among some of his more noticeable accomplishments include:
• He holds several International Patents;
• Is recipient of many International Environmental Awards (Globe, Frost & Sullivan, MISTIC, Environmental Business Journal, and Roy F. Weston Awards);
• Has developed several innovative remediation product and process technologies for air, soil, water, and groundwater remediation;
• Is currently working on several high-profile remediation projects globally.

When he's not busy solving complicated contaminated site remediation problems, he very much enjoys long distance running, multi-day hiking, great food and wine in the company of good friends!

Claudio Sandrone, P.Eng.
President, BAW Environmental Engineering

Claudio is the President of BAW Environmental Engineering and was project lead in Italy. He specializes in environmental design and consulting for remediation technologies.

Co-Author

Dr. James Meuller
President Provectus Environmental Products, Inc

Additional questions can be directed to George at budivey@iveyinternational.com

Myth: You Can't Get Closure Using Site-Specific Risk Assessment

Trevor Burgers, Senior Environmental Scientist, Millennium EMS Solutions &
Lindsey Mooney, Risk Assessment Specialist, Millennium EMS Solutions

A variety of sites with different parameters of potential environmental concern (POPC) have successfully applied SSRA methods, advancing sites to regulatory closure. Three case studies are presented to examine how risk assessment was successfully applied to different site models and POPC groups. In case study #1 SSRA methods were applied to a condensate release into an aquatic habitat. The results of the SSRA were used to focus risk management and promote ecological function. In case study #2 SSRA methods were used for closure of elevated hydrocarbon concentrations to Tier 1 guidelines for the domestic use aquifer and ecological direct soil contact pathways. A SSRA focused on a detailed understanding of the Site including the hydrogeological setting, the delineation of the POPC and the remote green zone location of the Site. The SSRA included a detailed review of the applicability of the Tier 1 and 2 groundwater model for the Site and considered the final reclamation landform in determining the conclusions of the SSRA. The outcome was that soil concentrations greater than Tier 1 guidelines for various POPC did not require further remediation and the Site proceeded to final reclamation. In case study #3 a SSRA was completed with the alternate closure protocol for salt affected wellsites which lead to regulatory closure. With the application of this protocol the SSRA approach reduced the need for intrusive site remediation, thus minimizing additional site disturbance and reducing net remediation/reclamation costs.

The focus of this presentation is to provide an overview of three different SSRA methods, the different POPC addressed and how these methods have been successful applied to obtain regulatory closure. The presentation will help identify sites where taking an alternate SSRA route can lead to regulatory closure, where the application of Tier 1 or 2 guidelines may not. Examples will be presented in each case study that outline the approaches and procedures used, highlight key site information required and the SSRA methods applied. This presentation will also explain the information required to make the management decision to proceed with an SSRA approach to ensure project success and indicate potential problems to avoid.

Presenter Biographies

Trevor Burgers, M.Sc., P.Ag.,
Senior Environmental Scientist, Millennium EMS Solutions

Trevor has worked with Millennium EMS Solutions Ltd. since 2005, upon his graduation from the University of Alberta with an M.Sc in Land Reclamation and Remediation. He is an Environmental Scientist with industry leading expertise in the assessment and remediation of upstream oil and gas sites in western Canada and industrial settings. His work experience and training includes project management, site reclamation, environmental risk assessment and risk management, contamination remediation, due diligence for asset acquisition and divestment and managing and conducting hundreds of Phase 1 / Stage 1 and Phase 2 Environmental Site Assessment's and remediation projects for several industrial and oil and gas clients. Since 2013, he has been the Technical Lead for the Assessment and Remediation team within Millennium EMS Solutions Ltd.

Lindsey Mooney, P.Biol.,
Risk Assessment Specialist, Millennium EMS Solutions

Ms. Mooney's academic background in aquatic toxicology and microbiology has provided a base for a variety of science-based consulting projects. Since 2006, Lindsey has evaluated contaminated sites using risk assessment. She has led both human and ecological risk assessments from problem formulation through risk characterization and recommendations. Her risk assessment portfolio includes mines, dry-cleaning facilities, landfills, historical and active spill sites, oil and gas facilities, pipeline releases, wharfs, and industrial sites; encompassing a range of different chemical groups. More recently Lindsey has been applying risk assessment principles to risk management and program development. She's a member of Millennium's growing human health discipline.

Additional questions can be directed to Trevor at tburgers@mems.ca or Lindsey at lmooney@mems.ca

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Initial Spill Response: A Biologist's Perspective

Sandra Babiuk, Terrestrial Ecologist, RC BioSolutions Ltd. &
Lynnette Allemand, Ecologist, RC BioSolutions Ltd.

There is generally a negative public perception regarding oil spills and oil company response to those spills in Alberta. As such, timely, efficient and cooperative spill response remains an important issue in the oil and gas industry. Aging pipeline infrastructure continues to pose risk to the multitude of complex and sensitive wetland ecosystems through which they occur, increasing the importance of timely and effective emergency spill response. Companies are required to create and possess Emergency Response Plans (ERP) and Spill Response Plans (SRP), however, the efficacy and execution of such plans are only as successful as staff training, plan awareness, rehearsal, and plan practicality. If a spill occurs, the preparedness of all relevant parties to implement the ERP and SRP will determine the success of the response in minimizing impacts to the ecosystem.

During the initial emergency response phase of a spill within a wetland or watercourse system, many challenges emerge. The focus of this presentation is to discuss the complex challenges which may arise when managing wildlife impacts during both the initial spill response and the ongoing site remediation efforts. Based on our experience with a recent emergency oil spill response related to wildlife management, we will discuss regulator expectations during spill response and the reality of those expectations. We will also present practical solutions, procedures, and a triage technique that can be used to lead to a more effective, streamlined, and timely spill response, reducing overall impacts to wildlife from both the initial spill, clean-up efforts, and subsequent site wildlife monitoring during remediation.

Presenter Biographies

Sandra Babiuk, R.P.F.,
Terrestrial Ecologist, RC BioSolutions Ltd.

Sandra Babiuk has 16 years of experience as an Ecologist and is a Professional Forester (CAPF) within Alberta. Sandra is a technical professional with a focus on the assessment and characterization of terrestrial and wetland ecosystems. She has provided expertise and managed projects in accordance with federal and provincial (AB, BC, SK., Yukon, N.W.T and Nunavut) regulatory requirements. Sandra is skilled in ecological land classification and terrestrial ecosystem mapping, wetland impact assessments, detail vegetation inventories, soil classification, rare plant surveys, species at risk inventories, rangeland health assessments, weed surveys, wetland compensation agreements, and air photo interpretation. Sandra has been involved in evaluating environmentally significant/sensitive areas to help identify site-specific constraints and the development of mitigation measures for proposed developments in a variety of habitats.

Sandra has been responsible for project management, design and implementation of field programs, management and analysis of field data, writing of technical reports, the development and maintenance of budget controls associated with many different biophysical assessments, wetland impact assessments, environmental baseline reports, and environmental impact assessments.

Lynnette Allemand, AIT,
Ecologist, RC BioSolutions Ltd.

Lynnette Allemand has 2 years experience as an Ecologist and is a Professional Agrologist in training (AIA) within Alberta. Lynnette is a technical professional with a focus on the assessment and characterization of terrestrial and wetland ecosystems. Lynnette is skilled in field assessments with detailed knowledge of vegetation identification, terrestrial ecosystem mapping, weed surveys and air photo interpretations. Lynnette has been involved in evaluating environmentally significant/sensitive areas, aided in identification of site-specific constraints and development of mitigation measures for proposed developments within Alberta.

Lynnette has been responsible for weed identification and mapping, in accordance with the Alberta Weed Act for municipal government as well as the development and implementation of weed control programs in conjunction with landowners.

Additional questions can be directed to Sandra at sandra.babiuk@rcbio.ca or Lynette at lynnette.allemand@rcbio.ca

Watercourse Crossing Restoration Prioritization at the Landscape Level

Scott Wilson, Ecologist, Woodlands North

There is a growing concern for fish conservation in Alberta. Industry owned watercourse crossings are targeted as a significant driver of these declines despite several other identified causes. A portion of watercourse crossings in the green zone are in poor condition due to historical installation methods and deterioration over time. Many of these crossings no longer meet current regulatory standards and have created barriers to fish passage. Industry is required to inspect and restore problem crossings under their ownership. In the past, restoration occurred at the individual crossing level and did not always account for the importance of the crossing in terms of fish habitat within a watershed.

Recent proposed regulations have led to the need for an innovative approach to prioritize watercourse crossing restoration at the HUC 8 watershed level. It is often falsely assumed that industry is taking limited action to address problem watercourse crossings, when in fact they are leading a collaborative approach with government, academia and service providers to prioritize restoration at the landscape level. Woodlands North, in collaboration with industry partners has developed a restoration modeling approach that identifies the problem watercourse crossings in a given watershed that will open the greatest area of fish habitat upon repair. The model uses publicly available remote sensing data and field inspection data to rank crossings based on their position in the watershed, stream order they impact and habitat they will open upon repair. The result is a holistic approach to watershed restoration with greater potential ecological and economic benefit compared to conventional restoration focused at the individual crossing level.

Presenter Biography

Scott Wilson, M.Sc., BIT,
Ecologist, Woodlands North

Scott Wilson is a biologist with five years of experience working in Alberta. He completed a master's degree in ecology at the University of Alberta in 2017, where he examined the response of songbirds to regeneration of reclaimed wellsites in the boreal forest of Alberta. His interests lie in reclamation from a wildlife perspective. Scott has been with Woodlands North since May 2018 where he has primarily worked on watercourse crossing inspection and restoration planning.

Co-Authors

Geoff Sherman
Ecologist, Woodlands North

Bruce Nielsen
Ecologist, Woodlands North

Additional questions can be directed to Scott at scott@woodlandsnorth.com

Wildlife Usage Indicates Increased Similarity between Reclaimed Upland Habitat and Mature Boreal Forest in the Athabasca Oil Sands Region of Alberta, Canada

Virgil Hawkes, Vice-President & Senior Wildlife Biologist, LGL Limited environmental research associates

While there is no denying that oil sands development in the Athabasca Oil Sands Region (AOSR) is associated with large-scale habitat impacts, developers are legally required to return this land to "an equivalent land capability." While still early in the process of reclamation, land undergoing reclamation offers an opportunity to study factors influencing reclamation success, as well as how reclaimed ecosystems function. As such, an Early Successional Wildlife Dynamics (ESWD) program was created to study how wildlife return to and use reclaimed upland boreal habitat in the AOSR. Wildlife data comprising 184 species of mammals, birds, and amphibians, collected between 2011 and 2017 and from five oil sands leases, were compared from multiple habitat types (burned [BRN], cleared [CLR], compensation lakes [COMP], logged [LOG], mature forest [MF], and reclaimed sites [REC]).

The similarity of wildlife communities in REC and MF plots varied greatly, even at 33 years since reclamation (31-62% with an average of 52%). However, an average community similarity of 52% so early in the successional process, suggests that current reclamation efforts are creating habitats that have a high probability of developing into habitats with similar species composition as existing mature forest. Our data also suggest that REC plots are on a different developmental trajectory compared to stands recovering from natural fire (BRN) or other anthropogenic disturbances (LOG) which is likely due to differences associated with soil reconstruction and development on reclaimed plots. Regardless of the developmental trajectory of reclaimed habitats, a progression towards wildlife community similarity at REC and MF plots is apparent in our data. These findings support the notion that reclaimed upland habitat can eventually resemble natural occurring boreal forest, which is in stark contrast to the perception that the mining of bitumen leaves a legacy of degraded and highly impacted habitat on the landscape.

Additional questions can be directed to Virgil at vhawkes@lgl.com

Presenter Biography

Virgil Hawkes, M.Sc., R.P.Bio,
Vice-President & Senior Wildlife Biologist, LGL Limited environmental research associates

Mr. Hawkes has studied wildlife and their habitats in British Columbia and the Pacific Northwest, extending from California to coastal, central, eastern, and the north-central regions of BC, as well as portions of Yukon and Northwest Territories and Alberta, for more than 20 years. Much of his career has focused on the conservation of rare and endangered species and the interaction between rare and endangered species, their habitats, and human-induced disturbances on those habitats. Assessing the efficacy of mitigation strategies to offset or limit impacts to wildlife and wildlife habitat underlies much of his work. In that regard, Mr. Hawkes is currently leading several studies in the oil sands region including a regional program studying the efficacy of upland reclamation on active oil sands leases to provide habitat for wildlife.

Co-Author

Travis Gerwing, PhD.,
Ecologist, LGL Limited environmental research associates

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Is the Native Plant Story "Fake News"? Lessons Learned Compiling the Inventory of Native Species Seed Mixes in Alberta

Chris Powter, Owner, Enviro Q&A Services

The native plants story is a compelling one: Land management agencies, regulators, researchers and reclamation practitioners have recommended that disturbed sites be revegetated with native plants to conserve biodiversity, maintain ecosystem health and provide long-lasting cover similar to adjacent natural areas. Native plants are adapted to a wide range of soils and climates; contribute to biological diversity; provide wildlife cover and food; are self-sustaining and overwinter well; and, require fewer inputs to establish and maintain reclaimed systems.

