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Valorisation économique des infrastructures vertes dans le contexte des changements climatiques, Dieppe, Nouveau-Brunswick

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Les changements climatiques représentent l'un des défis majeurs du 21e siècle, entraînant des conséquences dévastatrices sur l'environnement. L'urbanisation rapide et l'accroissement démographique exercent une pression significative sur les villes et l'environnement, ce qui entraîne une diminution des infrastructures vertes et aggrave les risques liés aux phénomènes météorologiques extrêmes. Ces infrastructures, telles que les forêts, les cours d'eau et les zones humides, jouent un rôle crucial dans la régulation du climat, la préservation de la biodiversité et la protection contre les phénomènes météorologiques extrêmes, contribuant ainsi à renforcer la résilience des communautés. Cependant, l'absence de leur valorisation économique entrave leur intégration dans les politiques d'aménagement. Cette communication vise à présenter une méthodologie pour évaluer leur valeur économique, pour sensibiliser les décideurs et promouvoir une approche durable de l'aménagement urbain. La méthodologie adoptée repose sur une approche méthodologique mixte, combinant des méthodes qualitative et quantitative. La revue de littérature et la collecte des données ont été menées en deux phases distinctes, avec une méthode qualitative pour comprendre les concepts et collecter des données, notamment lors de leur valorisation économique. Une méthode quantitative a été utilisée pour l'inventaire et l'évaluation économique des infrastructures vertes, basée sur la quantification des services qu'elles rendent. Les résultats soulignent leur importance, avec des forêts ayant une valeur totale estimée à 766,260,000 $ CAD sur une superficie d'environ 44 km². En conclusion, ces résultats appellent à une intégration des infrastructures vertes dans les politiques d'aménagement urbain pour garantir un développement durable et résilient face aux défis climatiques à venir.

Using organic amendments to improve phosphorus availability

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Phosphorus is a key element in promoting plant development, and fields are often amended with phosphate to increase crop growth. However, soil processes such as sorption can prevent plant phosphorus uptake, particularly in acidic soils. Previous research indicates that organic amendments such as compost and biochar can help control these processes. In this study, two fields, one with a high (295 mg/kg) and the other with a low (49.1 mg/kg) soil phosphorus content, were divided into randomized plots and sown with soybeans. Each plot was given one of the following treatments: compost (7.1 t/ha), biochar (8.1 t/ha), compost + 1% biochar (5.9 t/ha), compost + 5% biochar (7.8 t/ha), P_2O_5 (50 kg/ha), or control. Soil pH and nutrient content were monitored throughout the

growing season, and the soybeans were harvested at the end. Yield, soil pH, and mineral phosphorus did not differ significantly under any of the treatments. In the low phosphorus field, treatments did not significantly change water-extractable phosphorus or micronutrient content. In the high phosphorus field, however, treatments of compost and compost/biochar mixture significantly improved water-extractable phosphorus, and treatments of biochar and compost/biochar mixture significantly increased soil magnesium and calcium content compared to the control. Initial results indicate that organic amendments can improve phosphorus availability in local fields; however, further research is required to fully understand their effects.

Improving sustainability efforts in NunatuKavut by empowering Inuit communities through community based participatory action research

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There are currently many limitations placed on island communities that interfere with their resiliency and ability to succeed in many sustainability-related endeavours. These limitations are widely shaped by western ontologies and colonialist influences that have impacted the ability of many researchers, non-governmental organizations, and other groups to provide effective and equitable aid.

Community Based Participatory Action Research (CBPAR) is a research model that challenges exclusionary norms in western academia that have led to a concerning trend wherein external researchers create and conduct research projects within communities, with little to no involvement from, or benefits to these communities. It emphasizes community engagement and participation in all aspects of research governance; and involves highly collaborative relationships that are developed over time, and respects ethical processes developed through these relationships. As a form of academic power decentralization, CBPAR holds the potential to uniquely benefit island communities, both real and metaphorical.

This presentation will explore the cruciality of co-learning, cross-cultural exchange, and the co-creation of knowledge when working with island communities; and what can be done to improve the ability of island stakeholders and rightsholders worldwide to confront sustainability challenges. This will be done by exploring a case study of a previously implemented CBPAR research project, co-lead by the NunatuKavut Community Council (NCC), centered on improving heat security and energy autonomy in the community of Black Tickle, an Inuit community located in the traditional territory of NunatuKavut, Labrador.

Hybrid AI permafrost modeling

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Deep learning offers a potent method for automatically extracting spatio-temporal features from vast datasets using intricate structures. These structures can learn from historical patterns and project them into the future if strong correlations are identified. However, while it may seem sufficient to build AI models and gather ample data to establish links between inputs and outputs, this approach may not guarantee adherence to physical laws, leading to issues such as extrapolation or 5 observational biases. Incorporating physics into models can provide crucial theoretical guidelines alongside observational data. In permafrost modeling, where data observations are often incomplete and spatial extrapolation is limited, simplifying physics becomes a common practice. This involves approximating solutions that capture broad spatio-temporal features while relying on more readily available predictors, such as surface air temperature or air pressure. Understanding the present-day thermal state of permafrost requires accounting for past climate conditions that have influenced long-term variations in organic 10 carbon reservoirs and ground ice. To address the need for both data and physical constraints, climate models can serve as data generators. CryoGrid Lite, a simplified version of the CryoGrid 3 permafrost model, simulates ground thermal regimes and ice balance using daily data of air temperature, pressure, and geothermal flux. This simulated dataset trains a neural network model to mimic CryoGrid Lite's behavior, with physics equations from the original model integrated into the objective function to guide training and enhance forecast reliability. This study explores a hybrid approach that combines physical process models 15 with the flexibility of data-driven machine learning, aiming to improve permafrost modeling performance while addressing reliability challenges. Integrating physics into AI structures could offer a promising avenue for enhancing their application in geoscience

Identifying barriers to connectivity for Atlantic Salmon in the St Mary's River using a field validated remote sensing framework.

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Habitat connectivity is an important characteristic for migratory species to access the resources and environments necessary to survive and thrive. Due to their anadromous life cycle that takes them from the headwaters of their home rivers out to the open ocean and back, Atlantic salmon (*Salmo salar*) require extensive and well-connected freshwater habitat to successfully reproduce and maintain viable populations. However, the installation of road culverts can fragment aquatic habitats and impede S. salar from reaching their spawning grounds. In mainland Nova Scotia, The St. Mary's River watershed represents an important habitat for a population that has been assessed as 'Endangered.' To predict culvert passability in the St. Mary's River, I use orthophotography and a digital elevation model created from Light Detection and Ranging (LiDAR) to estimate culvert slopes I ground truth these estimations using culvert survey data collected over the 2023 summer. I explore the impact of field-recorded culvert variables such as dimension, shape, and material on a culvert's ability to pass fish. By identifying key factors influencing culvert passability and a method to predict this utilizing remote sensing and existing data, I will produce a culvert risk framework to identify culverts at risk of posing barriers to connectivity. These results can be used to prioritize areas for culvert remediation or eventual road closure and remediation to support habitat connectivity for *S. salar*.

Predicting Olive-sided Flycatcher (*Contopus cooperi*) breeding habitat in Nova Scotia using LiDAR metrics informed by drone data.

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The Olive-sided Flycatcher (OSFL) is a forest species at risk bird in Nova Scotia. The strategy to promote their recovery is expected to revolve around conserving existing breeding habitat once these locations are identified through habitat modelling. Although forest stand structure is known to be an important feature of OSFL habitat, previous attempts to model OSFL habitat in Nova Scotia have not included within-stand variation. The recently available LiDAR (Light Detection and Ranging) data for Nova Scotia enables the calculation of within-stand variation at the provincial level. The objectives of this study are to use high-resolution drone imagery (6 cm resolution) to inform selection of LiDAR (1 m resolution) metrics as inputs for a model that predicts OSFL breeding habitat in Nova Scotia and then to produce the model. The canopy height models for the two datasets were compared for 19 known OSFL territories across the province to identify LiDAR metrics that reflect the within-stand

characteristics visible in the drone imagery. Three metrics were highly correlated in the drone and LIDAR data: canopy cover and the mean and standard deviation of tree height. These LiDAR metrics will then be used as inputs for a Maximum Entropy (MaxEnt) model, alongside other environmental layers important for characterizing OSFL habitat. MaxEnt creates a predicted distribution of the species from known locations and their relationships to the various environmental input layers. Once these habitat locations are identified, more effective recovery strategies can be developed to help conserve the OSFL population in Nova Scotia.

