

Report

on

Literature & policy review to inform opportunities to integrate nature-based solutions and restoration work on the Fraser Estuary.

Written By

Ilyas Kanybek, UBC Sustainability Scholar, 2024

Prepared For:

James Casey, Senior Specialist, Restoration

WWF-Canada



August 2024

Disclaimer

This report was produced as part of the UBC Sustainability Scholars Program, a partnership between the University of British Columbia and various local governments and organisations in support of providing graduate students with opportunities to do applied research on projects that advance sustainability and climate action across the region.

This project was conducted under the mentorship of WWF-Canada staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of WWF-Canada or the University of British Columbia.

Territorial Acknowledgment

The author acknowledges that the work for this project took place on the unceded ancestral lands of the Coast Salish peoples, including the territories of the Musqueam, Tsleil-Waututh, and Squamish Nations. These lands have been stewarded by these Indigenous communities for thousands of years, and their deep connection to the Fraser River Estuary is rooted in a profound respect for the natural world. The author recognizes the enduring presence and cultural significance of these lands to the Coast Salish peoples and acknowledges the privilege of conducting this work in a place that holds a deep historical and spiritual importance. The author is committed to honoring the knowledge, traditions, and ongoing contributions of Indigenous communities in the preservation and restoration of these vital ecosystems.

Acknowledgments

I would like to express my sincere gratitude to my mentor, James Casey from WWF – Canada, whose guidance, encouragement, and invaluable insights have been instrumental throughout the course of this project. His expertise and unwavering support have been essential in shaping the direction and outcomes of this research.

I extend my appreciation to the UBC Sustainability Scholars Program for providing me with this opportunity and the necessary support to undertake this project. The program's resources, support and structure have significantly contributed to the successful completion of this work.

My heartfelt thanks go to the key stakeholders and experts on and from the Fraser River Estuary who participated in the interviews and provided their valuable perspectives and knowledge. Their contributions have greatly enriched the quality and depth of this research.

I would also like to acknowledge the support and encouragement of my colleagues and friends at WWF – Canada, who have provided a collaborative and stimulating environment throughout this journey.

Thank you all for your support and contributions to this project.

Table of Contents

Disclaimer	2
Territorial Acknowledgment	3
Acknowledgments	4
Table of Contents	5
Executive Summary	6
Acronyms	7
Glossary	8
Introduction	11
Methodology	14
Key Terms in Policy Documents and Literature	16
Literature	16
Policy	19
Findings	24
Discussion.....	29
Alignment of Policy and Practice	29
Inconsistent Access to Funds.....	30
Structure of Property Ownership	30
Bibliography	32
Appendix 1	36

Executive Summary

This report analyzes global and local restoration policies, identifying gaps in integrating nature-based solutions. The review examines biodiversity-related policies of the Government Canada and the province of BC to assess alignment with global conservation objectives in the Convention on Biological Diversity and Canada's commitments to halt and reverse biodiversity loss. The review highlights the need for better ecosystem mapping policies, steady funding, and communication of restoration benefits to property owners.

Keywords: Fraser Estuary, Nature-Based Solutions, Ecological Restoration, Restoration Policies.

Acronyms

BC – British Columbia

CBD – Convention on Biological Diversity

ER – Ecological Restoration

EU – European Union

IP – Interview Participant

FAO – Food and Agriculture Organization

NBCS – Nature-Based Climate Solutions

NBSAP – National Biodiversity Strategy and Action Plan

SER – Society for Ecological Restoration

UN – United Nations

WWF – World Wide Fund for Nature

Glossary

Degraded Ecosystem – Degradation (of an ecosystem) – International Principles and Standards for the Practice of Ecological Restoration describes as a level of deleterious human impact to ecosystems that results in the loss of biodiversity and simplification or disruption in their composition, structure, and functioning, and generally leads to a reduction in the flow of eco- system services (p. 78).

Ecosystem – in the International Principles and Standards for the Practice of Ecological Restoration is described as – assemblage of biotic and abiotic components in water bodies or on land in which the components interact to form complex food webs, nutrient cycles and energy flows. The term eco- system is used in the Standards to describe an ecological assemblage of any size or scale (p. 79).

Ecosystem Health – According to the Draft British Columbia Biodiversity and Ecosystem Health Framework – concept or metaphor that describes environmental conditions in relation to natural/historical benchmarks for biodiversity and ecosystem structures, functions, and processes. Unhealthy ecosystems are degraded by human/industrial use (p. 3). Achieve a level of stewardship that maintains and enhances biodiversity, ecological integrity, and ecological resilience across the province (p. 5).

Reference condition – in Ecological Restoration Guidelines for British Columbia is defined as a less disturbed ecosystem similar to the one requiring restoration. (p. 69) AND undisturbed or less disturbed contemporary “reference” areas and historical landscape descriptions can be used in the development of restoration goals. Plant, animal, soil, and water data from these reference ecosystems provide useful “templates” for restoration work in similar sites (Gayton 2001). The potential and problems of using both contemporary and historical reference area information are

discussed here in turn. The serious restoration practitioner should always consult a number of historical and contemporary sources before constructing a template for restoration (Gayton 2001) (P. 6).

Restoration – according to the Convention on Biological Diversity “Restoration refers to the process of actively managing the recovery of an ecosystem that has been degraded, damaged, or destroyed. Restoration activities can be undertaken for a variety of reasons and across a continuum of actions. For example, ecological restoration includes efforts to increase the area of a natural ecosystem and its integrity through recovering an ecosystem that has been degraded or destroyed, this includes conversion of non-natural transformed ecosystems back to a natural ecosystems state. On the other hand, ecosystem rehabilitation includes efforts to increase ecosystem functions and services of transformed ecosystems. Given, the continuum of restoration activities, efforts to reach this target should be specific and identify the type of restoration being undertaken, the overall objectives being sought, and the type of area or ecosystem being restored.”