Alberta's aboriginal communities have also developed cultural practices around the use of native plants for food, medicine and ceremonies. Seeding native species is one of several revegetation options available to practitioners to meet these goals.

The power of fake news is that it provides a narrative the reader already believes and is, therefore, going to share. Like an urban legend, the fake news story becomes real if repeated often and widely enough. So, is the native plants story real or fake news? The answer hinges on whether you believe the seed of plants you are deploying in your revegetation projects is really native.

Compiling InnoTech Alberta's Inventory of Native Species Seed Mixes in Alberta has shed light on the current status of the seed side of the native plants story. As much as we want to believe the story, and regale stakeholders with tales of our successful deployment of native species seed, the question remains: Are we telling the right story the right way, or are we simply repeating what we believe to be true?

Additional questions can be directed to Chris at envirogas@shaw.ca

Presenter Biography

Chris Powter, M.Sc.
Owner, Enviro Q&A Services

Chris has a B.Sc. in Ecology and an M.Sc. in Plant Ecology from the University of Guelph. He is the owner of Enviro Q&A Services, a consulting firm providing environmental advice and guidance to the resource industry and government regulators since 2015. From April 2010 to December 2014 Chris was the Executive Director of the Oil Sands Research and Information Network (OSRIN) in the School of Energy and the Environment at the University of Alberta.

Chris worked for Alberta Environment for 29 years, including duties in land reclamation from 1981 to 2002, then in policy and legislation development from 2002 to 2007 and finally as the head of the provincial environmental assessment program from 2007 to 2010. Chris has also been a member of the Environmental Appeals Board and the National Energy Board's Participant Funding Review Committee.

Chris was the recipient of the Canadian Land Reclamation Association's Edward M. Watkin Award in 1988, the Noranda Land Reclamation Award in 2001 and the Alberta Chamber of Resources 2004 Reclamation Citation for lifetime achievement. He was also a long-time editor of the CLRA's Reclamation Newsletter and the IALR Newsletter, and author of Curmudgeon's Corner in the Canadian Reclamation magazine for 10 years.

Co-Author

Marshall McKenzie
Native Plants Technologist, InnoTech Alberta

Quantifying Natural Recovery in Forested Areas: Reclamation Mitigation Success on Pipelines

Wade Pruett, Senior Environmental Advisor, TransCanada Corporation &
Brittany Flemming, Director of Research, Paragon Soil & Environmental Consulting Inc.

Natural recovery is a reclamation technique that allows disturbed sites to re-vegetate from the seedbank or ingress from adjacent undisturbed areas. The objectives of this project were to (1) assess the success of natural recovery in forested areas, (2) develop metrics to measure the success of native vegetation re-establishment in forested areas, and (3) explain if mitigation objectives can be achieved in a timely manner without the additional cost of active mitigation. Four pipeline segments were included in the field assessments for the Project representing 1, 3, 5, and 8 to 10 years post-reclamation. These pipeline segments occur in the Boreal Forest of northwestern Alberta, span several natural subregions, and were revegetated using natural regeneration processes along much of the Right-of-Way. Data collected from the disturbed assessment sites were compared to data collected from reference sites in adjacent undisturbed areas. Circular plots (3.99 meter [m] radius [50 m^2]) were established at upland, transitional, and wetland assessment locations.

Vegetation community composition was described by layer (stratum) in circular plots, including percent cover and vigour. Tree seedling density data and presence of prohibited noxious or noxious weeds, as well as invasive and agronomic species were recorded. These data were used to calculate (1) weed species abundance, (2) target species richness, (3) community diversity, (4) community evenness, (5) tree establishment, and (6) characteristic plant species in disturbed and undisturbed reference sites. Thresholds for recovery for each pipeline segment and habitat type were calculated for community indices (diversity, species richness, evenness) and tree establishment (stem count).

Preliminary results suggest that, even at this early stage of natural recovery, some community indices in disturbed sites were within threshold levels for natural recovery. Values for species richness were often below threshold levels, regardless of years since reclamation. Similarly, upland habitats and the youngest pipeline segment (one year since reclamation) were often below threshold levels for assessed indices. Multiple characteristic species were also identified for each habitat type.

This Project provides empirical evidence that natural recovery can be effective on pipeline segments in forested areas 1, 3, 5, and 8 to 10 years post-reclamation, depending on site conditions. The methods used could be applied to any project to help operators develop site-specific thresholds for natural recovery and help to identify sites that are on a trajectory towards recovery.

Presenter Biographies

Wade Pruett, P.Ag.
Senior Environmental Advisor, TransCanada Corporation

Wade is a Professional Agrologist specializing in soil conservation and reclamation with over 16 years of environmental consulting and industry experience. Wade graduated from the University of Alberta with a B.Sc. in Environmental Science in 2002. He has worked as an environmental practitioner in multiple regulatory jurisdictions across Canada, including over 10 years of field experience conducting baseline surveys, soil conservation planning, reclamation planning, construction and reclamation oversight and post-construction monitoring. After joining TransCanada in 2013 he has focused on environmental planning and permitting for new projects as well as abandonment projects. He has been responsible for oversight of large Environmental and Socio-Economic Assessments, provided expert testimony before the National Energy Board and served the lead for the Post-Construction monitoring program. Wade is currently the subject matter expert for soils and reclamation at TransCanada. His role as Chair of the Canadian Energy Pipeline Association Environmental Working Group allows him to participate in industry lead initiatives as well as interface with regulatory agencies on emerging policies.

Brittany Flemming, Ph.D, P.Biol
Director of Research, Paragon Soil & Environmental Consulting Inc (Paragon)

Dr. Brittany Flemming is a Vegetation Ecologist with over 10 years of environmental consulting and international research experience. She completed her Bachelor of Science degree at the University of Guelph, Master's degree at Memorial University of Newfoundland, and PhD at Otago University in New Zealand. She is well versed in the practice of plant ecology, with a focus on interactions and community assembly in a wide range of habitats. As a vegetation ecologist at Paragon, Brittany has been able to transfer skills developed during her research to real-world applications, including, work for oil sands, in-situ, and mining operations including developing research programs, monitoring reclamation and developing thresholds for success, developing planting prescriptions for closure landscapes, facilitating workshops, and conducting literature reviews. As Director of Research, Brittany is also responsible for helping to guide colleagues through the Scientific Method and to develop and execute their own research projects. Brittany is the primary author of multiple peer-reviewed research articles, and co-author of reclamation plans, mine reclamation and closure plans, and multi-year research plans.

Co-Authors

Vincent Futoransky
Senior Ecologist, Paragon Soil & Environmental Consulting Inc

Lee Paterman
President, Paragon Soil & Environmental Consulting Inc

Additional questions can be directed to Wade at wade_pruett@transcanada.com or Brittany at bflemming@paragonsoil.com

A Skeptics Guide to Sorting Through Erosion Control Specifications

Trevor Kloeck, Business Development Manager, Synermulch

Regulators, government, and industry end users have become increasingly more stringent on environmental compliance in recent years and scrutiny from them public is increasing. It is more important than ever that the most effective solution to environmental challenges be deployed on a regular basis. This means two fundamental shifts in thinking:

1. Challenging our historical industry specifications and honestly evaluating their effectiveness.

2. Applying common sense and sound scientific principles to products that claim performance well in excess of what the natural environment can support.

This presentation will provide a breakdown of common product claims in the erosion and sediment control industry with the intent of helping industry make better educated decisions on when, and more importantly when not to to use, certain products. The vast majority of products on the market have technically sound applications, but they are often improperly specified, or deployed based on dubious product claims. This presentation will dig into the most common erosion control standards the industry faces, what they mean and how they can be screened for effectiveness. Key areas for discussion include: erosion control effectiveness, germination improvement, product toxicity, and product longevity in the context of what actually happens in the natural environment. All of these key factors utilize standardized testings to determine effectiveness, but as with all methodologies, understanding how to interpret and utilize the test results are most important.

Presenter Biography

Trevor Kloeck, B.Sc.
Business Development Manager, Synermulch

Trevor grew up on a farm in northern Alberta and has a Bachelor of Science degree from the University of Alberta with a specialization in plant biology and ecology. Initial roles and responsibilities after graduating university were focused on applied research in crop agronomy and soil conservation practices in Northern Alberta for a regional non-profit agricultural group. Trevor then began work for the Alberta government as a regional crop production specialist in cereals, oilseeds, and pulse and special crops. Trevor's role within the Alberta government then shifted to business development, where his crop and plant production were used to market Alberta internationally and conduct product development. This led to the establishment of the Alberta Biomaterials Development Centre, a nationally recognized initiative to develop advanced materials from plant fibres. Trevor then led business development activities for the ABDC nationally and internationally.
Trevor is now employed by Synermulch erosion control product in Calgary Alberta as their business development manager. Responsibilities include new product development, technical training and expansion of the Synermulch product line internationally. Since Trevor joined Synermulch, the company has grown from a start-up to being active on three continents.

Co-Author

Ian Corne, CPESC, M.Land.Arch., B.E.S
Application Specialist - Erosion and Sediment Control, Nilex Civil Environmental Group

Additional questions can be directed to Trevor at tkloeck@synermulch.com

PLENARY SESSIONS: 13:00 – 14:30

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Lyme Disease: The Myths and Facts: A Personal Journey

Jaime Cobler, Project Manager, Deeproots Environmental Ltd.

Lyme Disease was diagnosed as a separate condition for the first time in 1975 in Old Lyme, Connecticut when it was originally mistaken for juvenile rheumatoid arthritis. It is an infectious disease caused by a bacteria spread by ticks. Fake News about Lyme Disease is that is does not occur in Saskatchewan or Alberta and that if positively diagnosed doctors are able to treat it effectively. Some patients have symptoms that come on slowly and were unaware they had a tick bite, leading to inconclusive or misdiagnoses. Patients are told “you seem fine, your bloodwork is good, it must be a virus and will pass, maybe you are depressed”. I was diagnosed September 2017 with 3 different strains of Lyme, and two co-infections Bartonella and Babesia, as well as 5 viruses which were all transferred from a single tick bite. I have been in treatment ever since and feel awareness and prevention are key in our western provinces to prevent the spread of this life altering disease.

Presenter Biography

Jaime Cobler, C.Tech, A.Ag.
Project Manager, Deeproots Environmental Ltd.

My name is Jaime Cobler. I have worked in the oilfield doing Rec/Rem work for the past 20 years. June 2017 I contracted Lyme Disease from a tick. Within a week of finding the buried tick(the next morning) I started to have blurry vision, vertigo, exhausted, swollen glands and back of head pain. Two weeks after a bullseye rash appeared around the bite and by then I had migrating muscle and joint pain, night sweats and chills, confusion not knowing what time of day, not sleeping as in too much pain and couldn't even ride in a vehicle without throwing up. After 3 months at my doctor and clear ct scan, neg lyme test and good bloodwork my doctor said must be menopause and depression. He told me the lyme test isn't very accurate but its not in Saskatchewan so don't worry. By now my family was looking for answers and found a private doctor who could do an accurate test and treat if needed. Since Sept 2017 I have been on antibiotics of all kinds and have been slowly recovering getting back to work part time in may 2018. I have decided that since I am a lot better I need to help others in the field be aware of the risks of lyme disease and how to prevent.

Additional questions can be directed to Jaime at deeproots@sasktel.net

Effects of Atmospheric Sulfur and Nitrogen Deposition on Soil Properties and Foliar Nutrient Concentration in the Athabasca Oil Sands Region

Dr. Sebastian Dietrich, Research Fellow, University of Alberta

The Wood Buffalo Environmental Association was established in the late 1990's to monitor air quality in the Athabasca oil sands region (AOSR). Heavy industry such as surface mining and upgrading can lead to soil acidification which is caused by sulfur (S) and nitrogen (N) deposition and associated with negative impacts on forest community structure and growth. A network of forest health monitoring sites was established in dry jack pine ecosystems of the region as an early detection system. Recent research conducted by environment Canada suggests an exceedance of critical loads based on modeled acid deposition data in Alberta and Saskatchewan. In this study atmospheric deposition of S and N was measured at forest health sites with ionic exchange resin columns, placed in the open and under the canopy, and was modeled at sites without deposition collectors as a function of distance to closest mining operation. Inverse distance weighting was used to examine spatial relationships, and regression analysis was used to look at dependant and independent variables. Increased deposition of SO4 resulted in increased foliar, LFH, and mineral soil SO4 concentration, while increased N deposition was only associated with increased foliar N concentration. Soil pH in the LFH and mineral topsoil was neither significantly correlated with base cation deposition nor potential acid input. However, pH of the LFH layer was significantly increased with deposition of ammonia (NH3). This indicates that emissions rather have an alkalifying effect on forests soils in the study area. Ammonia is used in scrubbers of plants to remove sulfur dioxide from flue gas and might be a potential source for atmospheric deposition. Our findings suggest that future research should focus on NH3 deposition and associated effects on ecosystem function.