Fisheries management in a changing climate: Insights from the Prince Edward Island lobster fishery

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The one hundred and fifty year-old lobster fishery of the Northwest Atlantic is a management success story, boasting continuous increases in abundance and value since the 1990s. However, there are signs that these trends are changing, and this may be related to climate change. This study attempts to illustrate the adaptive capacity of Prince Edward Island (Canada) lobster fishers through the lens of social capital in the context of climate change and 'islandness'. With data gathered through semi-structured interviews, personal observation and grey and scholarly literature, features of social capital and how it is mobilised are compared and contrasted between two groups of Island fishers with different fishing customs. One group operates with 'territorial use rights in fisheries' (TURFs); the other does not. The data suggests that TURFs may have less adaptive capacity in response to some climate impacts on lobster. It also indicates that micro level features of social capital, such as attitudes and practices of collective action, have less influence on the adaptive capacity of Island fishers than macro level features, which include formal relationships, structures, and participation in the policy process. Lastly, this study and numerous others indicate that continued effort to improve the working relationships of scientists, regulators, processors and fishers is key to strengthening the adaptive capacity of the fishery, as is smaller-scale research and planning.

Scientific Communication in a Vulnerable Language

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The results of a study cannot affect positive change or advance policy if they remain unknown, hence the need for effective scientific communication in diverse forms. This includes reformulating ideas and concepts for different target audiences, and even a translation of those ideas into other languages to broaden scope. The blog post *Scientific communication in a vulnerable language* explores how ideas,

technical terms, and concepts in limnology and paleolimnology can be expressed in Mi'kmaw, and the process behind such a translation of summer 2023 research experiences. The results of aquatic science studies in the maritime provinces of Canada are important for all those living there, including several thousand Mi'kmaw speakers. The expression of these results and the processes involved in studying aquatic science (among other fields) in Mi'kmaw and other Indigenous languages is therefore an emerging key component of the communication of ongoing, pertinent scientific research.

Construction effects on the hydrology and vegetation of the Grenfell Campus fen

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The Grenfell Campus fen is a small wetland located behind Grenfell Campus of Memorial University, Corner Brook, Newfoundland and Labrador. An earlier study conducted in 2008 established surveying plots throughout several distinct zones of the fen, and documented the vegetation and an array of environmental parameters. Since then, two large buildings were constructed in the uphill areas surrounding the fen. The purpose of this current project is to determine if that construction caused any changes to hydrology and, subsequently, to the vegetation communities of the fen. In summer 2023, the key measurements from 2008 were repeated following the original methodology as closely as possible, with additional focus on the groundwater flow regime. Ground-penetrating radar transects provided supplementary data on the stratification of the fen, and confirmed the potential bedrock sloping from the forest towards the fen as well as relatively consistent thickness of the peat layer. Determination of surface elevation, slope, and ground water levels characterized the water flow patterns, and revealed a potential interference to water flow by the new buildings. Surface water pH and electrical conductivity measured at each location, and complemented with apparent electrical conductivity measured with electromagnetic induction sensors, demonstrated shifts in these parameters throughout the area. Vegetation surveys repeated at the established plots showed significant changes in individual plant distributions and plant communities of the fen. The possible relationships between the changes in water flow, environmental parameters and vegetation are discussed.

The potential health impact of airport pollutants on recreation in Kincaid Park in the winter of 2023 to 2024

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Commercial airport activity has a negative impact on the surrounding air quality of the nearby environment. However, little is known about the impact of cold-weather airports and on locations co-located with each other away from other significant emission sources. Here, we investigated the potential health impacts of airport pollutants in Kincaid Park in the winter of 2023-2024 by performing a literature review, setting up a continuous fixed location air quality monitoring system and producing a Gaussian dispersion model to create a likely plume for NO_x emissions. Our findings show a potential health impact, and NO_x emissions entering the park downwind from the airport. These results can used for further study of this issue and possible development of mitigation strategies.

Applying natural disturbance-based management to Nova Scotia forest landscapes with an individual-based forest landscape dynamics model

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The province of Nova Scotia (NS), Canada, is transitioning its forestry approach from production-focused sustained yield forestry to ecological forestry, centered on emulating natural forest ecosystems' cycles, namely natural disturbances. Previous research in Nova Scotia synthesized over 400 years of historic disturbance data to devise a theoretical framework for forest management based on potential natural vegetation (PNV) and natural disturbance cycles. This framework, though untested, aims to guide forest management toward ecological principles. This study seeks to advance this framework by using landscape models to assess its applicability. Objectives include (1) modeling natural disturbance regimes on real forest landscapes to explore resulting age class distributions and species composition and (2) modeling natural disturbance-based forest management regimes to evaluate their emulation of natural disturbances, focusing on age class distributions and forest structure. Three landscapes in NS have been selected based on species composition and dominant natural disturbances. The simulation will be conducted using the iLand model (Individual based Landscape and Disturbance model), which emphasizes natural disturbances and forest ecosystem processes, and includes in-depth simulation of forest management activities. This research aims to provide insights into the feasibility and effectiveness of natural disturbance-based forest management to facilitate the transition to ecological forestry in Nova Scotia and other jurisdictions across the

Wabanaki-Acadian forests of Canada and the US.

Effects of shelter belts on insect biomass and biodiversity in lowbush blueberry, *Vaccinium angustifolium* fields

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The lowbush blueberry *Vaccinium angustifolium* is one of Nova Scotia's most important agricultural industries, producing $123 million in exports in 2021 and covering the largest area of agricultural production in the province. Many insect species are known to be associated with blueberry production, and some several recent studies have reported concerning declines. Shelter belters, a commonly used management practice in agroecosystems play a large role in increasing and maintaining insect diversity in agroecosystems. Surprisingly, there is very little information on the importance of shelter belts for supporting insect biomass in Atlantic Canada. Therefore, the main objective of this study was to determine the importance of shelter belters in supporting insect biodiversity, and to investigate the relationship of insect biomass with local environmental conditions (i.e. wind, max temperature, and precipitation, shelterbelt plant community composition). This study was conducted over the 2023 growing season, in 3 commercial blueberry fields from May to September. Overall insect biomass varied (0.35g-21.64g) among samples over the 4-month period. Furthermore, results also showed a steady increase in insect biomass throughout the growing season rather than during peak blueberry bloom. This result suggests the importance of blueberry fields play a significant role in providing food and nesting resources for insect species from May to September. Higher biomass was also recorded in fields without shelterbelts in comparison to fields with, suggesting the impact of local environmental variables.