Restoration Risks/Vulnerabilities – According to the Ecological Restoration guidelines for British Columbia restoration work may involve risk to ecological values or species at your site, as well creating risk to property values. As part of your planning process, you should ensure that any risk is warranted and mitigated. Getting the proper permits, making detailed plans, and consulting with the community will lower your liability and your risk. An obvious example of managing risk is with fire-supported restoration. If you plan to do a prescribed burn, you will need to manage risk to organisms and habitat features on the site, as well as ensure that your fire doesn't escape and damage property. Other options besides fire will need to be explored when the risk or consequence of failure is too high.

Nature-based solutions (NBS) – are defined by International Union for the Conservation of Nature (IUCN) as actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.

Introduction

The Fraser River Estuary, located in British Columbia, Canada, represents a critical, globally significant ecological zone where the Fraser River meets the Pacific Ocean. This unique estuarine environment encompasses diverse habitats, including tidal flats, salt marshes, and mudflats, which support a rich array of biodiversity and provides essential ecosystem services. These habitats are vital for migratory birds, fish species, and other wildlife, as well as for protecting shorelines and offering recreational opportunities to local communities. The Estuary has also experienced high development as it is home to the Greater Vancouver area. The high level of impact of development and urbanization is an important characteristic of Fraser River Estuary.

In recent years, the importance of NBS in ecological restoration efforts has gained significant attention globally and in Canada in particular. Nature-based solutions leverage natural processes and ecosystems to address environmental challenges, including climate change mitigation and adaptation, biodiversity conservation, and water management. The Convention on Biological Diversity (CBD) and other international frameworks have highlighted the need for effective restoration of degraded ecosystems to enhance resilience and ensure sustainable development.

This project is aimed to review existing NBS related literature and Canadian federal and provincial policies to better inform and broaden our understanding of frameworks integrating NBS into the restoration work on the Fraser Estuary, as well as seek ways of how it could be better implemented. The primary objective is to understand ways to integrate NBS into restoration policies to supporting ecosystem resilience, biodiversity conservation, and climate change adaptation on a federal policy level.

The project is structured around several key objectives. Firstly, it aims to conduct a policy review to understand how different levels of governments within Canada and on international level define terms related to ecosystem restoration, such as "degraded land," "converted land," "effective restoration," "biodiversity offset," "biodiversity credit," "habitat bank," and "offsets." This review provides valuable insights into the existing regulatory landscape governing restoration efforts in the Fraser River Estuary.

Secondly, the project undertakes a gray literature search to identify and analyze Nature-Based Climate Solutions (NBCS) projects implemented across the Fraser River Delta. By examining the spectrum of NBCS initiatives and their alignment with restoration practices, the project aims to identify opportunities for integrating nature-based solutions into broader restoration strategies within the estuarine environment.

Furthermore, the important contribution of the project is the qualitative research through the development of interview questions and the conduct of expert interviews with key stakeholders and researchers involved in restoration activities within the Fraser Estuary region. These interviews offer valuable insights into the current state of restoration practices, their contributions to NBCS, and potential areas for improvement or innovation.

Based on the findings from the policy review, literature search, and expert interviews, the project will synthesize and analyze the gathered data to generate recommendations for potential enhancement of restoration practices in the Fraser River Estuary. These recommendations can be a resource for restoration practitioners, policymakers, and other stakeholders involved in ecosystem management and conservation efforts in the region.

Overall, this project aims to contribute to evidence-based restoration strategies that bridge gaps between policy, research, and on-the-ground practice. By promoting sustainable and

effective approaches to ecosystem restoration, the project seeks to contribute to the broader objectives of biodiversity conservation and environmental stewardship in the Fraser River Estuary.

Methodology

This section outlines the methodological approach employed in and for the *Literature & policy review to inform opportunities to integrate nature-based solutions and restoration work on the Fraser Estuary*. The methodology is designed to comprehensively review and analyze restoration practices, focusing on integrating nature-based solutions (NBS) to enhance ecosystem resilience and biodiversity conservation in the Fraser River Estuary. The researcher utilizes a mixed-methods approach, incorporating policy review, literature search, and qualitative research through stakeholder interviews.

Policy Review

The objective has been to understand how different levels of government and different policy documents produced by them define key concepts related to ER and to identify the regulatory landscape governing restoration efforts in the Fraser River Estuary. The process included following steps:

1. Document Collection: Relevant policy documents, legislative texts, and regulatory frameworks were collected from federal, provincial, and local government sources under the guidance of the mentor. Key documents include but are not limited to the Convention on Biological Diversity (CBD), Canada's 2030 National Biodiversity Strategy and Action Milestone Document, and the Tripartite Framework Agreement on Nature Conservation.
2. Content Analysis: The collected documents were analyzed to extract *definitions and interpretations* of key terms such as "degraded land," "converted land," "effective restoration," "biodiversity offset," "biodiversity credit," "habitat bank," and "offsets." This also involved *identifying the frequency of usage* and context of these terms within the documents.

3. Comparative Analysis: The definitions and regulatory approaches and the frequency of usage were compared across different policy documents to identify inconsistencies, gaps, and potential benefit for the Fraser River Estuary.

Qualitative Research – Interviews

I conducted [N] semi-structured interviews with key stakeholders and experts involved in restoration activities within the Fraser Estuary region, focusing on their current practices, challenges, and opportunities for integrating NBS.

