Challenges and opportunities to accelerate eelgrass and saltmarsh conservation and restoration in the Fraser River Estuary

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Executive Summary

Background. Intact estuaries, and especially the eelgrass and saltmarsh ecosystems that exist within them, provide many important ecosystem services and benefits to people and other species, yet many stressors individually and cumulatively cause their degradation or disappearance. In the Fraser River estuary and surrounding regions, eelgrass and saltmarsh coverage declined precipitously following European colonization of North America until at least the 1990s, as did the ecosystem services these areas once provided. Efforts are underway to understand the net balance of losses and gains, and to accelerate the recovery of these habitats.

Purpose. The purpose of this project was to gather insights about the key challenges and opportunities that exist to accelerate eelgrass and tidal marsh conservation and restoration, and ways that an NGO like WWF-Canada (internship sponsor) could contribute to this effort.

Approach. I gathered, synthesized, and contextualized opinions and ideas about the key challenges and opportunities to accelerating eelgrass and saltmarsh conservation and restoration from a literature review and 31 semi-structured interviews. Interviewees included people working in diverse roles related to the conservation, restoration, or creation of eelgrass and saltmarsh habitat in and around the Fraser River Estuary in British Columbia.

Findings. The most salient key limiting factors to accelerating this work identified by interviewees included:

- ***Lack of strategy and coordination*** (*e.g.,* uncoordinated work plans, confusing and sometimes contradictory regulatory mandates, and weak relationships and exchange between organizations working in this field)
- ***Insufficient capacity and resources*** (*e.g.,* insufficient project funding; insufficient staffing to facilitate project implementation, permitting, and enforcement of regulations)
- ***Disturbances in the nearshore environment*** (*e.g.,* herbivory by hybridized Canada geese, invasions of exotic or hybridized plant species, boat wake, erosion and plant mortality from storm and heat wave events, and anthropogenic log escape and scouring)
- ***Competition for other land uses*** (*e.g.,* inability to find suitable restoration sites due to high costs or limited political will to restore urbanized landscape)

Interviewees offered many ideas for interventions or actions that they think are promising approaches to facilitate greater eelgrass and tidal marsh conservation and restoration.

- ***Increasing coordination and collaboration*** (*e.g.,* develop a coordinating regulatory body, embrace co-management approaches that foreground First Nations' vision and leadership)
- ***Formal strategic planning and prioritization*** (*e.g.,* develop region-wide vision and plan, identify and prioritize potential project sites)

- ***Identify and draw upon new funding sources and human resources*** (*e.g.,* compensation for dredging payment systems, formalizing a Fraser River Estuary Research Institute, advocate for increased agency capacity to lead or subcontract work)

Interviewees suggested that WWF-Canada (or similar organizations) might best support ongoing efforts by helping to convene or coordinate practitioners to exchange knowledge or engage in strategic planning; providing project funds, matching funds, or letters of support for grant applications; helping to answer scientific questions or conduct ongoing monitoring; running outreach or advocacy campaigns; and providing volunteers or staff time to collaborative efforts.

Recommendations. I offer ten suggested possible next actions (derived from the interviewees) for consideration by this community of practice. Many of these recommendations echo or build upon prior suggestions (e.g., Langer 2019, Kehoe et al. 2021).

1) Mobilize a group of practitioners to develop and propose a vision and recommendations for a coordinated procedure for developing area designations and reviewing and permitting activities in the Fraser River estuary.
2) Convene a multi-stakeholder group (with First Nations leadership) to develop a vision, goals, rationale, and strategic plan for management of Fraser River estuary ecosystems.
3) Advocate for a dedicated position to create, standardize, and manage an online, centralized clearinghouse of information about nearshore conservation and restoration in the Fraser River estuary and surrounding region. The Restore America's Estuaries website could serve as a template (https://estuaries.org/).
4) Consolidate and build upon existing knowledge (e.g., Kistriz 1996, Stewart et al. 2022, DFO 2012, DFO 2017) about successes and failures of past projects into an online, interactive map.
5) Hire a contractor or graduate student to gather case studies of successful, innovative, natural hazard mitigation strategies for coastlines from around the world, and to propose transferrable projects.
6) Create an overarching "Fraser River Estuary Research Institute" consisting of scientists and researchers already working on research about the Fraser River estuary.
7) Convene a group to propose pathways to modernize compensation requirements.
8) Advocate for multi-agency, long-term funding pool.
9) Advocate for the Province and the Port of Vancouver to review and reform land tenure processes to be more inclusive of conservation and restoration.
10) Establish a timeline and process for convening Fraser River estuary meetings.

Aerial view of the Fraser River Estuary

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Introduction

Estuaries are paradoxically among the most productive and valued *and* most degraded and at-risk landscapes in the world. Human civilizations began beside estuaries around 8,000 years ago (Kennett and Kennett 2006). Twenty-two of the 32 largest cities in the world are located beside estuaries and 60 per cent of the world's population live along estuaries and the coast (United Nations 2017). As a result, coastal ecosystems are overburdened with human activities that have destroyed more than 65% of seagrass and coastal wetland habitat, degraded water quality, and accelerated species invasion in estuaries (Lotze et al. 2006). Biodiversity and productivity of these ecosystems are rapidly declining (e.g., Nash et al. 2017; Halpern et al. 2008), and some habitats, like eelgrass, are rapidly disappearing (e.g., Lotze et al. 2006; Orth et al. 2006; Waycott et al. 2009). One recent estimate suggests 14% of all seagrass species are considered at risk of extinction (Short et al. 2011).

There is growing momentum to reverse the loss of ecological function in estuaries (Halpern et al. 2008) and begin to restore them (Duarte et al. 2020). “Restoration” can include strategies to promote natural recolonization, return degraded habitats to conditions resembling their original condition, and establishing new meadows in suitable areas that were historically not inhabited by these plants (Tan et al. 2020). However, marine restoration is a relatively new and still developing field. Efforts and research into marine restoration has trailed behind similar efforts in other systems (Blignaut et al. 2013); despite this, interest in the (relatively young) field of marine restoration is increasing rapidly (Saunders et al. 2020; Wood et al. 2020). Early results suggest that some efforts have been successful in slowing or even reversing declining trends in marine ecosystems in some regions (de los Santos et al. 2019). There is also evidence that marine ecosystem restoration can be effective over large spatial extents, persist for decades, expand in size, be cost effective, and generate social and economic benefits (Saunders et al. 2020). Restored habitats, such as created marshes, can even resemble natural habitats within a few decades (Stewart et al. 2022).

However, despite the promise of the rapidly developing field of marine ecosystem restoration, landscape restoration is complex because it requires understanding both the biophysical and the sociopolitical landscape (Jellinek et al. 2019). Restoring ecosystem function and services in an urbanized and coastal landscape is even more complicated because it requires coordination across multiple jurisdictional realms (Griffiths et al. 2020), directly affects diverse land uses and stakeholders and rights-holders, and can take on political and social meaning. In many cases, the most limiting factors to ecosystem recovery in urbanized estuaries may be fundamentally social or political in nature, and new governance (e.g., Kehoe et al. 2021) or economic models

(e.g., Saunders et al. 2022) may be some of the most effective strategies for improving the success of eelgrass and salt marsh conservation and restoration efforts.

Purpose & Scope

The purpose of this rapid research project was to gather insights from people working in diverse roles related to the conservation, restoration, or creation of nearshore habitat and around the Fraser River Estuary in British Columbia. Specifically, I gathered, synthesized, and contextualized thoughts, opinions, and ideas from a literature review and 31 semi-structured interviews about the key challenges and opportunities that exist to accelerate this work.

Literature Review

This rapid literature review characterizes what is known about:

- The ecological and social importance of coastal wetlands, specifically eelgrass and saltmarsh ecosystems,
- Factors that threaten or impact eelgrass and saltmarsh ecosystems,
- Challenges for implementing restoration work in eelgrass and saltmarsh ecosystems (including both social and ecological factors),
- Strategies and recommendations for accelerating eelgrass and saltmarsh conservation and restoration work in complex social-ecological landscapes.

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Where appropriate, this literature review characterizes these dimensions in the context of the Fraser River Estuary in southwest British Columbia. This literature review is not exhaustive;

rather, it is intended to be a rapid review to summarize key concepts in marine restoration to help guide the direction of subsequent interviews.

Ecological and social importance of coastal wetlands

Coastal wetlands provide wide range of ecosystem services to coastal communities (Nordlund et al. 2016, Nordlund et al. 2018). Intact coastal wetlands, including eelgrass and saltmarsh habitat, provide many important ecosystem services and benefits to people and other species in the Fraser River estuary and beyond. For example, they:

- **Provide food; refuge; breeding, spawning, and nursery habitat** to many species, including critical habitat for many at-risk species, such as Pacific salmon (Unsworth et al. 2019; Nordlund et al. 2018; Murphy et al. 2021)
- **Protect shorelines from erosion** by buffering wave action and trapping sediments (Maxwell et al. 2017)
- **Counteract climate change** by absorbing and storing atmospheric carbon (Mcleod et al. 2011; Crooks et al. 2011; Duarte et al. 2013)
- **Mitigate the impacts of climate change**
- **Improve food security** and underpin food supplies for 500 million people (Selig et al. 2019, Cullen-Unsworth et al. 2014)
- **Support local business and industry,** like commercial fisheries (Jinks et al. 2020; Unsworth et al. 2019)
- **Reduce disease** by reducing concentrations of human-derived pathogens (Lamb et al. 2017)
- **Cycle and remove excess nutrients** (e.g., Reynolds et al. 2016, Flindt et al. 1999)
- **Contribute to physical and mental well-being** of people and allow people to express cultural values (e.g., Cullen-Unsworth 2014)

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Coastal wetlands, including eelgrass and saltmarshes provide critical habitat to many species. Each year, at least 1.7 million waterbirds and raptors, representing 263 species, use the intertidal flats of the Fraser River Delta (Butler et al. 2021)

Right: A spotted sandpiper, which commonly breeds in British Columbia and may overwinter as far south as southern South America (https://www.audubon.org/field-guide/bird/spotted-sandpiper)

Threats and impacts to eelgrass and saltmarsh ecosystems

Eelgrass and saltmarsh coverage have declined precipitously in the Salish Sea generally, and particularly in the Fraser River estuary between European colonization of North America up until at least the 1990's. An analysis of aerial photos from three smaller, less developed estuaries in the Gulf Islands suggests that eelgrass coverage in the study area decreased by 45% from 1932-2016 (Nahirnick et al. 2020), and an estimated 30% of eelgrass coverage loss occurred at Roberts Bank between 1969 and 1984 (Harrison 1990). Existing habitat has become more fragmented and eelgrass bed conditions have declined in this region, possibly due to shoreline activities and residential housing development (Nahirnick et al. 2020). Similarly, approximately 250 hectares of tidal marsh have been lost since the 1980's in the Fraser River delta, including at least 160 ha at Sturgeon Bank (Balke, 2017).

There are multiple activities and threats that can impact sensitive estuarine ecosystems in general (Table 1); however, the cumulative effect of all the impacts together may be the most concerning. There is evidence that the ability of an ecosystem to recover from a single harm can be greatly diminished when the system is already suffering stress from other sources, such as higher water temperatures or shading, predation, or pollution (Wright 2002).

Table 1. Human-driven activities that intersect and drive multiple mechanisms for eelgrass and tidal marsh decline

ACTIVITIES	MECHANISMS OF DISTURBANCE
Forestry & agriculture	**DIRECT IMPACTS TO PLANTS**
Land runoff & chemical contaminants	Compaction
Land conversion and development	Breaking leaves and shoots
Log transport & storage	Herbivory
Transport/shipping	Loss of Indigenous cultivation
Port and harbor development & dredging/filling	Disease & bacterial contamination
Urbanization & development	
Shoreline/overwater structures (e.g., dock, jetty, dike)	**HABITAT AVAILABILITY**
Effluent (e.g., overflow, septic, industrial runoff)	"Coastal squeeze"[1]
Hazardous wastes	Changes to hydrology
Recreation & Tourism	Land subsidence
Anchoring of boats and propellor cuts	
Trampling/human disturbance	**HABITAT SUITABILITY**
Exotic, invasive species	Disturbance of sediments
Fisheries & Aquaculture	Deposition of sediment
Bivalve harvesting (e.g., raking, digging, hydraulic)	Sediment erosion
Loss of Indigenous cultural practices	Shading/reducing light
Energy generation	Food web changes
Oil spills, spill mitigation, and pipelines	Polluted sediment
Hydropower development	Nutrient loading & eutrophication
Climate impacts	
Increasing storm frequency and intensity	**WATER CONDITIONS**
Rising water temperatures & heat waves	Rising water temperature
Sea level rise	Changing salinity
Ocean acidification	Increasing acidity
Species range changes	Increasing turbidity
Sea ice melt & upwelling currents	Polluted water

[1] Pontee (2013) define "coastal squeeze" as "one form of coastal habitat loss, where intertidal habitat is lost due to the high water mark being fixed by a defence or structure (i.e., the high water mark residing against a hard structure such as a sea wall) and the low water mark migrating landwards in response to sea level rise.'"

Photo: Dave Simonson, https://www.flickr.com/photos/45877650@N00/21095472615

Challenges to eelgrass and saltmarsh restoration

The field of marine restoration is rapidly expanding, and methods and principles are being developed and improved upon to guide effective projects (e.g., Addy 1947, Fonseca 2011, Saunders et al. 2020, Unsworth et al. 2019, Murphy et al. 2021, Tan et al. 2020). With respect to eelgrass restoration, there is some evidence that propagating and dispersing seagrass seeds may be effective in the Atlantic and relatively inexpensive in some contexts compared to plantings (Orth et al. 2012). Seeding experiments in the Pacific Northwest have not resulted in successful revegetation, suggesting that this method is likely not effective in the Fraser River estuary or surrounding region (Durance, *Personal Communication)*. Some are experimenting with heat adapted propagules, which appear to promote resilience against future climate change (e.g., Jarvis et al. 2011, Suonan et al. 2017). Planting experiments in the Atlantic suggest that revegetation can be done using seagrass fragments, plugs (soil cores), seeds, and can be done through both manual and mechanical planting means (e.g., Paling et al. 2001), with a variety of anchoring methods (Tan et al. 2020, Matheson et al. 2017). However, experiments planting fragments, cores, and unanchored shoots have been unsuccessful in this region, suggesting that the anchoring of shoots may be essential in the Fraser River estuary and surrounding areas (Durance, *Personal Communication*). Less experimentation appears to have occurred with saltmarsh restoration, but some experiments suggest that small modifications to planting design can double survivorship and biomass (Silliman et al. 2015) by simply clumping plantings together, rather than dispersing them. Further experimentation is planned in the Salish Sea to create armored planting berms with channels in between (Sutherst n.d.).

Despite a growing understanding of what kinds of replanting strategies work (and which do not) to successfully revegetate restoration sites, restoration projects must overcome a wide variety of social, economic, political, and technical challenges to find success. It is further complicated by the variety of landscapes in which estuary recovery occurs, and the particular challenges that exist in agricultural, urban, relatively intact, and small estuaries may differ (Cereghino et al. 2015).

Table 2. Challenges encountered in eelgrass and tidal marsh conservation and restoration (identified through literature review prior to interviews)

THEME	Challenge(s)
SCIENTIFIC UNCERTAINTY	**Data gaps** like distribution and status (Unsworth et al. 2019), functional diversity, and ecosystem functioning (Murphy et al. 2021, Wright 2002) **Cumulative impacts** of chronic pressures and **acute disturbances** diminish recovery capacity (Ortiz et al. 2018) and are difficult to predict **Natural change** occurs in non-static systems even in the absence of human activities (Unsworth et al. 2019) **Global environmental change** will influence seagrasses, the ecosystems they create, and the services they support in unpredictable ways (Unsworth et al. 2019) **Difficulty assessing counterfactuals**, like what would the outcomes at a site have been if a restoration project had not occurred (e.g., Baylis et al. 2016) **Perceptions of being prone to failure** (Saunders et al. 2020) **Ecosystem recovery involves moving targets** (Ingeman et al. 2019) that change based on new ecological understanding, spatial variability, and changes in perceptions of intact versus degraded habitats **Social and economic benefits** of restoration are not as widely measured or reported as ecological outcomes (Wortley et al. 2013, Martin and Lyons 2018)
ADDRESSING ROOT CAUSES OF HABITAT DECLINE	**Mitigating stressors** is often required in addition to restoration (Saunders et al. 2020) **Impacts to these ecosystems are diffuse** over large scales (Unsworth et al. 2019) and across both land and ocean (Grech et al. 2012) **Threats vary regionally** (Unsworth et al. 2019)
LAND OR RESTORATION SITE (UN)AVAILABILITY OR (IN)ACCESSIBILITY	**Inability to restore** sites to comparable reference sites, **or recover ecosystem functions** (Saunders et al. 2020) **Shifts to unsuitable environmental conditions** (e.g., Boström et al. 2014) **Loss of intertidal area** due to “coastal squeeze” (Pontee 2013)
CAPACITY (COST, LABOR, TIME)	**Time consuming** and **labor intensive** to plant, monitor, and replant (if necessary) (Bayraktarov et al. 2016, Unsworth et al. 2019) **Limited scientific resources,** such as research funding, data availability, scientific expertise (Unsworth et al. 2019) **Difficult to predict project costs** (Saunders et al. 2020) **Lack of long-term funding** to carry out long-term projects

	Siloed funding (e.g., lack of funding for project development, community engagement) **Lack of nimble, fast funding** available to take advantage of time-sensitive opportunities such as land acquisition (Cereghino et al. 2015) **Managing sociopolitical conflicts** can stretch restoration groups too thin (Cereghino et al. 2015)
SUPPLIES	**Limited propagule supply** (Tan et al. 2020)
COORDINATION	**Poor integration across jurisdictional realms** prevents holistic management strategies (Griffiths et al. 2020) **Lack of institutional structures** to bring people together and to support coastal management **Little agreement about priorities** for what should be protected or restored **Little agreement about techniques** for protecting or restoring eelgrass or saltmarsh **Lack of dialogue, working relationships, joint planning, and coordination** among all the stakeholders and rights-holders who are interested in eelgrass and saltmarsh conservation and restoration
REGULATION & ENFORCEMENT	**Lack an overarching conservation management plan** **Lack of restoration-focused policies** (Stewart-Sinclair et al. 2020, Saunders et al. 2020) **Lack of integrated land-sea conservation planning** (Nordlund et al. 2014) **Lack of integration between regulations** across the US-Canada border **Regulatory constraints** prevent eelgrass and saltmarsh conservation and restoration projects **Lack of adherence to and enforcement** of existing regulations that would support eelgrass and saltmarsh conservation and restoration
INCENTIVES	**Targets do not exist** for marine restoration (Saunders et al. 2020) **Local citizens do not pressure** local decision-makers **People are generally disconnected from the natural environment**, which is sometimes a prerequisite for environmental action (Dunn et al. 2006) **Seagrass (and saltmarsh) have low "charisma"** in comparison with other habitats (Duarte et al. 2008)

Photo: Pacific Northwest National Laboratory, https://www.flickr.com/photos/36016325@N04/3629720592

Research Approach

The rapid research approach (Fig. 1) consisted of five stages. First, I conducted a targeted and rapid review of peer-reviewed and gray literature about ecological and social dimensions of eelgrass and tidal marsh conservation and restoration. I recorded mentions of challenges the authors described in their work to conserve and restore eelgrass and tidal marsh, as well as strategies they used to overcome those challenges. Second, based on our literature review my project mentors and I identified key areas of inquiry and developed open-ended and structured interview questions. Third, I recruited and interviewed 31 individuals who worked in diverse roles related to eelgrass and tidal marsh conservation and restoration in and around the Fraser River estuary region (Southwest British Columbia and Vancouver Island). I conducted 29 interviews via Zoom, and two in-person. Interviews lasted between 45-120 minutes. I recorded and downloaded automated transcripts from Zoom. Fourth, I cleaned and analyzed the interview transcripts using inductive qualitative coding[2], to summarize key themes and a descriptive quantitative analysis of answers to the structured questions. Lastly, I summarized quotes into key themes, removing quotes that seemed redundant.

In the Interview Findings section (below), I have chosen to present detailed quotes from interview participants related to each emergent theme. Although this has resulted in a long report, I have chosen to include this detail because I learned through the interviews that many people working in this field want a detailed understanding of what their colleagues are experiencing. I have also included quotes that showcase the range of perspectives on each topic, recognizing that not all interviewees agreed about the importance of different challenges or the promise of different strategies for accelerating eelgrass and tidal marsh conservation and restoration work.

[2] Inductive qualitative coding is a data analysis process in which the researcher reads and interprets raw textual data to develop concepts and themes (e.g., Corbin and Strauss 1990). There are many strategies for inductive qualitative coding (Saldaña 2021). In this work I have predominantly relied on attribute, initial, and focused coding strategies (Saldaña 2021).

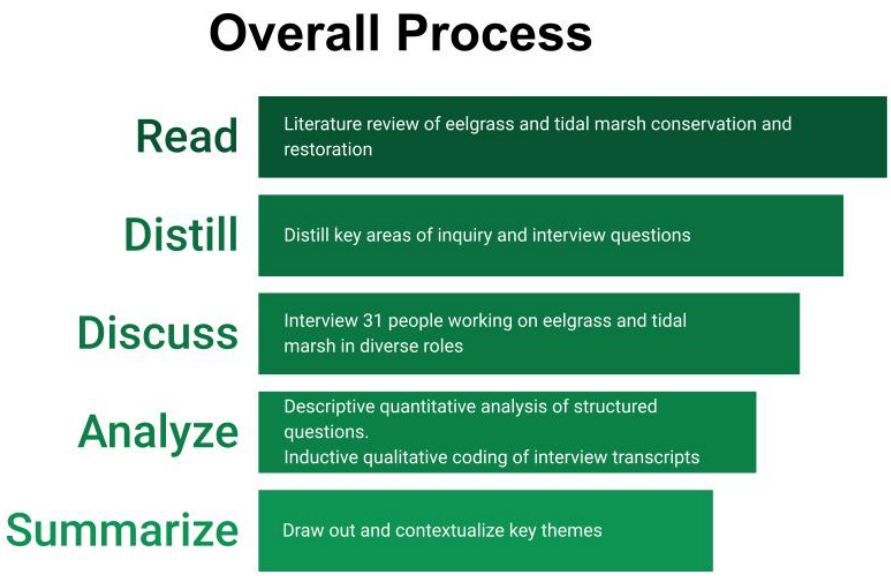


Figure 1. Overall research process

Interview questions

Our interview questions covered six overarching topics (Fig. 2, full list of interview questions in Appendix A), including:

1) Interviewees' background and how and why they came to work in this field.

2) Open-ended conversation of examples of successful and unsuccessful projects interviewees had worked on, and factors that contributed to those outcomes.

3) Open-ended conversation about the overall most significant challenges that interviewees thought limit the ability conserve and restore eelgrass and tidal marsh habitat in the Fraser River estuary, and structured questions to evaluate their perceptions of the relevance of particular challenges that were prevalent in the literature to the Fraser River estuary context.