Presenter Biography

Sebastian Dietrich, Ph.D., P.Ag.
Research Fellow, University of Alberta

Dr. Dietrich is an environmental soil scientist and ecosystem ecologist. He is holding a Ph.D. in Soil Science from the Department of Renewable Resources, University of Alberta and an M.Sc. in Natural Resource Management and a B.Sc. in Forest Science from the Dresden University of Technology, Germany. In line with his Ph.D. studies, at the University of Alberta, he conducted research to improve capping materials for oil sands mine reclamation and to characterize soil spatial heterogeneity of boreal forest ecosystems. He currently works as a research fellow with the Soil-Plant Relations Lab at the University of Alberta, where he conducts research in collaboration with the Wood Buffalo Environmental Association's Terrestrial Environmental Effects Monitoring program. Besides this, he is a Soil specialist with Paragon Soil. He has eight years of combined experience in applied research and environmental consulting and is an expert in the fields of soil-plant interactions, mineral plant nutrition, biogeochemistry, ecosystem ecology, and land reclamation.

Co-Author

M. Derek MacKenzie, Ph.D.
University of Alberta

Additional questions can be directed to Sebastian at sdietric@ualberta.ca

Evaluation of Upland Forest Vegetation Growth Performance of Land Reclamation at Syncrude Canada Ltd. Oil Sands Mine Operations

Marty Yarmuch, Soil Scientist, Syncrude Canada Ltd.

Surface mining of oil sands deposits requires the disturbance of existing landscapes and processes, followed by the construction of new landscapes and ecosystems. A number of different substrates, each with unique physical and chemical characteristics, are used to construct landforms that are reclaimed and will remain in the closure landscape. Specific substrates that will comprise a significant portion of the upland forest reclamation landscape include natural geologic materials (e.g. overburden), tailings sand and process by-products such as petroleum coke. Each substrate has unique properties that present risks and opportunities for land reclamation. Soil cover designs (i.e., soil material types, placement configuration and capping thickness) can further enhance land capability and/or mitigate potential environmental risks of a closure landform. A range of revegetation strategies are also available to target a specific end land use(s).

Syncrude Canada Ltd. has been in operation since 1978 and during this period more than 3,000 hectares of disturbed land has been permanently reclaimed. As the vegetation on reclaimed lands mature it provides an opportunity to assess the long-term growth of landforms and adopted soil cover designs. Reclamation monitoring and research programs have played an important role in assessing the recovery of reclaimed ecosystems and improving best management practices for oil sand mine operations. This now provides Syncrude with an opportunity to move from predicting capability, which was the practice in the early years of oil sands mine reclamation, to measuring performance of the actual reclaimed landscape.

Vegetation growth performance from reclamation research and monitoring programs will be presented for a range of substrates that will comprise the majority of the upland forest closure landscape. The results highlight that the reclamation practices and closure landforms will meet desired reclamation outcomes, while debunking misconceptions that oil sands mining activities cannot be responsibly developed.

Presenter Biography

Marty Yarmuch, P.Ag,
Soil Scientist, Syncrude Canada Ltd.

Marty Yarmuch joined Syncrude in 2009 as a Soil Scientist in their Mine Closure Research Group. He is currently involved in a number of soil related research and monitoring projects to develop appropriate soil cover designs for reclamation that will achieve mine closure certification.

Prior to joining Syncrude, Mr. Yarmuch worked as an environmental consultant for more than 10 years specializing in soil related activities in the oil sands, conventional oil and gas and mining industries primarily in Alberta. Marty graduated from the University of Alberta with a BSc in Environmental and Conservation Sciences in 1997, and earned an MSc in Soil Science in 2003.

Co-Author

Craig Farnden, RPF,
Revegetation Research Specialist Syncrude Canada Ltd.

Additional questions can be directed to Marty at yarmuch.marty@syncrude.com

Pilot Mentorship Program – ECO Canada

Lynette Esak, Volunteer Program Lead, Esak Consulting Ltd.

University of Alberta, ALES and ECO Canada have partnered with a licensing agreement to provide a mentorship opportunity for 4th/5th year Environmental and Forestry students (protégés) within a pilot program for 2018-2019. The ECO Canada / Faculty of ALES Pilot Mentorship Program (Pilot Mentorship Program) gives protégés the opportunity to learn from seasoned professionals through eight meetings between November 2018 and July 2019. The intent behind the Mentorship Program is not for the mentors to provide the protégé with an internship or job offer, but rather to create a comfortable learning environment, challenge the protégé to explore career paths, be accessible to provide guidance throughout the established mentorship timeframe, to set clear boundaries, and to maintain confidentiality. The Pilot Mentorship Program provides a forum for experienced environmental professionals, less experienced professionals and protégés to discuss professional growth and further development of professional growth/soft skills, project planning and execution, and working in the environmental sector. Thus, the program to provide protégés the resources and opportunities needed to help facilitate personal and professional success, as well as helping in preparing their transition to the corporate world as the next generation of leaders in environmental or forestry professions. It is hoped that in future years, this program can be expanded to include 3rd year protégés as well as graduate studies protégés.

The mission of the Mentorship Program is to foster leadership qualities needed for protégés to truly excel in their chosen career paths. All personnel (protégés, mentors, committee members) involved and accepted within this Pilot Mentorship Program will sign a term of agreement and code of conduct. The ECO Canada EP Code of Ethics will be followed. Protégés are not permitted to solicit mentors for internships or jobs – the purpose of the program is to explore a career path and build networking opportunities.

The role of a mentor does not require helping future Environmental Professionals (EP) with their education, examination preparation or job search. Also you do not have to be a member of ECO Canada to be a mentor, but it is an option. It is also preferred that the mentors belong to a professional regulatory association. Instead, the mentor can expect to:

- Provide future EP with support and insight that can broaden their mindsets
- Give back and invest in the future of the profession
- Enhance your personal growth and professional development from mentoring
- Receive access to professional development-eligible resources and tools
- Commit a minimum of 8 sessions from November 2018 to July 2019 to the program (minimum 1.5 hour per month or session)

There is an application process for both the mentors and proteges and will hopefully be released next summer for the 2019-2020 year. This presentation will provide an awareness of the Pilot Mentorship Program.

Presenter Biography

Lynette Esak, P.Ag, EP,
Volunteer Program Lead, Esak Consulting Ltd.

Lynette Esak, M.Sc, P.Ag, EP, has an extensive agricultural and environmental career that has covered many sectors and industries in Alberta with focus on sustainability, soils, reclamation, remediation and regulatory applications. Her company Esak Consulting Ltd. which has been in business since 1992 has experienced the many economic swings in Alberta and continues to provide expert level problem solving solutions to environmental questions in Alberta's environmental assessment, monitoring, and sustainability sectors. She volunteered to set up and coordinate the Pilot Mentorship Program that is a licensed agreement between the University of Alberta ALES and ECO Canada for 2018-2019. Lynette is active on many advisory boards and volunteers on several committees including the AIA Soils Network, NAIT Environmental Sciences Advisory, UofA Environmental Resource Management Certificate program, AHS Patient/Family Network, Ridge Community League and River Ridge Homeowners Association. Her love of family, quilting, and travel keeps her busy.

Additional questions can be directed to Lynette at lynette.esak@esakconsulting.com

CONCURRENT SESSIONS: 15:00 – 16:30

Monaco

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RemedX Remediation Services Inc.

Combined Effects of Climate Change and Reclamation on Future Forest Vegetation in the Mineable Alberta Oil Sands

Hedvig Nenzen, Landscape Reclamation Modeler, Canadian Forest Service, Natural Resource Canada

Bitumen mining in Canada's oil sands requires reclamation to "equivalent land capability", implying restoration of vegetation similar to an undisturbed boreal ecosystem in the region. However, there is growing consensus that projected climate warming is likely to produce major changes in the boreal forest landscape. It is unknown how climate change will affect regional reclamation success and the sustainability of the future landscape. Moreover, there is considerable socio-economic uncertainty in the future of oil sands development, which could affect how much of the area containing surface-mineable bitumen is exploited and reclaimed. Here, we used a forest landscape model to represent the potential impacts of both climate change and oil sands mining on future forest sustainability. To represent climate uncertainty we used projected changes in future climate simulated by the CanESM2 earth system model forced by three Representative Concentration Pathway scenarios. To represent socio-economic uncertainty in future mining, and hence the extent of land use change, we developed three hypothetical mining scenarios: (1) stop at the current extent; (2) exploit only the currently active leases; (3) exploit the entire surface mineable area. Mining scenarios assumed that mines were exploited for 40 years and then reclaimed by planting species commonly used in reclamation. To represent the uncertainty on long-term species growth in reclaimed areas, accounting for possible future technological changes, we varied species growth by decreasing and increasing baseline growth by 25%. To assess whether future forest landscapes would be similar to natural forests, we compared results to baseline simulations without climate change or mining.

Presenter Biography

Hedvig Nenzen, Ph.D,
Landscape Reclamation Modeler, Canadian Forest Service, Natural Resource Canada

Hedvig works as a research scientist at the Canadian Forest Service. She obtained her MSc from Uppsala University (Sweden) and PhD from Université du Québec à Montréal, both in biology.

Co-Authors

Yan Boulanger,
Research scientist, Canadian Forest Service

Elizabeth Campbell,
Canadian Forest Service

David Price,
Canadian Forest Service

Additional questions can be directed to Hedvig at hedvig.nenzen@canada.ca

Evaluating Innovative Techniques and Products to Enhance Reclamation Success

Sarah Thacker, Researcher, InnoTech Alberta
Bonnie Drozdowski, Team Lead/Researcher, InnoTech Alberta

Everyone wants a “magic bullet” to help them achieve reclamation success faster and more easily; a novel gizmo or gadget or “innovative” technology or process to make plants grow ‘bigger’, ‘better’, ‘faster’, tolerate adverse growing conditions, or generally improve the likelihood of reclamation success. The issue in applying “innovative” tools, techniques, or technologies on reclamation sites is that there is generally limited research to validate the applicability and effectiveness of these technologies for native plants under variable field conditions, and even if there is, there may be challenges associated with regulatory acceptance. There is a need to optimize and validate technologies and approaches for the benefit of industry, practitioners and government stakeholders.

“Magic bullets” are particularly desirable to enhance reclamation outcomes in native grasslands, which are notoriously difficult to reclaim as native grass species are often outcompeted by weeds. Reclamation challenges are exacerbated when soil quality is affected by elevated hydrocarbon or salt concentrations. Salt contamination can be a significant problem as anthropogenic salts can degrade soil properties, thus impairing vegetative growth and development. InnoTech Alberta has conducted research on technologies to improve germination, early establishment, and growth of a variety of native grasses in optimal and adverse growing conditions both in the greenhouse and in the field using plant growth-promoting rhizobacteria (PGPR), plant growth regulators (PGRs) and soil amendments such as biochar.

PGPR are rhizobacteria that exert beneficial effects on plant development via direct or indirect mechanisms. PGPR have the potential to benefit plants throughout their life-cycles through various modes of action; however, developing a commercial product for general use to enhance reclamation success requires consideration of many factors. PGRs are plant hormones typically used in agriculture to enhance certain qualities in plants, and their application to native species in Alberta is novel. Biochar is produced from pyrolysis of biomass and can reduce contaminant mobility via adsorption, improve soil water retention, mineralize nutrients, and improve soil structure.

Each of these technologies has shown advantages and limitations for their application to improve reclamation outcomes in Alberta. Results from field and greenhouse trials will be presented that demonstrate what worked and what didn’t under the conditions evaluated, in addition to the constraints and considerations for commercial application of these technologies.

Presenter Biographies

Sarah Thacker, MSc.,
Researcher, InnoTech Alberta

Sarah Thacker (M.Sc) is an environmental scientist working in applied research with the reclamation group at InnoTech Alberta. She has been working on a variety of reclamation projects at InnoTech Alberta, both at the greenhouse and field scale. Sarah’s area of expertise is plant-soil interactions, and she enjoys combining her knowledge of both plants and soil to advance applied research in Alberta.

Bonnie Drozdowski, P.Ag.
Team Lead/Researcher, InnoTech Alberta

Bonnie Drozdowski (M.Sc, P.Ag), is the team lead for the reclamation program at InnoTech Alberta which focuses on developing of innovative and practical land reclamation and remediation procedures and technologies for landscapes disturbed by industrial activities. She has been working in applied reclamation research for over 10 years managing and participating in multifaceted projects integrating business and science in various industries including upstream oil and gas, mineable and in-situ oil sands, coal mining, sand and gravel, diamond mining, forestry, and pulp and paper. She passionate about working collaboratively with colleagues in industry, academia and the environmental services sector to capitalize on varying expertise and experience in developing innovative solutions to complex problems.