Preliminarily we have identified key stakeholders through a network analysis under the guidance of the mentor, including government officials, researchers, environmental organizations, and local community representatives. Prior to that interview questions were developed aimed to explore various aspects of restoration practices, NBS integration, policy implementation, and stakeholder collaboration. The questions were designed to elicit detailed, qualitative responses.

These in-depth interviews were recorded and then transcribed using AI for accurate data capture. The transcribed interviews were analyzed using qualitative coding techniques to identify recurring themes, patterns, and insights. This analysis provided a nuanced understanding of the practical and policy-related aspects of restoration work in the Fraser River Estuary.

Synthesis and Reporting

To integrate findings from the policy review, gray literature search, and qualitative research into one comprehensive report that would be useful for the restoration practices in the Fraser River Estuary, findings were synthesized to provide a comprehensive overview of current restoration

practices, policy frameworks, and stakeholder perspectives. This synthesis ensured that all relevant data from various sources were cohesively combined into one document – current report.

Some recommendations were also formulated to guide the integration of nature-based solutions (NBS) into restoration strategies. These recommendations addressed areas such as policy harmonization, best practices, new ideas in stakeholder engagement, and potential areas for innovation, ensuring they were practical and relevant for enhancing restoration efforts in the estuary.

This mixed-methods approach ensures a thorough and holistic analysis of restoration practices in the Fraser River Estuary, providing a robust foundation for developing effective and sustainable ecosystem restoration strategies.

Key Terms in Policy Documents and Literature

This section analyzes the occurrence of key terminology in articles published in ScienceDirect and 10 key policy documents. These results would range from the year of publication of the Ecological Restoration Guidelines for British Columbia in 2002 until 2024, spanning 22 years, with a checkpoint in 2019 when the 2nd edition of International Principles and Standards for the Practice of Ecological Restoration was published.

Literature

The data on the occurrence of the term "**ecosystem health**" in article titles on ScienceDirect from 2002 to 2024 is in two key periods: 2002–2019 and 2019–2024.

- **From 2002 to 2019**, there was a steady increase in the use of "ecosystem health" in article titles of around 15%. Starting with 1,419 mentions in 2002, the term's occurrence grew to 15,604 by 2019. The notable acceleration in mentions, especially from 2011 (4,474 articles with the term in their title), onwards.
- **2019 to 2024**: further rise in mentions, from 15,604 in 2019 to 29,143 in 2024, with approximately 13% growth a year. The sharp rise of 30% from 2020 (19,071) to 2021 (24,858) could be connected to the publication of International Principles and Standards for the Practice of Ecological Restoration. Overall, the term "ecosystem health" has seen substantial growth in usage, with a pivotal increase post-2019.

The occurrence of the term "**reference condition**" in article titles on ScienceDirect has seen substantial growth from 2002 to 2024.

- **2002–2019**: The term's mentions increased steadily from 85 to 3,390, with notable acceleration in the latter half of this period, reflecting an annual growth rate of approximately 24.21%.
- **2019-2024**: The trend continued upwards, peaking at 5,843 mentions in 2023, with an annual growth rate of approximately 6.28%.

The occurrence of the term "**environment**" in articles on ScienceDirect

- **2002-2019**: Starting from 721 mentions in 2002, the term "environment" saw a substantial increase to 11,309 mentions by 2019. This represents significant growth over the 17-year period, with an average annual growth rate of approximately 18% per year.
- **2019-2024**: From 2019 to 2024, mentions increased from 13,848 to 21,639, with an average annual growth rate of approximately 9.3% per year.

The occurrence of the term “**ecosystem**” in article titles on ScienceDirect from 2002 to 2024.

- 2002-2019: The term’s mention started at 5,100 in 2002 and rose to 34,312 by 2019, with an annual growth of around 12%.
- 2019-2024: The number of data points increased from 34,312 in 2019 to 49,967 in 2024, with an annual growth of around 8%.

The occurrence of the terms "**degraded**" and "**degradation**" in article titles on ScienceDirect has seen substantial growth from 2002 to 2024.

- **2002–2019**: The term's mentions increased from 193 to 7,212, with an annual growth rate of approximately 23%.
- **2019-2024**: The trend continued upwards, reaching 11,058 in 2024, with an annual growth rate of approximately 9%.

The occurrence of the term "**biodiversity**" in article titles on ScienceDirect has seen significant growth from 2002 to 2024.

- **2002–2019**: The term's mentions increased from 1,645 to 13,971, with an annual growth rate of approximately 13.41%.
- **2019-2024**: The trend continued upwards, reaching 18,456 in 2024, with an annual growth rate of approximately 5.73%.

Analysis

From 2002 to 2024, the occurrence of key environmental terms in articles published on ScienceDirect reflects evolving research trends and priorities. The term "ecosystem health" saw a significant increase, from 1,419 mentions in 2002 to 29,143 in 2024, with an annual growth rate

of around 13% post-2019. Notably, there was a sharp rise of 30% from 2020 (19,071) to 2021 (24,858), potentially linked to the publication of the International Principles and Standards for the Practice of Ecological Restoration. Similarly, the term "reference condition" grew from 85 mentions in 2002 to 5,843 in 2024, with a slower annual growth rate of 6.28% post-2019. The term "environment" experienced significant growth from 721 mentions in 2002 to 21,639 in 2024, with an annual growth rate of approximately 18% from 2002 to 2019 and 9.3% from 2019 to 2024. The term "ecosystem" maintained steady growth, with mentions increasing from 5,100 in 2002 to 49,967 in 2024, reflecting an annual growth rate of around 12% from 2002 to 2019 and 8% from 2019 to 2024. Furthermore, the term "degraded" also saw substantial growth, from 193 mentions in 2002 to 11,058 in 2024, indicating an annual growth rate of approximately 23% from 2002 to 2019 and 9% from 2019 to 2024. "Biodiversity" mentions grew significantly, from 1,645 in 2002 to 18,456 in 2024, highlighting its central role in environmental research, with an annual growth rate of approximately 13.41% from 2002 to 2019 and 5.73% from 2019 to 2024.