Technology and capitalism in Nova Scotia's new Climate Change Plan

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The failure of global and regional climate policies to effectively mitigate the climate crisis stems largely from their refusal to challenge the political economy of capitalism. This study examines Nova Scotia's Climate Change Plan for Clean Growth, a new policy document released in December 2022, to situate it in relation to this global policy paradigm. To do so, it systematically analyzes each mitigation-related policy action in the Plan to uncover relevant political and economic trends in the Plan's proposed climate solutions. The study qualitatively measures two key characteristics of each action: firstly, to what extent the intended reduction in greenhouse gas emissions comes from replacing current technology with "cleaner" options or from creating cultural changes in the collective provision of

needs; and, secondly, to what extent the action leverages individual market incentives or direct collective action to mobilize climate change mitigation. The rankings of each action on these two spectrums are placed on a conceptual compass chart for clear visualization of the results. The analysis finds that most actions are technologically-driven rather than culturally-driven, while they range evenly from highly individual to highly collective. This reliance on technology and economic growth indicates that the Plan follows a predominantly liberal-capitalist ideological framework, in line with global trends. Based on these findings, the study concludes that Nova Scotia's overall approach to mitigating climate change is disingenuous, irresponsible, and morally self-contradictory. Lastly, the authors discuss the potential for a more radical climate politics in Nova Scotia

White-Nose Syndrome and Its Impacts on the Northern Long-Eared Bat and The Little Brown Bat in North America

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White-nose syndrome is a fungal infection responsible for mass mortality among bat populations in North America. The disease is almost always fatal as it awakes bats from hibernation during the cold winter months when no food source is available. This causes them to deplete all of their fat reserves before the warmer spring season arrives. This project investigates the effects of white-nose syndrome, its origin, distribution, and impacts on North American bat populations. This research specifically focuses on the Little brown bat and the Northern long-eared bat, as both species have fallen victim to a significant population decline which led them to be officially listed as endangered by the overnment of Canada under SARA (Species At Risk Act). Methods being used across North America to treat and manage white-nose syndrome are explored and the most promising initiatives are proposed to be applied to the Prince Edward Island context.

Watershed applications of DDT and legacy impacts to benthic invertebrates in lakes from New Brunswick, Canada

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Between 1952 and 1968, 5.7 million kg of the organochlorine insecticide DDT was applied to ~50% of New Brunswick (NB) forests to combat outbreaks of spruce budworm (*C. fumiferana*). Through atmospheric and surface water inputs, DDT is transported to aquatic ecosystems where it can negatively impact benthic macroinvertebrate communities. To examine legacy effects of DDT, we will use sediment cores from 31 lakes across NB to assess legacy DDT, DDD, and DDE (total DDT), as well as chironomid (midge fly) subfossil assemblages using a top-middle-bottom paleolimnological

approach. Watershed delineations were made using ArcGIS and the average amount of DDT applied in each was calculated in kg/ha from digitized historical maps. Using these values, we divided the lakes into low, medium, and high groups. Watershed area and other characteristics (e.g., land use, topography) varied between lakes, and this may influence the amount of total DDT found in lake sediment. Our next steps will involve analyzing chironomid assemblages and determining total DDTs. This data will help resolve historical discrepancies in DDT application records and determine modern DDT contamination. Chironomid response to DDT inputs may reveal how modern assemblages have been shaped by this legacy contaminant.

Variation de la qualité de l'eau sur 20 ans d'une rivière du nord-est du Nouveau-Brunswick et influence des facteurs environnementaux.

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Ce projet de recherche de maîtrise en Études de l'environnement porte sur la variation de la qualité de l'eau de la rivière Pokemouche située au nord-est du Nouveau-Brunswick. Le bassin versant de la rivière, le plus grand de la région, a subi d'importants changements en 20 ans, notamment en termes de déboisement. Le but de l'étude est de décrire les variations de la qualité de l'eau de la rivière sur une période de 20 ans et d'évaluer l'impact des changements territoriaux et climatiques sur cette qualité.

Des échantillons ont été prélevés à 12 stations, de l'amont à l'aval de la rivière, quatre fois par année en 2001, 2002 et 20 ans plus tard en 2022, 2023. Au total, 36 paramètres de qualité de l'eau (pH, teneur en oxygène dissous, coliformes fécaux, concentration de métaux lourds, etc.) ont été mesurés dans les laboratoires provinciaux sur l'initiative du Comité de gestion environnementale de la rivière Pokemouche.

Nous présentons des résultats préliminaires de la variabilité spatiale (entre les stations à l'amont et celles en aval) et temporelle (saisonnière et annuelle) de quelques paramètres choisis. Il est aussi prévu de vérifier si les changements observés dans la qualité de l'eau coïncident plutôt avec les changements territoriaux ou plutôt avec les variations de conditions climatiques. En dernier lieu, les résultats seront mis en contexte avec la Stratégie de l'eau pour le Nouveau-Brunswick 2018-2028.

Using eDNA to assess fish populations in aquatic environments of Prince Edward Island, Canada

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Environmental DNA (eDNA) sampling is becoming a popular method to assess fish populations due to its non-invasive nature and high detection sensitivity. In aquatic systems, eDNA techniques have been successful in assessing the occurrence of target species. The current challenge for eDNA sampling is to effectively gather quantitative data for fish abundance indicators in a given area without having to enter the river. The concentration of DNA in an environment is influenced by factors such as water chemistry, flow, and temperature, which means that a quantitative relationship found with fish counts are region or even basin dependant. This project aims to create a baseline for the use of eDNA sampling as a quantitative method to survey fish populations in Prince Edward Island. eDNA sampling was paired with electrofishing in rivers across the province to assess brook trout (Salvelinus fontinalis) and Atlantic salmon (Salmo salar) populations. In addition, eDNA-only sampling of 62 rivers was conducted to establish species distributions across the province with molecular techniques, and certain sites may be used to validate the quantitative model generated from the electrofishing surveys. Molecular analysis was conducted using existing species-specific qPCR assays gathered from existing literature and tested for cross-amplification among co-occurring species before use. This research investigates eDNA techniques and best practices for integrating eDNA sampling as a quantitative technique into salmonid surveys.

The Path to Carbon Neutrality - Community Based Renewable Energy on Prince Edward Island

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In 2022 Prince Edward Island (PEI) released its 2040 Path to Net Zero document, introducing steps and a framework to facilitate a provincial transition to net zero greenhouse gas emissions by 2040, 10 years before the target set by the Government of Canada. PEI is one of the latest island jurisdictions proposing to act as a vanguard in the mitigation and adaptation of the climate crisis. As the province aims to decarbonize the economy, and expand the production of renewable energy, the introduction of place-based policy and institutions reflective of the socioeconomic characteristics of the island will be important in facilitating this transition. In the same year, Scotland announced that six Scottish Islands would be supported by their Carbon Neutral Islands Project as pilot projects to explore the best practices for local renewable energy expansion for the country. Through a comparative policy analysis

of Scotland's Carbon Neutral Island's project and PEI's 2040 Path to Net Zero, and qualitative data gathered through interviews with members of the PEI community of Mount Stewart, this research explores the characteristics of policy and governance that could best facilitate PEI's energy transition. The research provides an analysis of energy governance on PEI, while also contributing to the available literature on decarbonization and energy transitions.

Regional Climate Projection for Atlantic Canada under SSP245 and SSP585

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We use the Weather Research and Forecasting model for a regional climate simulation in Atlantic Canada. We seek to establish a robust repository of future climate projections for the region, that include the influence of northern ice coverage from the Labrador Sea and Ungava Bay, and sea surface temperatures. The simulation is bounded by a Bias-Corrected ensemble of 18 CMIP6 General Circulation Models that offer better quality boundaries conditions than the individual CMIP6 models in terms of the climatological mean, interannual variance and extreme events. The simulation extends from a historical period from 1980 to 2014 and two future scenarios (SSP245 and SSP585) from 2015 to 2100. The finest resolution at 3 km by 3 km cover an area of 10 approximately 561 kilometers by 462 kilometers around the province of Nova Scotia, Canada. The temporal resolution in WRF is set at 180 seconds, with boundary conditions updated every 6 hours, yielding output at a 6-hour time step for all WRF variables. To validate the historical simulation, we use the reanalysis from ECMWF and Station-Level Inputs and Cross-Validation for North America from The Oak Ridge National Laboratory. These findings 15 provide valuable insights into the model performance and variability, and highlight areas for potential refinement for our projections scenarios. Analyses of the future (2015-2100) simulations are focused on estimating future precipitation (convective permitting), and surface air temperature (T2) extreme events.

Determining effectiveness of forestry beneficial management practices for Olive-sided Flycatcher (*Contopus cooperi*), a species at risk bird in Nova Scotia.