Additional questions can be directed to Sarah at sarah.thacker@innotechalberta.ca or Bonnie at bonnie.drozdowski@innotechalberta.ca

Reclaiming a Former Airstrip to Wetland Status: A Case Study

Melanie Bird, Research Technician, NAIT Boreal Research Institute

Wetland reclamation for in-situ features built in peatland settings is an emerging discipline. Despite significant progress over the last decade, there are still few well known, successful strategies available for reclaiming boreal peatlands affected by in-situ activities. Under current reclamation criteria for peatland well sites, development of peat forming (mire) ecosystems have been demonstrated using technologies adapted from the peat mining industry by removing mineral fill, restoring a saturated peat surface, and introducing donor vegetation material. However, this approach is not suitable where peat is unavailable and/or removal of significant volumes of mineral fill is not feasible. Alternative strategies are therefore needed to reclaim mineral features and to restore functional wetland ecosystems, with the potential to become peat forming ecosystems over time. There are very few case studies on this topic and currently no relevant guidelines for creating and assessing reclaimed mineral wetlands for in-situ facilities.

Here we present a case study of a wetland reclamation trial of a former airstrip adjacent to a highway and traversing a peatland complex. The airstrip was constructed in the 1960's by removing the entire organic layer. The absence of stockpiled peat led to the decision to restore a self-sustaining marsh community with the potential to evolve into a peat forming mire.

Civil earth work for the 4 ha wetland commenced in summer 2014 by removing the clay overburden, followed by trenching and decompacting across the reclaimed area. Wetland planting followed in spring 2015. Despite severe drought during the first two growing seasons, a persisting wetland community has established by 2018. The reclaimed area is dominated by a marsh type community with scattered pockets of bryophytes and woody species. We will discuss the site progression and community development to date. Key lessons learned on the initiation of mire ecosystems directly on mineral substrate will also be examined. By sharing early learnings from this study and our other studies, we hope to demonstrate progress restoring wetland ecosystems and that innovation in this field is continuing.

Presenter Biography

Melanie Bird,
Research Technician, NAIT Boreal Research Institute

Melanie is the research technician for the Peatland Restoration program at NAIT's Boreal Research Institute. She joined the program in 2014, and has worked in peatland research since 2012. She manages day to day operations, including experimental setup, field logistics, and data collection. She is passionate about wetland restoration technologies and has overseen the civil earthwork and revegetation of the majority of the program's reclamation trials. She earned a BSc (Hons) in geography, and was a member of the Wetland Soil and Ecohydrology research lab at the University of Calgary. She is also the facilitator of the Alberta Native Plant Council's Peace Region Plant Study Group.

Co-Author

Bin Xu, PhD
NAIT Boreal Research Institute

Additional questions can be directed to Melanie at mbird@nait.ca

Santano

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Floating Island Selenium Bioremediation of Mining Waste: Bench and Field Trials

Steven Tannas, Senior Vegetation Ecologist, Tannas Conservation Services &
Ashley Easton, Reclamation Specialist, Tannas Conservation Services

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 been attributed to the island design and vegetation species selection to address the site-specific issue. With a focus on biology, as well as chemistry, an innovative program was developed that has the potential to enable industry to meet regulatory guidelines for water quality while enhancing biodiversity and reducing costs over the long term. To meet the remediation objectives of the client, a research program was undertaken to develop a low-cost alternative to active remediation options which integrates the benefits of using native species, natural processes, and minimal infrastructure and maintenance requirements. The project was completed in four components: an initial bench trial (2016-2017), field testing of islands/ shoreline plantings (2015-2017), a second bench trial at Olds College (2017), and finally full-scale implementation on the mine site (2018). The two bench trials looked at depletion of selenium by eight native wetland plants found within the area adjacent to the field site, the species growth rate, and concentration of selenium within native plants. The initial field testing looked at over 10 native wetland species growing in the pond (shoreline and on test floating islands) and evaluated the viability of commercially available floating islands. Soil, water and vegetation biomass (roots and shoots) were analyzed to determine the concentration of selenium (and other parameters) within the various components, rate of uptake over time, and identify where the selenium was being stored as its concentration in water depleted. Utilizing the information provided during the testing phase, a new floating island system was developed to improve plant growth and selenium uptake potential of the islands. In 2018, the full scale application of this program was implemented onsite.

This presentation will provide an overview of the experimental design, results over the past three 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 as well as the anticipated timeframe.

Presenter Biographies

Steven Tannas, PhD., PAg., QWSP
Senior Vegetation Ecologist, Tannas Conservation Services

Steven is a Senior Vegetation Ecologist and a Qualified Wetland Science Practitioner (AB). His work spans through a wide range of practice areas within Western Canadian ecosystems including: bioengineering, reclamation, revegetation, native plant propagation, wetland and plant community assessment and classification, and rangeland management. He has worked within Alberta, BC, Saskatchewan, and Manitoba, as well as within the Yukon, NWT and Nunavut. Steven is a highly experienced plant taxonomist and able to spot identify over 1000 plant species. He has extensive experience working with industrial clients, oil and gas, electrical grid, mines and agriculture, and with federal, provincial and municipal governments. He has over 14 years of experience working with the industry in his professional career and over 10 years prior to that apprenticing within his parents' company prior to obtaining his first degree. He's been developing an innovative design for floating island remediation using native species over the past several years.

Ashley Easton, BSc., PAg.,
Reclamation Specialist, Tannas Conservation Services

Ms. Easton has been working in the environmental industry for over 10 years conducting environmental site assessment (ESA), including Phase 1/I, 2 and 3; spill response; site reclamation; revegetation; and reclamation certificate applications. She specializes in soil, native vegetation, reclamation and revegetation. Her technical skill set also includes bioengineering, soil and vegetation inventory, assessment and classification; plant identification; and wetland, rangeland and riparian assessment. Ashley has worked on projects within natural areas, urban, oil and gas (upstream and midstream), and mining in Alberta, and Saskatchewan. She has extensive experience in project management of varying types, sizes and complexities of projects, development and tracking of budgets, technical document preparation and document review, as well as leading and managing multi-disciplinary teams to complete project objectives. Ashley has instructed various courses, and mentored/trained numerous junior and intermediate environmental scientists in technical, project management, leadership and team work skills.

Additional questions can be directed to Steve at steven@tannasenvironmental.com or Ashley at a.easton@tannasenvironmental.com

Critical Evaluation of Drilling Waste Compliance Option Triggers: How Do They Correlate to Phase 2 ESA Results?

Jim Purves, Technical Advisor, North Shore Environmental Consultants Inc.

As part of the Upstream Oil and Gas Reclamation and Remediation Program, the Alberta Energy Regulator (AER) requires documentation showing drilling waste disposal areas (DWDAs) are in compliance with Directive 050 and/or Alberta Tier 1. In the absence of this documentation, Compliance Option Checklists and Calculation Tables are completed during the Phase 1 ESA confirming that specified requirements have been met. A Phase 2 ESA is required on the DWDA when the Compliance Option 1 or 2 checklists and/or calculations trigger for potentially exceeding parameters of concern including petroleum hydrocarbons, metals and salinity.

Checklist triggers include the use of an advanced gel-chem mud systems, unknown mud products, kicks, flows or salt zones encountered. Calculations can trigger for sodium hydroxide equivalency, barite, zinc, chrome-based thinners or post-disposal oil concentrations. But how well do these specific Compliance Option triggers correlate to Phase 2 ESA analytical results? How do they relate to an actual confirmed endpoint exceedance of D050 and/or Tier 1? If barite exceeds the mix concentration calculation, is there any correlation to barite failing via intrusive sampling? Is there any relationship between calculating DST returns using the default chloride concentration and failure to meet D050 EC/SAR endpoints during the Phase 2 ESA? Is the current default DST chloride concentration too conservative? Do older vintage wells or spud date have an influence? What about well depth or specific areas of the province?

The intent of this presentation is to provide insight and guidance on the assumptions associated with the Compliance Option Checklists and associated calculations. By critically evaluating hundreds of Phase 1 ESAs and their correlation to Phase 2 ESA analytical results, we'll examine the conservative assumptions and whether these triggers translate into DWDAs that require remediation. Where correlation has not been established, is there opportunity to utilize the statistics to justify low risk sites?

Presenter Biography

Jim Purves, PAg,
Technical Advisor, North Shore Environmental Consultants Inc.

Mr. Purves is a Professional Agrologist with over 20 years of experience in the environmental and agricultural industries. As a Technical Advisor, Mr. Purves provides technical support, senior report review as well as mentorship and staff training to his team members. His focus is on complex projects; mainly contaminated sites in the form of guideline modification, risk assessment and Subsoil Salinity Tool (SST). Mr. Purves' remediation and reclamation experience includes all aspects of the 'life cycle' approach from Phase 1, 2, and 3 ESAs, spill clean-up and restoration, reclamation, DSAs, and the implementation of various remediation techniques.

Additional questions can be directed to Jim at jpurves@northshoreenv.com

Biosparge Pilot System for Aerobic Degradation of Sulfolane

Jennifer Harder, Project Manager, Golder Associates &
Dider Jouen, Project Manager, Imperial Oil Limited

Background/Objectives: Sulfolane is an emerging contaminant used in the chemical industry and for sweetening sour gas. Sulfolane has properties conducive to groundwater transport and has been reported to biodegrade under aerobic conditions. A former gas plant in Alberta was piloted for enhanced attenuation via biosparging to increase the aerobic biodegradation capacity of sulfolane in groundwater. A biosparging system was designed, constructed and operated in fracture bedrock to augment the groundwater with oxygen (via air injection) to enhance the growth of sulfolane-degrading microorganisms and sulfolane degradation rates. Traditional biodegradation indicators, microbial testing and culture-based techniques were employed to monitor for evidence of biodegradation. Success evaluation for the project was based on three categories; mechanical performance of the system, the delivery of oxygen to the subsurface and evidence of biodegradation of sulfolane.

Approach/Activities: Biosparge system design and construction were followed by an initial optimization stage including tracer tests and air injection step tests. A baseline sampling event was completed on the newly installed monitoring and injection well network prior to any air injection. Operational parameters (operating pressure, pulsing frequency and flowrate) were adjusted to optimize oxygen delivery during the pilot stage. Groundwater samples collected with spatial (upgradient, within the sparging zone, and downgradient) and temporal (baseline and regular intervals during operation) variation were used to assess changes in sulfolane concentration, geochemistry, and overall microbial community composition and sulfolane-degrader concentration.

Results/Lessons Learned: The project was deemed a success on all three areas evaluated. The mechanical system performance targets were all met which facilitated the delivery and maintenance of dissolved oxygen concentrations to the desired level (greater than 2 mg/L). Sulfolane concentrations decreased (below the applicable guideline in some locations) and dissolved carbon dioxide and dissolved sulphate concentrations increased within and downgradient of the sparging zone. Putative sulfolane-degrading isolates were identified containing reported sulfolane-degraders. Analysis of plate counts and next generation sequencing data showed increases in the relative abundance of colonies and operational taxonomic units closely related to putative sulfolane-degraders after biosparging began, within and downgradient of the sparging zone. Some challenges encountered included operating in winter conditions, associated aerobic nitrification and nutrient supply.

Presenter Biographies

Jennifer Harder, P.Ag.
Project Manager, Golder Associates

Jennifer Harder is Project Manager with Golder Associates in the Edmonton office. She received a Bachelor of Science in Environmental and Conservation Science with a Land Reclamation major in from the University of Alberta in 2008 and has been registered as a Professional Agrologist since 2012. She has field and project management experience in geo-environmental site investigations, spill response, liability assessment and remediation programs across Western Canada. Her experience includes phase I, II and III environmental assessment programs and associated reporting. This experience includes designing assessment and closure plans for complex sites, deriving site specific guidelines and developing risk management plans including use of the Subsoil Salinity Tool. She has experience interfacing with the Alberta Energy Regulator on applications for approvals under the Water Act, energy project amendment/renewal applications under the Environmental Protection and Enhancement Act (EPEA) and various temporary license applications under the Water Act and Public Lands Act.

Didier Jouen, P.Eng.
Project Manager, Imperial Oil Limited

Didier Jouen is currently a project manager for the Environmental & Property Solutions with Imperial Oil Limited, located in Calgary, Alberta. He received his undergraduate engineering degree in Mining with a minor in management from McGill University in 2012. As a young engineer, his first role with Imperial Oil was a 10 days on/10 days off rotation as a mine planner supporting the Operations group at the Kearl mine. Similar to his career, the Kearl mine had just started production and was exponentially growing. For a little less than five years, after rotating through various assignments in the mine technical group, his career took a different turn when he was asked to manage end of life projects for the Environmental and Property Solutions group. He is currently responsible for managing the cost and schedule associated with an upstream oil and gas facility portfolio, with various sites scattered across B.C and Alberta. Didier stewards the consultant on project plan development, implementation and progression while providing safety leadership. He also interfaces with the regulatory agency, property owners and local government officials.

Co-Authors

Sylvain Hains,
Technical Advisor, Golder Associates

Éric Bergeron
Technical Advisor Golder Associates

Trent Key
Technical Advisor ExxonMobil Environmental Services Company

Linda Eastcott
Technical Advisor, Imperial Oil Limited

Additional questions can be directed to Jennifer at jharder@golder.com or Dider at didier.jouen@esso.ca

Palermo

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Olds College

Alternative Salinity Evaluation; Description and Benefits of an Additional Line of Evidence Accepted by the BC Oil and Gas Commission

Daniel Gorsic, CEO, SynergyAspen Environmental

The BC Oil and Gas Commission (OGC) now accepts an Alternative Salinity Evaluation as an additional line of evidence to determine sodium and chloride concentrations in organic soils such as muskeg. This approach can be used for Certificate of Restoration (CoR) applications at Upstream Oil and Gas sites.