Policy

The analysis of frequency of key terms in ecological restoration and biodiversity documents highlights the thematic focus and priorities of different frameworks and policies. This analysis examines the usage of terms such as "*ecosystem health*," "*reference condition*," "*environment*," "*ecosystem*," "*degraded*," and "*biodiversity*" across various international, national, and regional documents. The documents reviewed include the International Principles and Standards for the Practice of Ecological Restoration, the FAO UN Decade Indicator on Area under Restoration, the Convention on Biological Diversity, and others.

- **International Principles and Standards for the Practice of Ecological Restoration**

In this document, the term "*ecosystem*" appears most frequently (33 times), "environment" (19 times) and "biodiversity" (11 times) are also prominently featured, reflecting the document's comprehensive approach to ecological health. "Reference condition" (4 times) and "degraded" (6 times) are mentioned less frequently, indicating a more conceptual focus on ecosystem status and degradation. However, it can also mean that these concepts are still in the development stage and/or are not widely understood and applied.

- **FAO UN Decade Indicator on Area under Restoration**

This document heavily emphasizes "ecosystem" (47 times) and "degraded" (10 times), highlighting the focus on quantifying and addressing ecosystem degradation. "Biodiversity" (9 times) and "environment" (4 times) are also mentioned, though less prominently, suggesting that while biodiversity is considered, the primary focus is on ecosystem restoration metrics.

- **Convention on Biological Diversity (CBD)**

The CBD document is one of the central global documents related to ecological restoration, with "biodiversity" (66 times) and "ecosystem" (52 times) being the most frequently mentioned terms. This reflects the CBD's overarching goal of biodiversity conservation. "Environment" (45 times) and "ecosystem health" (12 times) are also significant, indicating a balanced emphasis on environmental conditions and ecosystem integrity.

- **Draft Biodiversity and Ecosystem Health Framework**

This draft document emphasizes "ecosystem" (108 times) and "biodiversity" (64 times), reflecting a strong focus on both ecosystem functionality and biodiversity conservation. The frequent mention of "ecosystem health" (8 times) highlights the importance of maintaining healthy ecosystems. "Environment" (20 times) and "degraded" (7 times) also appear, indicating a broad consideration of environmental factors and degradation issues.

- **Tripartite Framework Agreement**

In this relatively short agreement, "ecosystem" (32 times) and "biodiversity" (27 times) are key terms, suggesting a balanced focus on both ecosystem management and biodiversity conservation. "Ecosystem health" (11 times) and "environment" (11 times) are also significant, indicating an integrated approach to ecological health and environmental management.

- **Canada's 2030 National Biodiversity Strategy and Action Milestone Document**

This national strategy document frequently mentions "biodiversity" (69 times) and "ecosystem" (59 times), reflecting Canada's commitment to biodiversity and ecosystem restoration. "Environment" (42 times) is also prominent, indicating a comprehensive approach to environmental sustainability.

- **Ecological Restoration: Nature-Based Solutions for Climate Mitigation and Engaging Canadians with Nature**

The emphasis in this document is on "environment" (123 times) and "ecosystem" (112 times), highlighting the role of ecological restoration in climate mitigation. "Biodiversity" (51 times) is also significant, suggesting an integrated approach that includes biodiversity conservation. However, other terms are mostly absent.

- **Ecological Restoration Guidelines for British Columbia**

This guideline document focuses primarily on "ecosystem" (29 times) and "environment" (4 times), reflecting the specific regional focus on ecosystem management. "Degraded" (1 time) and "biodiversity" (1 time) are mentioned less frequently, indicating a narrower focus on practical restoration measures. However, it provides an interesting comparative perspective with more recent policy documents.

- **Draft Nature Accountability Act**

This draft act mentions "environment" (16 times) and "ecosystem" (11 times), suggesting a legislative focus on environmental accountability and ecosystem management. "Biodiversity" (8 times) is also considered, though to a lesser extent.

- **Fisheries and Oceans Habitat Restoration Priorities Plan for British Columbia and Yukon (Draft)**

In this draft plan, "ecosystem" (38 times) and "environment" (8 times) are key terms, reflecting regional priorities in habitat restoration. "Degraded" (1 time) and "biodiversity" (0 times) are mentioned minimally, indicating a focus on ecosystem-level priorities.

- **European Union Nature Restoration Law**

The EU law emphasizes "ecosystem" (130 times) and "environment" (79 times), indicating a strong focus on comprehensive ecosystem restoration. "Biodiversity" (65 times) and "degraded" (12 times) are also significant, reflecting the EU's integrated approach to ecosystem and biodiversity conservation. This policy document is one of the most well-developed ER related policy documents that can serve as a good comparative analysis.

Analysis

Across the policy documents, "ecosystem" and "environment" emerge as the most frequently mentioned terms. "Biodiversity" is also frequently discussed, especially in the CBD and Canada's 2030 National Biodiversity Strategy. The term "ecosystem health" appears sporadically, with notable mentions in the CBD and the Draft Biodiversity and Ecosystem Health Framework, suggesting a growing but not yet ubiquitous focus on this concept. "Reference condition" is rarely mentioned, potentially indicating that it may be a less commonly used term or concept that is still developing. The variable frequency of terms like "ecosystem health" and

"degraded" suggests possible differing focal points and terminologies across various documents and frameworks.