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The Olive-sided Flycatcher (*Contopus cooperi*) is an at-risk migratory landbird that breeds in forests across Nova Scotia. Habitat loss from forestry is the greatest threat to this species in the province, and previous research has found that while Olive-sided Flycatcher (OSFL) occupy protected spaces (e.g., National Parks, Conservation Areas, etc.), these areas are insufficient in recovering this species and that future efforts must shift to include habitat conservation in working forests. Beneficial Management Practices (BMPs) are practices that aim to reduce environmental harms and are often created and implemented for species at risk conservation. A species-specific BMP was developed for OSFL in the context of forest management and recommendations guided by these BMPs were applied in harvesting in Cape Breton. This study aims to determine the effectiveness of the BMP recommendations through analysis of acoustic data obtained using autonomous recording units. Past research has displayed that OSFL vocalization rates vary throughout the breeding season and follow a predictive pattern in the case of successful reproduction. By analyzing song rates and utilizing change point analysis to distinguish between breeding stages, we aim to identify whether OSFL were able to reproduce successfully given harvesting with BMP recommendations. This project will provide insight into the effectiveness of forestry BMPs in mitigating the impact on OSFL in Nova Scotia by assessing how they influence OSFL presence and reproductive activity. The results will allow us to better advise future forest harvesting practices in the province to consider the conservation of suitable habitat for OSFL.

Influence of giant Irish moss-blue mussel clumps on local biodiversity in a Marine Protected Area (Basin Head, PE)

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A unique variety of Irish moss (*Chondrus crispus*) can be found solely in Basin Head, a coastal lagoon in eastern Prince Edward Island. This variety has declined since the 2000s, even after Basin Head was declared a Marine Protected Area in 2005. Little is known about the influence of clumps of giant Irish moss and its associated blue mussels (*Mytilus edulis*) on the biodiversity of Basin Head invertebrates. Thus, this study aimed to address this gap by conducting field surveys and experimental studies assessing the influence of these clumps on local-scale biodiversity levels. Samples were collected from bare sediments, blue mussel clumps, and giant Irish moss-blue mussel clumps. In addition, real clumps

and clump mimics were deployed, and colonization was quantified. Epifauna and infauna that colonized the habitats were present in higher abundance and higher species richness in the most complex habitat, giant Irish moss-blue mussel clumps. It was also evident that different species of amphipods, polychaetes, and gastropods are present in higher proportions across all clump types (and higher in real than mimic clumps) than any other type of marine invertebrates. This talk presents the background, the questions that motivated this study and a description of its design, highlighting the importance of its outcome for understanding the ecology and conservation of giant Irish moss and blue mussels.

Can introduced dung beetle *Onthophagus nuchicornis* effectively use dung from mammals native to eastern North America beyond agroecosystems?

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Dung beetles (Coleoptera: Scarabaeoidea) contribute to essential ecosystem functions (such as organic matter decomposition and nutrient cycling) through natural feeding and nesting behaviours. Introduced dung beetle species in North America are important contributors to ecosystem functions, particularly in managed agricultural environments with livestock. However, they also have the potential to outcompete native species, negatively impacting insect biodiversity. Despite the significant body of research concerning introduced (and often invasive) dung beetles in agricultural contexts, there has been minimal study concerning the impact that these species may have on native dung beetle populations in non-managed environments. Here we examine the potential impact of introduced dung beetle Onthophagus nuchicornis on native dung beetle populations. O. nuchicornis thrives in northeastern North American climates and is a generalist feeder, making the question of its potential impact on native insect biodiversity beyond the agricultural ecosystem is highly relevant. We investigated the potential of this impact in a controlled lab experiment by housing beetles in simulated natural environments and measuring how effectively they used dung from bobcat, red fox, moose, raccoon, and sheep; representing native mammals from herbivorous, omnivorous, and carnivorous feeding guilds. Offspring fitness and the number of offspring produced by beetles feeding on each dung type were measured to determine the effectiveness of each dung type for reproduction. The number of developed offspring was significantly different among treatments (p=0.0005), which could not be explained by the nutritional profiles of the dung samples alone, indicating that other components of dung beyond nutrient availability impacted beetle reproduction.

Evaluation of erosion mitigating infrastructure across Prince Edward Island

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Coastal erosion remains a constant threat to the fragile shores of Prince Edward Island, Canada. Rates of coastal erosion have been increasing across the Island as a result of climate change - a rising sea level, increasing storm events, and changing phenology of sea ice - resulting in threats to the provincial infrastructure of parks, causeways, lighthouses, and golf courses. On direction and funding from the PEI Department of Environment, Energy and Climate Action, the Canadian Centre for Climate Change and Adaptation at the University of Prince Edward Island has undertaken drone flights to monitor the vulnerability of the provincial infrastructure from coastal erosion due to climate change. Drone flights using a DJI Phantom 4 RTK RPAS (Remotely Piloted Aircraft System) were conducted at eight (8) provincial infrastructure sites over three years (twice a year) to understand the End Point Rate (EPR or annual rate of change at meters per year calculated by dividing the distance between coastlines by the time elapsed between aerial imagery), and the Net Shoreline Movement (NSM or the distance in meters between the two coastlines examined). Results from the first years of the study suggest that coastal armouring approaches using nature's forces to protect provincial infrastructure is successful in half of the cases, however following the impacts of post tropical storm Fiona all sites were unsuccessful in slowing rates of erosion. This presentation will describe the provincial efforts at coastal protection and define ways to move forward.

White spruce vulnerability to experimental drought under different levels of pre-commercial thinning

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Drought is expected to increase in severity under current climate change projections which will have negative impacts on white spruce (*Picea glauca*) plantations in Atlantic Canada. Pre-commercial thinning (PCT) is a silvicultural tool used commonly in the region. By allocating more resources per tree, PCT is viewed as a promising way to manage fibre supply while increasing climate change resilience. In this silvicultural trial, we aim to quantify the effects of PCT on the vulnerability of a white spruce plantation to increasing drought. To test this, a fully crossed two-factor factorial drought experiment was set up in New Brunswick, Canada, where we test three levels of rain exclusion (0, 25, and 50%) over 20 x 20 m plots, and three levels of PCT (no PCT, standard, and high). The treatment

combinations are replicated in two blocks totalling eighteen plots. Results obtained during the first year of treatment in 2023 were confounded by an exceptionally wet summer, with precipitation approximately 44% higher than normal. Soil moisture sensors and tree water potential measurements indicate no drought despite our efforts, while electronic dendrometers and manual bands suggest no decline in growth or tree moisture during the growing season. As we plan for an additional season of data collection in 2024, we are hopeful for a summer with typical precipitation patterns.

Comparaison des niveaux de stress physiologiques chez *Homarus americanus* par identification de biomarqueurs

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L'acclimatation des crustacés est un processus qui leur permettent de s'ajuster à des facteurs environnementaux stressants. Cependant, le homard américain (*Homarus americanus*) est très vulnérable aux facteurs de stress lorsqu'il mue, particulièrement dans la zone de pêche du homard (ZPH) 25. Leur vulnérabilité, confirmée par l'augmentation du nombre de homards qui possèdent un indice Brix faible (< 6,0 unités/mL) au cours de la saison de pêche dans la ZPH 25, est la raison pour laquelle il est primordial d'identifier des biomarqueurs de stress chez cette espèce. Afin de déterminer quelle condition de détention sur les bateaux de pêche minimise leur stress physiologique, l'hémolymphe des homards détenus à l'air ambiant, sur de la glace et sur de la glace tout en étant arrosés a été analysée. En effet, les taux de glucose étaient plus élevés chez les homards détenus dans ces conditions de détention que chez les homards fraîchement pêchés. Les homards détenus sur glace (~ 4°C) et détenus à température ambiante (~17°C) avaient des taux de glucose comparables, tandis que les homards humidifiés avaient des taux de glucose plus faibles. Il a également été démontré qu'il y a une relation positive entre l'indice Brix et le taux de glucose chez le homard. Ces résultats démontrent que le glucose et l'indice Brix sont de bons indicateurs de stress chez cette espèce. Enfin, ces résultats permettront d'élaborer des mesures de détention adéquates pour les pêcheurs de la ZPH 25 afin de préserver la santé de cette ressource de pêche importante.