An accepted alternative lab method (a modified saturated paste) was recommended by SynergyAspen as a result of a research project funded by BC ORGIS. The alternative lab method measures the salt concentration in muskeg pore water. This departs from the standard saturated paste method that measures salt concentrations in muskeg "soil". The alternative lab method eliminates two major biases as follows:

1. Denominator Bias
Lab results for the standard saturated paste method are expressed as weight (mg) of contaminant (i.e. sodium or chloride) divided by the dry substrate weight (i.e. muskeg). Let's assume a sample of wet muskeg weighs 1kg, contains 10 mg of sodium, has a water content of 80%, and the density of dry muskeg equals that of water. The reported analytical result would be 10 mg of sodium divided by the weight of dry muskeg (200 mg). The reported analytical result is 50 mg/kg; five (5) times higher than the actual sodium concentration present in the wet muskeg in the environment.

2. Numerator Bias
Salt dissolves in water. When muskeg samples are collected, salty water is unintentionally and unavoidably lost. Since the standard saturated paste method reports a ratio of mass (mass of sodium or chloride divided by mass of dry muskeg), salty water lost during sampling can bias low reported lab results. Let's assume 50% of the salty water within a volume of muskeg was lost during sampling (i.e. the lost salty water never made it to the sample jar). The reported mass of sodium reported by the lab would decrease by 50%. The analytical result would therefore be one half (or 50%) of the sodium concentration in the environment.

Using the Alternative Salinity Evaluation line of evidence, industry in BC should use the modified saturated paste method and compare these lab results (reported in mg/L) to new proposed guidelines. The new guidelines are a result of a research project completed by Hemmera funded by BC ORGIS.

We will provide an overview of SynergyAspen's research project, an explanation of the Alternative Salinity Evaluation, and benefits of using this line of evidence.

Additional questions can be directed to Daniel at dgorsic@synergyaspen.ca

Presenter Biography

Daniel Gorsic, PChem.
CEO, SynergyAspen Environmental

Daniel Gorsic is a professional chemist and a contaminated sites practitioner with 25 years of experience. He is the CEO of SynergyAspen Environmental Inc. SynergyAspen provides contaminated sites, reclamation and natural sciences consulting services in northeast BC and northwest Alberta. SynergyAspen's purpose is to protect and improve the environment. He is passionate about accurately identifying muskeg contamination. This motivated him to work on the project he's presenting.

EM31 and OhmMapper Surveys, Calibrated with Physical Analytical Soil Data, to Create Impacted Soil Volume Estimates Before Remediation - A Case Study in Achieving Site Closure

David Barcham, Project Manager, Pinchin Ltd. &
Adam Peake, Geophysicist, DMT Geosciences

Volume estimation and three-dimensional mapping of salt-impacted soils is an integral part of both remediation and risk management activities in order to create accurate budgets, alternative remedial options, and to properly characterize the site for risk management. This reviews a case study documenting the process and final results after the combined acquisition and interpretation of novel geophysical survey data using innovative techniques for mapping chloride contaminated soils in the vicinity of a historical pipeline release. The integration of geophysical data from the OhmMapper and EM31 systems with borehole measured concentrations and conductivities enables quantifiable constraints for the geophysical data to be used. For this case study, a start to finish methodology can be recognized, highlighting impacted soil volume estimates compared to actual impacted soil volumes removed from site during a remedial excavation to achieve site closure.

Presenter Biographies

David Barcham, GIT
Project Manager, Pinchin Ltd.

David has consulting experience including management of spill and emergency response, risk assessments, remedial solution design, compliance monitoring, complete remediation, reclamation, Detailed Site Assessments, Reclamation Certificates, environmental audits and liability assessment of upstream sites and corporate assets. This experience extends to commercial and privately held properties. This includes conducting baseline risk assessments, corrective measures studies, remedial feasibility studies implementation planning. David has also been responsible for the on-going environmental compliance of permitted facility programs and the provision of both short-term and on-going strategic advice to promote compliance with operation permits.

Adam Peake, P.Geo
Geophysicist, DMT Geosciences

Adam has significant work experience with seismic geophysical software to his expertise including acquisition, processing and interpretation of Electrical Resistivity Imaging (ERI), capacitively coupled resistivity (OhmMapper), fixed frequency electromagnetic methods (e.g. EM31), seismic methods and Ground Penetrating Radar (GPR) among others. Adam has applied these methods in remediation and reclamation environmental applications, permafrost mapping, bedrock characterization, groundwater detection, and near surface gravel/sand resource identification.

Additional questions can be directed to David at dbarcham@pinchin.com or Adam at adam.peake@dmt-group.com

The Good, the Bad, and the Salty: A Collaboration of Technologies for Site Remediation in Naturally Occurring Saline Areas

Ken Grykuliak, Project Manager, Stantec Consulting Ltd.
Patrick Mah, Geophysicist., DMT Geosciences Ltd.
Cathy Kingdon, Environmental Engineer, Stantec Consulting Ltd.

This gas well, located in eastern Alberta, was drilled in 1914 and abandoned in 1928. The well was licensed in 1932 before the Alberta Energy Regulator's existence, meaning the well was licensed after it was already abandoned. Due to its age, limited information was available regarding on-site infrastructure and production; however, some photographic evidence was found. In 1992 a gas leak resulted in the re-abandonment of the well. As the well was originally grandfathered, no reclamation was completed, but concerns by the neighbouring landowner, after the re-abandonment, resulted in numerous studies being completed at the site. The end goal of site remediation has not been achieved. This presentation shows how science and innovation have been applied to this site to return it to a productive land use.

The project incorporated several technologies, both new and old, and through collaboration between Stantec Consulting Ltd. and DMT Geosciences Ltd. the site is now productive agricultural land after more than 100 years.

The most challenging aspect of this project was the presence of naturally saline and sodic soils at the site and in the region. These soils were extremely high in both electrical conductivity and sodium adsorption ratios and had a soil rating category of unsuitable. So additional techniques using specialized geophysical work, drone imagery, the application of the SST and background salinity values were incorporated into the site assessment process to tease out naturally occurring salinity issues from those related to the historical activity at the site.

Advances in geophysical technologies and methodologies can be used to add insight to environmentally impacted sites and assist in identifying between naturally occurring and anthropocentrically salinity. Rapid conductivity volume was applied to this legacy site and used to generate several conductivity volume models based on existing data and regulatory limits. Drilling and laboratory results were then integrated into the geophysical model to refine the conductivity volume.

Presenter Biographies

Ken Grykuliak, P. Tech. (Eng.)
Project Manager, Stantec Consulting Ltd.

Ken is a senior project manager within the Environmental Services group at Stantec and has over 25 years of industry experience. He has worked on numerous upstream oil and gas, downstream, industrial, and commercial facilities in western Canada. He has extensive experience in the implementation of remedial systems and remedial excavations completing several throughout his career. Over the past 15 years, most of his projects have been conducted at upstream oil and gas facilities. He has dealt with various contaminants of concern, including petroleum hydrocarbons, salinity, herbicides, and metal-impacted soils and groundwater. He also has extensive experience in the design, installation, and commissioning of diverse remediation systems, including multiphase extraction, vapour extraction, air injection, air stripping, interception, groundwater recovery and treatment, and off gas treatment (activated carbon filtration and thermal/catalytic oxidation) systems. Ken's knowledge and skills have allowed him to solve complex technical issues and make decisions that keep projects on track with consideration of time and cost. Ken lives in Edmonton and is a recognized Professional Technologist (Eng.) in the province of Alberta.

Patrick Mah, P.Geo. Geophysicist.,
DMT Geosciences Ltd.

Patrick is a Professional Geophysicist with DMT Geosciences. Prior to joining DMT, he worked as a borehole geophysicist for an engineering firm. Since joining DMT in 2011, Patrick has developed expertise in using geophysics for engineering, exploration, and environmental applications. He has been integral at DMT in developing a multi-disciplinary approach to geophysical data in environmental assessment. Patrick is an active member of the geophysics community and has provided mentorship to several graduating students through the Canadian Society of Exploration Geophysicists.

Cathy Kingdon, P. Eng., Environmental Engineer, Stantec Consulting Ltd

Cathy is an environmental engineer with over 30 years of experience, including over 20 years as part of Stantec's Environmental Services group. Cathy has seen Stantec grow from a small engineering firm to a large multi-national company, and has worked on a diverse range of projects, including contaminated site remediation, site characterization, environmental monitoring, and environmental impact assessment. She has several long-term industrial clients who ensure her life is never boring! From stakeholder engagement to engineering design work, Cathy manages an interesting range of projects. Brownfield redevelopment is one of Cathy's key fields of interest, and the incorporation of risk assessment to make informed remedial decisions for contaminated sites is a practice Cathy likes to incorporate into her project work. Cathy is proud to work with a diverse team of individuals who create multi-disciplinary solutions for contaminated sites.

Additional questions can be directed to Ken at ken.grykuliak@stantec.com or Patrick at patrick.mah@dmt-group.com)

Savona

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Analytical Chemistry in the Commercial Laboratory – Keeping Up

Chris Swyngedouw, Technical Specialist, Exova Group Limited

The remediation and reclamation industry relies very heavily on laboratory generated data and a trust is developed between the laboratory and the client. This presentation will offer some reflections on commercial laboratory analytical chemistry, focusing on minimizing mistrust and how the laboratory report deals with new developing environmental perspectives.

A main objective of environmental analysis is to provide valid results, traditionally shown by the precision and accuracy of the employed analytical method. Although improvements of detection limits of trace analytes are often first thought of to provide a most complete detection, there are several other data quality aspects that need to be considered. Some of the more important ones include:

1. Method detection levels versus environmental criteria;
2. Data quality objectives and checking analytical data quality;
3. Measurement uncertainty and analytical results;
4. Data verification, professional signoff, and chemical sense.

These considerations illustrate not only the necessity of sample pre-treatment and the influence of instrumentation on analysis, but also the need of seeking collaboration between the regulator, the analytical laboratory industry, and other stakeholders such that data and laboratory reports are presented in a context that does not trigger a defensive, emotional reaction. Some examples will be given to illustrate this.

A last reflection will be on the compliance costs an analytical laboratory incurs when a regulation changes or new environmental guidelines are implemented.

Presenter Biography

Chris Swyngedouw, PChem
Technical Specialist, Exova Group Limited.

Chris joined Element in June 2000 and is a Technical Specialist in their Health Sciences and Environmental Division. Other roles at Element (previously Exova) include Technology Transfer Consultant and Consulting Scientist for the environmental analysis division.

Dr. Swyngedouw has a Biosciences Engineering degree from Ghent University, Belgium, a Ph.D. in Organic Chemistry and a Certificate in Management Consulting, both from the University of Calgary.

Chris has been employed by the industry for more than 25 years in various capacities, and has accumulated a breadth and depth of knowledge and experience in method development and validation, technical and special project management, quality systems, and data review and interpretation.

Additional questions can be directed to Chris at chris.swyngedouw@exova.com

Soil Contamination Sampling Intensity: Determining Accuracy and Confidence using a Monte Carlo Simulation

Preston Sorenson, Chief Science Officer, Maapera Analytics Inc.

Soil pollution is an extensive global problem, and effective management of soil contamination depends on accurate characterization and mapping of the extent of contamination. To determine the accuracy associated with different sampling intensities, a Monte Carlo simulation was conducted. A simulated contaminant plume was created based on inverse distance weighting and different sampling intensities were used to generate a plume map using inverse distance weighting. The relative error was then determined as part of a Monte Carlo simulation that ran 10,000 simulations for each grid intensity for a total of 90,000 simulations. The optimal number of samples was determined based on economic factors, and the error functions generated with the Monte Carlo simulations. Average error ranged from 35%, for 25 data points, to 0.8% for 2,800 data points. The 95th percentile error ranged from 85% to 1.6% for the sample data point range. Based on these results, the optimal number of samples, depending on pricing, ranged from 33 samples for a 10 m3 contaminant plume to 1,410 samples for a 10,000 m3 soil contaminant plume.

Presenter Biography

Preston Sorenson, P.Ag.
Chief Science Officer, Maapera Analytics Inc.

Preston is Chief Science Officer at Maapera Analytics, where he leads the development of data analysis systems to process environmental datasets. He has experience conducting Phase I and II Environmental Site Assessments, Soil Monitoring Programs and Remediation projects as an environmental consultant prior to founding Maapera Analytics. Preston has a B.Sc. in Land Use and Environmental Studies from the University of Saskatchewan, a M.Sc. in Soil Science from the University of Alberta and is currently pursuing a Ph.D. in Soil Science from the University of Alberta. Preston specializes in the use of machine learning and geostatistics to solve complex environmental data analysis challenges.

Co-Authors

Stuart McCormick
Maapera Analytics Inc.