4) Open-ended conversation about the overall most promising opportunities interviewees think exist to accelerate eelgrass and tidal marsh conservation and restoration in the Fraser River estuary, and structured questions to evaluate perceptions of how impactful potential strategies were that were prevalent in the literature in the Fraser River estuary context.

5) Open-ended conversation about interviewees' opinions and ideas about what is and is not working regarding governance of eelgrass and tidal marsh areas in the Fraser River estuary, and ideas for how to improve governance.

6) Open-ended conversation about potential opportunities for WWF-Canada or similar organizations to support eelgrass and tidal marsh conservation and restoration.

Figure 2. Six overarching interview question themes

Participant recruitment

I began participant recruitment by first working with my project mentors to pre-identify potential individuals and organizations based on our prior knowledge, attending the Salish Sea Ecosystem Conference, authors from our literature review, suggestions from colleagues, and internet searches. I initially reached out to around 30 individuals who, from our judgement, seemed to be leading work in this field. I then asked interviewees for recommendations for other interviewees, and, whenever possible, followed up with them. I stopped recruiting new interviewees after about a month, primarily due to time and capacity limitations for this summer internship. I do believe we were approaching theoretical saturation of themes, which is when few or no new ideas emerge as you conduct subsequent interviews.

In total I attempted to contact 55 individuals (Fig. 3). Of those, 31 participated in interviews, eight were interested but unavailable or too busy during the limited time frame of this project, nine were unresponsive, and seven responded that they were willing to be interviewed, but eelgrass and tidal marsh conservation and restoration in the Fraser River estuary was not a main focus of their work or within their area of expertise; therefore, we agreed that these individuals were outside of our population of interest and I excluded them from the sample. Excluding ineligible folks, our response rate was around 65%.

Individual interviewees chose whether they preferred to have their name and organization listed in this report as recognition of their contribution to this work (Table 3), or have their participation remain confidential.

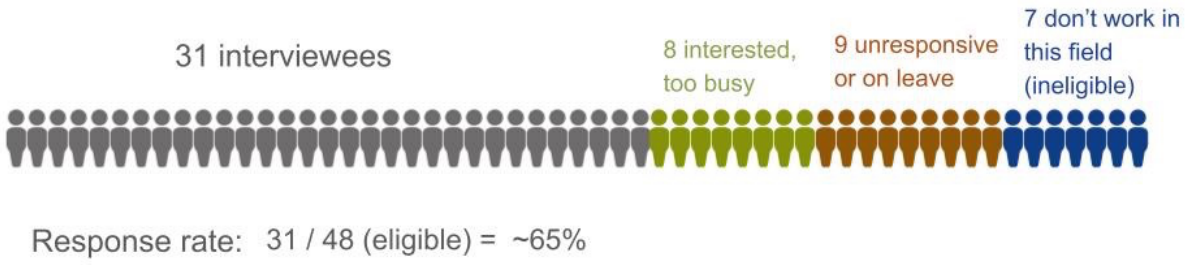


Figure 3. Interviewee response rate calculations

Table 3. Interviewees who preferred to be identified as participants in the research process. Please note that some of the 31 interviewees are not listed by name or organization.

ORGANIZATION	INDIVIDUAL(S)
Asarum Ecological Consulting	Daniel Stewart
Birds Canada	James Casey
City of Delta	Mike Brotherston, Rosaline Choy
Comox Valley Project Watershed Society	Jennifer Sutherst
Ducks Unlimited Canada	Eric Balke
Environment and Climate Change Canada	Kathleen Moore
Envirowest Consultants, Inc.	Mark A. Adams, R.P.Bio.
Hatfield Consultants	Stewart Wright
Kerr Wood Leidal Associates Ltd	Patrick Lilley
Latitude Conservation Solutions Company	Tim Ennis
Lower Fraser Fisheries Alliance	Ian Hamilton
Loyola Marymount University (Frank R. Seaver College of Science and Engineering, Dept of Biology)	Sarah Joy Bittick
Peninsula Streams Society	Kyle Armstrong
Precision Identification	Cynthia Durance
Raincoast Conservation Foundation	David Scott
SeaChange Marine Conservation Society	Sarah Cook
SeaChange Marine Conservation Society & The University of British Columbia, Department of Zoology	Fiona Beaty
The University of British Columbia	Dominic Janus
Tsawwassen First Nation	.
UBC, Department of Geography	Sarah Knox
Vancouver Fraser Port Authority	.

Photo: jmv, https://www.flickr.com/photos/61767360@N00/15614090899

Interview Findings

Interviewee background(s)

Interviewees shared many details about their backgrounds, but here I focus on two measures: 1) the sector that they primarily worked in at the time of the interview ("sector"), and 2) the number of years' interviewees had worked in this field ("experience"). Interviewees worked in NGO; consulting; research/academia; municipal, federal, and First Nations governments; and one worked in a cross-sector role, which I categorized as "other". The greatest participation in our interviewees came from NGOs (n=9) and consultants (n=7) interviewees, and the least participation from First Nations governments (n=1) and the provincial government (n=0).

Given the unequal participation across sectors, I note that some perspectives may be under- or over-represented in our analyses. However, our data is not intended to be statistically representative of all perspectives that exist on our research topics. Rather, our snowball sampling approach better captures the diversity of perspectives, especially among those who are well-known and well-networked among their peers, in this field.

Our sample included interviewees with a wide range of years' experience working in the field of eelgrass and tidal marsh conservation and restoration (Fig. 4, left). On average our participants had 18 years' of experience working in this field; cumulatively, they had a total of 554 total years' experience (Fig. 4, right).

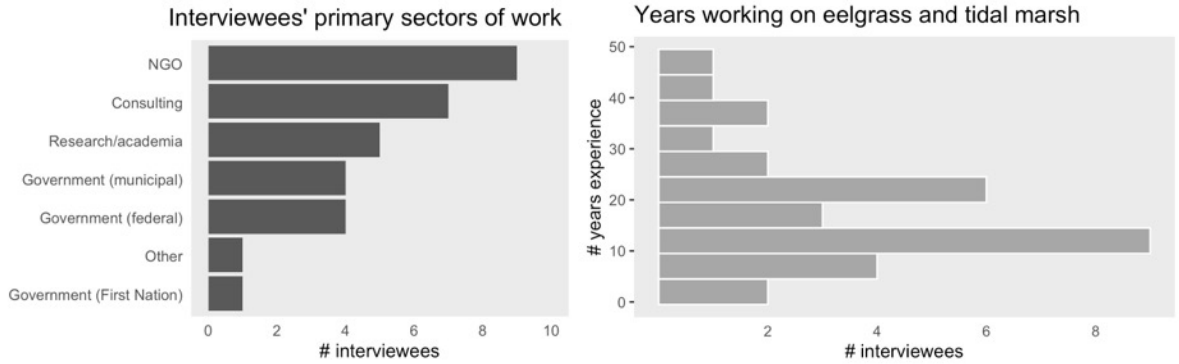


Figure 4. Two key measures of interviewees' backgrounds: primary sector of work (left) and number of years' experience working in the field of eelgrass and tidal marsh conservation and restoration (right)

Project-specific successes and failures

Interviewees discussed at least six dimensions of project successes and failures (Fig. 5). Some defined success or failure based on site conditions, especially vegetative, other biotic, and abiotic functions. These included, for example: density and coverage of vegetation, species composition, how fish and other native species used sites, and site stability. Other interviewees defined success or failure based on whether or not a project had fulfilled or exceeded its intended objectives. This included, for example, legal obligations, like compensation requirements, or ecological objectives set in the design of the project, like contributing to overall net gain of habitat in the estuary. Finally, some interviewees discussed project success or failure in relation to the social outcomes of the project, like whether or not it had effectively involved and satisfied community members, or if they felt it had meaningfully contributed to reconciliation goals with First Nations.

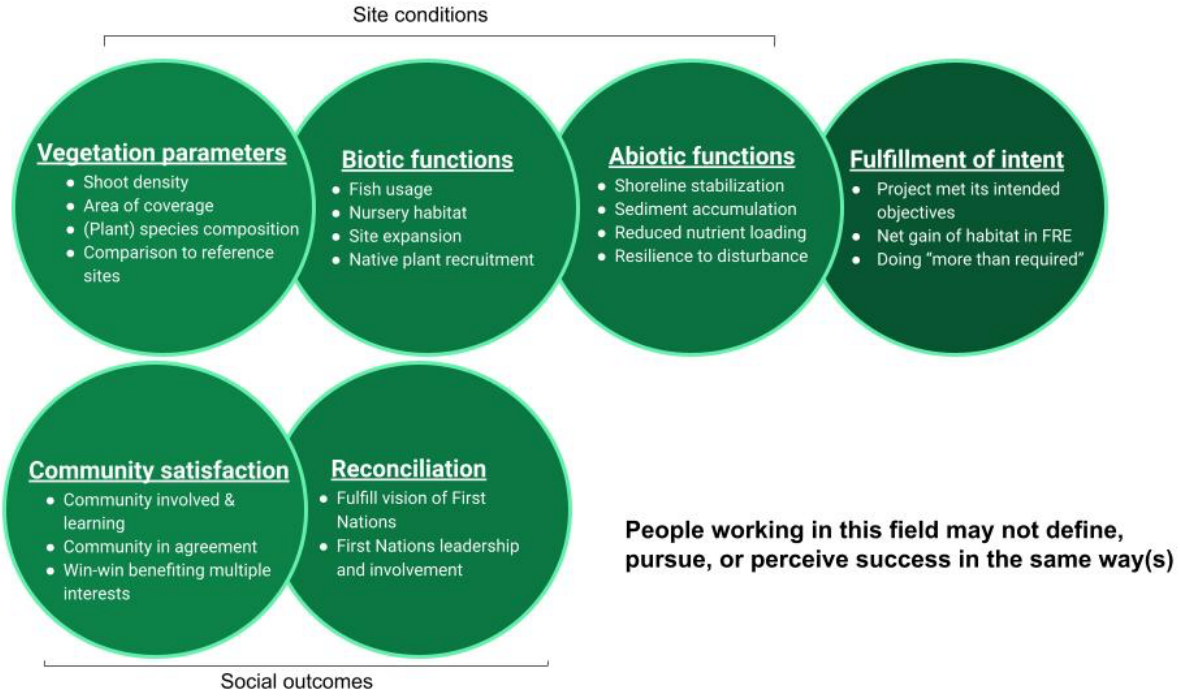


Figure 5. Dimensions of project success and failure discussed by interviewees

Interviewees discussed many factors that contributed to positive or negative project outcomes; these factors can be grouped into 10 overarching themes (Fig. 6). Interviewees discussed these factors in both positive and negative ways; meaning that, when these factors are well-attended to, they can contribute to positive project outcomes, however, when neglected, these factors can contribute to project failures or missteps. The factors presented are not in order of importance or prevalence in the data; rather, they are organized in a roughly logical order for project design and implementation.

Figure 6. Ten factors contributing to project-level outcomes in eelgrass and tidal marsh conservation and restoration discussed by interviewees

Challenges limiting eelgrass/tidal marsh conservation and restoration

Interviewees described a wide range of challenges they encounter in their work when asked to list the factors that most limited their and others' ability to conserve and restore eelgrass and tidal marsh in the Fraser River estuary. I have grouped these challenges into 10 overarching categories (Fig. 7), which are arranged by their relative prevalence in interviewees' responses. Five challenges were most cited by interviewees as limiting their work in response to this initial prompt: site availability (n=16), physical and chemical disturbances to conservation or restoration sites (n=16), tension between development and habitat conservation and restoration (n=16), an overall lack of coordination and strategy (n=15), and capacity gaps (n=12). These challenges may be the most salient to our sample of interviewees. Other challenges were also mentioned, but less frequently, such as knowledge gaps (n=9), rules and regulations (n=9), existing paradigms or ways of thinking that were not in alignment with conservation and restoration goals (n=7), difficulty procuring needed materials (n=4), liability and risk tolerance issues (n=2). Fewer individuals mentioned these latter challenges in response to our open-ended prompt. Those who did not mention any particular item may still perceive that item as a challenge. Rather, not mentioning an item suggests that it may be less salient to an individual. Overall, no challenge was mentioned by more than 16 interviewees, which suggests that people working in this field experience a diversity of salient limiting challenges.

Figure 7. Ten themes emerging from interviewees' responses to question about the biggest challenges they think limit the ability to conserve and restore eelgrass and tidal marsh in the Fraser River estuary and surrounding region. The number on the left represents the total number of interviewees who brought up this idea in response to an open-ended prompt.

Participants evaluated a set of 12 structured questions that represent key challenges that were prevalent in the literature on eelgrass and tidal marsh conservation and restoration (Fig. 8, see Appendix A or subsequent pages for full prompt text). This structured activity complemented open-ended discussion about challenges to provide a fuller picture of each participant's perceptions of challenges.

Overall, the three challenges from our structured list that interviewees perceived as most limiting were: insufficient or unreliable funding, physical disturbance to conservation and restoration sites, and the effectiveness and enforcement of existing regulations. The challenges perceived as least significant were: having a lack of scientific understanding to take management actions, and having difficulty securing support due to uncertain project outcomes. Most interviewees thought all of the challenges were at least somewhat limiting in the Fraser River estuary.

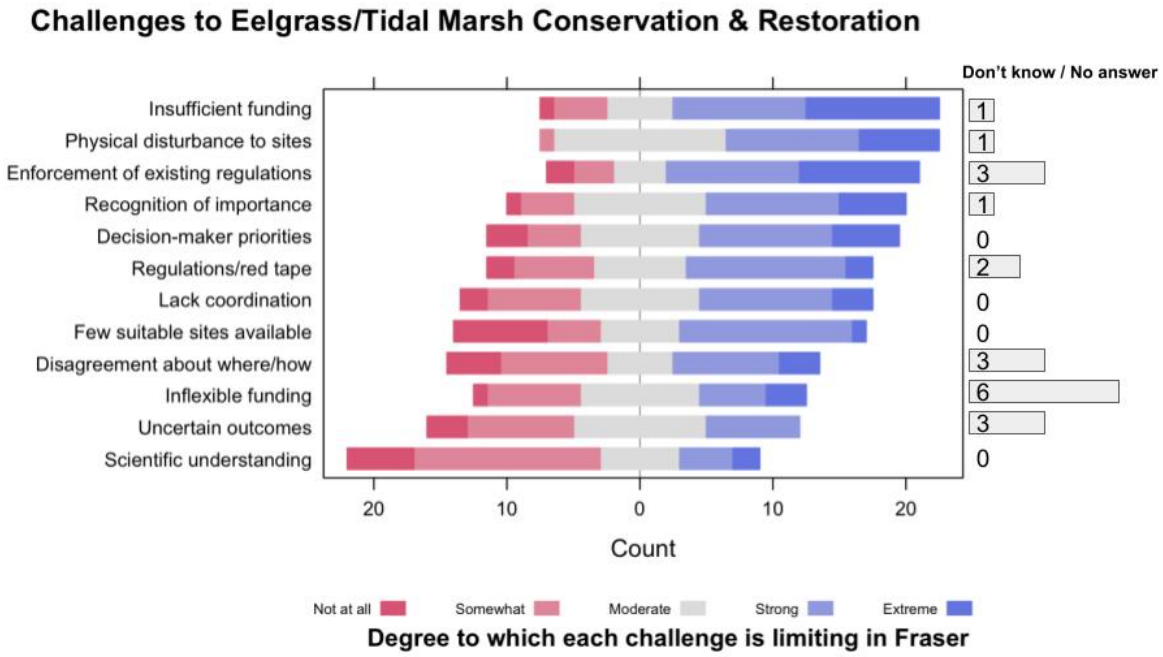


Figure 8. Interviewee ratings of how limiting twelve challenges (derived from the literature) are in the Fraser River region

Insufficient funding

The top-ranked limiting challenge was insufficient funding. Interestingly, people with the greatest amount of experience (40+ years) seem to have perceived this as less of a challenge than those with the shortest amount of experience (less than 10 years) working in the field. Interviewees working at NGOs generally perceived this as a major or critical challenge, academics had more moderate responses, and consultants expressed diverging opinions.

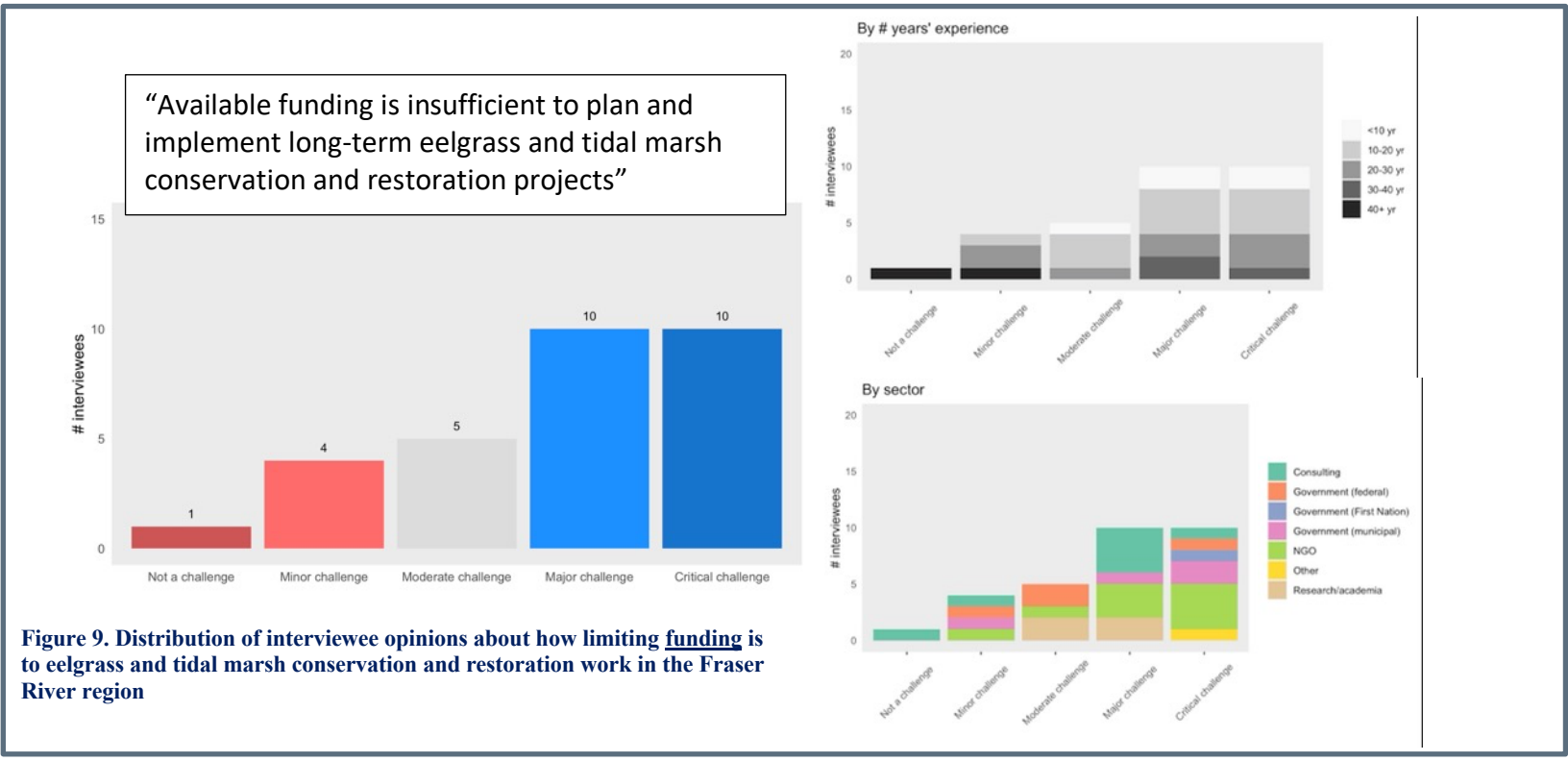


Figure 9. Distribution of interviewee opinions about how limiting funding is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"It does seem like there's **more funding** online than there has been."*
- *"It's **easy to get money**, but we have refused… before the root causes [of decline] have been addressed"*
- *"I would love for the funding… to come from sources that aren't **associated with project proponents**"*
- *"Every one to five years… they will **not continue funding for the same theme** or the same work. So, every time we apply for a grant, we have to change it enough to engage the imagination of the funder. It's like selling yourself over and over again…. in five years, or two years or one year, you can't address the huge problems"*
- *"**Monitoring needs** to be funded, you know… and more funding to do **conservation** first and then restoration… like we need to protect the available habitat that exists."*
- *"There's a lot of money, right now, so there's money, but you it's kind of like quick and you gotta kind of be ready, and so it makes it **harder to plan** for the longer term"*
- *"I don't get the feeling that this is very well coordinated. They pitch an idea, and they get some funding, whether it's **successful or not**…. the coordination of it is, is quite a problem."*
- *"We **could be much more effective** at both targeting and planning and using the money we have. So, the actual funding is a minor challenge. It's much more **coordination** of how to use that money.*

Physical disturbances

Nearly all interviewees perceived physical disturbances of restoration or conservation sites as a moderate, major, or critical challenge. Interviewees from NGOs perceived this as a particularly important challenge, while consultants perceived it as a bit less of a challenge.