Impacts of drought on the urban environment

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The amplification of urbanization in the second half of the 20th century has become an increasing concern for urban climatologists due to climate changes induced by the increase in size and number of cities. These changes largely contribute to the emergence of natural phenomena that require swift interventions through the implementation of adaptation and management plans to bring various direct and indirect benefits economically, socially, and environmentally. Among these natural phenomena, drought in urban areas of New Brunswick has become a crucial issue due to its impacts on the urban environment and its population. In this context, this study examines this phenomenon based on recent academic contributions. This study explores the specificity of drought in the urban environment, the characteristics of the study area, and the importance of mapping to better understand this phenomenon. This project highlights the growing global importance of drought in cities as well as its physical and anthropogenic mechanisms using current knowledge of New Brunswick's climate.

Understanding Commercial Fishers' Perspectives on Marine Protected Areas in Cape Breton

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My study investigated commercial fishers' knowledge, beliefs, and concerns about Marine Protected Areas (MPAs) and Marine Refuge Areas (MRAs) in Cape Breton, Nova Scotia. As we face declining fish stocks and environmental challenges, understanding fishers' attitudes towards MPAs and MRAs is crucial for effective fisheries management. The St. Anns Bank MPA and the Eastern Canyons MRA off the coast of Cape Breton were the focus of my study. A mixed-methods approach was used, including online surveys of commercial fishers (n=58), interviews with an MPA researcher and a DFO MPA manager, and a review of the literature associated with MPA public consultation. Survey results found 76% of commercial fishers were aware of MPAs while only 47% were aware of MRAs. A large proportion of commercial fishers (88%) indicated they did not trust the government's assurances regarding the potentially negative impact of MPAs on their fishing practices. Almost half (45%) expressed uncertainty about the effectiveness of conservation measures associated with MPAs. The interview with the MPA researcher and Fisheries and Oceans Canada manager provided valuable insights into the complexities of monitoring and managing marine protected areas in Cape Breton, highlighting the challenges of balancing ecological conservation with the diverse interests of stakeholders, particularly commercial fishers. It is essential to establish a connection between policy

goals and community concerns to achieve sustainable fisheries management and protect marine ecosystems. By understanding the perspectives of fishers, this research may contribute to the development of more comprehensive and successful marine conservation strategies in Atlantic Canada.

Characterization of Lake Trophic State and Cyanobacteria Presence in Kejimkujik National Park

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Kejimkujik National Park (KNP) and National Historic Site (Nova Scotia, Canada) is home to numerous lakes which support a multitude of aquatic habitats and recreational activities. The aquatic environment within the park supports a large number of diverse organisms, which are important to the park's ecosystem. Previous studies indicate that cyanobacteria are present within the park's lakes, but little is known about the threats these photosynthetic bacteria pose towards humans and other animals. The objective of this study is to identify the lakes within the park that are most susceptible to cyanobacteria blooms, and to determine what is driving these blooms. Several factors could influence the proliferation of cyanobacteria in KNP, including nutrient abundance, light availability, water temperature, mixing regimes, and flushing rates. This study involves a vulnerability assessment, which uses publicly available spatial and water quality data, to characterize the lakes in KNP. The preliminary results of this study indicate that a potentially toxin-producing cyanobacterium, Nostocales, is present in three of the study lakes. The total phosphorus concentrations for these lakes indicate they are oligotrophic or ultra-oligotrophic, suggesting that nutrient abundance is not the primary cause of cyanobacteria proliferation within these lakes. This indicates that other factors are driving the presence of cyanobacteria within lakes in KNP. Additionally, this study will assess the applicability of using this screening approach for identifying lakes vulnerable to blooms, by comparing information collected from a park-wide cyanobacteria sampling program and a toxin survey conducted in 2023 to the results of the screening approach.

Regional marine trends following the cessation of carbon emissions: what will be the future of warm coral reefs?

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The Zero Emissions Commitment Model Intercomparison Project (ZECMIP) explored what will happen to global climate after reaching net-zero carbon emissions. The globally averaged value of the Zero Emissions Commitment (ZEC) was found to be approximately zero, but has strong regional variations. Moreover, ZECMIP projects that atmospheric CO_2 levels are to decrease, but that leaves unanswered questions about the fate of CO_2 being sequestered in the ocean. Dissolving excess CO_2 into the ocean will result in ocean acidification and will have various negative impacts on marine ecosystems, such as warm coral reef ecosystems. The ZECMIP datasets are used here to examine marine trends such as ocean surface temperature and aragonite saturation state at the locations of three major modern warm coral reefs. The aragonite saturation state implicitly considers ocean pH and in conjunction with surface ocean temperatures, will act as an indicator of healthy coral reef conditions. Given the current global trajectory, major coral reefs are expected to undergo mass bleaching events resulting in widespread coral mortality. Still, there are many unanswered questions about the future of coral reefs. Will the regional marine trends indicate viable warm coral reef ecosystem conditions after CO_2 emissions cease? Or will warm coral reefs face irreversible changes due to climate change?

Analysis of stream flow in response to surface water irrigation and its effects on TSS.

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A 20-year moratorium was imposed in 2002 on the construction of high-capacity wells for irrigation purposes in Prince Edward Island (PEI). The Dunk River Watershed (DRW) within PEI has an area of 16,650 ha with 50% of the land used for intensive agriculture. Before the moratorium was lifted in Summer 2022, farmers of PEI had little choice but to irrigate their crops using surface water. Once the moratorium was lifted, farmers in the DRW were permitted to have high-capacity deep water wells drilled for irrigation purposes. The wells will be implemented for irrigation purposes in Summer 2024. Bi-weekly flow measurements recorded in 8 different sites within the DRW since Summer 2021 will be compared as rating curves with the data to be collected during Summer 2024. Preliminary results show that stream flows are at their annual lowest in the months when irrigation practices are most common. 1 of the sites is equipped with an Acoustic Doppler Current Profiler (ADCP) for further comparative analyses. Stream flow effects on TSS are captured by taking stream samples during precipitation events and combining them with their respective flow at the time of sampling. The samples are taken above

and below a pond hypothesized to act a sediment trap within main tributary of the Dunk River. Sediment from the stream sample will be filtered through a vacuum apparatus to attain TSS. Further particle analyses will be carried out so to infer on the effects stream flow has on TSS.

Mapping Benthic Habitat in the Northumberland Strait with Multibeam Echosounders and Backscatter

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The Northumberland Strait, located in the southern Gulf of Saint Lawrence, is an important area for scallop and lobster fishing. Marine management strategies in this area include the use of scallop fishing buffer zones to protect juvenile lobster habitat. Our understanding of this benthic ecosystem could be greatly improved through creating benthic habitat maps using multibeam echosounder (MBES) technology. This study aims to increase our understanding of this area, particularly surrounding scallop and juvenile lobster habitat. Using bathymetry, bathymetry derivatives, backscatter, and drop camera imaging, substrate maps and habitat suitability maps for lobster were created using random forest and maximum entropy modelling respectively. The sediment was classified into four substrate categories chosen using the folk 7 scale; muddy sand, sand, mixed sediment, and course sediment. The location of the current fishing buffer zones (shoreline to 1km offshore) align with where hard bottom is expected to be. The drop camera footage shows that lobsters were found on mainly mixed sediment. The substrate characteristics from the areas where lobsters were found were compared to those where they were not found to determine the species' habitat preferences. The efficacy of the placement of the fishing zones from a species conservation standpoint will be discussed based on the observed habitat preference. From these early results, it is predicted that there will be ideal lobster habitat located outside of the fishing zones, and that there are areas within the zones that lack hard/mixed sediment.