Miles Dyck
University of Alberta

Additional questions can be directed to Preston at psorenson@maapera.com

Accessible Management and Analysis of Problematic Data in R: It's Easier Than You Think

Stefan Schreiber, Director, EnviroStats Solutions

Robust scientific inference and evidence-based decision making require data that inform the underlying objective or question. Accordingly, study design and data collection must be question-specific and should not be generalised. The higher the stakes, the greater the required confidence. Confidence in the results is achieved through (1) appropriate experimental design, (2) proper data analysis, and (3) effective and honest visualisation. While this is well known in theory, it is often more complicated in reality, especially when data are messy and require a great deal of cleaning, or data do not behave as "normal" and cannot be analysed using simple linear models or analysis of variance. In such cases, researchers often transform their data to meet statistical assumptions, although other tools are readily available that can easily handle the data in their native format. Another major roadblock, which often leaves important data untouched and thus projects unfinished, is the time investment needed to "wrangle" data into the appropriate shape for the desired analysis. While small datasets can be managed in Excel, larger datasets that involve various cleaning steps require a reproducible programming approach to prepare, analyse, and visualise.

Recent advances in the R Language for Statistical Computing makes Data Science easier than ever, mainly through a set of R packages collectively referred to as the tidyverse. R (incl. the tidyverse packages) is freely available to anyone under the GNU General Public License. Here, we present a full analysis of a "problematic" data set, intended to demonstrate the accessibility of R based data cleaning, wrangling, analysis, and visualisation using the tidyverse approach. We use vegetation cover data as a case study, as they are known for a high proportion of zeros and highly non-normal distributions. While such data are often considered problematic, we will provide straightforward approaches to demonstrate that this need not be the case.

Presenter Biography

Stefan Schreiber, Ph.D, P.Biol
Director, EnviroStats Solutions

Stefan is a professional biologist with over 15 years of academic training in designing field experiments, data analysis and interpretation of scientific results. His work focuses on applied research questions in forest reclamation and ecophysiology. He has also taught university courses in univariate and multivariate statistics. Stefan's passion lies in data organisation and visualisation of scientific results in R. He holds a PhD in Forest Biology and Management from the University of Alberta where he is also appointed as Adjunct Professor.

Co-Author

David Roberts, PhD,
Director, EnviroStats Solutions

Additional questions can be directed to Stefan at stefan.schreiber@ualberta.ca

Marseille

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So You Want To Be An Environmental Scientist? No Fake News Here – Connecting Your Classroom Studies to The Oil and Gas Industry

Kirk Elliott, Environmental Scientist, Trace Associates Inc. &
Megan Rennie, Environmental Scientist, Trace Associates Inc.

No more fake news – we're here to talk about what it takes to be a reclamation expert. New grads often struggle to make a connection between their classwork and the actual workload of starting a career in environmental consulting. This presentation will explain what you can expect in your first reclamation job. After over a decade of interviewing and hiring junior employees we have observed some trends in new grads' changing career expectations. Students get into reclamation with certain job expectations, which can be different from the reality of environmental consulting. Often the limited insight students get before starting their careers is from conferences or presentations where we talk about all the fun and exciting projects that we do. While this is often what gets us all excited about reclamation, the reality is that this is a small part of the day-to-day work that we do.

This presentation will focus on what new grads can expect for their first few years on the job. We will discuss the ever-changing schedules of field work, and the experience and training required for students to build a long-term career in the industry. Working in the reclamation industry is more than just a job, it is a way of life. This presentation will include the perspective of a person responsible for hiring junior employees as well as that of a recent grad who has found success early on in her career.

Presenter Biographies

Kirk Elliott, R.T. (Ag)
Environmental Scientists, Trace Associates Inc.

Mr. Kirk Elliott is a Reclamation Program Manager for Trace Associates Inc. (Trace) with 12 years of experience conducting environmental site assessments, remediation, and reclamation work, primarily in the oil and gas industry. Mr. Elliott grew up on a ranch in southwest Saskatchewan. He now resides near Didsbury, Alberta, with his wife and 5-year-old daughter, and works out of the Trace Didsbury field office. He attended Lethbridge College and graduated in 2007. Kirk is a Partner with Trace and his career has focused on the project and program management of reclamation programs. He has been the recipient of the Alberta Institute of Agrologists 2014 Lethbridge College Career Virtuoso Award and the 2017 Outstanding Young Agrologist Award. Mr. Elliott is a staff supervisor and has managed Trace's summer student program for the past two summers..

Megan Rennie, A.I.T.,
Environmental Scientists, Trace Associates Inc.

Ms. Megan Rennie is an Environmental Scientist for Trace Associates Inc. (Trace) with two years of experience conducting environmental site assessments and reclamation work, primarily in the upstream oil and gas sector. Ms. Rennie grew up in St. Albert, Alberta. She now resides in Calgary, Alberta, where she enjoys spending time cycling, running, and skiing in the mountains and works out of the Trace Calgary office. She attended the University of Alberta and graduated in 2014. Megan's career has focused on vegetation inventory and assessment, rangeland and riparian health, specifically in native grassland and tame pasture. She was the recipient of the 2017 Trace "Rookie of the Year" Award. Ms. Rennie has trained new juniors and summer students on detailed site assessments and groundwater monitoring this past year.

Additional questions can be directed to Kirk at kelliott@traceassociates.ca or Megan at mrennie@traceassociates.ca

Can Small Sensors and Citizen Science be Trusted as Real Science?

Kevin McCullum, Senior Engineer, Matrix Solutions Inc.

Traditional monitoring is performed using expensive fixed reference samplers that involved in-depth calibrations, quality assurance and quality control of data. As we move forward into the new online era citizens want to be involved with sampling to both understand their environment and get the "real story". For reference and regulatory, sampling must be conducted adhering strict protocols and procedures on methods and handling. The intent is to allow for reproducibility and comparability among sampling events in the environment. By turning to citizen and small samplers we see a new emerging style of data collection and dissemination of information to the public. The question asked – who do you believe the everyday person collecting data with nothing to gain versus the corporation or government collecting environmental data. Followed by the question what is the agenda of the citizen science data collection.

The goal overall is to produce credible and quality data that allows us to make decisions with. Examples were investigated on citizen science programs and the benefit of using small sensors to collect data and provide the information in an unbiased form. The nature of citizen science is gaining momentum as it is accessible to everyone to be part of the solution. To this extent both USEPA and Environment and Climate Change Canada have established information packages to give basic procedures to follow for the potential of collecting good data.

With costs of traditional monitoring often quite high, we are in need to collecting scientifically credible data from more locations and at an acceptable cost. We are now at the edge of a strong growth of smaller and often more complex sampling devices that can now include drone-based samples, remote sensing, or miniaturization of mass spectrometers. The cost of equipment and sampling will play into the future of how we collect, analyze, store, and distribute information at and around sites to the public and stakeholders.

Presenter Biography

Kevin McCullum, PhD, PEng,
Senior Engineer, Matrix Solutions Inc

Kevin is senior engineer at Matrix-Solutions Inc, and lecturer at the University of Regina. Kevin holds a Ph.D. in Environmental Engineering from the University of Alberta, with specialties in Ambient Air Quality and River Water Quality. He has work much of his career in the air monitoring field working with airzones throughout western Canada, focusing on air quality data analysis and interpretation, monitoring instrumentation, as well as transport modeling. Kevin works closely with universities teaching courses in Engineering at the University of Regina, and First Nations University and has a passion to deliver partnerships and monitoring research capabilities.

Additional questions can be directed to Kevin at kmccullum@matrix-solutions.com

All Sites with High Hydrocarbon Levels are Contaminated. Myth or Fake News?

Lisa Neville, Director, Technical Science, AGAT Labs

Petroleum hydrocarbons (PHCs) are one of the most prevalent and wide spread contaminants characterized in Canada; their presence in the environment initiates reclamation and remediation programs. Or are they? PHCs may be one of the broadest and most overestimated contaminants in Canada as hydrocarbons exist naturally. Natural (or biogenic) hydrocarbons, stored in boreal soils, are wide spread and can result in exceedance of regulatory guideline levels for hydrocarbons without any human created contamination. Ecologically sensitive peatlands cover an extensive area of northern Canada, and in Alberta alone account for roughly 12 million acres of boreal forest. The boreal forest, including the peatlands, provide a major ecological and environmental service to Canada—and the world—by acting as one of the world's largest carbon sinks, holding trillions of dollars of stored carbon and sequestering hundreds of millions of dollars' worth of carbon every year.

Prescribed methods for site monitoring and assessment are insufficient to delineate the hydrocarbon contributions as several compounds are common to both petrogenic and biogenic sources. Until recently, methods for interpreting the biogenic signal was very subjective and preparatory attempts to remove biogenic impacts are none specific, including silica gel (SG) extraction or mathematical modeling, and are susceptible to their own inherent errors. In addition, clear differentiation of specific high risk compounds is not possible by standard GC-FID analysis. The inability to fully separate the petrogenic and biogenic signals may cause PHC values at a site to appear over guidelines leading to reclamation of un-impacted environments. Conversely, in some cases, during the manual removal of the biogenic signature from a sample some petrogenic signal can also be removed which can lead to a site appearing below guidelines allowing contamination to remain in the environment.

GCxGC (2-Dimensional GC) is the newest method for measuring PHCs. GCxGC enables clear separation, identification, and quantification of biogenic and PHC contributions in a single run – eliminating operator and equipment bias. This method can also be utilized on impacted sites to identify the level of PHC contribution as compared to biogenic and enable informed site assessment while aiding in reducing potentially unnecessary and detrimental impact from remedial activities enabling valuable boreal soils to remain undisturbed.

Additional questions can be directed to Lisa at neville@agatlabs.com

Presenter Biography

Lisa Neville, Ph.D,
Director, Technical Science, AGAT Labs

Lisa is a micropaleontologist with a diverse academic background. Throughout her career she has researched and worked in the fields of earth and environmental science, geology and biology. She has completed an NSERC post-doctoral fellowship with the Geological Survey of Canada, a Ph.D. in Earth Sciences from Carleton University, a M.Sc. in Earth Sciences and a B.Sc. Honours double major in Earth Sciences and Biology from Brock University.

For her post-doc, Lisa transitioned into oil and gas exploration, working as a biostratigrapher characterizing oil and gas potential in arctic formations. The research focuses on hydrocarbon generation, chronostratigraphic refinement, and the history of the Arctic Ocean and its marine to marginal marine sediments. Lisa's Ph.D. research was conducted for the Geological Survey of Canada and was part of a federal program aimed at identifying whether or not by-products of the oil sands operation were impacting natural environments. The program identified that natural climate changes are a significant driver of changes in the environment. Lisa's masters research was conducted for Syncrude Canada and Suncor Energy Inc. and investigated a means of monitoring benthic ecological health in tailings ponds by specifically investigating the response of microorganisms to the by-products of oil sands extraction.

CLRA SOCIAL
17:00 – 18:30

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INDUSTRY BANQUET AND AWARDS 18:30 – 22:30

Exhibition Hall

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Why Western Sky?

Dustin Pate, Executive Director, Western Sky Land Trust
Ellen Magidson, Communications & Development Manager, Western Sky Land Trust

All proceeds from theCLRA Alberta Charity Golf Tournament were donated to Western Sky Land Trust (Western Sky) again in 2018. Western Sky aims achieve a significant and measurable conservation impact in southern Alberta by conservating open and natural landscapes that have important natural, agricultural, scenic, recreational and heritage values. To accomplish this, Western Sky protects critical watersheds in our region, conserve vital habitats and provide managed public access for recreation and education. They also work with other agencies and organizations to further protect and enhance natural areas and champion the conservation of environmentally sensitive lands that support the health of our watersheds.

Western Sky has produced a new and evocative short video (3.5 minutes) that showcases the extraordinary value and beauty of Alberta's treasured landscapes and the need to conserve those vital lands for future generations.

http://www.westernskylandtrust.ca/

Western Sky Land Trust
Conserving Our Sense of Place

Presenter Biographies

Dustin Pate
Conservation Manager, Western Sky Land Trust

Dustin Pate is a native of South Carolina and joined Western Sky Land Trust in July of 2011 as Conservation Planning Manager. He currently oversees landowner outreach and planning, implementation and management of Western Sky's conservation projects. Dustin holds degrees in Historic Preservation and Community Planning from The College of Charleston and a Master of City and Regional Planning from Clemson University. He is currently enrolled in the Haskayne School of Business to complete an Executive MBA.

Ellen Magidson
Communications & Development Manager, Western Sky Land Trust

Ellen Magidson joined Western Sky in January 2011. As Communications & Development Manager, she is responsible for community engagement, marketing, event planning and fundraising.

Previously, Ellen was a 15 year associate with Market Alert Limited, a Toronto based competitive intelligence consultancy that provides primary market research as well as educational support to Canadian corporations. Ellen holds a BA, Economics, from McGill University as well as an MBA, specializing in communications. She serves on a number of not-for profit boards, both national and community-based.