This analysis only looked at policies and legislations and did not consider guidance associated with federal funding opportunities. However, given the importance of funding to determining outcomes it suggests further analysis should look at funding mechanisms. The analysis also did not look at Indigenous legal orders nor First Nations specific restoration strategies for the Fraser Estuary. Additional research and analysis is recommended for these and other gaps.

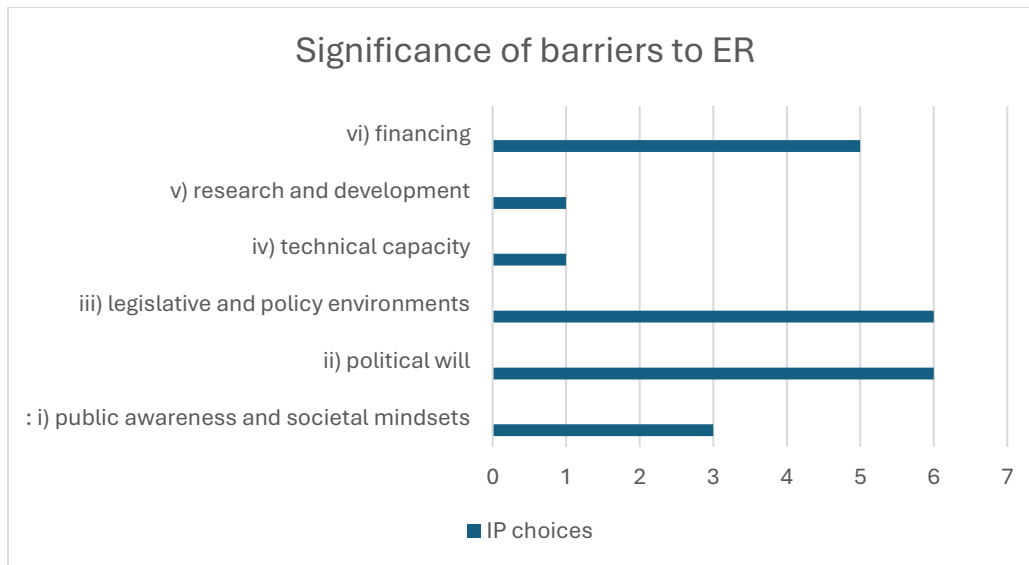
The analysis highlights a strong alignment between academic literature and policy documents in emphasizing the importance of ecosystems, biodiversity, and environmental health. However, policy documents tend to have a broader and more balanced focus, integrating terms like "biodiversity" more frequently than literature. Terms like "ecosystem health" and "reference condition" are more prevalent in academic discourse. The variable frequency of terms across documents suggests differing focuses and terminologies, reflecting the evolving and fluid nature of ecological research and policy frameworks. This variable usage underscores the need for integrated approaches to address environmental challenges effectively and better connectivity and communication between policy and academia.

Findings

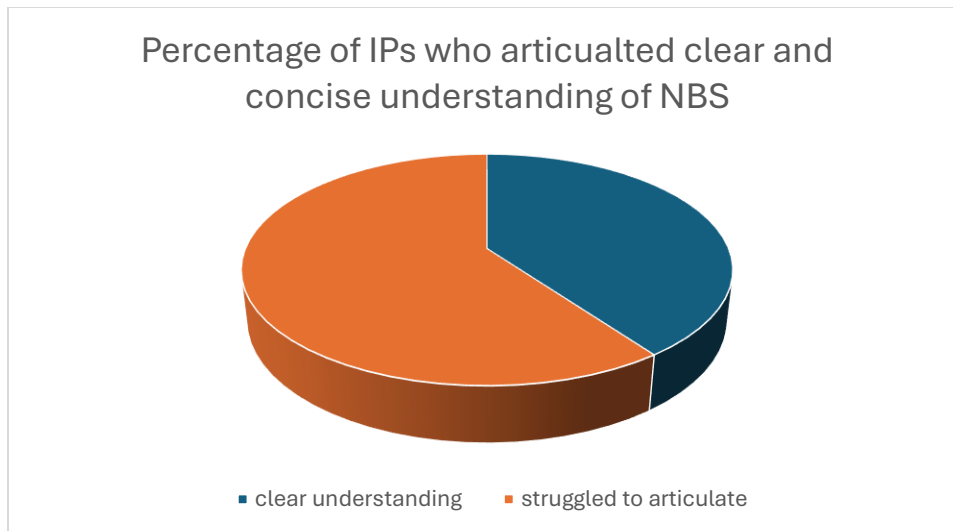
In this research, qualitative methods, primarily interviews, were employed. 11 interviews were conducted with various stakeholders active in the Fraser River Estuary, including restoration practitioners, representatives from local NGOs, community groups, government officials, and others. Each interview, lasting between 30 and 50 minutes, was structured around predetermined questions and conducted online.

The interview questions covered six main topics: 1) barriers to ecological restoration; 2) incorporation of Nature-Based Solutions (NBS); 3) policy and regulatory landscape; 4) implementation challenges; 5) community involvement; and 6) hallmarks of successful restoration. These questions aimed to capture the perspectives and experiences of stakeholders involved in ecological restoration and climate resilience projects in the Fraser Estuary, contributing to the development of effective, evidence-based strategies.