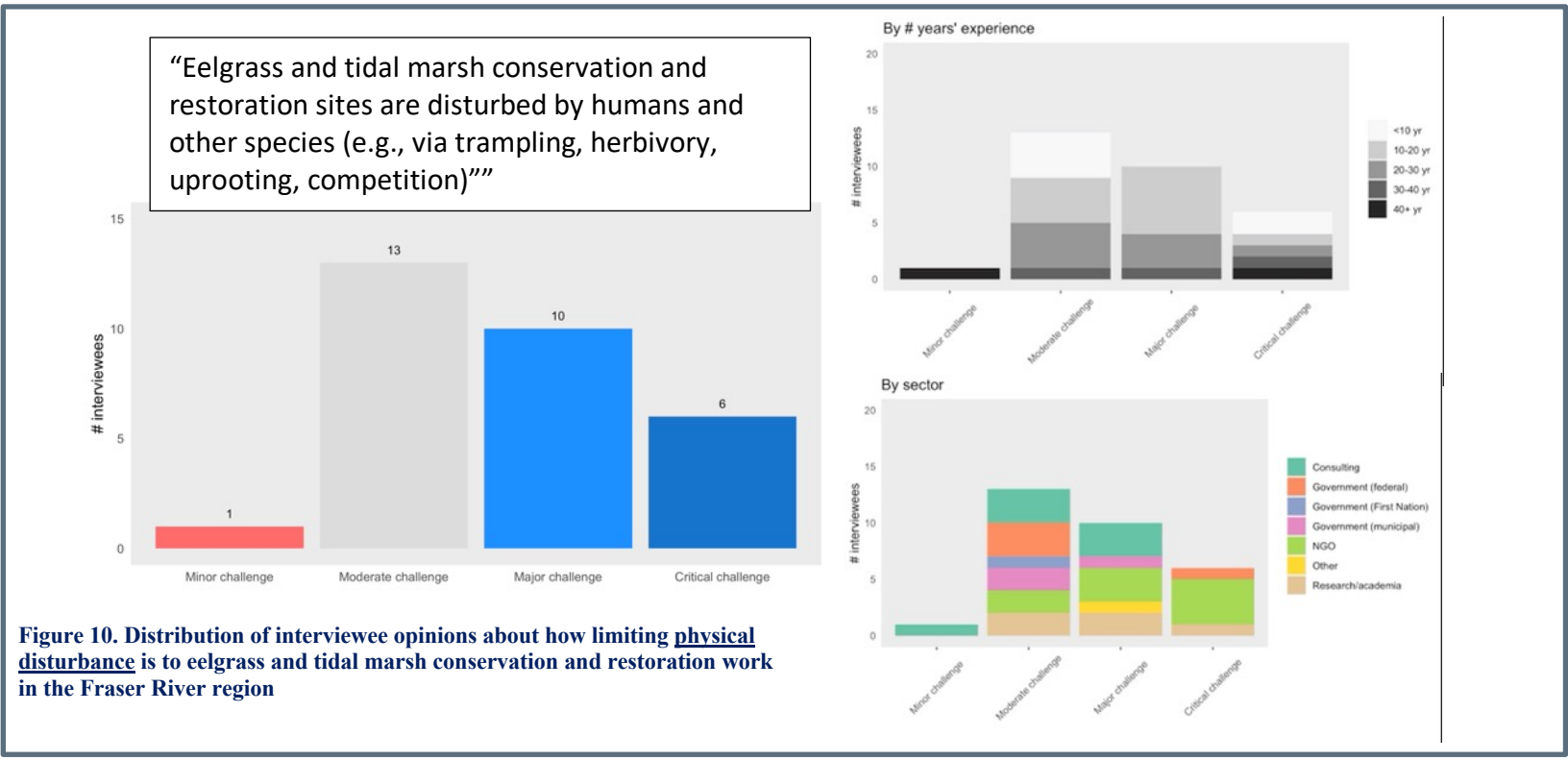


Figure 10. Distribution of interviewee opinions about how limiting physical disturbance is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"If you include **log storage** and all those things yeah then it's critical."*
- *"Where it is shallow enough that **people would walk** out or kind of be in that area…"*
- *"We don't do intertidal restoration because it's so much more like exposed to **predation by birds**, but also like **interference by people**, so we just do subtidal restoration."*
- *"You need to split out **historic versus contemporary disturbance**… in our area most of the big scale disturbances were historic and just haven't recovered yet."*
- *"The **dogs** were a major issue… they were just pulling it up… that initial stage, when the shoots are not well rooted or whatever that makes it more susceptible and also that is just specifically a very popular spot for people to walk their dogs."*
- *"**Herbivory** is a big deal and it's **snow geese** and **Canada geese** in particular."*
- *"Exposure is a big deal with a salt marsh, so **storms** can be quite destructive… the November **flood**, for instance."*
- *"Maybe related to…. **climate change**… in the **heat** pickleweed was dying and… tide pools we're becoming **hypersaline**…. probably too much for even pickle weed… and **desiccation** is a big deal with plants, so if you're getting these really high marshes maybe you know the native species may be stressed, and then the invasive maybe a little more adaptable."*
- *"We're seeing the proliferation of **narrow-leaved cattail**, which is a sort of an **invasive** cattail species that is overtaking some tidal marsh habitats and in the eelgrass area we're seeing… **Spartina.**"*

Implementation and enforcement of regulations

Interviewees, especially from NGOs, perceived implementation, and enforcement of existing regulations as troublesome. Many thought regulations have not had their intended impact.

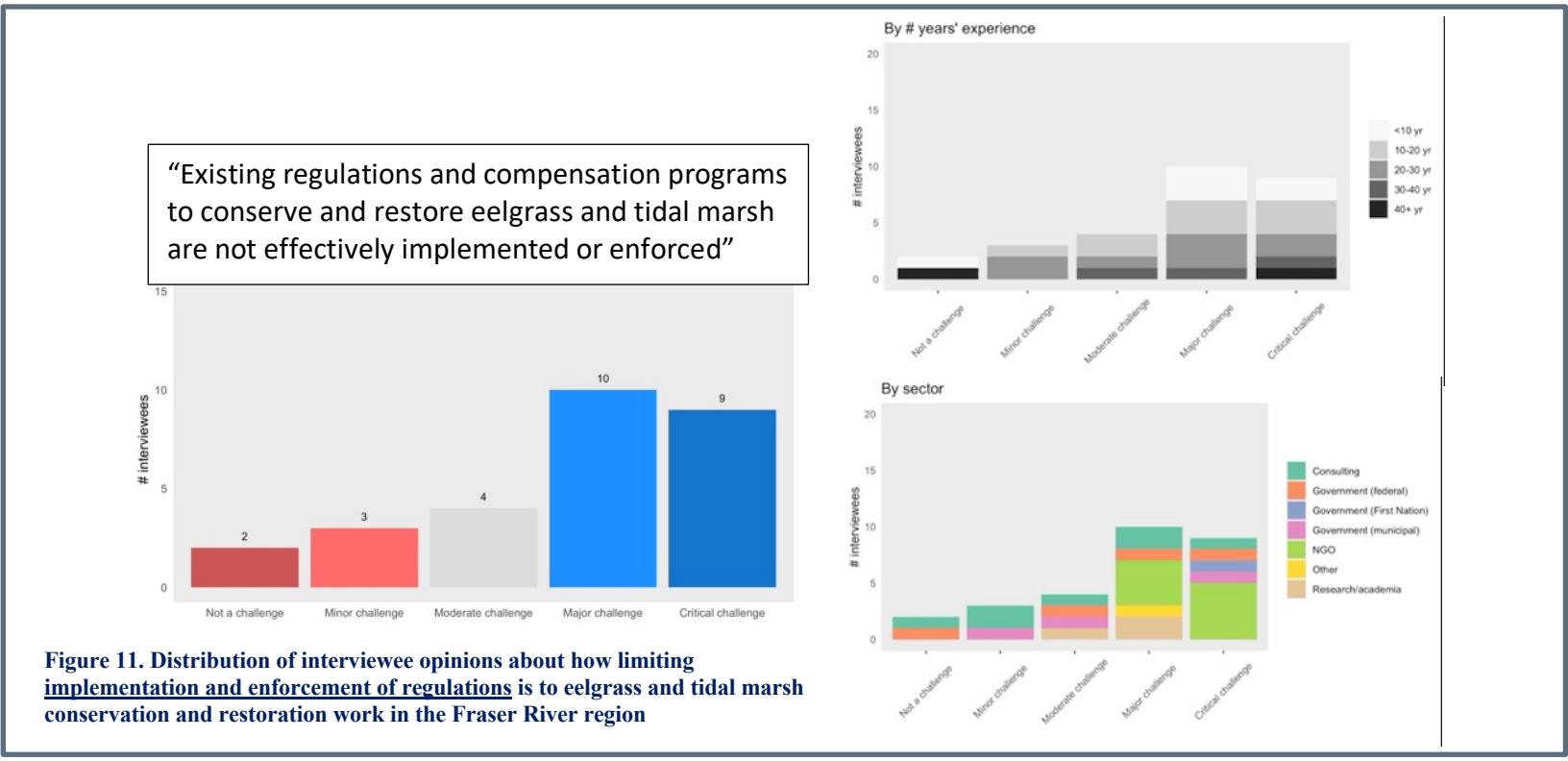


Figure 11. Distribution of interviewee opinions about how limiting implementation and enforcement of regulations is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"People are doing what's required of them. There **isn't any corner cutting**… the bigger question would be, 'Are these regulations adequate?"*
- *"**People** that would prevent the certain environmental degradation, or destruction, like Environment and Climate Change Canada… **are not actively in this area** unless we request them to be."*
- *"There's a huge **lobbying force** in the boating community to repress [derelict vessel] legislation."*
- *"The regulations are **not being enforced** and some regulations **don't even exist**."*
- *"Historic, compensatory habitat decades later is **ripped up** or is… **abandoned** and so now it's just like **derelict infrastructure**… [offsetting] continues to eat away at our baseline of habitat."*
- *"We just **don't really understand [the science] well** enough [to design projects so that they comply with regulations like 'no net loss of habitat' policy long into the future]… it was poorly implemented, but again, probably not through a lack of effort or anything else, like that."*
- *"They have all the bonding in the world to do this, but they are **reticent to cash in the bonds** to do the work… should have a mechanism by which can cash in the bond and award the task to someone."*
- *"Statute of limitations for a lot of these offset projects is five years… but that's not enough to maintain the ecosystem service of that habitat on the long-term view and unfortunately, a degraded restoration project can be as detrimental, as it was once beneficial… **longevity** is the real issue."*
- *"I will never quite understand **how [DFO] determine what equivalent habitat value is**, and I have tried to push this and open that pandora's box, but at the end, I have been unable to do it."*
- *"The **lack of monitoring** is a big, big thing for me… it's been on NGOs to go out and monitor years after the fact… it shouldn't be that the funding has to come from conservation organizations or from grants."*

- *"I've **never seen enforcement of anything** that we've ever done on site"*
- *"There's **nobody out on the water, except the guardians**. When you call because you have observed some damage being done actively -- there's just an answering machine for government offices. Regulation is really, really poor."*

Public awareness and recognition

Interviewees held a range of opinions on whether or not lack of public awareness of the importance of eelgrass and tidal marsh is limiting their work. Early-career professionals seemed to have perceived this to be a greater challenge than others.

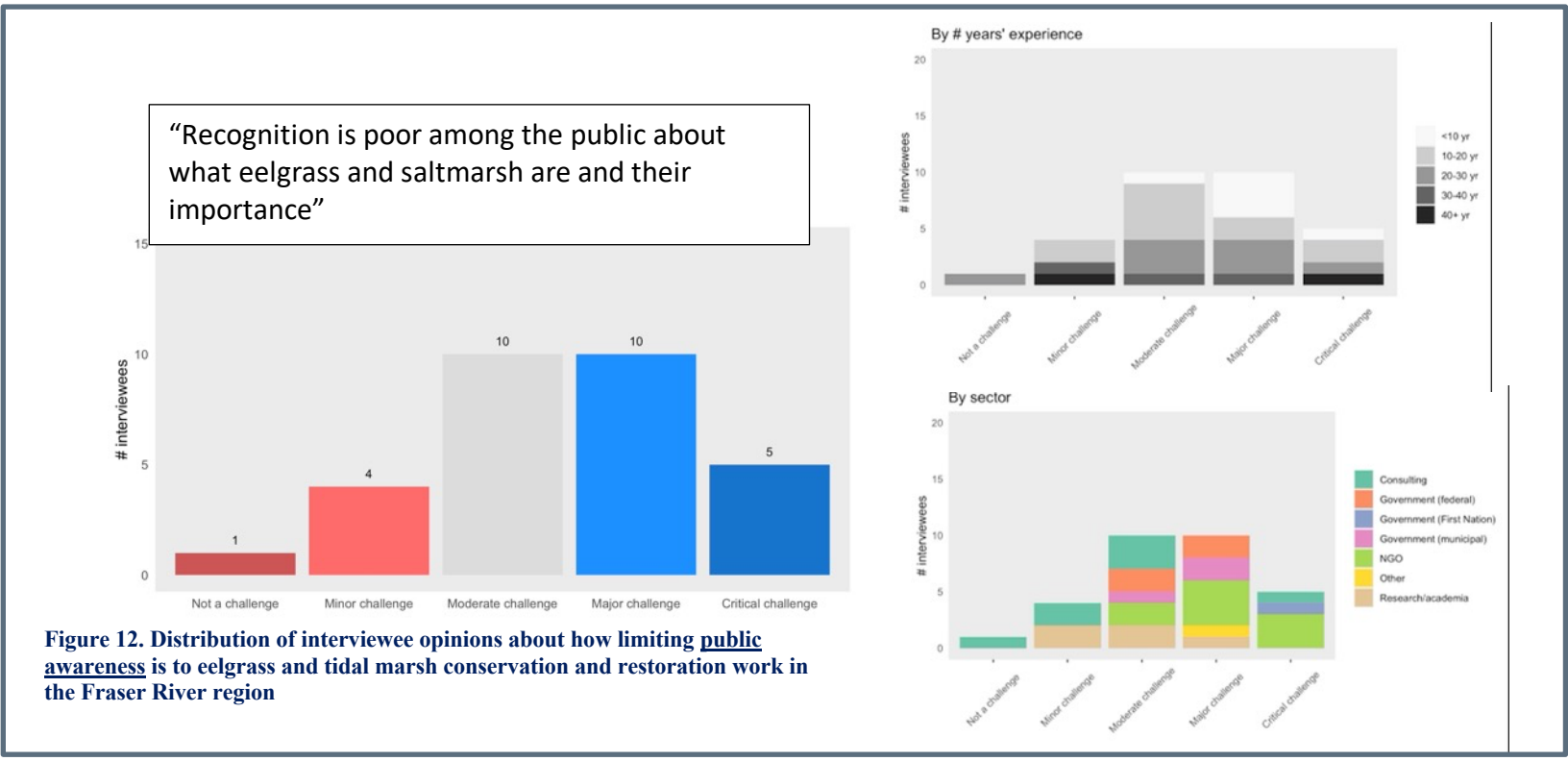


Figure 12. Distribution of interviewee opinions about how limiting public awareness is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

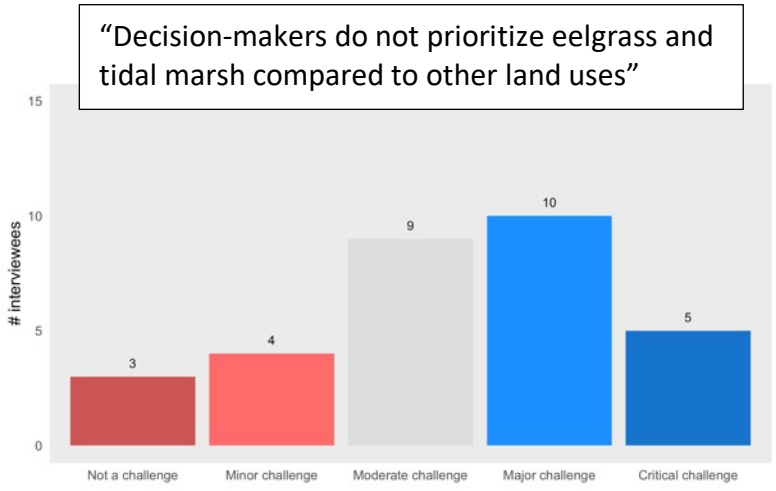
Comments:

- *"Many, many, many people. come to this coast, with very **little knowledge** of how the ocean works… they buy property… by the ocean and then shore up as best as they can against the energy of the saltwater coming into their property… we tend to replicate the conditions from which we come… the education has to be about 'No, you're not at home anymore, Dorothy.' It is a whole different place… the revolution, the **reconnection with nature** has to start with human beings. Nature is going to do what she does to reach balance and she's not going to be educated…. Human beings have to realize we have to adapt to these changing conditions."*
- *"People who need to be aware of eelgrass are the people who damage it, like developers and forestry folks and boaters and also like the regulators who have the power to protect it from the cumulative effects of coastal development and sewage. I think amongst most of those groups they're pretty aware, but that **awareness doesn't always translate to valuing** it."*
- *"When you wonder why there's not funding, it's probably at the source that **public don't think it's a problem**."*
- *"When I talk to my friends…, a lot of people **don't even know what eelgrass is.**"*
- *"A lot of people really **don't know just how important** those ecosystems are.*

- *"There's definitely a sect of the Community in the Fraser that is aware of the importance of it, but like **by and large the population isn't**."*
- *"[People] see the value, especially when you put it in terms of migratory birds and fish."*
- *"The conversations around salmon have sort of brought a lot of news… recognition, but I **don't think most people really understand why** it's so important"*
- *"People are more aware now than they were before of the importance of eelgrass habitats… but **recognition of salt marsh significance is years behind** that."*
- *"I couldn't say for sure how the lack of public support has impeded implementation of policy."*
- *"I think there's been a lot of work specific specifically around the relationship between juvenile chinook salmon and… these habitats… there's been a fair amount of education, we were kind of **partway there**. I think there's a lot more that could be done."*

Decision-maker priorities

Interviewees held diverging opinions about whether or not decision-maker priorities were limiting eelgrass and tidal marsh conservation and restoration, with early-career (<10 years) and NGO and First Nation interviewees highlighting this as a more critical challenge than others (Fig. 13).



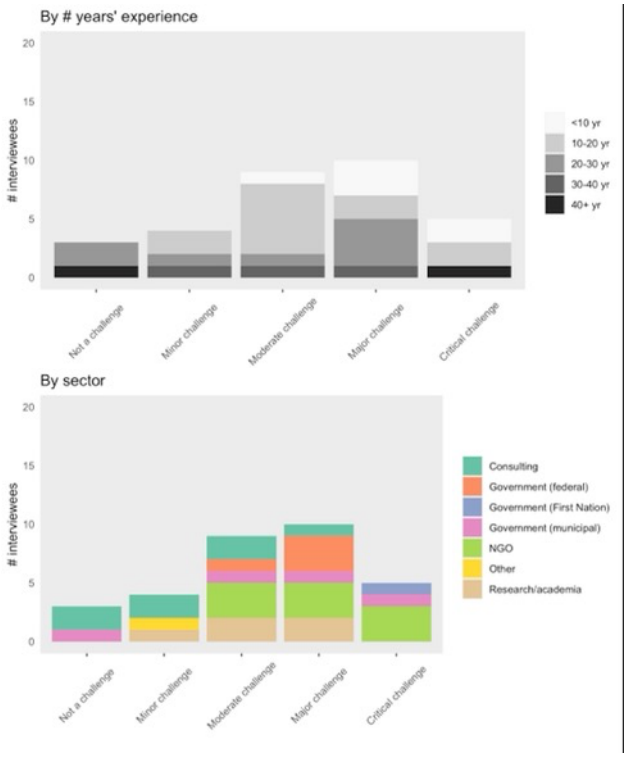


Figure 13. Distribution of interviewee opinions about how limiting decision-maker priorities are to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"We invest billions of dollars in infrastructure and whatnot… it's **multiple orders of magnitude – [compared to] the investments made in in other areas**."*
- *"That might have been the case, historically, but… now, all these habitats are **under the [Marine Conservation Areas Act]** and I assume they **will figure prominently** in new provincial initiatives as well."*

- *"When I talk about it with government agencies… blue carbon is the thing that is highlighting eelgrass a lot… [but **blue carbon] takes away from the force of the message** we have to decrease our emissions, the plants cannot compensate for what we're doing."*
- *"There's a lot of goodwill in the region where I work that's not necessarily expected elsewhere… there's always **more work to be specific in the policy and in the bylaws** about eelgrass."*
- *"It's more than just like designating the land use. **You have to back it up with resources**"*
- *"There's **jurisdictional issues** there… so it's inherently challenging for decision makers to work in those environments, they're tripping on each other."*
- *"Funders are a lot more **interested in getting a very clear return on investment** and it's easy in a fish bearing stream to say, 'We did work, now there's more salmon.' You do work in an estuary, it's very difficult to show."*
- *"The whole Fraser Delta system is a victim of **conflicting mandates** and so without that coordination you end up with, 'Which government organization has the most sway at a particular moment and the most money?' And so, their mandate will drive the decision-making."*
- *"If we had a more holistic decision-making body or even a more holistic plan in which to provide a framework for making decisions, that could be helpful, but we don't… and so as a result it's **very siloed decision-making**."*

Regulations or "Red Tape"

Most interviewees identified regulations as a major, moderate, or minor challenge, and only two thought it was critical. People with the greatest amount of experience (40+ years) and NGOs tended to perceive this as a lesser challenge, while municipal government employees seemed to perceive it as a greater challenge (Fig. 14).