Ellen moved from Toronto to Calgary with her family in 2001, where they all love living under a western sky. Ellen is passionate about the beauty of the Calgary region and Alberta and welcomes the opportunity to further conservation of Alberta's special landscapes.

Additional questions can be directed to Dustin at dpate@westernskylandtrust.ca or Ellen at emagidson@westernskylandtrust.ca

Student Award Recipients

Cruz Canlas
Environmental Assessment & Restoration Diploma Candidate
Lethbridge College

I am from Elkford, B.C. which is a small coal mining town located in the Rocky Mountains. My dad works at Teck Coal and my mom is a dialysis nurse. I have an older brother who is attending the University of Lethbridge and a younger sister who is in grade nine. Presently I am a second year student at Lethbridge College in the Environmental Assessment and Restoration program. Growing up in Elkford, I was exposed to a variety of outdoor activities. My love for fly fishing, mountain biking, skiing, golfing, hiking and camping led me to have a great appreciation for nature and the outdoors. This helped influence my interest in Environmental Sciences. I had the opportunity to job shadow an Environmentalist at Elkview Coal. She was a great resource and highly recommended the program at the Lethbridge College. Now that I am completing the diploma, I look to further my knowledge by pursuing the Ecosystem Management degree that is offered at the College.

Lethbridge College

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Murdoch McKinnon

Bachelor of Science (B.Sc.), Environmental Science Candidate
Mount Royal University

Murdoch McKinnon is a third year Environmental Science student at Mount Royal University. Raised in Calgary, his passion for getting outside started with early camping trips to the Rockies which inspired him to pursue a career that wouldn't be all office work. Environmental Science seemed like a good fit, and since then he has discovered an interest in just about every class he has taken. Murdoch still enjoys getting out to the mountains as often as possible, and can be found hiking and scrambling in the summer and snowshoeing in the winter. His future ambitions are to find a job in reclamation or another area of the environmental industry and to learn how to cross country ski.

Mount Royal University 1910

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Student Award Recipients

Amy McKinnon

Land and Water Resources Program (Reclamation Major) Candidate
Olds College

Amy was born and raised in Calgary, Ab. She spent much of her time growing up in interior B.C. which fostered the love and appreciation she has today for flora and fauna, water and wildlife. Amy has always been a proud Albertan and an advocate for of our provinces' industries, and the resources which have made them so prosperous. She was drawn to the world of reclamation because she was excited by its fusion of environmental stewardship with its supportive capacity to sustain our economy. One of Amy's career goals to perform reclamation work across the country, across all industries. She believes reclamation is imperative for a sustainable future in Alberta, Canada, and across the world; and looks forward to playing a role in shaping that future. In her free time, Amy enjoys watching documentaries, taking care of her houseplants, and wandering through antique stores looking for vintage textiles.

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Valisa Ulrich
Environmental Conservation Reclamation Candidate
Lakeland College

Valisa is from Fort McMurray, Alberta where she lived with her parents and older sister. She was raised to appreciate nature and developed an interest for outdoor activities such as hiking, camping, and skiing. This love and curiosity for nature lead her to earn her degree in geology from the University of Alberta. After graduating, she made the decision that her desire to work with nature could be better pursued through environmental sciences. Valisa is currently enrolled in her second year of Environmental Conservation and Reclamation, and is excited to start applying her knowledge and experience in the field.

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Student Award Recipients

Alison Gries
Environmental Reclamation Program Candidate
Medicine Hat College

Alison Gries was born and raised in the city of Medicine Hat. Growing up she spend a large amount of time playing outdoors with her friends and causing trouble with her mischievous cousins. During camping trips in the Cypress Hills and British Columbia, Alison developed a love for nature and all the beauty it offers. Upon graduating high school in 2016, Alison spent a year working in an effort to find herself. It was during this time that she researched various jobs and degrees stumbling upon the Environmental Reclamation Technologies diploma offered at Medicine Hat College. She knew it was a perfect fit and has thoroughly enjoyed her time in the program. In January 2019, Alison was accepted into the University of Lethbridge and will be continuing her studies this fall, furthering her understanding of our beautiful and delicate environment.

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Kyle Stratechuk
Bachelor of Environmental and Conservation Sciences
University of Alberta

I was born and raised in Edmonton, Alberta and still call the city home. My interest in the environmental sciences came from my childhood, as I often found myself in the mountains for family vacations, typically camping and hiking. I remember loving the nature signs they had out on the trails and would stop to read them all as I found it all so fascinating. I gradually developed an interest in my grade school ecology courses and by the time I decided to attend university, I knew that I wanted to study something related to the environment that would let me work outdoors. This is why I decided to complete my bachelor's degree in land reclamation and pursue a master's degree in the same field. I enjoy being active and spending most of my free time outdoors as well, with some of my favorite activities being camping, hiking, kayaking, and skiing.

Graduate Student Award Recipients

Karly Tram Anh Do

Environmental Design, PhD Candidate
University of Calgary

Karly is a born and raised Calgary native in her second year of the recently-accredited Master of Landscape Architecture program at the University of Calgary. During her time as an undergraduate student studying Zoology and French literature at the U of C, she discovered a passion for conservation biology and cultural heritage. She decided that pursuing a career in landscape architecture would be the best way to marry these newly found interests with her natural attraction to the arts and travelling. In her spare time, she enjoys practicing yoga and teaching piano. Following the completion of her Master's degree, Karly hopes to gain international experience working in the fields of heritage conservation and environmental reclamation.

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Yihan Zhao

Land Reclamation and Remediation, PhD student
University of Alberta

Yihan Zhao, a Phd student in University of Alberta. Her interest in land reclamation began with her Masters program in Canada with Dr Anne Naeth in U of A. She very much enjoys the multidisciplinary nature of reclamation. In her current program, she is working on an international reclamation study in assessing the possibility of a coal derived humic material and arbuscular mycorrhizal fungi as a nutrient enhancing and soil conditioning amendments in coal mine reclamation. She showed her great passion and performance in reclamation research. Yihan was awarded the Len Leskiw Graduate Award in Land Reclamation in 2018.

Outside of research, Yihan's dream is travelling all over the world and she has been to 11 countries till now. She loves to talk with people from different countries and learn different cultures. As a foodie herself, she likes cooking and studying recipes.

CLRA
Award Recipients

Gerry Bourassa Award

Winner to be Announced at the Time of Award Presentation

WEDNESDAY
FEBRUARY 13, 2019

PLENARY SESSIONS: 08:30 – 12:30

Exhibition Hall

Room Sponsored By:

Alberta Society of Professional Biologists

CLRA National Updates

Andrea McEachern, President, CLRA National / VP & Co-Founder, PurLucid Treatment Solutions

CLRA National Updates

Presenter Biography

Andrea McEachern
CLRA National President & VP & Co-Founder, PurLucid Treatment Solutions

Andrea has been the President of the National CLRA Board since 2011 and previously served on the Alberta Chapter board as President. When she doesn't have her 'volunteer' hat on, she works at her company, PurLucid Treatment Solutions, a water treatment company based in Calgary.

Additional questions can be directed to Andrea at andreafong@purlucid.com

Overview of the Conservation and Reclamation Directive for Renewable Energy Operations

Shane Patterson, Science and Technology Specialist, Alberta Environment and Parks

In 2018 the Government of Alberta amended the Conservation and Reclamation Regulation to include renewable energy operations as a specified land activity and released the Conservation and Reclamation Directive for Renewable Energy Operations. The directive contains the conservation and reclamation (C&R) requirements for the generation of electricity from wind, solar, and geothermal. The presentation will outline the C&R related requirements from initial application through to reclamation certification.

Presenter Biography

Shane Patterson, Ph.D, P.Ag
Science and Technology Specialist Alberta Environment and Parks

Shane Patterson is a Science and Technology Specialist within the Land Conservation and Reclamation Policy Section at Alberta Environment and Parks. He received his PhD from the University of Alberta and has been with the GoA for 10 years, 8 with the department and 2 with Economic Development and Trade. During this time he has worked on various initiatives including: assessing the use of earth observation and remote sensing for monitoring land disturbances; and more recently; the development and release of the 2010 Reclamation Criteria for Wellsites and Associated Facilities; and recently, amendments to the Conservation and Reclamation Regulation and release of the C&R Directive for Renewable Energy Operations.

Additional questions can be directed to Shane at shane.patterson@gov.ab.ca

BC OGC Regulatory Update

Devin Scheck, Supervisor, Environmental Stewardship, BC Oil and Gas Commission

The presentation will focus on the passage of Bill 15, the development and the details of the dormant site regulations that are intended to provide a structured approach to ensure the timeliness of restoration for inactive sites in British Columbia.

Presenter Biography

Devin Scheck, P.Ag
Supervisor, Environmental Stewardship, BC Oil and Gas Commission

Devin is a professional Agrologist with a degree in forest science from the university of British Columbia. After a few years working as an environmental consultant out of Fort St John, he joined the BC Oil and Gas Commission in 2001. He has had a number of roles with the Commission and for the past 14 years he has led the OGC team responsible for regulating waste discharges to the environment as well as the remediation and reclamation of oil and gas activity sites. Currently heading the Environmental Stewardship Branch of the Operational Policy and Environment Division, responsibilities include oversight of operational policy related to air emissions, surface water and groundwater resources, site remediation and reclamation, Waste discharge permitting, area based analysis and habitat management.

Additional questions can be directed to Devin at devin.scheck@bcogc.ca

Stop the Spread: Alberta's Decontamination Protocol for the Containment of Whirling Disease and Aquatic Species

Kelly Skaug, Decontamination Technician, Alberta Environment and Parks

In August 2016, the presence of whirling disease was confirmed in fish from Johnson Lake in Banff National Park and the Bow River Basin in Alberta. This was the first confirmed occurrence of whirling disease in Canada. Whirling disease has been observed in the United States since the 1950s and is prevalent in the western and northeastern states. The disease is caused by a microscopic multicellular organism, Myxobolus cerebralis, which can affect trout populations by deforming and killing juveniles. Whirling disease can be transmitted to other water bodies through fish and fish parts, or by moving infected water or sediment on gear, equipment or vehicles.
In response to the growing threat of quagga and zebra mussels in neighbouring Provinces and States, watercraft inspection stations became mandatory in province in 2015 and target out of province boat traffic. In 2018, over 31 000 watercraft inspections where completed throughout the 13 provincial stations. Since 2013, mussel-fouled watercrafts have been intercepted entering Alberta 77 times and Alberta remains invasive mussel free today.

The Government of Alberta is committed to preventing the spread of whirling disease beyond the infected watersheds as well as the introduction and spread of aquatic invasive species by implementing management strategies to reduce the threat to our wild trout populations. In August 2017, the Government of Alberta Decontamination Protocol (http://aep.alberta.ca/fish-wildlife/wildlife-diseases/whirling-disease/stop-the-spread.aspx) became policy and mandatory for a government staff that work in or near water with the intention of extending the adherence to all industries that are working under a Government of Alberta license, approval or contract. Decontamination protocols are the primary mitigation method to prevent the spread of aquatic invasive species and whirling disease and it is imperative that we take the necessary measures to ensure that work in or near water is not inadvertently spreading unwanted species. The shift to the Decontamination Protocol as a condition of approvals licences and contracts will support improved water management decisions as well as to meet the goals and outcomes identified in existing provincial policy. The Decontamination Protocol will be updated in spring 2019 to reflect the work and equipment used in industrial and construction activities that happen in or near water in Alberta.

Additional questions can be directed to Kelly at kelly.skaug@gov.ab.ca

Presenter Biography

Kelly Skaug
Decontamination Technician, Alberta Environment and Parks

Kelly is a Decontamination Technician with the provincial Whirling Disease Program in Alberta Environment and Parks. As a member of the Decontamination Team she works to assist with the implementation of the decontamination protocol for work being completed in or near Alberta waterbodies.

Originally from Perth, ON, she has worked for several non-profit organizations in both invasive species and water monitoring roles. She has been in Alberta since 2015, and has completed several roles within the Government of Alberta including work with the Invasive Species Program. Her educational background includes an Ecosystem Management Technician Diploma from Fleming College in Lindsay, ON as well as a Technologist Diploma in Recreation, Fish and Wildlife from Selkirk College in Castlegar, BC.

Update from the Orphan Well Association

Lars DePauw, Executive Director, Orphan Well Association

Update on OWA activities over the last year and looking forward.

Presenter Biography

Lars DePauw, M.Sc, P.Eng,
Executive Director, Orphan Well Association

Lars has been involved in assessing and managing environmental liabilities in the oil and gas sector for nearly twenty years. His current focus is on leading a diverse group of professionals who are handling the recent influx of properties being designated as orphans in Alberta resulting from the current downturn in the oil and gas industry. A large portion of his time is dedicated to managing the increased volume of properties as well as the substantial increase in funding including a provincial loan that will be repaid by the oil and gas industry.

Prior to joining the Orphan Well Association, Lars worked in the environmental consulting field, the oil and gas service sector and with a large producer. His work in all three sectors focused on the decommissioning and reclamation of oil and gas assets including estimating liabilities.