In the first question regarding barriers to ecological restoration, we focused on the Fraser River Estuary and Canada more broadly. Interview participants (IPs) were asked to rank the six main barriers identified by UNEP's "Strategy of the United Nations Decade on Ecosystem Restoration." Contrary to my expectations, financing was not seen as the primary barrier. Instead, IPs highlighted challenges in accessing and maintaining steady funding flows, often citing the short-term nature of available funds and bureaucratic application processes. Technical capacity and research and development were considered the least significant barriers, with many IPs collaborating with universities for research and training. Some IPs also pointed out that political will and the legislative and policy environment posed moderate challenges, as government processes are often slow to implement necessary policies.



The question of the incorporation of NBS explored specific examples and whether NBS helped overcome previously identified barriers. This question required some adaptation, particularly for non-practitioner IPs, as government and policy-level IPs were less familiar with its intricacies. It is a particularly important insight in understanding how NBS could be promoted at the policy level. To ensure a shared understanding, I provided the IUCN’s definition of NBS. It was evident that discussions about NBS were more productive with practitioners, while government and policy-level IPs were less familiar with its intricacies. Although all IPs recognized the inevitable rise of NBS in restoration activities, there was uncertainty about how specific policies could be improved. It is evident that there is a lot of room for raising awareness about the NBS in policy development. Many emphasized Indigenous-led approaches, underscoring the value of traditional ecological knowledge in restoration projects. Some practitioners also suggested the need for funding structures that support post-restoration monitoring and maintenance over 5-7 years.



In discussing the policy and regulatory landscape, IPs emphasized the need for improved policies, particularly regarding mapping, which influences policy development. Some noted that current regulations allow development in areas that should be secured, undermining restoration efforts. There was a consensus that more specific frameworks and detailed, ecosystem-considerate maps are needed. One IP highlighted the ineffectiveness of habitat protection policies, such as those under the Fisheries Act, and the complications arising from conflicts between federal and provincial policies. Some IPs identified that it would be more effective to take proactive measures prior to the impacts. Maintaining ecological stability and function is less costly. One of the IPs elaborated that the economic losses from 2021 floods were much higher than it would take to invest into flood resilience. Areas that were identified as important ecological sites need to be addressed can maintained in policy, especially given the growing economic impact.

When asked about challenges in implementation, IPs identified access to restoration sites as a significant barrier, particularly given that the vast majority of the land is privately owned, with national parks comprising only about 12%. This ownership structure complicates securing funding, as property owners may develop the land post-restoration, thus putting funders

investment at heightened risk. The province of British Columbia has vast crown land, but the Fraser Estuary is mostly private land, and this needs to be taken into account and addressed in the policy formulation. IPs suggested that policies and regulations should ensure the long-term conservation of restored sites, even if they occur on private land. Policies should be developed ensure the long-term benefit of restoration projects. Additionally, public engagement and education were seen as crucial for securing funding and fostering public support for ER.

Community involvement was another focus, with IPs discussing strategies to engage property owners in constructive dialogues about the benefits of nature-based ER. Collaboration with NGOs, Indigenous communities, and local governments was deemed essential for effective implementation. Many IPs stressed the importance of clearly articulating the financial and ecological benefits of ER to property owners. Education and community engagement, through sessions and workshops, were highlighted as key strategies for motivating active participation in ER.

The discussion on the hallmarks of successful ecological restoration (ER) revealed varied perspectives among the IPs. Many struggled to concisely define what constitutes successful ER, often providing insights relevant to their specific roles or organizations rather than capturing the holistic picture. However, a few IPs demonstrated a thorough and deep understanding of the broader situation across the entire Fraser Estuary and the general restoration process in Canada.

Some identified measurable increases in biodiversity as a primary indicator of success. While community engagement was mentioned by me as a prompt, several IPs felt that the current definition of engagement is too narrow and should extend beyond merely gathering people to do cliché activities such as planting trees; a more profound understanding of complex ecosystems is essential. The ability of species to complete their life cycles in restored habitats was also seen as

a key indicator of successful restoration. Additionally, IPs pointed out that successful ER projects often generate clear social and economic benefits, which reinforce the value of restoration efforts and help secure ongoing community support.

Finally, IPs were asked about future opportunities for incorporating NBS into ecological restoration in the Fraser River Estuary. Several emphasized the need for enhanced policies and financial mechanisms to support ER projects. A comprehensive approach to ER, considering the complexity of ecosystems, was also recommended. For example, while young forests provide food for elks, old forests offer refuge during harsh winters, highlighting the need for nuanced and holistic restoration strategies. Collaboration with industry stakeholders was also seen as crucial, given the highly urbanized and industrialized nature of the Fraser Estuary.

The interviews provided valuable insights into the challenges and opportunities in ecological restoration within the Fraser River Estuary. Key takeaways include the need for legislative and policy improvements, better mapping and development restrictions, the critical role of community engagement and education, and the necessity of a comprehensive approach to restoration that considers the full complexity of ecosystems. These insights will guide the policy and regulation development that will be able to better support future ecological restoration efforts and help ensure more effective and sustainable outcomes.

Discussion

The findings from this study underscored several critical issues that must be addressed to enhance the effectiveness of ecological restoration efforts in the Fraser River Estuary and incorporate NBS. Three main areas emerge as central to advancing the current state of restoration: inconsistent access to funds, the structure of property ownership, and the alignment of policy frameworks with practical challenges identified by practitioners.

Some IPs also pointed out that political will and the legislative and policy environment posed moderate challenges, as government processes are often slow to implement necessary policies.