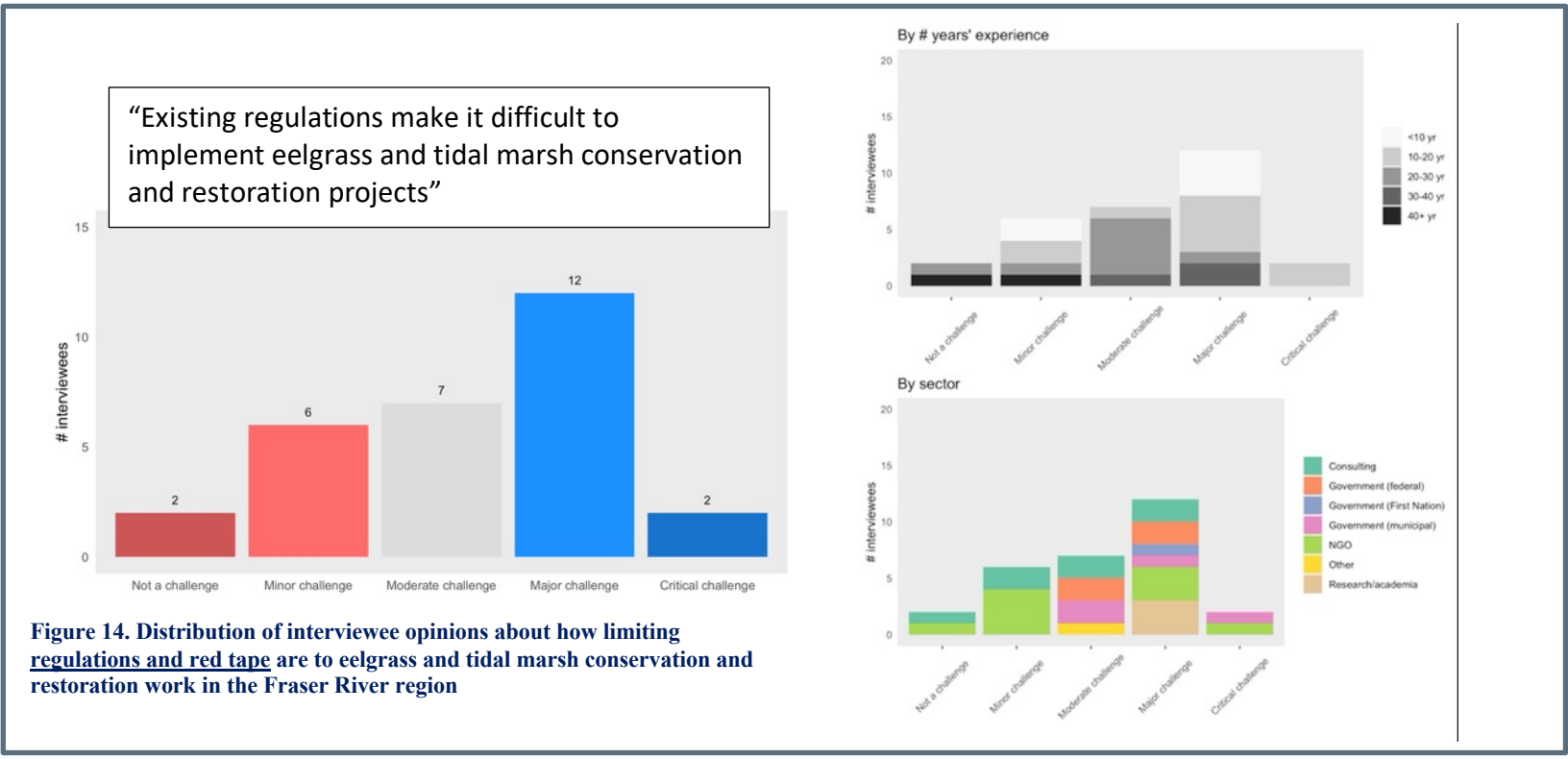


Figure 14. Distribution of interviewee opinions about how limiting regulations and red tape are to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

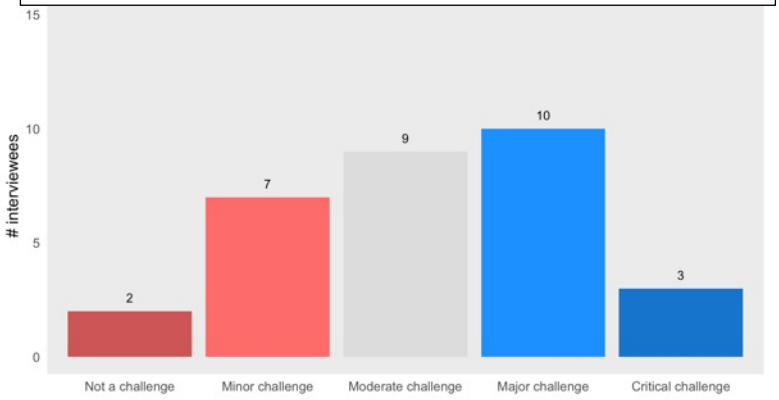
Comments:

- *"Another project that they were proposing... they **didn't consult with farmers** in the area… this one particular project now, as a result of this oversight, might not go through."*
- *"When we do restoration, **we don't have to go through the permitting process**, which is a huge relief, because that would be a time delay and… it's a pretty limited time of the year, and if we have to go through the permitting process, it delays how fast we can do the work that we want to do."*
- *"**Permitting** and phases that you need to go through to actually get something going can be a pretty **cumbersome process.**"*
- *"They definitely make it difficult to ensure success because of the **jurisdictional complexity** that is BC's coastline."*
- *"[A] logging company agreed to sell us and we agreed to buy [logging] tenures from the Province, but the **Province denied our requests to control those areas** because they are tenures for specifically for log booming and storage and unless we're doing log boom and storage, no, we can't have them… for the purposes of say, eelgrass or title marsh restoration... **restoration should be an allowable use of a water lot**."*
- *"DFO regulations around working in the fisheries windows and getting authorizations... **it's all there for good reason**, and it's just stuff you have to work through, and I don't think it's particularly difficult"*
- *"The politics of **First Nations** makes it where they **almost have a veto**, and we're running into that all the time. I'm very sympathetic… and I think it's really, really important but… they do **play political games**…. they're essentially another form of regulation…. Sometimes there's a struggle with capacity and expertise with the First Nations and I have had discussions with the Indigenous advisors, with the Federal and provincial governments, and I said, you know, "Does my expertise mean anything anymore? Because the First Nations, you know, politically if they dig their heels in, they can just reject"*
- ***"[Agencies] are understaffed hopelessly**, like DFO just had a thing, where a 30-day turnaround is now 60 days. The Province is, a year to 16 months. It's ridiculous when you have arguably the most experienced people in the Province working on projects, doing mitigation, bringing in the science, you know, trying to do the right thing, and having to **wait that long**."*
- *"Restoration definitely is affected by regulation.... certain kinds of projects might require an environmental assessment… and it can be quite, quite challenging… **could be several years** trying to get this in place*
- *"In the past, the only sort of regulation and money would have been in support of the Fisheries Act… Sometimes there's exemptions [to help with restoration], but there was no exemption for the product that was used for the spartina control, and it was well researched on the American side… and it was very successful but, in the Fisheries regulation, **there was not even an ability for an exemption… for a positive use** of a product, right? This is an example of regulations that actually impede conservation and restoration because they're **designed to prevent other [negative] things, but they are an impediment to the positive things."***
- *"The regulations sometimes **don't allow for… these restoration projects that don't fit their boxes** of what they're used to reviewing and the way in which they're reviewing it and so it doesn't feel kind of right that, you know, a **restoration project has to go through the same process as a development project**… a lot of it has been like educating the regulator, moving them through the process of helping them learn about the project and understand what the project is trying to achieve so that they can sort of evaluate it appropriately."*
- *"For permitting on some of these projects, because you have **different regulatory agencies responsible for different species** and they kind of don't agree on the loss of one [habitat or species] over the other."*
- *"We know where there's these points or solutions [to stormwater regulations], and we know that the fixes are relatively simple in the grand scheme… and yet we continue to hit challenges with getting them to actually address it and move it forward and so that's an example of like the **regulation being so siloed**. And, so [stormwater] is kind of local government, but [the Province] oversees it, but they're not enforcing anything… once that water flows out into the ocean or the marsh or the seagrass, it's not Provincial, it's DFO, and so there's this **disconnect between the regulators**."*

Lack of Coordination

Interviewees expressed varied opinions about how limiting lack of coordination was to eelgrass and tidal marsh conservation and restoration (Fig. 15). Those who did perceive it to be critical tended to be later-career interviewees. Federal government employees tended to see this as a major or critical limiting challenge.

"Stakeholders and rights-holders do not coordinate, share ideas, or work together on eelgrass and tidal marsh conservation and restoration"



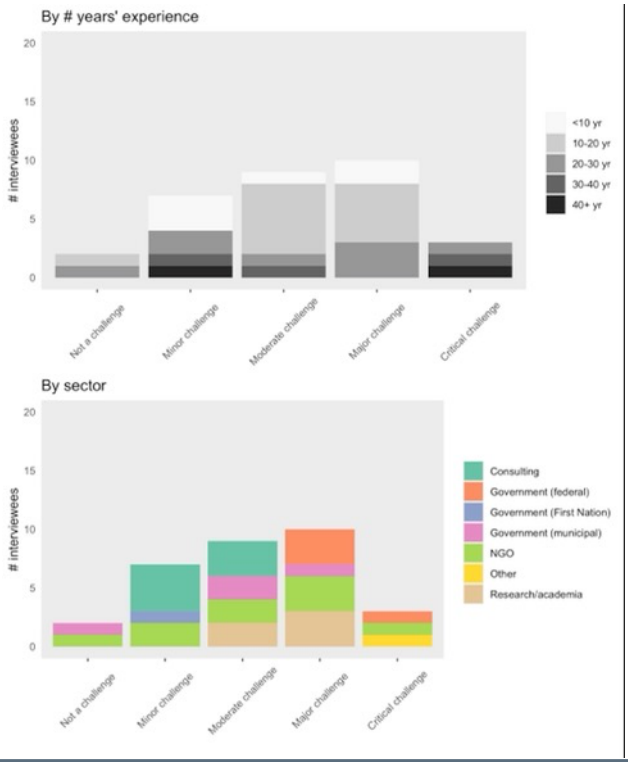


Figure 15. Distribution of interviewee opinions about how limiting lack of coordination is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"There's an **opportunity for better engagement with rights holders -- with First Nations in particular**."*
- *"Estuary restoration **roundtables were maybe a bit more prominent a decade ago**. I think you could never do enough on that front to kind of coordinate and stay communicating with each other and… each different community needs to be networked better than they are…. It was a major program of the Pacific Salmon Foundation, at one point in time… the creation of these estuary management plans, and other local governments had specifically stepped up to make sure there were roundtables in place… there's **not that much in terms of active work on those I don't think anymore**."*
- *"Even when you do get all the right people in a room and they generally agree, overall -- first of all -- it's that hard to get those people all together, because again of **everyone being overstretched**. And I've seen a lot of these meetings really not turn into anything, even though everyone's agreeing… Environment Canada will be there and First Nations people will be there, environment nonprofits people are there, academic scientists are at the table, and we're all agreeing…, but one party will say, 'Well, it is our mandate -- the Federal Government in particular -- but we just don't have the time or resources to deal with it.' So, not necessarily blaming Environment Canada, but it's like one example of this like, **we're all agreeing but there's nothing we can do about it**."*
- *"The lack of coordination and lack of just sharing of what's happening, I mean, it's getting better… but every time we go to the like the Salish Sea Ecosystem Conference or something, all of the work is about what's going*

on in Washington State. ***It's amazing how little we talk to each other up here in BC*** *about what's going on…. There's so many different groups doing the work… it's wonderful to see so many people recognize the importance and wanting to do it, but coordination is so important."*

- *"It's a huge focus, like all these roundtables and with everybody and their mother there. [Roundtables] drive me nuts because it's like 15 chefs in the kitchen and you're trying to do something.... And a lot of the* ***people don't know what they're talking about*** *very much, so it's frustrating.... but I mean you should have to deal with things and get people you know, develop a consensus…. Generally, I'd say we're working together, it's just -- it* ***needs to be well facilitated*** *and you know* ***getting the appropriate people [and] expertise at the table****."*
- *"Industry's interests and their motivations are totally different than the community's."*
- *"After FREMP disbanded, [coordination] didn't, it wasn't occurring very well, but I think* ***in the last few years there has been more coordination****, but I still think there's a way to go…. Again, it's not because of formal funding or support it's more just because of* ***relationships having been built and people utilizing their relationships****. I've been a part of some recent calls where it has been like, "Hey, this round of funding is coming up, we should talk about what different folks are doing and share ideas and what we could apply for funding, so that we're not competing against each other, or our ideas are somewhat coordinated."*
- *"We really try to make an effort to have those views represented in our projects, but in general I think it's* ***difficult to do, unless you have the people, resources, and time****."*

Site Availability

Opinions diverged on whether site availability was an important limiting challenge (Fig. 16). Federal government, consultant, and early career (>10 years) interviewees tended to see this as a greater challenge. NGO interviewees were divided.

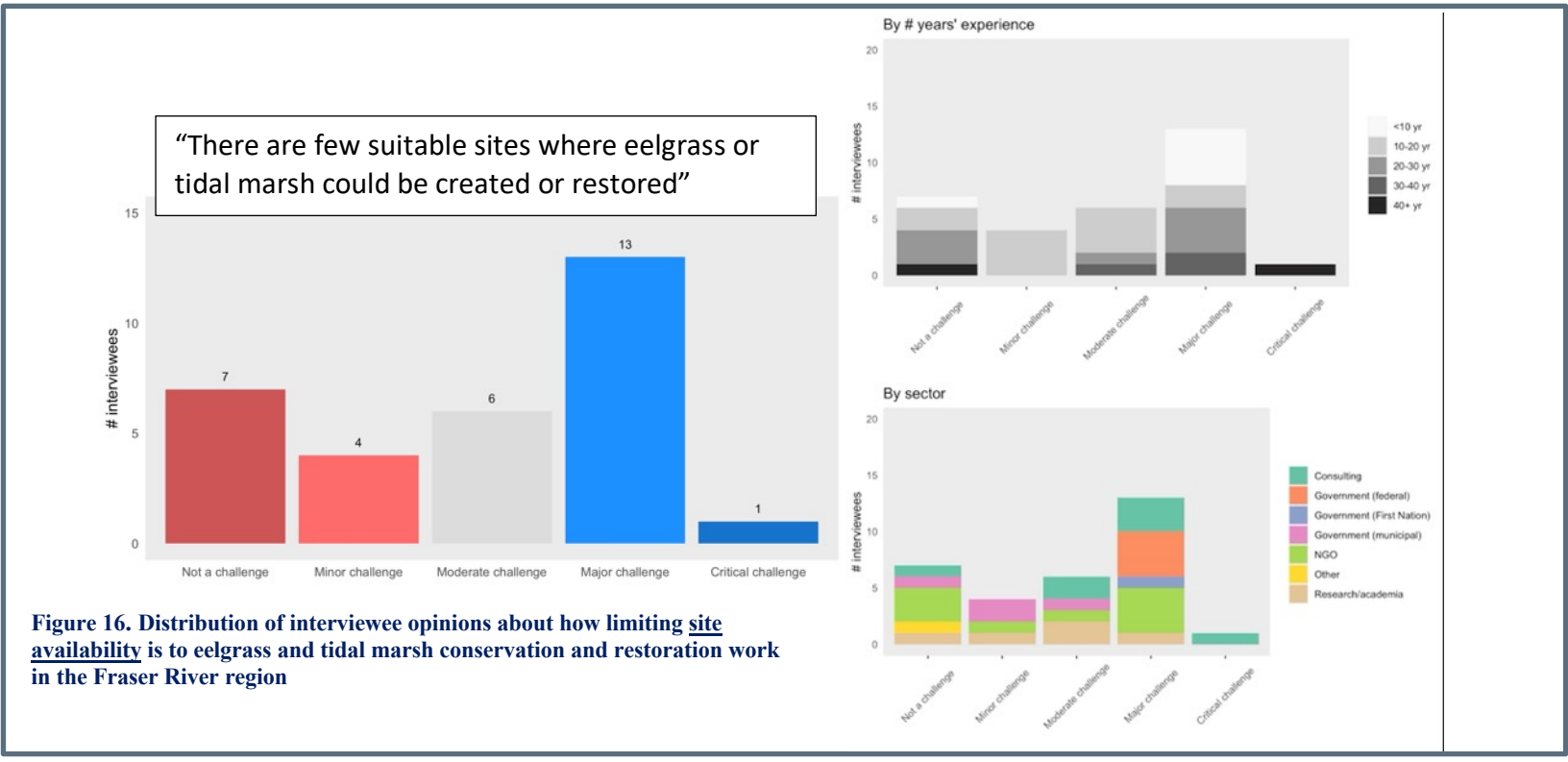


Figure 16. Distribution of interviewee opinions about how limiting site availability is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"We have **massive swaths that we still need to protect**… although they may be within provincial conservation land, there is action needed to protect them against sea level rise. But I would say there are fewer opportunities to restore them."*
- *"Iona and all of Sturgeon Bank have restoration potential if people wanted to put the money into it. So, it's **not really an area limitation, it's like a prioritization limitation**."*
- *"There are many, many suitable sites, it **just takes a lot more investment** and doing surveys and testing of sediment and making a commitment to **not only the Salish Sea, but the whole coastline**."*
- *"The Fraser Estuary has been very heavily impacted by log booming and any site where there's historic, or where there's the accumulation of woody debris, **it's really hard to warrant investing in restoring those areas** because the benthos is just so messed up chemically, it's often like anoxic environment. So, there's opportunities to conduct restoration there but they often tend to be a lot more expensive because they involve either dredging or capping the sediment and then planting on top of that. It's doable but you need more money, and so I think that that would kind of remove a lot of opportunities in the Fraser River."*
- *"It's kind of a **race to identify those and protect them** before someone comes forward with a development proposal to destroy them for the sake of whatever that that company industry, whatever is focusing…"*
- *"We're **running out of real estate**."*
- *"We go back and look at that list and **there's just not the big, big sites**"*
- *"I think that is definitely major, and **potentially becoming a critical challenge** with sea level change."*

Lack of agreement

There were diverging opinions about how limiting the lack of agreement among stakeholders and rights-holders has been (Fig. 17). NGO employees tended to think this was a lesser challenge.

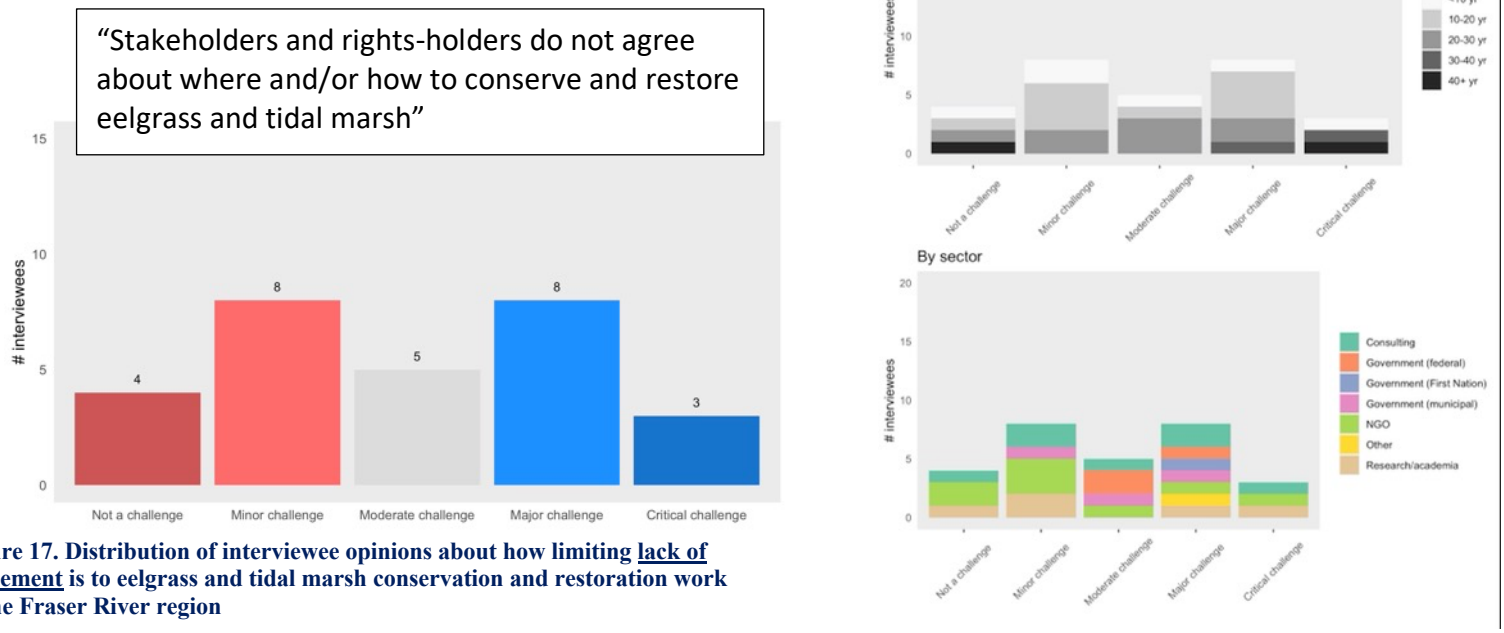


Figure 17. Distribution of interviewee opinions about how limiting lack of agreement is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

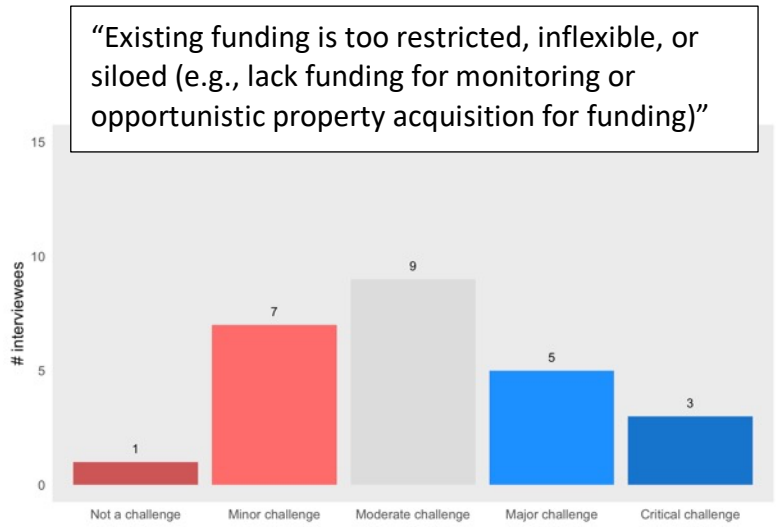
- *"I think people are **pretty on board… with the protocols** for protection and restoration."*
- *"[Log boom tenure **lessees] say 'We don't, we are not responsible**, we are not the culprits…. we don't do anything to the eelgrass, we don't do anything to the estuary.' We proved them wrong."*
- *"It **isn't about whether we agree or not… it's that we don't know**. That's why we're testing with different treatments… that's the purpose of the pilot."*
- *"High on the list is **fisheries and shellfish harvesting and there's no disagreement about that**. You know, the nearshore has, always been considered critical for those kinds of activities... and if nothing, it's the opposite. There's high interest in restoring or protecting these habitats"*
- *"**I haven't really run into that.** Maybe it's the way we do business because we… engaged with rights holders and stakeholders early on, and had several workshops, and they… actually helped with the prioritization process…. but it might be different in other areas."*
- *"There's a lot of **diverging opinions, and there's no handbook on what the best solution is**… it's definitely real. But… I think **disagreement can sometimes be healthy and helpful, but it does delay things** at the minimum. You need a lot more meetings to kind of work these things through."*
- *"A lot of times there's really great public community-based processes, like the estuary management planning processes that were, I think, at one point, a little bit more common here…. You bring all of those diverse stakeholders and right holders to the table to come up with you know sort of those bigger picture plans on an estuary-by-estuary basis, and I think that process really works great. **You can usually find quite a lot of common ground** on where and how, when you do that."*
- *"I'm aware of some estuaries where, you know, **certain recreational activities might be it hampered by estuary restoration** and that has caused some challenges."*
- *"Certainly, in terms of that Living Dike example there's **lots of different views around how best to do it** and where it should be done and concerns about.... how that may impact on other habitats, for example, biofilm. Certainly, I've heard from **regulators that they're very nervous about.... changes between habitat [types],***

about [how] that changes the underlying value*…. Shorebirds is a particular and understandable concern. I think that stakeholders and rightsholders may have different… focus."*

- *"Trying to get agreement, particularly among rights holders, that's can definitely be very challenging, particularly where those rights intersect between a lot of different jurisdictions. So, we have private landowners versus federal vs provincial vs municipal. And* ***unfortunately, eelgrass and tidal marsh live in that area where you're going to have the highest number of those conflicts****… it's not a fun challenge."*
- *"Some stakeholders want to develop, and we're having a thing where* ***we're not allowed to even go on to a property to do studies, because… they're afraid that we're going to find something which would [hinder development],*** *and they won't even, let us go in the property."*
- *"There's a very* ***distinctive divide between the focus and interests of the First Nations communities and that of the recreational and commercial fishing sector****s. What the Nations see as viable and necessary restoration and habitat enhancement, is for the sake of food security, cultural identity stewardship, and ecosystem conservation…. other stakeholders are basically doing restoration for the interest of their own gain, right? …You're going to run into distinct differences in opinions when you discuss what needs to be restored, where, and why…."*
- *"I think, generally, people agree. We need to restore, what area we need to protect…. If you talk to stakeholders that are more like development focused… you end up sort of hearing different things about the importance of different areas to the overall ecosystem and… cumulative effects… Roberts Bank Terminal 2 is an example of that where you, you know,* ***there's different perspectives on the impacts that that development of that site would have****."*
- *"It's just* ***so many different views and different entities, different jurisdictions****."*

Restricted or siloed funding

Most interviewees thought inflexible or siloed funding was only moderate or minor challenge (Fig. 18). Late-career (40+ years), federal government, and academic interviewees tended to perceive this as less of a limitation than others.