The Orphan Well Association is an independent non-profit organization that operates under the delegated legal authority of the Alberta Energy Regulator. Orphan properties are wells, pipelines, facilities and associated sites which have been left behind by defunct or insolvent companies and are designated as orphans by the Alberta Energy Regulator.

Additional questions can be directed to Lars at lars.depauw@orphanwell.ca

Alberta's Revised Remediation Regulation

Lisa Fairweather, Alberta Environment and Parks &
Norman Sawatsky, Alberta Environment and Parks

Alberta Environment and Parks (AEP) has amended the Remediation Regulation, which came into effect on January 1, 2019. Changes in the regulation are intended to support effective contaminated sites management and brownfield development. In this talk, we will discuss the major regulatory amendments that you should be aware of and briefly touch on the new draft guidance documents that will support implementation of the regulation.

The presentation will focus on remedial objectives and guidelines in the regulation, Tier 2 letters of compliance, Site-based and limited remediation certificates, duty to take remedial measures and the remedial action plan.

Presenter Biographies

Lisa Fairweather
Brownfield Coordinator, Alberta Environment and Parks

Lisa Fairweather has been Alberta Environment and Parks' Brownfield Coordinator since November 2016 and was awarded the Brownfielder of the Year award in 2017.

Norman Sawatsky, Ph.D, P.Ag,,
Contaminated Sites Policy Advisor, Alberta Environment and Parks

Norman Sawatsky has been working as a contaminated sites specialist for Alberta Environment for 20 years. He is currently working as a Contaminated Sites Policy Advisor for the land policy section in Alberta Environment. Norman Sawatsky has a PhD in Soil Science from the University of Alberta, and a B.Sc. in Chemistry from the University of Winnipeg.

Additional questions can be directed to Lisa at lisa.fairweather@gov.ab.ca or Norman at norman.sawatsky@gov.ab.ca

Partial Reclamation Certificates and Site Reductions

Douglas Dafoe, President and Chief Executive Officer, Ember Resources Inc.

In February 2016, Ember Resource Inc. (Ember) approached the Alberta Energy Regulator (AER) to consider revising the policy to that restricts site reductions and the issuance of Partial Reclamation Certificates. The Guide to Certification for Site Reductions, Additions, Overlaps, Multi-Well Facilities, and Forced Lease Boundary Changes, AEP, Land Policy, 2015, No 2 (Policy) currently restricts lease reductions; however, this practice was permitted and partial reclamation certifications were issued up until 2001.

Following AER consultation, Ember completed a 66 site pilot program on operating minimal disturbance leases to determine if site reductions could be completed in a cost effective manner and to demonstrate that operational and abandonment activities could be carried out on leases with a reduced footprint. The Pilot demonstrated that site reductions could be completed with an acceptable ROI and that most minimal disturbance leases with operation shallow gas wells could be reduced by 50%. After a year of consultation, the AER endorsed the initiative to change the policy and referred Ember to the Alberta Environmental and Parks (AEP) as this policy cannot be revised or repealed by the AER. In February 2018 Ember presented the Pilot and proposed Policy changes to the AEP, the findings of the Pilot were favourably received, however the AEP indicated that more industry consultation would be required to determine if there would be enough industry interest to warrant a change in policy.

Pilot findings and proposed changes to the policy have since been presented to Canadian Association of Petroleum Producers (CAPP) and Explorers and Producers Association of Canada (EPAC), both of which endorsed the proposed policy changes. Most recently in September 2018, Rhonda Goulden, ADM, Policy and Planning with AEP, indicated that the policy was still under review and that further consultation would be required.

The Policy that restricts site reductions and the issuance of partial reclamation certificates is a dated practice that has leaves oil and gas companies stranded with thousands of hectares of fully reclaimed land they no longer need..

Presenter Biography

Douglas Dafoe, CPA, CA, C.DIR
President and Chief Executive Officer, Ember Resources Inc.

Mr. Dafoe has more than 30 years of industry experience in financial and operating positions of increasing responsibility. Prior to joining Ember, Mr. Dafoe was President and Chief Executive Officer of Thunder Energy Inc., a company he co-founded in 1996 and the predecessor company to Ember. Mr. Dafoe has a Bachelor of Business Administration from the University of North Dakota, is a Chartered Accountant and holds the ICD.D certification from the Institute of Corporate Directors.

Mr. Dafoe has served on the Board of Governors of the Canadian Association of Petroleum Producers (CAPP) and several TSX-listed companies. He currently serves on the Board of Akita Drilling Ltd., a TSX-listed company and is also a director of Point Loma Resources Ltd., a TSX Venture-listed company

Additional questions can be directed to Douglas through Bryce Watson at bwatson@emberresources.com

LUNCH & AGM: 12:30 – 13:20

Exhibition Hall

Alberta Chapter Annual General Meeting

Board of Directors

2018 President's Report	• Review of 2018 Events • Golf Tournament • Fall Tour • Artworks
2018 Treasurer's Report	• Review of Fiscal 2018 • Change of Fiscal year end
What's coming for 2019	• Golf Tournament • Lunch and Learns • Fall Tour • 2019 AGM & Conference • CLRA Vision for Moving Forward • Acknowledge Outgoing and Incoming Directors • Announce new Executive Directors

CLRA | ACRSD

PLENARY SESSIONS: 13:20 – 15:30

Exhibition Hall

Room Sponsored By:

Alberta Society of Professional Biologists

Defining and Quantifying the Ecological Restoration Economy

Nicolas Mansuy, Ph.D, Research Scientist, Northern Forestry Centre, Canadian Forest Service

There is a powerful narrative that environmental protection is bad for business and that environmental regulations kill jobs and revenues. However, missing from this public debate has been a detailed accounting of the economic output and jobs that are actually created through environmental conservation, landscape restoration, and mitigation actions—the activities that are part of the "Restoration Economy``. These activities are undertaken by a variety of existing industries, including reclamation specialists, trees planters, nurseries, soils and waste managers, landscape designers, and engineering *firms*, as well as a number of newly emerging markets, including ecosystems goods and services, mitigation banking, and other activities that contribute to restore or reclaim degraded landscapes. Sizing the restoration economy in terms of jobs and market opportunities can support Canadian national priorities and offers a relevant opportunity to leverage its restoration efforts on sensitive issues (caribou recovery, land reclamation, climate change mitigation, fire smarting, watershed management, etc.). In addition, the restoration economy represents an opportunity for Canada to value and highlight national and regional effort, which has been ongoing for years in many disturbed areas and which could contribute to Canada's reputation of excellence in ecosystem management. Valorisation of this economical sector could elevate and link existing national and sub-national processes but also reinforce domestic support for restoration objectives

Presenter Biography

Nicolas Mansuy, Ph.D
Research Scientist, Northern Forestry Centre, Canadian Forest Service

Nicolas Mansuy is a research scientist with the Ecosystem Health department at the Northern Forestry Centre (NoFC). His research focuses on Forest Landscape Restoration in boreal forest ecosystems in relation to Cumulative effects

Research Areas/Expertise

- *Identifying the impact of cumulative effects (natural and anthropogenic disturbance) as feedback mechanisms in boreal forest systems*
- *Assessing the co-benefits, costs, and priorities of landscape restoration to mitigate human footprint in disturbed ecosystems*

Wood-based bioenergy with indigenous communities.

Additional questions can be directed to Nicolas at nicolas.mansuy@rncan.gc.ca

Liability Management: Challenges and a Path Forward

Robert Wadsworth, Vice President, Closure and Liability Management, Alberta Energy Regulator

The AER is building and transitioning to a new liability management framework that establishes inventory reduction targets and uses a corporate health rating to assess a company's ability to address its closure obligations. As a result of the Government of Alberta's Liability Management Review the AER was directed to assess the existing Licensee Liability Rating Program (LLR), implement a corporate health assessment of companies, and introduce inventory reduction requirements. The number and scale of insolvencies along with the pending Supreme Court of Canada's Redwater decision are additional drivers requiring the AER to better manage liabilities associated with energy development. This briefing will provide a status update on the new framework and share next steps.

Presenter Biography

Robert Wadsworth,
Vice President, Closure and Liability Management,
Alberta Energy Regulator

Mr. Wadsworth joined the Alberta Energy Regulator (AER) in 2013 as the Vice President of Authorizations. In 2015, he was named to set up a new business unit "The Centre of Regulatory Excellence" later renamed to the "Enterprise learning Branch" to increase internal staff competencies and skill. In June 2017, Robert was named the Vice President of Closure and Liability Management at the AER.

Robert has more than 30 years' experience in the public sector, and several years in the private Nuclear Power Generation Sector. The latter was at Bruce Power, the largest Nuclear power generator in the world, located on the shores of Lake Huron. Rob's distinguished military career spanning 28 years of service, serving in both the Canadian Armed Forces and with the US Military, including deployment to many tourist hotspots such as Cyprus, Angola, Mozambique, Bosnia. In addition he has 4 years' experience in Afghanistan.

Mr. Wadsworth is a graduate of Royal Military College, with a Bachelor of Arts degree in Military Arts and Science. In addition' he has obtained executive education from Harvard University Kennedy School of Government, Ivey Spencer Leadership Centre and Queens University School of Business.

Additional questions can be directed to Robert through dustin.shauer@aer.ca

Area-Based Closure

Dustin Shauer, Senior Specialist, Alberta Energy Regulator

Area-Based Closure is an innovative approach to an old challenge. The program is designed to enable a more efficient, effective and outcome-based oil and gas infrastructure site closure process from abandonment to reclamation. It is not a prescriptive regulatory requirement but rather a voluntary program. Area-Based Closure is a mechanism for performing closure work that considers risk, economics, and infrastructure in the early planning stages.

The program incorporates timely sharing of information, innovation and best practices for the benefit of the entire oil and gas community to optimize closure activity in pursuit of reducing the liability associated with inactive sites. It is a flexible approach that will reduce oil and gas inactive liabilities through efficient movement of inventory to closure. Industry participants choose the most effective way to achieve timely closure of inactive sites which creates the potential to achieve greater liability reduction for the same expenditure.

Presenter Biography

Dustin Shauer, P.Geo.
Senior Specialist, Liability Strategy, Alberta Energy Regulator

Dustin Shauer is a Senior Specialist with the Closure and Liability Strategy Team at the Alberta Energy Regulator. He has over 13 years of experience in the Alberta public sector following a brief start to his career in the environmental consulting industry. Prior to joining the Liability Strategy Team in November 2017, he worked as a hydrogeologist for the Alberta Energy Regulator, Alberta Environment and the Alberta Geological Survey.

With the Liability Strategy Team, Dustin was a major contributor in the development of the Area-Based Closure program that was released in August 2018. The area-based closure program was developed by the AER, the Canadian Association of Petroleum Producers, the Explorers and Producers Association of Canada, and the Petroleum Services Association of Canada and will encourage more efficient and effective closure of oil and gas infrastructure.

Additional questions can be directed to Dustin at dustin.shauer@aer.ca

AER Record of Site Condition

Daniel Pollard, Remediation and Contamination Management Specialist &
Sara Blacklaws, Remediation and Contamination Management Specialist, Alberta Energy Regulator

In 2019 the AER will be releasing an updated record of site condition specific to energy industries, and which will replace the existing record of site condition for submissions to the AER. The new form, developed with the invaluable support of industry stakeholders, is intended to facilitate ongoing initiatives to support a streamlined and transparent approach to contamination management in Alberta. The new form departs from the content of the existing record of site condition, requiring information on concentrations of any contaminants present and additional details of the management plans. In this presentation we will provide an outline of the intent and content of the form, highlighting the new elements and providing some context, along with further information regarding the release of the form and available guidance.

Presenter Biographies

Daniel Pollard, M.Sc, P.Geo,
Remediation and Contamination Specialist, Alberta Energy Regulator

Daniel Pollard works in the Oil and Gas sector of the Closure and Liability Branch at the Alberta Energy Regulator as a Remediation and Contamination Management Specialist, with a focus on contaminant hydrogeology. He is a Professional Geoscientist with a BSc in Geological Science and an MSc in Geochemistry. He has 13 years of experience assessing and managing contaminated sites.

Sara Blacklaws, PAg,
Remediation and Contamination Specialist, Alberta Energy Regulator

Sara Blacklaws, B.Sc., P.Ag, is a Remediation and Contamination Management Specialist in the Closure and Liability branch at the Alberta Energy Regulator (AER), responsible for providing technical support and subject matter expertise and evaluating legislative compliance within the oil, gas and pipeline sectors. Sara has over a decade of experience with environmental site assessments, contamination management and remediation from consulting in upstream and downstream environments and from working as a regulator.

Additional questions can be directed to Daniel at daniel.pollard@aer.ca or Sara at sara.blacklaws@aer.ca

Remember, You Must be Present to Win!

Thank You!

Thank you for joining us at 2019 CLRA AGM and Conference!
We appreciate your continued support and look forward to seeing you again next year.

Save the date

2020 CLRA Alberta Chapter AGM & Conference
February 26 to 28, 2020
Sheraton Hotel and Conference Centre
Red Deer, Alberta

For more information, event registration, news updates and much more visit our website at www.clra.ca