Sedimentary PEC-Qs of legacy DDTs and the risks to lake benthos in New Brunswick, Canada

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DDT is an organochlorine insecticide that causes adverse effects on organisms and can persist in aquatic environments for decades. This insecticide was used heavily throughout New Brunswick from 1952 to 1968 to manage outbreaks of eastern spruce budworm. Using dated sediment cores from four headwater lakes, this study aims to investigate the long-term changes in midge and zooplankton assemblages as they relate to inputs of DDT, as well as land-use change that we hypothesize leads to greater levels of DDT from the catchment. Preliminary results show that probable effect levels were

exceeded by ~7, ~65, 300 and ~450 times during the peak DDT period. Modern lake sediments remain elevated in DDD and DDE at levels known to impact production and composition of benthic invertebrates. Our goal is to determine how key trophic levels were affected by legacy DDT and to understand lake recovery in an ever-changing world.

MeHg and THg concentrations of Hawaiian invertebrates and surface soils: potential volcanogenic influence

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Mercury (Hg) is a highly toxic element with organic forms (e.g., methyl mercury - MeHg) which can bioaccumulate and biomagnify in food webs. The island of Hawai'i has extensive volcanic activity which has been shown to release elemental and oxidized forms of mercury. Once this Hg is deposited it can be converted into MeHg which enters the base of the food web. Aquatic invertebrates have increasingly been used as biomonitors of MeHg in ecosystems, however there is much less data available on terrestrial invertebrates. This project used a combination of soil THg and invertebrate MeHg samples from 15 locations to examine mercury distribution on the island of Hawai'i. Surface mineral soils (A horizon) were dried, sieved to a silt/clay fraction and analyzed for THg and LOI using thermal pyrolysis AAS. Invertebrates were dried and analyzed for MeHg using ethylation GC-AFS (Brooks-Rand MERX). Soil samples were grouped based on their proximity to the most active volcano, Kileaua and the dominant wind direction. Invertebrates were identified to their taxonomic family, and MeHg data grouped by functional feeding group (i.e., herbivores, omnivores, or carnivores). The carnivore group was significantly higher in MeHg than both the omnivore and herbivore groups (p<0.05). THg in soils was significantly higher in the Kilaeua slope group. More sampling is required to better quantify the spatial distribution of THg in soils and factors affecting bioaccumulation in terrestrial invertebrates.

Bobolink (*Dolichonyx oryzivorus*) breeding and habitat in the Wolastoq/Saint John River Valley

Meghan Oliver[1], Joseph Nocera[1]

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Bobolinks (*Dolichonyx oryzivorus*) rely on the nesting habitat created from hayfields and pastures. However, this association with agriculture has resulted in population declines due to nest disruptions from haying. Delaying hay harvests can improve survival, but this incurs costs to farmers as hay quality decreases further into the summer. As such, it would be beneficial to explore local factors contributing to breeding success to make this management strategy more precise and potentially more acceptable to farmers. Such management plan refinement is especially important for Bobolinks breeding in the Wolastoq/Saint John River (SJR) Valley of New Brunswick because the agricultural areas are highly fragmented and surrounded by a wooded matrix which is unlike most areas in the Bobolink's breeding range. Therefore, the purpose of this study is to assess the small- and large-scale environmental conditions that may contribute to abundance and nest success or failure of Bobolinks breeding in the Wolastoq/SJR Valley. We collected abundance and breeding data using point count surveys and a reproductive index. We used geospatial modelling to quantify 4 nest site characteristics: field area, edge length, maximum distance to edge, and proportion of agriculture in the landscape. Preliminary results suggest that our site metrics do not predict breeding success. Abundance varied throughout the breeding season but peaked in mid- to late-July, and analyses are ongoing to determine which site characteristics best predict abundance. Ultimately, the findings from this study can be used to determine critical nesting habitat and revise population estimates for this threatened grassland bird.

Effects of biological insecticide (tebufenozide) application on the fitness of wood-warblers that prey on spruce budworm larvae

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Eastern spruce budworm (Choristoneura fumiferana; hereafter SBW) outbreaks have periodically occurred in eastern Canada for millenia. These outbreaks can affect forests through mass defoliation, growth reduction, changes in regeneration patterns, and tree mortality. Atlantic Canada is undergoing a trial period for the Early Intervention Strategy (EIS) that optimizes uses of Bacillus thuringiensis var. Kurstaki (Btk) and tebufenozide as control agents. The Bay-breasted warbler (Setophaga castanea), Tennessee warbler (Leiothlypis peregrina), and Cape May warbler (S. tigrina) are known as "budworm-linked warblers", since they show population increases when SBW populations are rising, likely due to the food abundance that SBW outbreaks provide. Little research has investigated if the use

of control products for SBW outbreaks negatively affects these bird populations. Therefore, the purpose of this study is to determine whether such changes can alter reproduction and survival of SBW-linked warblers. I plan to 1) determine adult and nest survival rates of SBW-linked warblers in treated and untreated areas, and 2) use DNA metabarcoding to investigate the diets of SBW-linked warblers in treated and untreated areas. The research will advance our knowledge of SBW control techniques by studying the impact of tebufenozide application on the overall fitness of SBW-linked warblers. Results of this study will allow EIS to be better informed in planning or delivering future SBW control efforts.
Keywords: spruce budworm; warblers; insecticide; tebufenozide; diet

Utilization of marine & coastal fungi as bioremediation tools for plastic pollution

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It is estimated that there are 1.8 million pieces of garbage on the seafloor of the Bay of Fundy. The presence of plastics among the debris can have a negative effect on the overall health of the ecosystem found in this area. However, recent literature has suggested the utilization of marine fungi as plastic biodegradation agents. Using this literature as a guide, we will test four marine fungi (*Cladosporium cladosporioides*, *Alternaria alternata*, *Pleospora herbarum*, and *Trichoderma hamatum*), and their capacity to biodegrade PP (polypropylene) and LDPE (low density polyethene), the two types of plastic most common in the North Atlantic ocean. Environmental variables were considered as part of the experimental planning, by analyzing the differences in biodegradation depending on which of the four types of media was provided for the marine fungi. These media were salt water agar, artificial salt water in falcon tubes, artificial salt water in shaker flasks, and empty petri plates. Plastic biodegradation will be studied using gravimetric weight loss techniques, and SEM analysis. Preliminary results indicate a stronger affinity of all four marine fungi to artificial salt water in shaker flasks, suggesting a correlation between aeration and mechanical degradation and higher levels of colonization. Our study provides new insight as to how to best utilize marine fungi as biodegradation agents targeted towards plastic.

Photovoice as a tool for community building among social and environmental movements

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It is well understood that environmental threats ultimately stem from social dynamics. There is a need for social and environmental movements to work together to build a more just place for every living being. We invited cis-women and gender-diverse activists to participate in a Photovoice project, in which participants took photographs of what motivates them to engage in the environmental, feminist, and social justice movements they support. We found that this participatory research contributes to community building among these movements by bringing together voices of women and gender-diverse people. We held four group meetings, and conducted a thematic analysis of the conversations from which we co-created a thematic tree through participatory analysis. From the initial prompt question "What does it mean to be an activist", we discern four main categories: (1) being conscious of society's injustices, (2) acting collectively to build the world we want, (3) believing in values and (re)learning others, and (4) nourishing your fire and spirit. The collaboration during the research resulted in the creation and reinforcement of connexions among activists. Our findings suggest that photovoice projects are a useful tool to increase community building between groups, and thus strengthen social and environmental movements' cohesion and societal impact.

Shifting Sands: Changing Perceptions of Prince Edward Island's Gulf Shore Dunes

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Canada's smallest and only island province, Prince Edward Island (PEI), lies in the southern Gulf of St. Lawrence on the east coast. The vulnerability of its sandstone coast to erosion and flooding has received significant attention in recent decades, but there is less awareness of the ecosystem services - including protection of property and habitat - provided by the coastal dunes along northern Gulf shore.