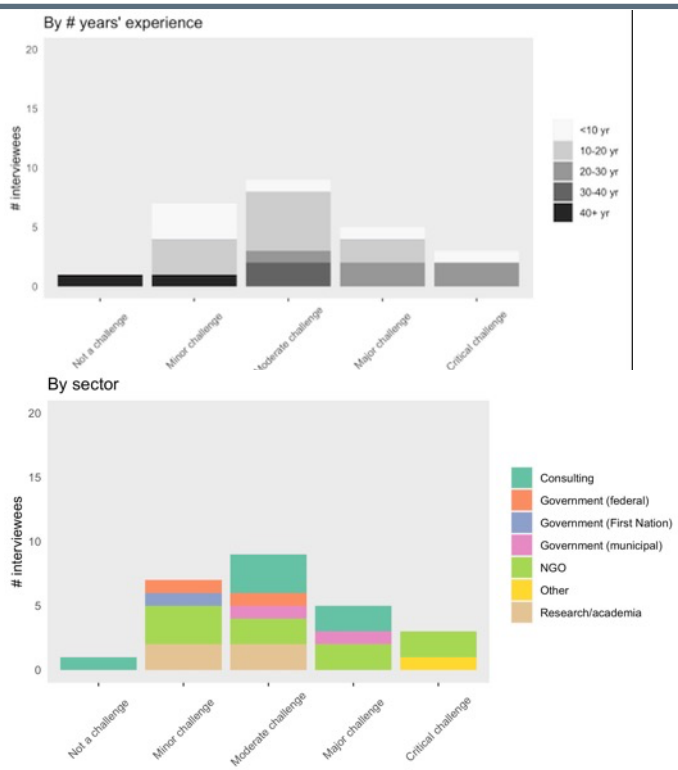


Figure 18. Distribution of interviewee opinions about how limiting restricted or siloed funding is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"I mean it's typically **very targeted, very limited, and… intermittent**."*
- *"I don't think that's too much of an issue because, in part, I don't think there has been very much dedicated to eelgrass and tidal marsh. So, **it's always in the context of like salmon restoration,** for the most part, … or larger marine planning initiatives, whereas the eelgrass and marsh could be like a component of that."*
- *"It's more so, a matter of competition, because I know a lot of people are starting to get into this work, right? … It's not a matter of being inflexible or restricted it's a matter of… **just simply not being enough money to go around**."*
- *"You know the **deliverable model sounds good to somebody sitting in front of their computer** in their office five days a week. It always looks good around the board table where they're deciding. [But] when you're out in the field, you've got to think of the whole system, and you have to think of the long-term problems and the long-term solutions."*
- *"For our work, we have to apply for one thing to get the baseline data, and then another fund for the construction, and another fund for them monitoring. So, yeah, kind of like the weakest link in the chain **causes the whole thing to break down or stop.**"*
- *"The **lack of funding for property acquisition** turned out to be a huge challenge for our work…. We were always sure that we would be able to get money for the restoration component, but it was really hard to get people to step up for the acquisition, particularly when it's an old industrial site."*
- *"**Funding is limited and not being used wisely**… there might be a lot of duplication."*
- *"Some of the coastal engineers I've been talking to think we can [use a new approach/technology beneficially], but there's no funding… I'm blowing the budget digging through scientific literature like crazy trying to learn about all this stuff… this is brand new… I realized, they have funding, and they have limits, but **sometimes to do a better job, you have to you know it's not a fixed budget**."*
- *"Previously, that would have been a challenge. People are a little bit more open minded [now]. Like, I find funders are a little bit more understanding. Obviously, they have their own mandates and sort of eligible cost criteria… but it's starting to change because diversity of the challenges is increasing, and the diversity of the approaches to fix it is increasing the flexibility of funders. [They're] starting to allow that because they recognize that the world we live in, now is not the world we lived in yesterday or years ago and they need to be more responsive and flexible to it."*
- *"As far as sufficient dollars for the different elements of conservation, I think there **has been enough for the different stages,** but I think there needs to be much bigger dollars to address all of the issues, right?"*
- *"Typically, we're relying on funding streams that have **very strict criteria** around like what types of projects they'll fund…. Rather than the needs for projects dictating the spending, it's the funding criteria dictating what money gets spent. So, it's **preventing sort of a strategic approach** where we're identifying what the limiting factors are and what needs to be done. Instead, we're sort of identifying what projects fit within the funding envelopes and pursuing them that way."*
- *"[We're] definitely getting all these **weird funding applications** where it's either blue carbon or it's… what about just restoration? Can we just do that?"*

Uncertain outcomes

No interviewees considered uncertainty about project outcomes a critical limiting factor (Fig. 19). Early career interviewees (>10 years) did perceive this as more limiting, especially compared to late-career interviewees (40+ years).

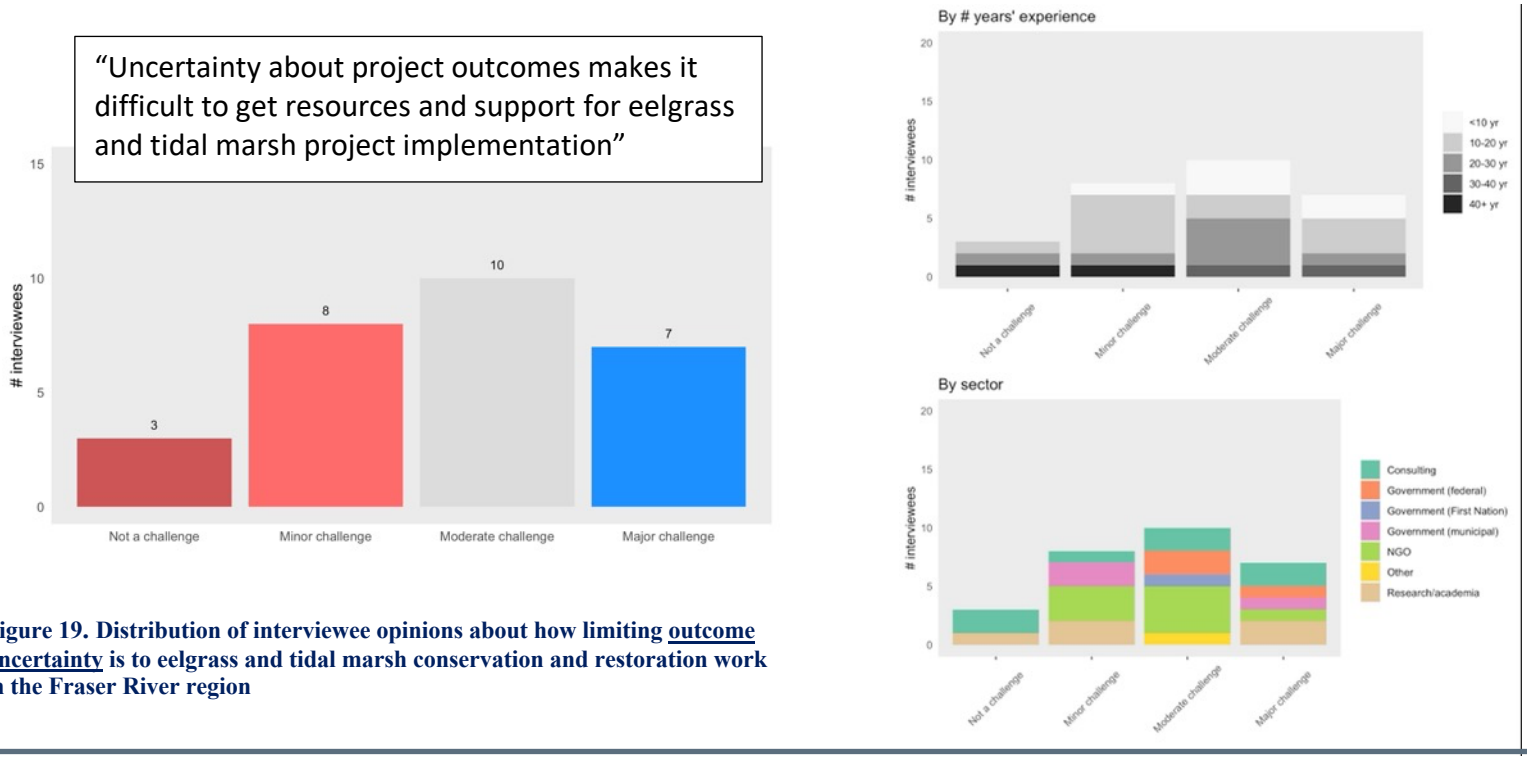


Figure 19. Distribution of interviewee opinions about how limiting outcome uncertainty is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"I don't know, I'm not a funder, so I can't speak from their point of view. I can say **uncertainty is part and parcel of restoration.** And if you're if you're in the field of restoration thinking that 100% success is going to happen, I think that's a false sense of assurity. You have to be open to failure, and again it's about learning what we've learned from the failure, and how we can pass that on so that we don't repeat our mistakes, but we keep progressing in a positive motion."*
- *"Uncertainty is just part of restoration work… it's **not a drawback, as long as you're transparent** about it and you're not like falsely inflating people's hopes."*
- *"I mean, there's always a bias towards like, 'I have a project where I say I can do X…. guarantee the results.' And then for eelgrass or marsh, it's like, "Well, I can try. But I'm only fifty percent confident it's going to work…." I feel there's definitely some bias away from those, and **we just don't really have a good track record** where I can say, like 'Here are ten really awesome projects that you know they nailed it.' So, that does put it at a disadvantage. But it, I think **a lot of it is more like a perceived bias.** But that still is a problem like if someone who's very passionate about the work, if they might like self-censor the project because of that discomfort."*
- *"There are reasons why it's difficult to secure support, but **uncertainty about the project outcome I don't think is one of the main causes**."*
- *"There seems to be more recognition that restoration projects, in particular, have an inherent uncertainty to them that you know you need to do to do everything you can to minimize it but there's **always going to be things that crop up** that you're maybe not expecting,"*

- *"If people are like, 'Well we aren't sure if this project will be successful or not', and therefore it makes it hard for people to maybe fund it or provide support for it because they don't feel certain that the project will work. That can be, well like I say,* ***for offsetting -- it's a major challenge****. And like, with the hybrids you know, affecting things, invasive species, geese herbivory, it's more and more and more of a challenge."*
- *"There is definitely some uncertainty in the success of these projects, but I think recently there's been support for them because****… these habitats are important and that they need to be restored****."*
- *"I think scientists, we get caught up on the uncertainty of what we're talking about, and the decisions that we can, you know, contribute to.* ***Even with the uncertainty that frightens the scientists, it's probably better*** *than a lot of other decisions we make in the world to plan and manage resources."*

Lack of scientific understanding

Most interviewees perceived lack of scientific understanding as a minor limiting challenge (Fig. 20). In particular, late career (40+ years), NGO, and municipal government interviewees tended to perceive this as a minor limitation or not a limitation at all.

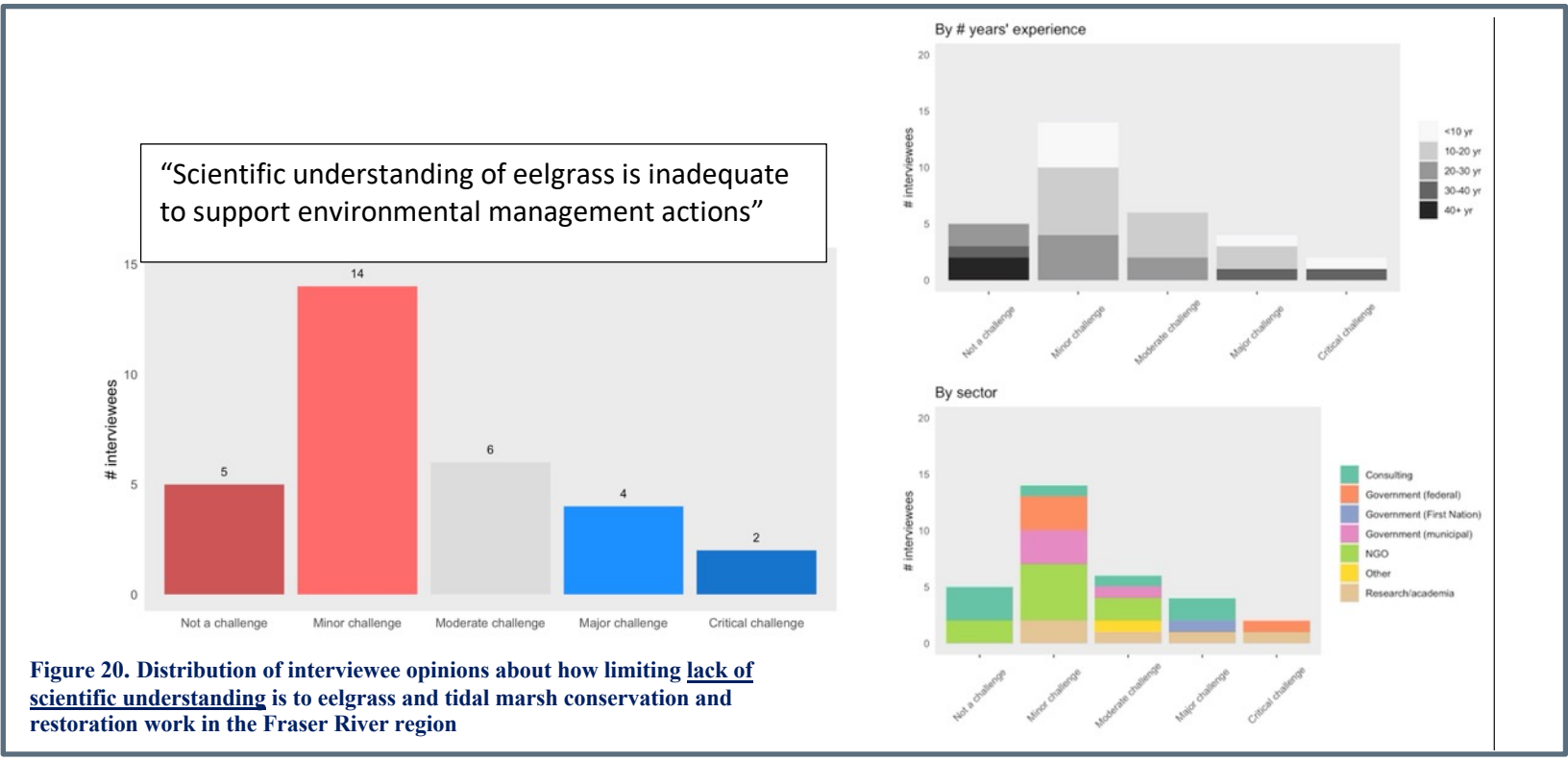


Figure 20. Distribution of interviewee opinions about how limiting lack of scientific understanding is to eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"The limiting environmental conditions issues that I put forward like, what are the* ***light limitations*** *in certain areas? And you know some samples for* ***nutrients and substrate****."*
- *"I think there's been a lot of interest in the scientific community to research eelgrass and how it functions for marine life, particularly for salmon. I think, where the, where the problem lies, is causing the* ***bridge between the scientific research and the managers****."*

- *"I mean, **it varies. Like, environmental management actions is quite broad**. I think the most invasive method is trying to construct new marsh. I think that that's quite critical, the lack of understanding. But then, you know, just removing invasive species, we have a good scientific understanding of that."*
- *"I think, you know, we can always learn more. There's no question. But **this is not something that we cannot proceed with because of a knowledge gap**. We've done it, it works, we know how... send money and we'll do it more."*
- *"We do know a lot of stuff, but it is **hard to implement**."*
- *"We have a lot of good information, but I think **specific information from our region** on conservation and restoration. I don't think it's not out there. I think, partially it's **not accessible**… There's a lot of grey literature, which I know is out there, but can't get it."*
- *"The scientific understanding is there, **but people aren't familiar with the literature, and don't make effort to look at literature."***
- *"My pet peeve now is there's a whole realm of… abiotic and biotic things happening in the marsh, and I **don't think we're plugging in enough science**…. The amount of information that is out there now is like exponentially increased and almost on every facet you could think of…. I certainly don't think we are on top of that, and… I think there's a lot more science, we could be pulling into it [and do more pilots]."*
- *"Understanding of the estuary and the importance of eelgrass and tidal marsh is starting to grow, so I would say it's a moderate challenge, moving in the right direction. It's a **matter of what the decision makers decide to do with that information**."*
- *"I think we still have a lot to learn about **what sustains these ecosystems and what sort of the limiting factors are**…. We also have a lot of **knowledge that we're just not able to like apply** because the funding isn't there like we don't… Generally, the funding doesn't allow for… long term monitoring and knowledge gathering that's needed to kind of understand and learn from projects, and so **we implement a lot of projects, but we don't follow up and monitor and learn from the successes and failures** and I think that that if there was more funding or support for that type of monitoring, we could definitely increase our scientific understanding… I think there isn't always the knowledge transfer from those successful projects to help inform them."*
- *"The information is there. We need to take the **time and effort to synthesize it and roll it out** and present it."*

Opportunities to increase eelgrass/tidal marsh conservation and restoration

Interviewees described a wide range of ideas and opportunities when asked what actions they would take if they were in charge of accelerating eelgrass and tidal marsh conservation in the Fraser River estuary. I have grouped these opportunities into 10 overarching categories (Fig. 21), which are arranged by their relative prevalence in interviewees' responses. Two strategies were – by far – the most cited by interviewees in response to this prompt: increasing coordination and collaboration among those working in this field (n=19) and working on strategic planning and prioritization (n=18). Other less frequently mentioned strategies included: finding or creating new sites for conservation or restoration (n=8), trying and learning from new or innovative methods (n=8), increasing capacity (e.g., funding, staff, specialized expertise) to implement work (n=7), improving surveillance and response (n=7), specific ideas to develop new revenue sources (n=6), better management of physical disturbances to sites (e.g., goose herbivory) (n=5), shifting the paradigms and priorities underlying our relationships with eelgrass and tidal marsh areas (n=3), and policy changes or improvements to policy implementation (n=3). Fewer individuals mentioned these latter opportunities in response to our open-ended prompt. Those who did not mention any particular item may still believe that item may be a worthwhile opportunity. Rather, not mentioning an item suggests that it may be less salient. Overall, the diversity of ideas suggests that people working in this field have a

variety of strategies and opportunities that are salient to them, though a majority are highly focused on improving coordination and collaboration and strategic planning.

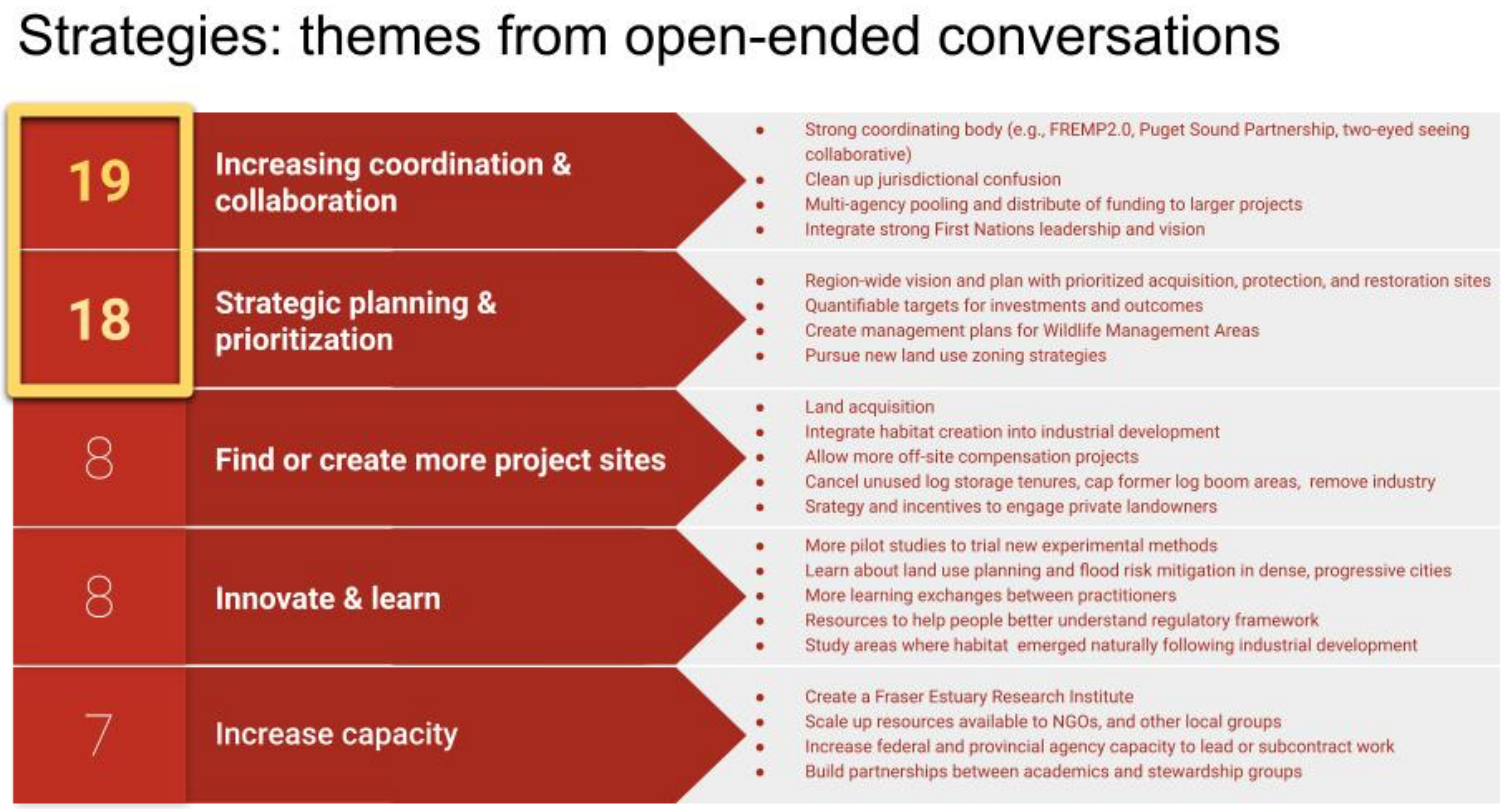


Figure 21. Top five themes emerging from interviewees' responses to question about how best to accelerate work to conserve and restore eelgrass and tidal marsh in the Fraser River estuary and surrounding region. The number on the left represents the total number of interviewees who brought up this idea in response to an open-ended prompt.

Participants evaluated a set of 12 structured questions that represent key strategies that were prevalent in the literature for accelerating eelgrass and tidal marsh conservation and restoration (Fig. 22, see Appendix A or subsequent pages for full prompt text). This structured activity complemented open-ended discussion to provide a fuller picture of each participant's perceptions of the opportunities and promising strategies to try to accelerate this work.

Overall, the three strategies from our structured list that interviewees perceived as most impactful were: increasing the available resources for projects, investing in green infrastructure, and establishing a clear regional vision and plan for eelgrass and tidal marsh conservation and restoration. The strategies perceived as least impactful were: trying to increase the general public's awareness, and developing a better participatory process for

public engagement on projects. Most interviewees thought all of the strategies could be at least somewhat impactful in the Fraser River estuary.