Alignment of Policy and Practice

The interviews reveal a disconnect between the policy frameworks governing ecological restoration and the practical realities faced by practitioners. While policies often emphasize the importance of biodiversity and ecosystem health, there is a gap in how these policies are implemented on the ground. For instance, the inadequate incorporation of ecosystem needs into development restrictions when both ER and development go through the same approval process – one of the key areas where current policies fall short. Practitioners stressed the need for more specific regulatory and policy frameworks that align better with the ecological complexities of the Fraser River Estuary. Furthermore, the emphasis on NBS in policy documents does not always translate into actionable strategies on the ground, particularly in the context of indigenous-led approaches and the integration of traditional ecological knowledge. Moving forward, there is a need for policies that not only promote NBS but also provide clear guidelines and support for their implementation, ensuring that the insights from practitioners are fully integrated into policy development and execution.

Inconsistent Access to Funds

One of the most significant barriers highlighted by IPs is the inconsistent access to funding for ecological restoration projects. While funding itself is not entirely lacking, the short-term nature of available funds and the bureaucratic hurdles associated with securing and maintaining them pose considerable challenges. Practitioners noted that the time-consuming process of applying for grants, coupled with the uncertainty of continuous financial support, undermines the sustainability of long-term restoration projects. This inconsistency leads to interruptions in project momentum, making it difficult to achieve and maintain ecological gains over time. Going forward, policy frameworks must prioritize the establishment of more stable, long-term funding mechanisms that ensure sustained support for restoration activities, particularly those focused on NBS. These include but are not limited to the *Federal Fisheries Act*, which was mentioned by several of my IPs, where amendments could be made to streamline the permit process for restoration activities, distinguishing them from potentially destructive development projects. Additionally, the Act could be enhanced to include provisions for sustained funding mechanisms specifically earmarked for restoration activities in ecologically sensitive areas like the Fraser Estuary. Additionally, policies should streamline the grant application process to reduce administrative burdens on practitioners.

Structure of Property Ownership

The structure of property ownership in the Fraser River Estuary presents another significant challenge to ecological restoration efforts, as a significant portion of the land is privately owned. This ownership structure creates obstacles not only in securing funding but also in ensuring that

restoration efforts are not undone by subsequent developments on private land. The findings suggest that policies must be expanded and revised to better incentivize property owners to engage in restoration activities and to protect restored sites post-intervention. This could include the introduction of regulatory mechanisms to ensure long-term conservation of restored areas, possibly through conservation easements, reduced insurance premiums or other legal instruments that engage and motivate property owners to maintain the ecological integrity of their land.

The discussion highlights the need for policy interventions that address the key barriers to ecological restoration identified in the interviews. By securing consistent and long-term funding, addressing the challenges posed by property ownership, and aligning policies more closely with the practical needs of restoration practitioners, it is possible to significantly enhance the effectiveness and sustainability of restoration efforts in the Fraser River Estuary. These steps will be crucial in ensuring that restoration projects not only achieve their immediate ecological goals but also contribute to the broader objectives of biodiversity conservation and climate resilience in the region.

Bibliography

- Beunen, R., and J. J. Patterson. 2019. “Analysing Institutional Change in Environmental Governance: Exploring the Concept of ‘Institutional Work.’” *Journal of Environmental Planning and Management* 62 (1): 12–29.
- Blackstock, Kirsty, Kerry Waylen, Alba Juarez Bourke, and Keith Marshall. 2023. “Agency and Constraint in Environmental Policy Coherence.” *Journal of Political Ecology* 30 (1). <https://doi.org/10.2458/jpe.3055>.
- Canada, Environment and Climate Change. 2023a. “Canada’s 2030 National Biodiversity Strategy.” Navigation page - audience page. December 8, 2023. <https://www.canada.ca/en/environment-climate-change/services/biodiversity/2030-nature-strategy.html>.
- . 2023b. “Milestone Document.” December 8, 2023. <https://www.canada.ca/en/environment-climate-change/services/biodiversity/national-biodiversity-strategy/milestone-document.html>.
- . 2024a. “National Strategy to Protect Nature in Canada Unveiled alongside Bill to Ensure Accountability.” News releases. June 13, 2024. <https://www.canada.ca/en/environment-climate-change/news/2024/06/national-strategy-to-protect-nature-in-canada-unveiled-alongside-bill-to-ensure-accountability.html>.
- . 2024b. “Tripartite Framework Agreement on Nature Conservation between Canada, British Columbia, and the First Nations Leadership Council.” Featured articles. May 9, 2024. <https://www.canada.ca/en/environment-climate-change/services/integrated-nature-initiatives/nature-agreements/canada-british-columbia-nature-agreement.html>.
- Canada, Government of Canada; Indigenous Services. 2020. “British Columbia Tripartite Framework Agreement on First Nations Health Governance.” March 20, 2020. <https://www.sac-isc.gc.ca/eng/1584706392620/1584706415366>.

- Cooke, Steven, Stephen Murphy, Line Rochefort, and Nancy Shackelford. 2021. “Ecological Restoration: Nature-Based Solutions for Climate Mitigation and Engaging Canadians with Nature.”
- Douglas, Tanis. 2002. “Ecological Restoration Guidelines for British Columbia.”
- European Parliament. 2024. “Nature Restoration: Parliament Adopts Law to Restore 20% of EU’s Land and Sea | News | European Parliament.” February 27, 2024.
<https://www.europarl.europa.eu/news/en/press-room/20240223IPR18078/nature-restoration-parliament-adopts-law-to-restore-20-of-eu-s-land-and-sea>.
- Fish and Fish Habitat Protection Program. 2023. “Framework to Identify Fish Habitat Restoration Priorities.”
- Food and Agriculture Organization of the United Nations. 2022. “Global Indicators for Monitoring Ecosystem Restoration |.” UN Decade on Restoration. 2022. <http://www.decadeonrestoration.org/publications/global-indicators-monitoring-ecosystem-restoration>.
- Gann, George D., Tein McDonald, Bethanie Walder, James Aronson, Cara R. Nelson, Justin Jonson, James G. Hallett, et al. 2019. “International Principles and Standards for the Practice of Ecological Restoration. Second Edition.” *Restoration Ecology* 27 (S1): S1–46.
<https://doi.org/10.1111/rec.13035>.
- Government of Canada, Fisheries and Oceans Canada. 2023. “Habitat Restoration Priorities for British Columbia and the Yukon: Phase 2 | Pacific Region | Fisheries and Oceans Canada.” June 23, 2023. <https://www.pac.dfo-mpo.gc.ca/consultation/habitat/habitat-restoration-restauration-eng.html>.