My research will use an environmental history lens to understand factors influencing the resilience of PEI's coastal dune systems to human development and climate change. The project will examine both the social and ecological components of change at five dune sites along PEI's north coast from first European contact to the present, using literature review, historical GIS, and local records. The resulting environmental histories will be integrated into a conceptual Social Ecological System model, providing a framework for evaluating past and present coastal management strategies, and for identifying potential leverage points to enhance the system resilience of PEI's coastal dunes.

Based on preliminary research for the St. Peters Bay - Greenwich site, my poster will showcase the evolution of these dunes from 1765 to the 21st century, outlining the impacts of human settlement and changing human perceptions.

Quantifying the Impacts of Forest Management Practices on Albedo and Surface Temperatures in Nova Scotia

Evelyn Rusnak[1]

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To mitigate climate change, the Canadian government has increased focus on natural carbon sequestration through afforestation and reforestation. Traditionally, these forest management practices have increased coniferous tree cover when compared to natural forests. Recent studies have linked forestation practices to increased local surface temperatures caused by the reduced canopy albedo of coniferous tree stands. This study will determine to what extent forest management practices in Nova Scotia, Canada, have impacted stand-level albedo and surface temperatures through the increase in coniferous species canopy cover. Managed and unmanaged stands were identified through geospatial datasets provided by the Nova Scotia Department of Natural Resources and Renewables. Albedo and surface temperature values were derived from optical remote sensor data, collected by Landsat 8 over

July and August 2022 and processed on the Esri ArcGIS Pro platform. Initial comparisons of mean surface temperatures between managed and unmanaged stands show a rise of temperatures within managed forests. Next steps in analysis are to compare mean albedo values, and to run further analysis between different treatment types within managed stands. Following similar studies conducted in Europe, results illustrate a slight but significant rise in surface temperatures of managed forests. These findings bring into the question the efficacy of forests as climate change mitigators. Further research comparing the carbon capture capability of afforestation practices against their potential to increase surface temperatures are necessary to inform future forestry and climate change policies in Canada.

Halifax residential air quality: Public perception and PM2.5 concentrations

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Residents of Halifax's North end are raising concerns over neighborhood air quality. Exposure to elevated levels of airborne particulate matter poses serious risk to human health and increases strain on local healthcare systems. This study aims to quantify local concentrations of PM2.5 and compare them to Canadian Ambient Air Quality Standards (CAAQS). Additionally, it aims to understand public perceptions of air quality and sources of pollution within their neighborhood. PM2.5 concentrations were collected remotely from the 2600 block of Agricola street between November 2022 and November 2023. 276 usable days were recorded. An online 14 question survey is being circulated to people who live or work within a 200m radius of the air quality sensor. Participants are being asked to rate their perception of local air quality trends, level of concern, and perceived sources of pollution. The observed 24-hour average is 50.1 μg/m^3 and the annual average is 12.6 μg/m^3. Strong daily trends show the highest concentrations occur between 2-4pm. Averages exceed the highest CAAQS threshold of both 24-hour and annual averages. Survey results will be compared to observed PM2.5 concentrations to assess the ability of public perception to correctly identify air quality fluctuations. Regardless of perception, long term exposure to elevated PM2.5 levels poses a health risk to the public in the immediate vicinity; especially seniors, children and those with pre-existing conditions.

Effects of biochar and *Rhizophagus irregularis* on *Malus domestica*, variety Honeycrisp, in the presence of apple, replant disease pathogens.

Clara Ryan[1, 2]

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Apple replant disease (ARD) inhibits the development of young apple trees, leading to tree death. Recent research has focused on biocontrol methods to combat ARD following the ban on chemical soil fumigants. This growth chamber experiment used *Rhizophagus irregularis*, a beneficial arbuscular mycorrhizal fungus (AMF), as an inoculant and biochar, pyrolyzed biomass, as an amendment to reduce ARD symptoms on Honeycrisp (*Malus domestica*). Four pathogens isolated from apple rootstocks were also inoculated in certain treatments to determine their role in the ARD complex. After a six-week soil incubation with/without biochar and pathogens in pasteurized and non-pasteurized soils, Honeycrisp seedlings previously inoculated with/without AMF were potted in the incubated soils. Growth of Honeycrisp seedlings increased with AMF inoculation and was significantly higher ($p<0.05$) in pasteurized soils than in non-pasteurized soils. AMF colonization in the Honeycrisp roots were greater ($p<0.05$) in treatments with biochar and AMF present (80%) compared to other treatments. The phosphorus and potassium content in plants indicated a positive correlation (r>0.66) between AMF and plant growth, while their content in soils were negatively correlated (-0.48).

Contextualisation de la transition énergétique de l'industrie pétrolière. Enjeux et défis en termes de gouvernance territoriale : une analyse sous l'angle des représentations sociales

Mahus Dieuveille Samba[1] Majella Simard[1], Jean-Philippe Saprinski[1],

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Le réchauffement climatique dû à l'activité humaine est une réalité de nos jours. Ainsi, cette présentation portera sur la nécessité de la mise en place d'une transition énergétique associée à la gouvernance territoriale adaptée à l'industrie pétrolière. Ces dernières années, la province a été confrontées à de nombreux événements météorologiques extrêmes. Notre vision de la transition énergétique englobe non seulement le passage des énergies polluantes à des sources plus respectueuses de l'environnement, mais également la prise en compte des dimensions écologiques, économiques et sociales de cette transition. Notre étude impliquera une analyse approfondie de la gouvernance territoriale, évaluant le degré d'implication des acteurs de l'industrie pétrolière, de la société civile et de

l'État dans la transition énergétique au Nouveau-Brunswick. Ainsi, nous utiliserons une méthode qualitative en faisant passer des entretiens pour recueillir les points de vue des différents acteurs concernés. Cette étude contribuera à une meilleure compréhension du concept de transition énergétique tel que nous le définissons, ainsi qu'à l'exploration des possibilités de collaboration entre les différents acteurs pour la mise en œuvre d'un projet accepté et soutenu par toutes et tous. En conclusion, cette étude promeut une approche prospective de la transition énergétique dans l'industrie pétrolière du Nouveau-Brunswick, soulignant l'importance de la gouvernance territoriale et de la collaboration entre les acteurs impliqués. Ses résultats devraient fortement influencer l'élaboration de politiques visant à atténuer les impacts environnementaux de cette industrie tout en stimulant le développement local, marquant ainsi une avancée significative vers un avenir énergétique plus durable et équitable.

Evaluating temperate tree species' growth sensitivity to seasonal temperatures

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Under a warming climate, the projected migration of temperate tree species into boreal regions raises complex ecological questions, as the relative importance of specific climatic drivers remain poorly understood. Winter temperatures are commonly assumed to be the main constraint to the northern distribution limits of temperate species. However, evidence of winter cold tolerance in many temperate species challenges this hypothesis, suggesting other limiting factors may be at play. Here, we used a dendrochronological approach combined with on-site daily temperature monitoring across five elevational temperate-boreal gradients in northern New Brunswick to investigate climatic drivers of growth for red maple, sugar maple and yellow birch at their northern range limit. We find that minimum spring temperatures are a better predictor of growth than winter or growing season temperatures for all studied species, highlighting the dominant role of spring conditions at colder sites for these species. For red and sugar maple, we find that warmer spring temperatures are generally associated with increased growth, although we find an opposite effect on the growth the following year. Yellow birch displayed site-specific, contrasted trends in growth coupling with spring conditions. These results challenge the limiting role of winter temperatures on the northern distribution limits of temperate trees and could help enhance our ability to forecast range shifts of temperate tree species under climate change.