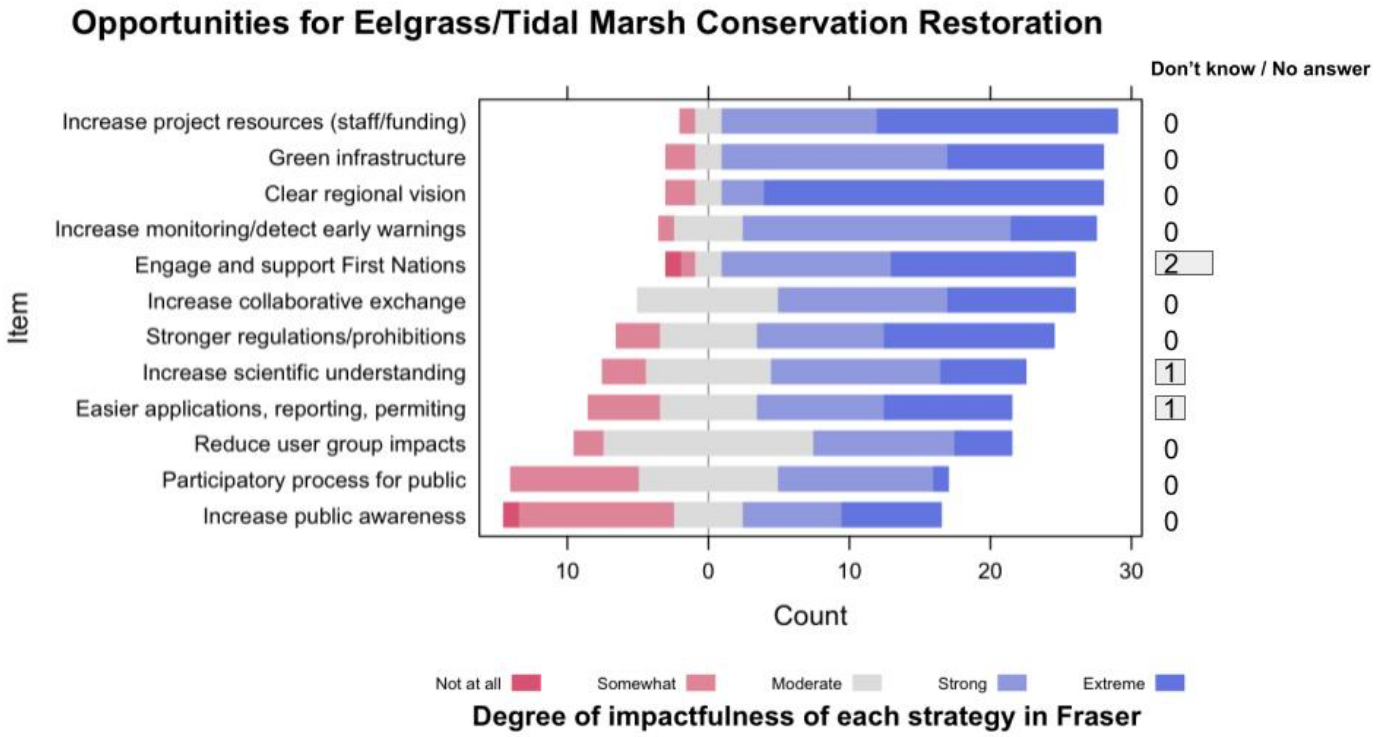


Figure 22. Interviewee ratings of how impactful twelve strategies (derived from the literature) for accelerating eelgrass and tidal marsh conservation and restoration would be in the Fraser River region

Increase resources (staff/funding)

One of the top-ranked opportunities was to increase resources available for this work (Fig 23). Interestingly, early- and mid-career interviewees thought this would be more impactful than late-career interviewees. Interviewees from across all sectors thought this would be extremely impactful.

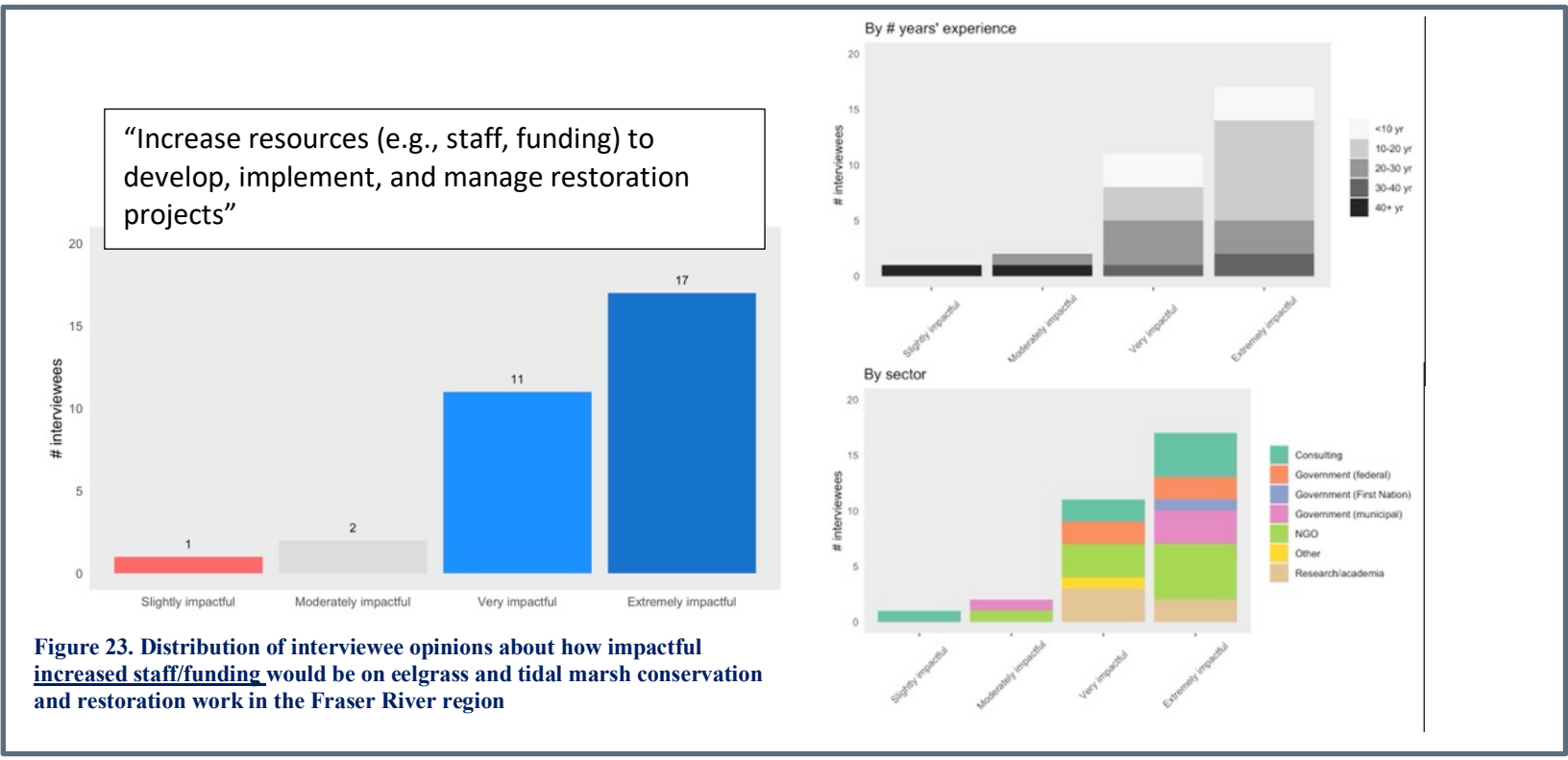


Figure 23. Distribution of interviewee opinions about how impactful increased staff/funding would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

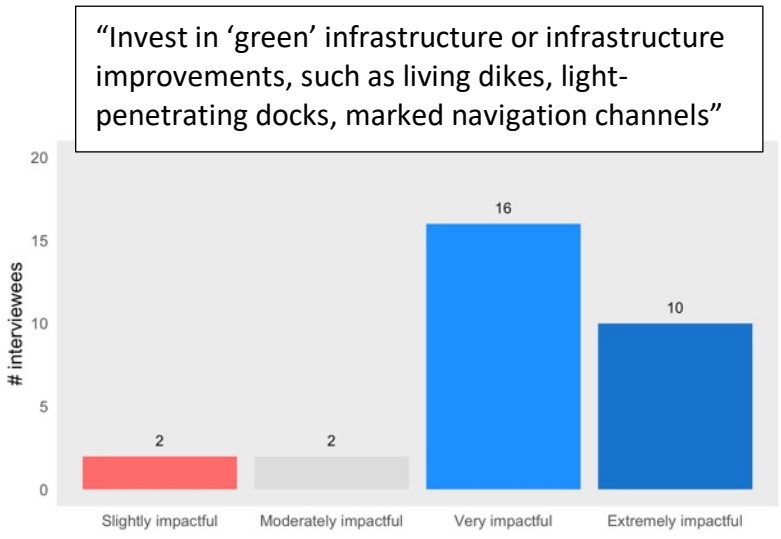
Comments:

- *"**Increasing and ongoing funding**, not just you know periodical times when you have ongoing interest. **Commitment, dedication to funding worthwhile projects** that have proven themselves to be effective."*
- *"We can be doing a whole lot more… if it was not **funding limited**."*
- ***"You can't just like throw money at something without a plan** and so, I think that's the key piece. It's, like, making sure that the mandate is clear and clean cut enough to enable them to succeed…. People kind of just go off and either create way too many details or rules or considerations and it becomes more bureaucratic so yeah, and there needs to be stages, like if you just like dumped $ millions overnight, then like it's going to fail, you can't grow that fast, but like, get to pilot… **with a plan to scale up**. A plan for a plan."*
- *"Before we want to increase, though, we want to **use it better**. Because I do think that there is a lot that's not being used…. increasing without **creating that community and the communication**… is not going to equate."*
- *"Permitting and staff …. [and] river forecasting is pretty important, especially nowadays…. permitting, they're hopelessly underfunded… So, **we need more people, increased resources**."*
- *"Very impactful, I think, especially **sustained resources** – again, more of a program instead of projects."*
- *"The challenge with that one is **how we do it**? … Government is very good at starting off programs, and then just sort of absorbing it into the next important thing. We may start off with a bunch of people that are really*

going to do this, and then, so they're blocked in the species at risk legislation five years later, or something like that right? I think, though, it's important. I mean you. You have to do it."

Green infrastructure investments

Nearly all interviewees suggested that investing in "green" infrastructure would be very or extremely impactful (Fig 24). Late-career (40+ years), NGO, and First Nations government interviewees, in particular, saw this as an impactful opportunity.



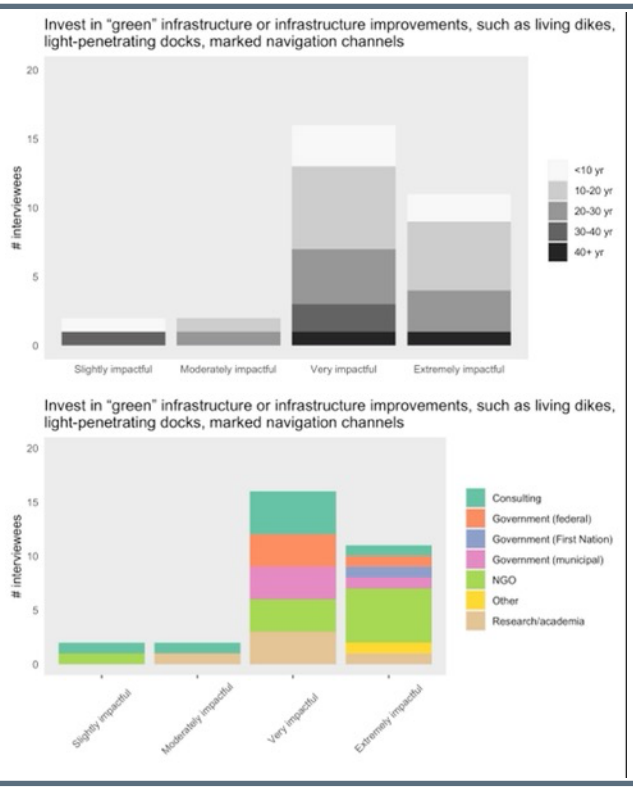


Figure 24. Distribution of interviewee opinions about how impactful green infrastructure investments would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"All the **shoreline should be greened up** and well the **riprap taken out or not any put in** in the first place.*
- *"Also, to really **encourage shared docks** so that not every property owner thinks that coming from Winnipeg, they deserve a dock... the shared dock is much more effective in conserving eelgrass."*
- *"I think that would be helpful, but it's kind of like a **band aid approach**, I think, to actually restoring proper functioning habitat by trying to make your armoring look more natural, you know? … I really am a big supporter of the concept in general, but I'm just not sure about in the estuary environment so much. Like, the living dike is still a dike, like it's functioning to hold water out, so you can clean it up by planting some greenery and shrubs or something, but like, **you're still cutting off** whatever's behind it from salt water."*
- *"That's one of the greatest opportunities in this sector moving forward, is, we have the new dike standards, we have the sea level rise predictions, And if we proceed with status quo, one, it's going to cost a ton, two, it's not going to be very effective at all, and three, it's going to have huge impacts on the systems, so it **just makes no sense to go with traditional infrastructure**, no sense at all. If I have a soap box to stand on that's it."*
- *"A lot of people really do want to see these kinds of things happen, so if you just make it easier and you just **start showing more and more examples** of it and people can see how much nicer it can make cities and areas to live in and to interact with nature… I think it would get a lot more support."*

- *"I kind of suspect that they'll need to get into this more. How well it will benefit the Fraser in all of its issues? …. It's amongst kind of the big toolbox, right?* ***Amongst many tools that need to be applied*** *in this area."*
- *"****Some of it may work. Some of it won't****. But you know that's the direction we have to go."*

Clear regional vision

The opportunity that the highest number of interviewees across all sectors said would be "extremely" impactful was establishing a clear regional vision and plan for eelgrass and tidal marsh conservation and restoration (Fig. 25). Late-career (40+ years) thought this would be less impactful than earlier career interviewees.

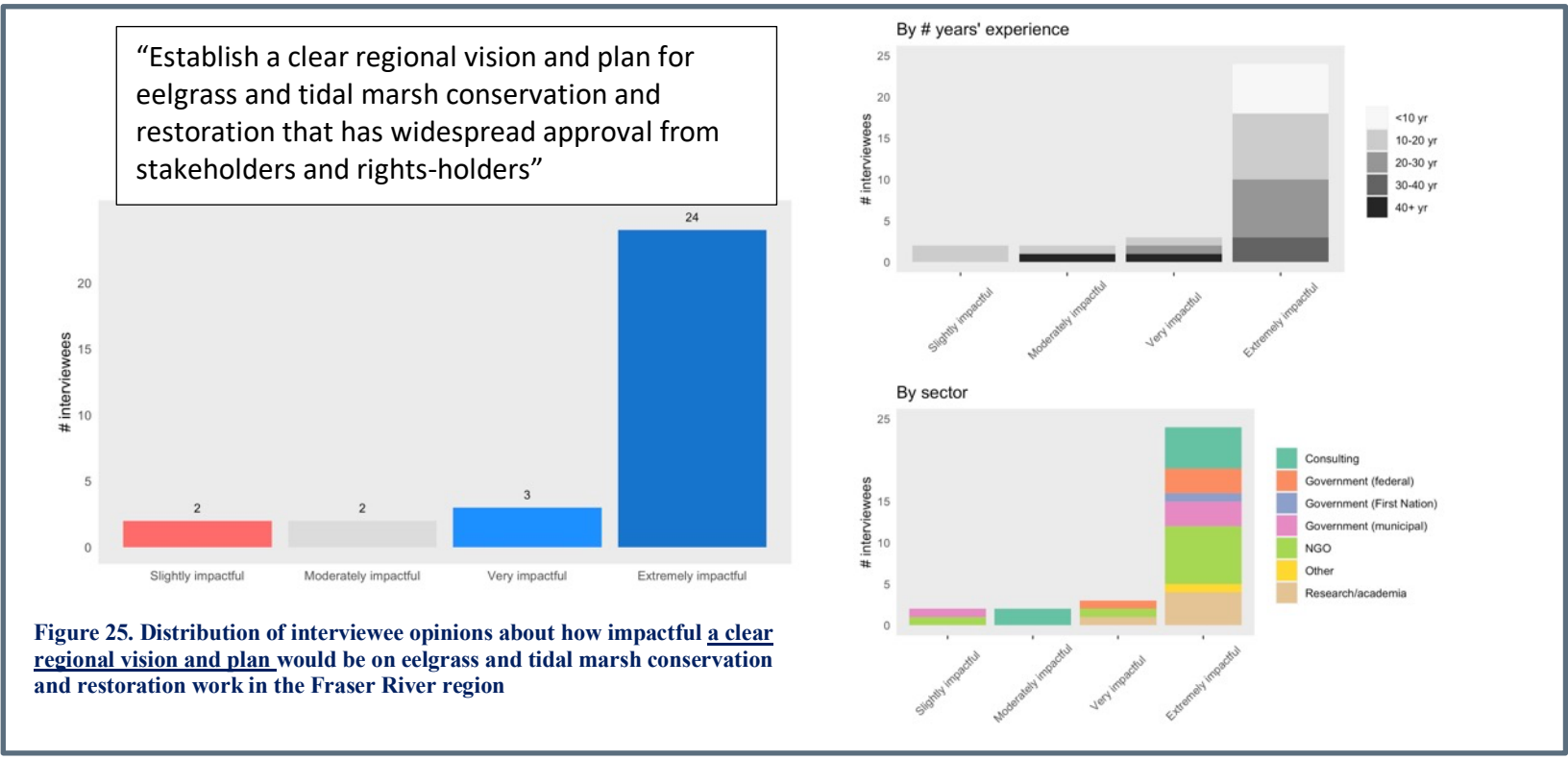


Figure 25. Distribution of interviewee opinions about how impactful a clear regional vision and plan would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

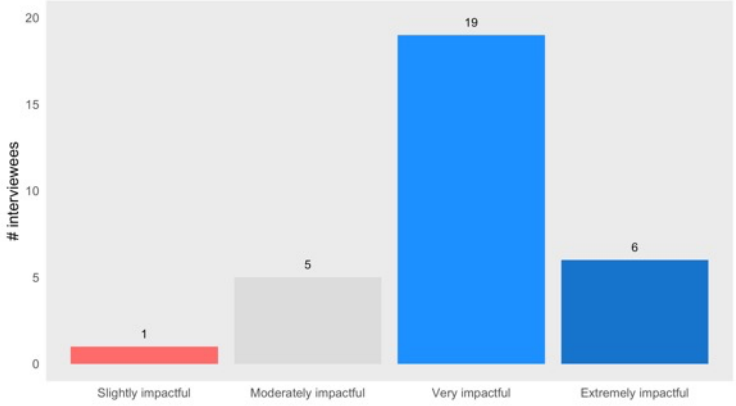
- *"I* ***don't think you can actually do that****. Every area is a little bit different… every community will have different interests… different needs, right? And then also the bay itself, the sediment movement is different, so, then what can be achieved in a certain area can be different, as well, so I think having a regional vision is going to be challenging because,* ***it's not a one size fits all type of situation****…. would use the resources differently."*
- *"I think, trying to* ***figure it out for [individual regions first] is good... and then come together****… and have a kind of a vision come together for the Salish Sea. We are so lacking in that kind of networking….* ***we're really lacking in capacity to collaborate with each other****. We don't meet enough, we don't bring our data together, we don't form these relationships that create bigger and better goals…. if there's money for transportation, food, and accommodations, it's not hard to bring people together because they really want to share and know more…. learn from each other…. There's huge appetite for it, so it's not because of an unwillingness to meet, its that support needs to be there ongoing."*
- *"That sounds exactly* ***like the Restore America's Estuary Program****, having that big-picture vision specific targets."*

- *"I've often said that **in the Fraser we should zone**… like even with birds or marsh…. We tried with the Fraser River Estuary Program."*
- *"[The estuary is] where your highest population density is. That's where your highest industry density is, right? That's where the most potential impact could come from, but there's no long-term vision and it gets changed every four years when you get a new political party… So there **needs to be a plan which is untouchable by government**, at least by government party right? So that when an incoming party… can't just go and say, 'scrap this' and start something new. There needs to be a long-term regional plan that I think **DFO could implement**, which is separate to what government parties can change. Because the problem we're fighting now is every four years or **every election cycle, the plan changes**, based on the interests and the mandate to the party who's in power…. If we want to fix this, it **needs to be a long-term plan which is almost secular to the political landscape** that we have. We need to develop a plan that's managed by the Federal Government, which is, which is sort of separate and outside of the grasp of changing political parties to amend, and that **needs to be a collaborative process where Nations, communities, the interest groups, the NGO groups all come together** and say 'this is what we're doing, and any party that comes in, can get on board with this and figure out how we're doing it,' but this needs to be maintained, sustainable and untouched plan, if we want any hope of fixing what we have. It needs to be separate from political influence…. I think that would be extremely impactful and not only extremely impactful but **necessary and necessary now**."*
- *"That would be wonderful…. I don't know how, you know, **maybe the Province is the leader**? Maybe somebody that fits in between there together? **Maybe an NGO** has that hands-off thing to be able to pull it together?"*

Increase monitoring/early-warning detections

Most interviewees thought that increasing monitoring and detections would be very impactful. NGOs, federal government, and First Nations interviewees, in particular, thought this would be an impactful strategy (Fig. 26).