Government of Canada, Social Sciences and Humanities Research Council of Canada. 2012. “Social Sciences and Humanities Research Council.” May 11, 2012. [https://www.sshrc-](https://www.sshrc-crsh.gc.ca/society-societe/community-communitite/ifca-iac/evidence_briefs-donnees_probantes/earth_carrying_capacity-capacite_limite_terre/higgs_cooke_murphy_rochefort_shackelford_wilson-eng.aspx)

[crsh.gc.ca/society-societe/community-communitite/ifca-iac/evidence_briefs-donnees_probantes/earth_carrying_capacity-capacite_limite_terre/higgs_cooke_murphy_rochefort_shackelford_wilson-eng.aspx](https://www.sshrc-crsh.gc.ca/society-societe/community-communitite/ifca-iac/evidence_briefs-donnees_probantes/earth_carrying_capacity-capacite_limite_terre/higgs_cooke_murphy_rochefort_shackelford_wilson-eng.aspx).

Keeley, James, and Ian Scoones. 1999. “UNDERSTANDING ENVIRONMENTAL POLICY PROCESSES: A REVIEW.”

Leipold, Sina, Peter Feindt, Georg Winkel, and Reiner Keller. 2019. “Discourse Analysis of Environmental Policy Revisited: Traditions, Trends, Perspectives.” *Journal of Environmental Policy & Planning* 21 (September):445–63. <https://doi.org/10.1080/1523908X.2019.1660462>.

Ministry of Water, Land and Resource Stewardship. 2023. “Draft B.C. Biodiversity and Ecosystem Health Framework.”

Food and Agriculture Organization of the United Nations. 2024. *Standards of Practice to Guide Ecosystem Restoration*. FAO; SER; IUCN; <https://doi.org/10.4060/cc9106en>.

United Nations. 1992. “The Convention on Biological Diversity.” Secretariat of the Convention on Biological Diversity. 1992. <https://www.cbd.int/convention>.

Voicescu, Sonia A., John-Francis Lane, Steven J. Cooke, Eric Higgs, Alina C. Fisher, Line Rochefort, Nancy Shackelford, and Stephen Murphy. 2023. “Awareness and Use of the Society for Ecological Restoration’s International Principles and Standards for the Practice of Ecological Restoration in Canada.” *Restoration Ecology* 31 (1): e13789. <https://doi.org/10.1111/rec.13789>.

Appendix 1

Interview Questions

Summer, 2024

Based on the context of the project, these 9 interview questions are designed to gather insights from representatives of various organisations (such as International Organisations, Environment and Climate Change Canada, Fisheries and Oceans Canada, and others) that are among the potential interview participants (IPs).

These questions aim to explore their perspectives on the integration of nature-based solutions, policy implementation, and the challenges and opportunities in ecological restoration and climate resilience in general and in Fraser Estuary, BC, in particular.

Some sections have incorporated questions used in the PhD thesis of Sonia Voicescu (UVic) and work on “*Ecological Restoration: Nature-Based Solutions for Climate Mitigation and Engaging Canadians with Nature.*”

1. Role and Involvement

- Can you describe your organisation’s role and involvement in ecological restoration projects within the Fraser River Estuary?

2. Barriers in the ER

- The UNEP’s “Strategy of the United Nations Decade on Ecosystem Restoration” identified six main barriers to ecosystem restoration: i) public awareness and societal mindsets; ii) political will; iii) legislative and policy environments; iv) technical capacity; v) research and development; and vi) financing. Can you rank them from most significant to least significant?

3. Nature-based solutions

- Can you give an example of incorporating nature-based solutions into your organisation?
- How does the concept of nature-based solutions help to overcome the above-mentioned barriers?

4. Policy and Regulatory Landscape

- Where could policies be strengthened, modified, or implemented to encourage restoration as a means to achieve nature-based solutions in Canada? (Voicescu et al.)
- Follow up: Are there any specific policies that have been particularly impactful?

5. Challenges in Implementation

- What are the barriers for your institution to securing access to funds to conduct ER?

- Follow-up: Have you come across any examples, you are able to share, of private sector interest in providing funding for nature-based solutions?

6. Community Involvement

- What strategies are you using to engage property owners in a constructive dialogue about the benefits of nature-based ER?

7. Success stories and lessons learned

- What are the hallmarks of a successful ER project? {Prompts: community engagement, ecological, social, economic, meeting predetermined goals or objectives} (Voicescu et al.)

8. Future Directions and Recommendations

- What do you see as the future opportunities for incorporating nature-based solutions into the ecological restoration in the Fraser River Estuary?

-
- Is there anything else we haven't touched on that you think I should consider regarding barriers and opportunities to integrating Nature Based Solutions and ecological restoration?

These questions should provide some understanding of the perspectives and experiences of various stakeholders involved in ecological restoration and climate resilience projects in the Fraser Estuary, helping to inform the research and contribute to developing effective and evidence-based strategies.