Assessing the use of translocation as a tool to prevent the extirpation of a population of yellow lampmussel (*Lampsilis cariosa*) in Nova Scotia

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Yellow Lampmussel (*Lampsilis cariosa*) is a freshwater mussel listed as Threatened in Nova Scotia and Special Concern federally. It is found in three watersheds in Nova Scotia, with the largest population in Blacketts Lake. Chain Pickerel (*Esox niger*) was illegally introduced into Blacketts Lake in 2010, resulting in a drastic reduction in White Perch (*Morone americana*), the obligate fish host of the Nova Scotia Yellow Lampmussel. Yellow Lampmussel cannot complete its lifecycle without this fish species. Density and age demographics of Yellow Lampmussel in Blacketts Lake were estimated by quadrat sampling to assess the impact of Chain Pickerel and examine the need/feasibility of translocation as a tool to prevent the extirpation of this at-risk population. I also carried out a pilot translocation within Blacketts Lake and developed and applied criteria to identify potential recipient lakes for translocated mussels based on habitat suitability and fish host availability. The average mussel density in Blacketts Lake was $1.9(\pm0.45SE)/m^2$. The oldest age class was 28 years and the youngest was seven, indicating no recent recruitment. Mussels responded well to being moved within the lake with all burrowing in sediment and resuming normal activity within 1 hour; no mortality occurred. Of 188 Cape Breton lakes assessed only three had habitat suitable to support Yellow Lampmussel. While there are few suitable recipient lakes, translocation may still be the best hope for preventing the extirpation of the Blacketts Lake Yellow Lampmussel population. However, ecological risks associated with translocation must be assessed before moving forward.

Variations in growth trajectories of white spruce plantations following recent multi-year drought in northern NB

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White spruce is a large part of the Maritime forestry industry, and its reported high sensitivity to drought and heat stress raises significant concerns for wood supply in the region. In this study, we take advantage of the recent drought that occurred during 2017-2021, the most severe in New Brunswick since the 1960s, to assess variations in drought sensitivity according to site and stand characteristics in an intensively managed forested landscape. On average the drought period was the driest in 10 years and the worst year, 2020 was the driest in 125 years. The drought period indicated by the river flow had a 15% drop below the historical mean and the worst year 2020 was 29% below.A dendrochronology

approach was used to assess the drought response of 600 trees across 32 plots that are 16-59 years old with a density range of 250-1900 trees ∘ ha-1. Preliminary analyses indicate that the studied landscape suffered growth declines during the drought period up to 10% annually. Once completed, our analyses should indicate how the stand resilience to drought varied according to stand density, tree age, soil and site characteristic. These results should help inform silviculture guidelines to better manage for drought prevent future growth declines.

Examining Temporal Trends in the Production and Bioaccumulation of Methylmercury in a Restored Wetland Habitat on Brier Island, Nova Scotia

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Mercury (Hg) is a contaminant of global concern due to its ability to undergo long-range transport from distant sources to sensitive ecosystems. In wetlands, Hg is readily methylated to methylmercury (MeHg) by sulfate-reducing bacteria. MeHg, a neurotoxin, then bioaccumulates and biomagnifies through aquatic food webs. Our study site, Big Meadow Bog (BMB) on Brier Island, Nova Scotia, underwent a water table restoration in 2018 which flooded the bog, altering Hg cycling. To determine the effects of this flooding on the biogeochemical cycling of Hg, outflow surface water was collected over five years (2018-2023) and invertebrate samples were taken over three summers (2021, 2022, and 2023). The filtered water samples were analyzed for MeHg, total mercury (THg), dissolved organic carbon (DOC), and nutrients (PO_4^{3-}, NO_3^-, and SO_4^{2-}), while THg and MeHg were quantified in invertebrate tissues. MeHg, DOC, PO_4^{3-}, and NO_3^- concentrations were significantly higher in the first year post-flooding and decreased through subsequent years. MeHg, DOC, and NO_3^- concentrations were all strongly correlated and significantly higher in the summer months than the winter months, indicating that biotic MeHg production was considerably affected by these factors. MeHg concentrations in water were correlated with those in invertebrate tissues, suggesting that this environment is conducive to invertebrate MeHg uptake. Further investigations into the composition of DOC and its role in MeHg cycling as well as the role of nutrients in the bioaccumulation of MeHg is warranted to complete our understanding of the biogeochemical cycling of Hg in altered wetlands.

Direct and Indirect Trophic Interactions in a Marine Sedimentary Bottom: Can Habitat Complexity Play a Role in Prey Survival Rates?

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The giant Irish moss *(Chondrus crispus)*, named after its broad fronds, is a red alga found exclusively in the Basin Head Marine Protected Area, Prince Edward Island. The alga forms clumps with blue mussels *(Mytilus edilus)*, which are known to contribute to local diversity and provide habitat and refuge to native mud crabs *(Panopeus herbstii)* against predation by European green crabs *(Carcinus maenas)*. However, little is known about their potential role in behaviourally mediated indirect interactions (BMII). We assessed whether this and two other habitats (bare sediments and blue mussel clumps), had an influence on indirect interactions between green crabs, mud crabs and a bottom level prey (juvenile eastern oysters, *Crassostrea virginica*). Field tethering experiments showed that the most complex clumps increased survival of mud crabs. Laboratory experiments show the same outcome for oyster survival rates against mud crabs. However, when the presence of a green crab (confined within a fish box) was added into the system, oyster survival rates greatly decreased as habitats became more complex. Such results can be explained by a change in mud crab behavior, which in the indirect presence of the green crab, activity rates decreased, with an increase in sheltering behaviour. Through the outcome of these trials, habitat plays an important role as a mediator of both direct and indirect interactions.

Casting Light on Mercury: A Comparative Analysis of Brook Trout in New Brunswick

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Although mercury is an element that naturally cycles through the Earth's spheres, human activities have led to levels 300-500% above background over the past century. Through the cycle of methylation mercury is transformed into a bioavailable form allowing for uptake into the biosphere. Bioaccumulation of mercury in fish tissue leads to both adverse effects for the fish and consumers. Using ICP-MS, mercury content in brook trout was determined across 14 lakes. Results from this study were compared with a lake survey performed in 1994 to analyze mercury trends within brook trout over the past 30 years. Of the 14 lakes studied, Neary Pond was found to have the highest average concentration of mercury (420.4 ± 308.5 ng/g) and Kenny Lake was found to have the lowest (36.4 ± 6.7 ng/g). Only one fish from Neary Pond was found to be above Canadian regulatory limits of mercury of 0.5 ppm (500 ng/g). Fulton's condition factor in relation to mercury content in fish was

found to show a negative correlation (F=12.63, p=0.0006). No statistical difference in mercury over the past 30 years was evident (df=13, p>0.05); however individual lakes experienced variation. Caribou Lake experienced the highest decrease (-481.9 ± 329.2 ng/g) and Neary Pond experienced the highest increase (159.2 ± 128.6 ng/g) over 30 years. Findings from this study demonstrate that while mercury variations are noted between lakes, mercury levels across lakes in New Brunswick have experienced little change over the past 30 years.

Case Studies on the Cradle-to-Gate Life Cycle Assessment of Softwood Lumber Production

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The urgent need to address greenhouse gas (GHG) emissions, has increased the focus on sustainability, especially within the construction sector. Globally, buildings account for 40% of carbon dioxide emissions, with 80% of embodied carbon originating from structural materials. Aligning with sustainable development goals, nations prioritize materials with lower environmental impacts, such as wood. Wood, acts as a carbon sink, mitigating climate change. The absorbed carbon during tree growth, remains stored in harvested wood products throughout their active service lives, especially in structural materials with a lifespan of 50 to 100 years, offering an environmentally superior alternative to steel and concrete, which heavily rely on non-renewable fossil fuels, resulting in significant carbon footprints.

This study was aimed at using the Life cycle assessment (LCA) as a scientific method to evaluate the environmental impact on the manufacturing of softwood lumber in New Brunswick, Canada. Data were collected by survey questionnaires and on-site visits from one softwood sawmills, covering production, raw material and fuel usage, electricity consumption. The LCA software, SimaPro, was employed to perform life cycle impact assessments (LCIA) using the North American impact method, TRACI 2.1 (Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts). The results showed that the softwood lumber production of the examined mill emitted approximately 62 kgCO2e/m3, excluding carbon storage. Mainstream operations contributed over 50% to total emissions. Carbon stored in lumber was about 748 CO2 eq, which was twelve times as large as its cradle-to-gate carbon footprint, a significant environmental benefit.