"Increase monitoring of sensitive or vulnerable shoreline to detect early warnings of decline"



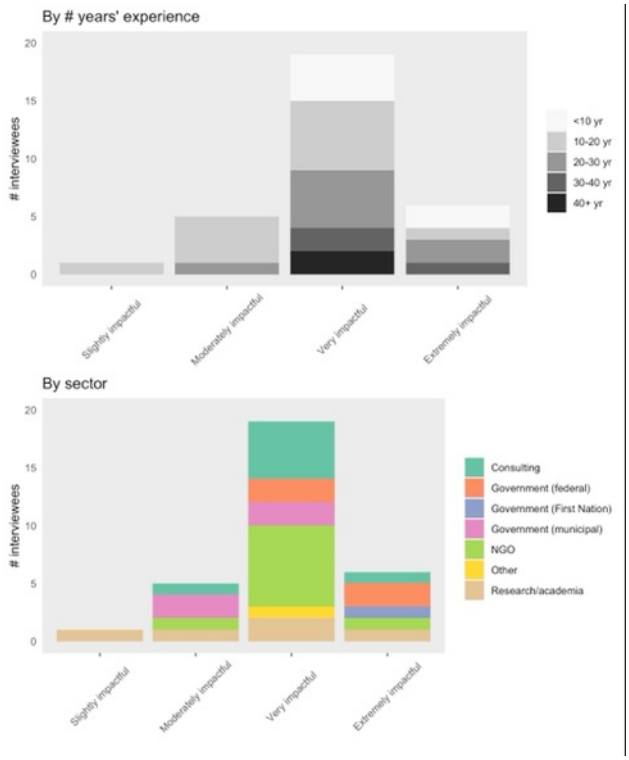


Figure 26. Distribution of interviewee opinions about how impactful increased monitoring would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments

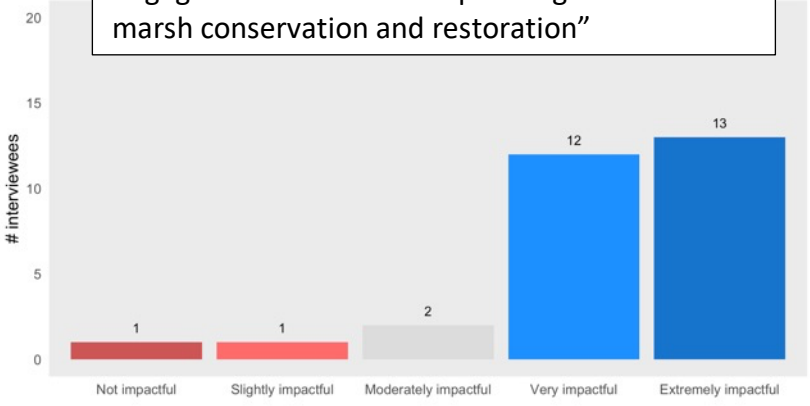
- *"If we knew about the marsh recession, **maybe we could have done something** about it before."*
- *"One thing… is to monitor, but [response] has to go hand in hand, right? Knowing something is in decline, but then **having a plan in place** to support it. That's what ultimately would help the situation. So, it's more of a life cycle analysis…. That would be the most effective is to **do more lifecycle planning** for this asset… so that it will persist over time. Staff will change five years from now, someone else could be in this role."*
- *"[If Indigenous] Guardians were out there in their boats, they would be able to see impacts as they happen and report them and hopefully have the capability of governance to say, not only report them to DFO, but have the power to say we have the jurisdiction to say, 'You need to leave and not return.' … We try to do monitoring every six months in eelgrass beds, but we don't know what happens during those six months when we're not there, unless a community member reports something. **Guardianship for First Nations is incredibly vital**, and we need to make that robust in any way that we can… to make sure that there's eyes and ears and boats on the water…. I know how many **infractions are happening** in the middle of the night or even in pure daylight, and nobody is reporting because we don't have a guardianship program on the water, seven days a week."*
- *"**Mapping and like surveying** eelgrass to understand like when and where it's declining, that's important for informing restoration, but also just for like informing people's understanding of how it's changing and like adding pressure and quantifiable data to back like, 'You need to act now.'"*
- *"In relation to **invasive plants** moving into restored habitat or keeping tabs on what's happening with the **Canada goose herbivory** issue, you know that kind of thing, I think that it is going to be important."*
- *"**Expensive, but impactful**."*
- *"I think honestly, the monitoring is good, and I **think we have a really good understanding of some of those warning signs** that we wanted to track."*
- *"It's that monitoring that provides a running sort of finger on the pulse of what's going on and will **help to keep us ahead of the potentially disastrous downturns** that the environment can take in terms of trophic cascades, or you know food web collapse, things like that. If we're aware of it many years before, it gives us a*

longer timeline to be able to address *things… and try and prevent it or reverse it. And, unfortunately, the estuary doesn't get the same kind of attention in terms of monitoring that the other habitats in the Fraser River do, because, again, the focus of people's interest is big fish not little ones."*

Engage and support First Nations

Nearly all interviewees thought that engaging and supporting First Nations' capacity would be very or extremely impactful (Fig. 27). Government and mid-career interviewees, in particular, rated this as highly important.

"Create a meaningful process and provide capacity support to First Nations for their engagement and leadership in eelgrass and tidal marsh conservation and restoration"



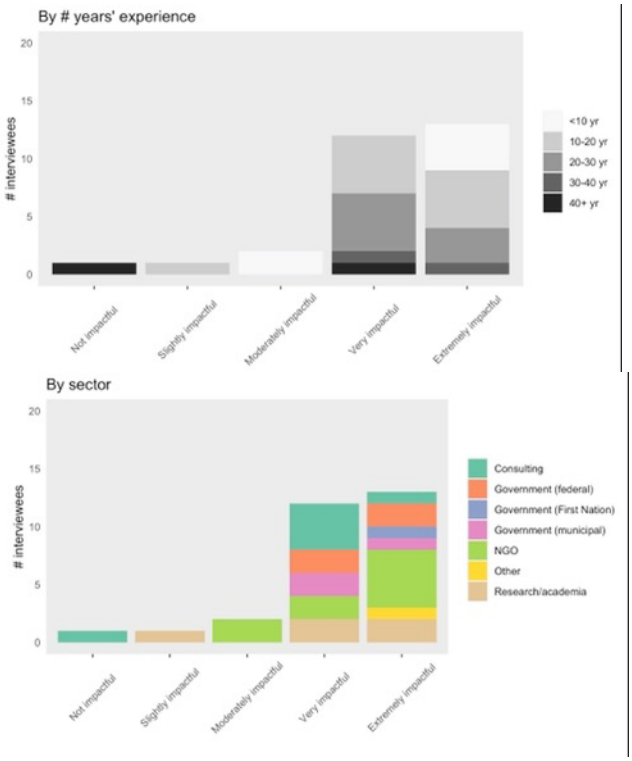


Figure 27. Distribution of interviewee opinions about how impactful engaging and supporting First Nations' capacity would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"There's so many burning issues that First Nations communities always have to attend to, and they're always putting out fires, and one of our major wishes is to increase capacity for First Nations to be able to steward their own nearshore environments… I get* ***super excited [about Guardian programs]*** *because not only the habitat will benefit, but knowledge will then be again in the community, shared by the knowledge holders, and an increase in understanding because they're out there on boats actually observing and mapping the habitat."*
- *"Anywhere that [we] can provide training and support for Guardians… is really a good step forward. Presentations, relationships with the bodies of Knowledge within the Community – whether it's the Chief of Band Council, but most likely it's the Lands Committee or other community groupings within First Nations that have an interest in talking to us…. We have a tendency to think of twenty-year-old databases as the baseline, and that's ridiculous because most of our impacts have happened over the last twenty years, right?* ***We need to talk to Elders and have them share what they're comfortable with,*** *what places looked like, as they have been taught and what the cultural practices were. And not that that that knowledge has to be shared with everyone, but the knowledge that they're comfortable sharing, we could* ***use as the original baseline*** *and then try to work from there into increasing the biodiversity that once was. We have a very limited time scope of what baselines look like… It is an acknowledgement of the long history that First Nations have with these*

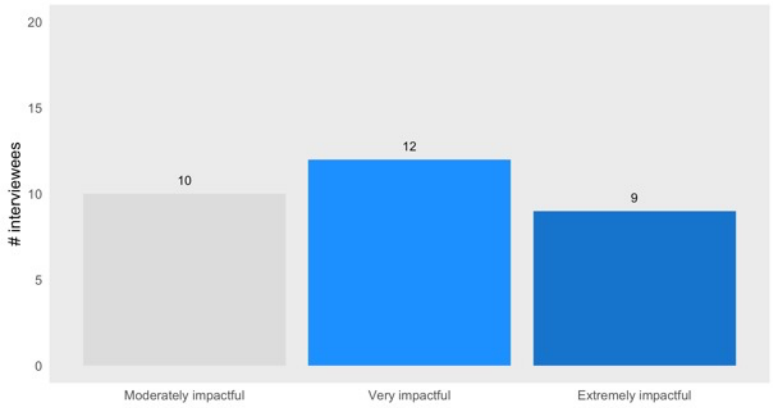
*places, especially along the shoreline, and [we need to] know also how to help **protect that information so it's not exposed to exploitation**."*

- *"I think they're getting a huge amount of support, right now, just from my experience… basically everything we do, they need to okay. And if they say 'Okay, well, we want you to add this', it will be added, so **I think they're already getting the recognition they need.**"*
- *"Most Nations are supposed to be, you know, being more engaged in any of these processes, but, yeah, the **capacity just isn't there, especially for a lot of the smaller Nations** so that would be a huge, huge support."*
- *"The thing that prevents the communities from getting more involved is a **lack of capacity and a lack of funding** to develop that and maintain it. There's big Nations up the delta front. As you get further up the river, they get smaller and smaller…. They're busy. If they had more funding to be able to allow them more time on the water, more monitoring, more oversight, more influence, you'd get a better outcome because there is no better steward of the habitats that we live on than the First Nations communities that have been here for thousands of years. One of the core mandates… is that we **get to a point where we can basically hand [all] project[s] to the Nation and they can run it.** So, it's kind of build it, polish it, build capacity in the Community, simultaneously. Then we can slowly take a step back…, but the limiting factor to that is funding."*
- *"It's easy to say that. You also need to make sure that the Community actually has the capacity to participate, and our experience has been **some have way more capacity than others**. So, it's not an easy thing to do, but yeah, it's definitely been very helpful and impactful on our projects."*
- *"It's important, just because, from a perspective of having the First Nations connected to the land, the sense of place, part of the community. In my case, in the Government, Canada, and a lot of places, **we have an obligation for reconciliation as well.** So, I mean it's important both because you may have to do it, but it's also important, because it's right."*

Increase collaborative exchange

All interviewees responded that increasing exchange of ideas, data, and resources would be at least moderately impactful (or greater) (Fig. 28). Federal and First Nations governments, in particular, thought this would be highly impactful.

"Increase exchange of ideas, data, and resources among those working on eelgrass and tidal marsh"



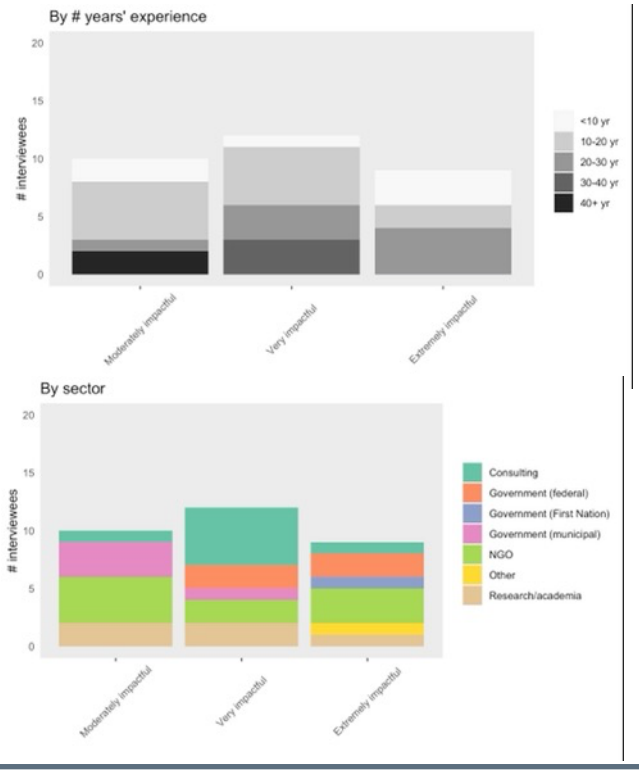


Figure 28. Distribution of interviewee opinions about how impactful increasing collaborative exchange would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"Quite often **just making those connections can be very fruitful**… and incredibly valuable."*
- *"You can talk to people until you're blue in your face… I mean it's good to exchange ideas… but you know **it's the decision makers and politicians that are the stumbling block**."*
- *"Setting up a network of Knowledge Keepers of all [backgrounds] is really, really important and to **keep that funded,** so transportation costs are paid for, and overhead like food and a place to meet. Networks of like-minded people… is really, really, really important not only for **relationship building**, but also for **strategies**."*
- *"I **don't think that happens organically** in this Community"*
- *"There is **fair amount of that going on already**."*
- *"I've seen the most success come out of like increased collaboration, or just like, calling a meeting and like sharing information, then just **seeing connections foster** out of that. It's incredible what actually comes from just like having a meeting."*
- *"I think like some people are doing a good job. But again, yeah, I think that communication and coordination, there are a lot of people doing a lot of things on this and **they communicate sometimes, then run out of time**."*
- *"Extremely effective, **especially the data[-sharing]**. So many times, you find out that someone else has been doing exactly what you were thinking, and you know they've got experts in the field… I find a lot of times people from DFO are really willing to share their time and their knowledge and stuff like that, you just have to **know who they are and know how to get ahold of them**, so yeah, that would be terrific."*

- *"There's an **awful lot of conferences**… you're not learning a lot of new stuff if you're going to them frequently."*
- *"There's this **disconnect between academia and the practitioner**… An academic, their job is to publish. Get it out there…. A lot of your restoration folks, they just want to get in there. Get it done. Move on. They need to get better to document some stuff…. Some sort of community is super important for that."*

Stronger regulations/prohibitions

Interviewees expressed a range of opinions about how impactful strengthening regulations and prohibitions would be (Fig. 29). In general, NGO, First Nations, and mid-career (10-20 years) interviewees thought this would be most impactful.

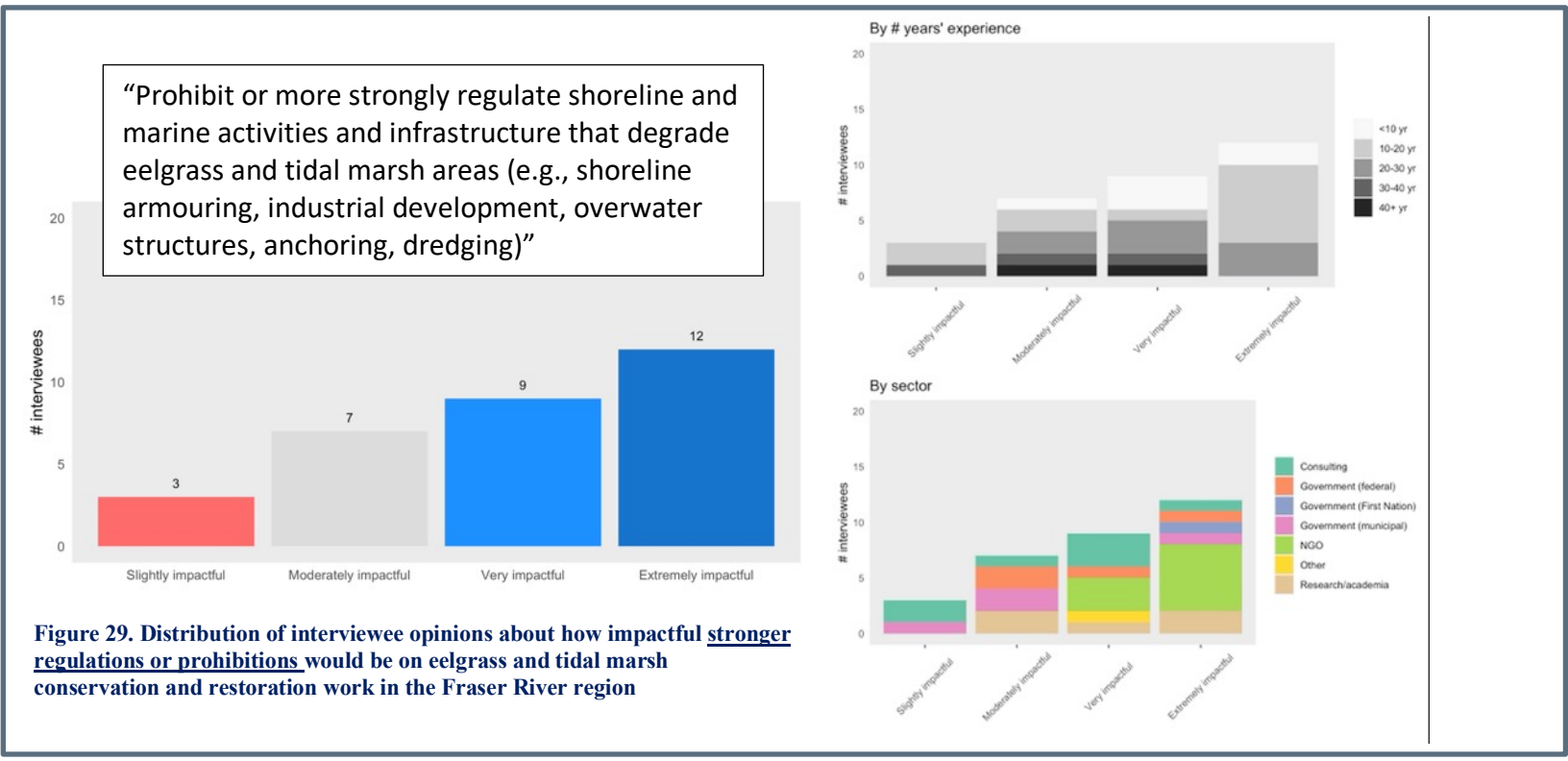


Figure 29. Distribution of interviewee opinions about how impactful stronger regulations or prohibitions would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"So, there's a **movement afoot… [for] a new and improved marine strategy plan for the BC coast**. And it's hopeful because the BC Province, at this moment in time, seems to be very open to looking at new strategies that would regulate what goes on in the nearshore and coastal areas and if that ever comes into fruition, I think we would have made progress and, the new department that's been established, I hope, has some legs to stand on…. There is this hopefulness within my sector that something will happen Provincially."*
- *"But are they gonna **enforce these regulations**? Because they're not doing much right now."*
- *"I think **we're pretty well protected** with the Wildlife Management Areas here."*
- *"I think that, **especially around shoreline armoring** as climate change impacts become a little clearer, building dikes bigger -- all that kind of thing is going to be detrimental to progress in tidal marsh but, again, a lot of the **impacts that we're trying to overcome are historic**, whether that's from old logging activity or old agricultural development. There's not so much new stuff happening or when there is it's like industrial development."*
- *"Historically, yes, nowadays, not so sure, because **there are rules in place**."*

- *"**Don't know what you do more** so than the federal Fisheries Act… it **would be wonderful to update the shoreline manual** with new regulations."*
- *"It is a lot of things that I think we could quite easily say just shouldn't be done in eelgrass and tidal marsh, unless there's some really, really, really good reason to… Eelgrass and tidal marsh areas are super important, but more often, they come with big tidal flats which most people think is just mud, and you know, we can just do stuff right on top of that, but it's a huge carbon sink, and it provides that connectivity between the tidal marshes and eelgrass, and it's just oftentimes we sort of try to overly delineate say, 'The tidal marsh is here, okay? So, it's fine to impact anything in the middle.' … It **would just be nice to see those, those places a little more protected**…. To me it's also about you know, **using well the places that have already been impacted**…. If you start prohibiting new dredging or make it a lot more difficult and like strongly regulated, I think people will get a lot more creative about using places that have already been highly impacted."*
- *"I just think that **maybe that's not a feasible approach here**…. One example, the Port of Vancouver operates under the Canada Marine Act which is federal legislation that essentially lets them do what they need to do to support trade goals for the country of Canada, so… it's **limited to really what can be prohibited and regulated** in the Fraser…. I think **there can be changes and accountability**."*
- *"You go on the DFO self-assessment thing as part of Working in Water, and if you're working in marine **they say, refer to these best management practices, but there are no marine ones**. They're all freshwater."*
- *"We know these things are happening, sometimes I scratch my head 'Why are we doing things?' and pollution right? **If things are polluting, why are we doing it**?"*
- *"Yes, exactly, but at the same time, **as long as that doesn't prohibit… restoration**."*
- *"I'm not sure regulate is the right word, like I think it's more coordination…. clear rules, and why those rules are there... they're directed into the right areas, they avoid other areas, things like that. I think this is a bit simplistic… you'll have people, 'Let's deregulate let's get out of the way business,' and then there's like 'Regulate the snot out of it, but with no money' right? … These are not simple solutions either way, right? … and **it's deceptive to the public that if we just add a regulation, this will fix the problem** and it won't."*

Increase scientific understanding

Interviewees generally responded that increasing scientific understanding would be moderately to very impactful (Fig. 30). Late-career (40+ years) and academic interviewees were among those who perceived additional research as less impactful compared to others.

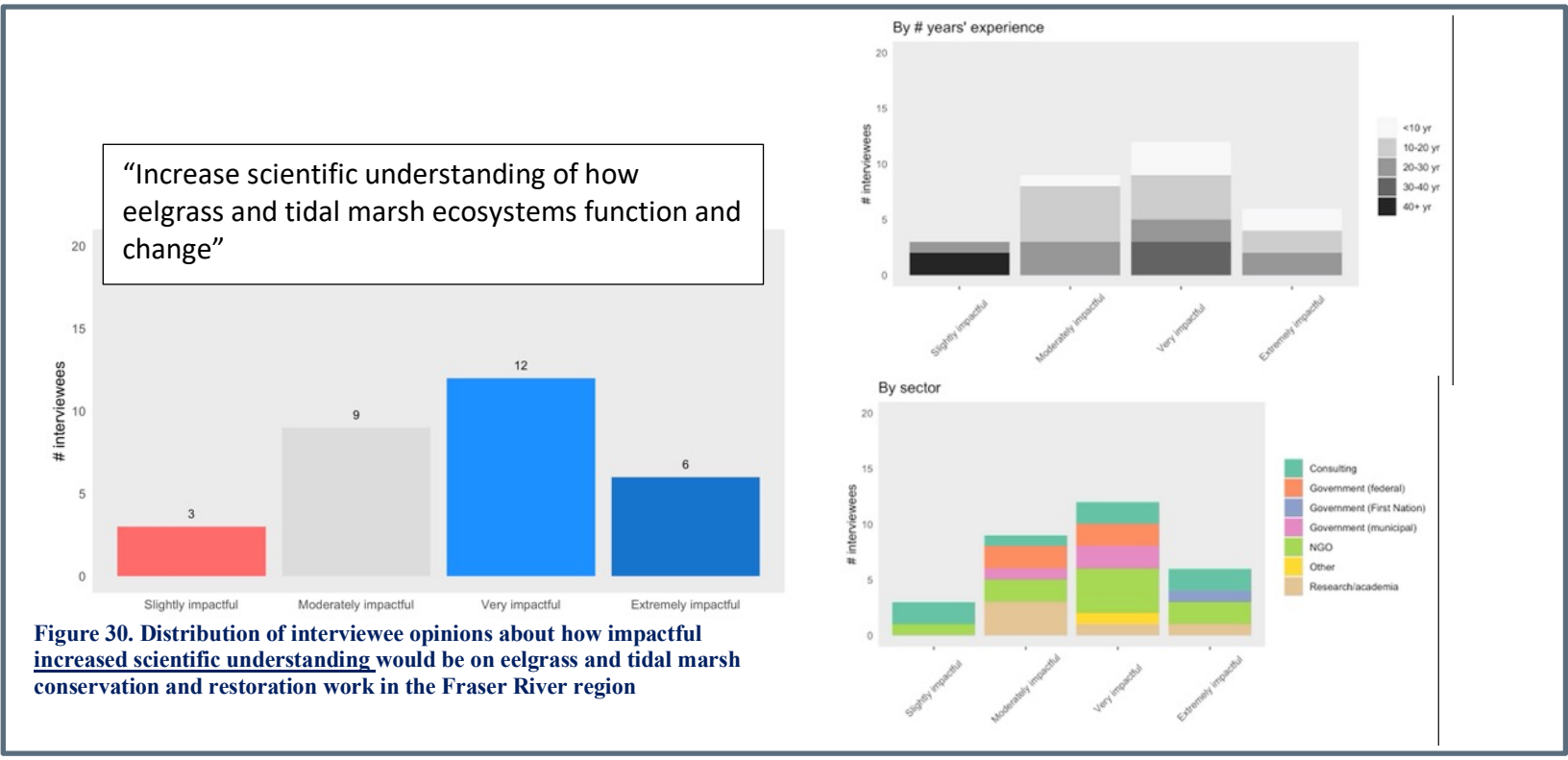


Figure 30. Distribution of interviewee opinions about how impactful increased scientific understanding would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"If we're including like **sea level rise resilience** and **causes of tidal marsh loss**, then yeah, I think that's important…. understanding these ecosystems, how they're functioning, why they're changing, and how they're changing, right? And if we also include **ecosystem extent and content and composition**, I would say [very impactful]."*
- *"**We have all the information we need** so, if people would pay [attention] to it… but I mean, we know."*
- *"We're starting to get a better understanding for the general population of how our environments are impacted as a result of climate change, and so I think **there's an appetite for this understanding**"*
- *"There's quite a bit of information out there, but I mean **there's always new variables**."*
- *"Researchers are doing work that they think is informative, but **it's kind of vague how you would apply that**."*
- *"We know enough about how to do this stuff. Investing a whole bunch of research on how to do it is **probably not really necessary**."*
- *"Research is **always good**."*
- *"There's other more impactful strategies and that's something that **would become more impactful once we have the broader strokes planning and principles in place**."*
- *"We have a pretty decent understanding of how these ecosystems function, although I don't think we really understand the variability from place to place necessarily as well, again, because a lot of the **studies are done on the very big estuaries**."*

- *"The scientific underpinning is what is the **government often relies on to make decisions**, right? They'll look to… scientists to be able to provide that insight… I would say that that the **inclusion of [traditional] ecological knowledge is probably as important, if not more**, because there's far more historic precedents, to understand how that ecosystem functions than science has because they don't have the timeline. But if you're going to have the public outcry and the public pressure, the government is going to… want to see some kind of scientific evidence as proof of what they're doing as having an impact."*
- *"**Only if it's paired with action** on the ground."*
- *"There's certainly **a lot of room to understand things better**."*

Easier applications, reporting, permitting

Interviewees across sectors and career stages had highly variable opinions about the impact of simplifying funding applications, reporting, and permitting (Fig. 31).

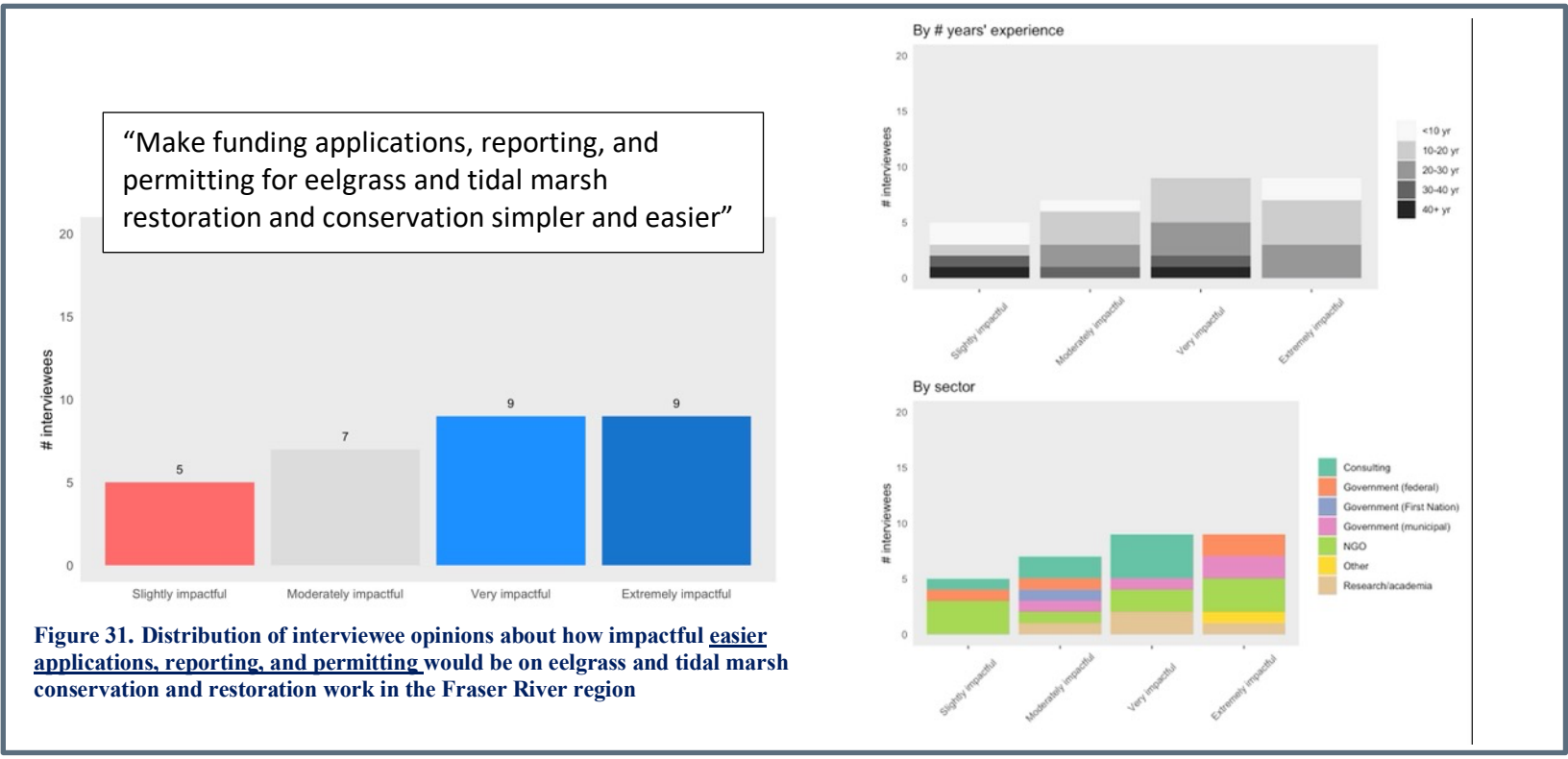


Figure 31. Distribution of interviewee opinions about how impactful easier applications, reporting, and permitting would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"I mean the song and dance routine is annoying but for NGOs we're familiar with that's **just a necessary step**."*
- *"There's pages and pages, so many pieces… **[it took] three years to like get planned and permitted**."*
- *"[Funding] **criteria are governing what's happening on the Delta**…. [municipalities] did a whole bunch of stuff on climate adaptation, but they wouldn't have otherwise…. The nonprofit sector as well… granting foundations are putting in criteria around community engagement, Indigenous engagement, transparency, all that kind of stuff, that are influencing how the various sectors are performing…. If you look at the nature-based solution stuff, there's very little in there about the biodiversity values of these two habitats, it's all about carbon values. So how do you, how do we **reformulate that nature-based solution [funding criteria]** to be enabling?"*
- *"The funding applications and reporting are not difficult **it's the permitting process that's extremely annoying and hard** to deal with."*

- *"**People change all the time in the funder seat**, and I think relationships are the foundation for trust, and trust within can lead to, 'Oh, yeah, we know their reputation, we know the players, and this is an ongoing funding stream.' Because writing and reporting is a huge headache, and it's taking over the best intelligence in the field. You talk to any nonprofit organization… they'd say we need this process to be easier and it **needs to be based on trust and reputation and the record of performance**, rather than how well we can phrase the funding project and, once again, sell ourselves as if we didn't exist years ago. It's --- the whole thing needs to be revamped."*
- *"I complain about the, like, reporting and stuff… but the **permitting can like make or break a project**."*
- *"I think that one's a double-edged sword, because I think **if you cut through some of the red tape, then you might get some less quality project**s. That's my concern with that. And I think that's the issue that the Province was having on that one. They were getting held up on the permitting piece."*
- *"Most of the funding applications that we typically [do] for subtidal-related work are federal because of the jurisdictional issue. And **federal funding applications of any kind are particularly detailed**, and they have really extreme reporting requirements. It's sort of a part of the culture of the federal government to make sure taxpayers' money is being really, really properly spent and all that kind of thing, which is important, I get it, but the amount of time and effort that goes into doing it is crazy."*
- *"There has to be a better way to do this. The permitting especially… even if they just, I don't know, can work with a group, and say 'Hey, **this is an approved group**… this group knows what they're doing.' Or, you know you start to submit the plans and everything, but you **don't have to necessarily have the same level of oversight**…. A lot of the work is being done by NGOs, and that doesn't necessarily mean we're going to have people who have that **legal expertise,** or anything like that. That would definitely help."*
- *"One of the things that that people get bogged down on is **the incredibly onerous reporting processes from federal and provincial government**. NGOs, less so, they're more focused on the outcome. The government is far more focused on the process and, unfortunately, we get into reporting season, where I can't leave my desk, right? Because you have to spend so much time going through these. If the applications were less onerous, the permitting was easier, and… simpler, **you'd have a much faster impact and a much bigger impact**."*
- *"I appreciate that some of it is onerous, but the **larger organizations can handle** these reporting requirements and permitting and all that."*
- *"Why is it **as hard as or more difficult to do restoration than it is to develop**? …It seems like it's across levels of government where that exists, and that needs to be completely overhauled… There's some local governments that are doing a really good job, and the Province like I think they're making steps, but, yeah, I don't know, it's super frustrating when you're trying to get a permit from the Province to do some you know work on Crown land that is restoration and, you know, **you have to follow either the rules that apply to someone who wants to say build a seawall or do development or sometimes even more stringent** and that is absolutely stupid… You throw your hands up."*
- *"I think that would probably **be helpful to know [what the funding is targeting]** … [so you] don't waste your time. You know it's, this is an NSERC funded one, it's going to be very academic focused, and even with that it's only going to be, you know, a twenty percent chance of getting it…. I'm not super optimistic, just by the nature of levels of government, that permitting ever becomes a simple thing."*

Reduce user group impacts

Most interviewees thought that targeted outreach to particular user groups would be only moderately impactful (Fig. 32). NGO and First Nations interviewees generally thought this would be more impactful than other interviewees.

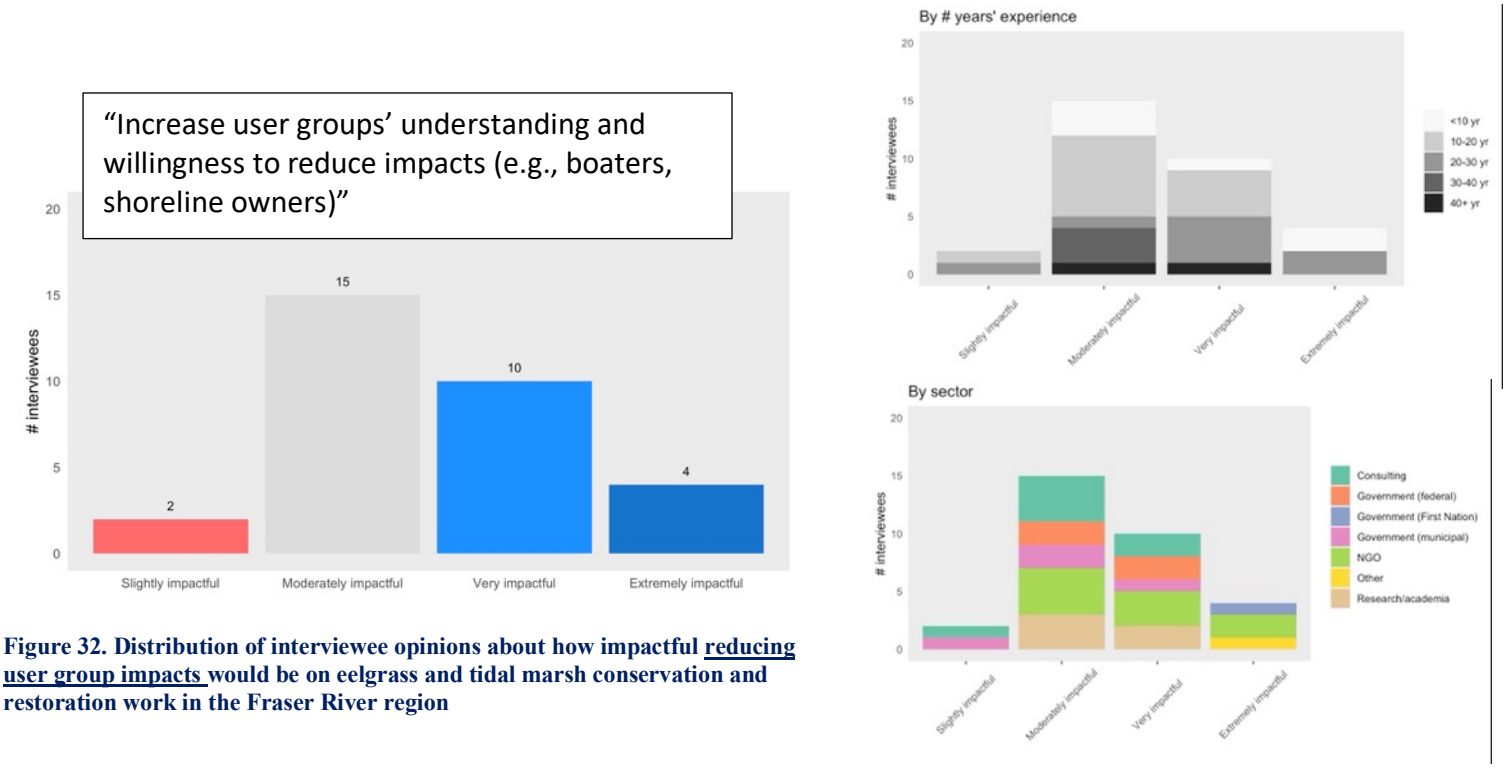


Figure 32. Distribution of interviewee opinions about how impactful reducing user group impacts would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"Chang[ing] some of the **log booming practices**, some of which have changed, then that can be like quite impactful. But in terms of more like boaters and people that have houses on the shoreline, maybe it's not quite as large of an impact."*
- *"The average shoreline owner, the average boater they're ultimately looking at their utilization of a site first and foremost as opposed to what else is going on in the site… whether or not it's ultimately successful with those particular user groups, that's tough to say."*
- *"Some people are **aware and choose to ignore**, but I think **some people might not be [aware]**."*
- *"A lot of **anchoring** disturbs eelgrass."*
- *"There's not a ton of houses right on like kind of the salt marsh, eelgrass fringe."*
- *"Targeting specific user groups like boaters and shoreline owners, for very meaningful conversations and meaningful education and not just have it be a 'Hey we're going to educate you,' but also 'we're going to listen to what you're telling us' you know, to have it be a **two-way conversation**. That would be the most impactful."*
- *"**Shoreline owners are keenly aware**."*
- *"We could be doing a lot more, and **especially [educating about] the interrelationships**."*

- *"Recreational boaters aren't really the issue in the estuary, they are an issue in the river. In the estuary, less so. Shoreline owners, for sure…. They look at the shoreline as something that they can use to basically get a better return on their investment…. If you can convince them that preserving and enhancing some of those foreshore habitats…, that's a component of the purchase… that could have a big impact because there are hundreds or thousands of **shoreline owners around here who probably could do a lot more on their property**… One person's focus on that may not make a big difference, but [many] people will."*
- *"In the States, they have **signage** like 'Don't anchor here.' Or… **mooring buoys** that have like the float at the bottom of the chain, so that it doesn't scour**. Simple intervention like that would be great**, so simple. So yeah, like more of that… it's not the grand scale thing, but it's a site level thing that can really help, especially with those small little patches of eelgrass."*
- *"A lot of those groups have kind of a lot of pre-existing kind of opinions and **it can be pretty difficult… to change people's mind** sometimes, so you don't want to like run keep running up against a wall."*

Participatory planning

Only one interviewee thought establishing a well-functioning participatory process for public input would be extremely impactful; most thought it would be very, moderately, or just slightly impactful (Fig. 33). In general, consultant and academic interviewees thought it would be less impactful than others.

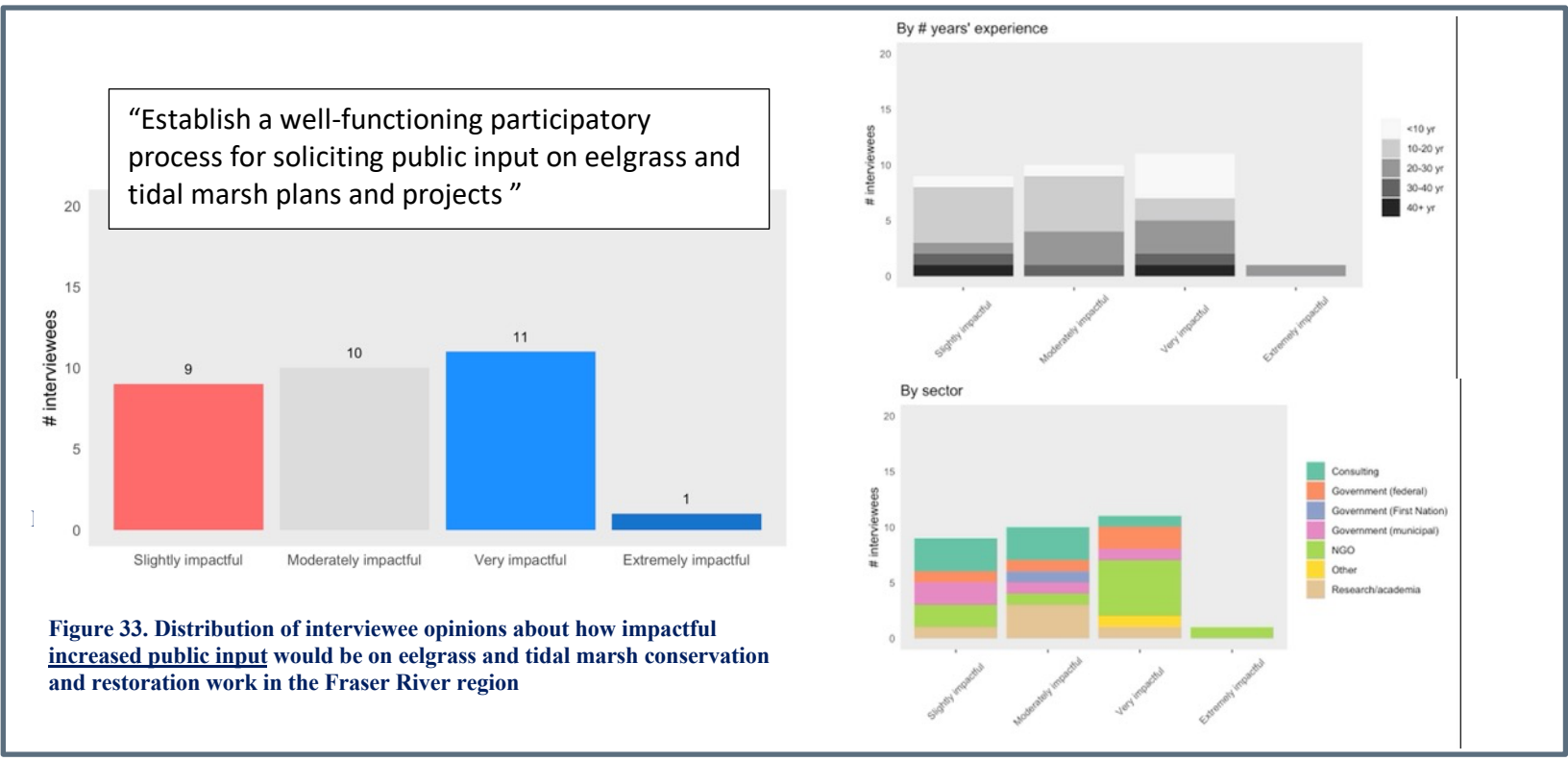


Figure 33. Distribution of interviewee opinions about how impactful increased public input would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"The public input process for project development [is] **usually very negative**…. for the well-intentioned public that knows about this work or knows that it's important and you would want to have their comments on file."*
- *"**Food is really important**. If you bring food to a meeting, you're saying you are worth your gold, right? You're saying we respect your presence… saying we appreciate you taking the time out of your day to come here and*

share your ideas and to and to hear what's being talked about, and to improve the strategy that might be coming forward. So again, well-functioning participatory processes with ***good leadership*** *is extremely impactful. What do I mean by leadership?* ***Good communication skills, listen everyone, being very, very inclusive****, starting with who comes, and being very respectful about* ***following up after a meeting*** *to make sure everybody's well-informed about what they heard and being open to changes to the record."*

- *"We've been definitely making sure that we have every six months or so like a public presentation about where the project's at and where it's going… I don't know that it's caused any major changes in our plans or processes or anything. So, I'm glad that we're working that way, but I* ***don't think it's going to have a huge impact*** *to the same degree that education and outreach work."*
- *"I think there's* ***already one in place****."*
- *"I* ***don't think that we need social license for this stuff anymore****… it honestly, just like often hurdles things."*
- *"It's definitely a* ***way for people to really meaningfully get involved*** *in all these projects, and some people want to be out there, doing things hands-on, some people want to just be able to put their two cents worth in, but it just* ***creates those connections, and it creates that sense of ownership****, which you know, you want people to have not in a proprietary kind of way, but in a 'I want to take care of this kind of way.'"*
- *"Have been part of* ***open house stakeholder consultation – they get absolutely untenable****. Sometimes it works, sometimes it doesn't."*
- *"I'm a little bit down on this, I think we're going too far the other way, with roundtables and every stakeholder you can think of,* ***it's just inefficient****. The number of hours, and we're not getting paid for that, we put into these roundtables… A social scientist looked at the efficiency of restoration projects and she said,* ***the most efficient way is a small group of high expertise people.*** *So, that's delivering things, but then we're on this 'making things, transparent and public involvement'…. Maybe if we could… make it well functioning? But I don't think we have the model."*
- *"Public input is what influences the political parties, more than anything, but the what the general public often lacks is the specific -- either indigenous knowledge or deep understanding. It doesn't necessarily need to be science of the habitat, I think there needs to be public input on this, But I think* ***there's groups that need to be prioritized and the First Nations and some of the NGO groups*** *and I have to be careful with that, because some of the NGO groups just get funding grandfathered to them when that really should be the First Nations that get money grandfather to them."*
- *"People just aren't that interested our experiences like they just don't show up. Like the regular public. But we do get strong interest from the NGOs and some of the key stakeholders… but* ***general public, unless it impacts their, they don't seem to care."***

Increase Public Awareness

Interviewees were somewhat divided in their opinions of the effectiveness of awareness campaigns for the general public (Fig. 34). The highest number of interviewees thought that this approach would be just slightly impactful, but some thought its impactfulness would be higher. Consultant interviewees, in particular, were split, but most interviewee groups expressed a range of opinions on this topic.

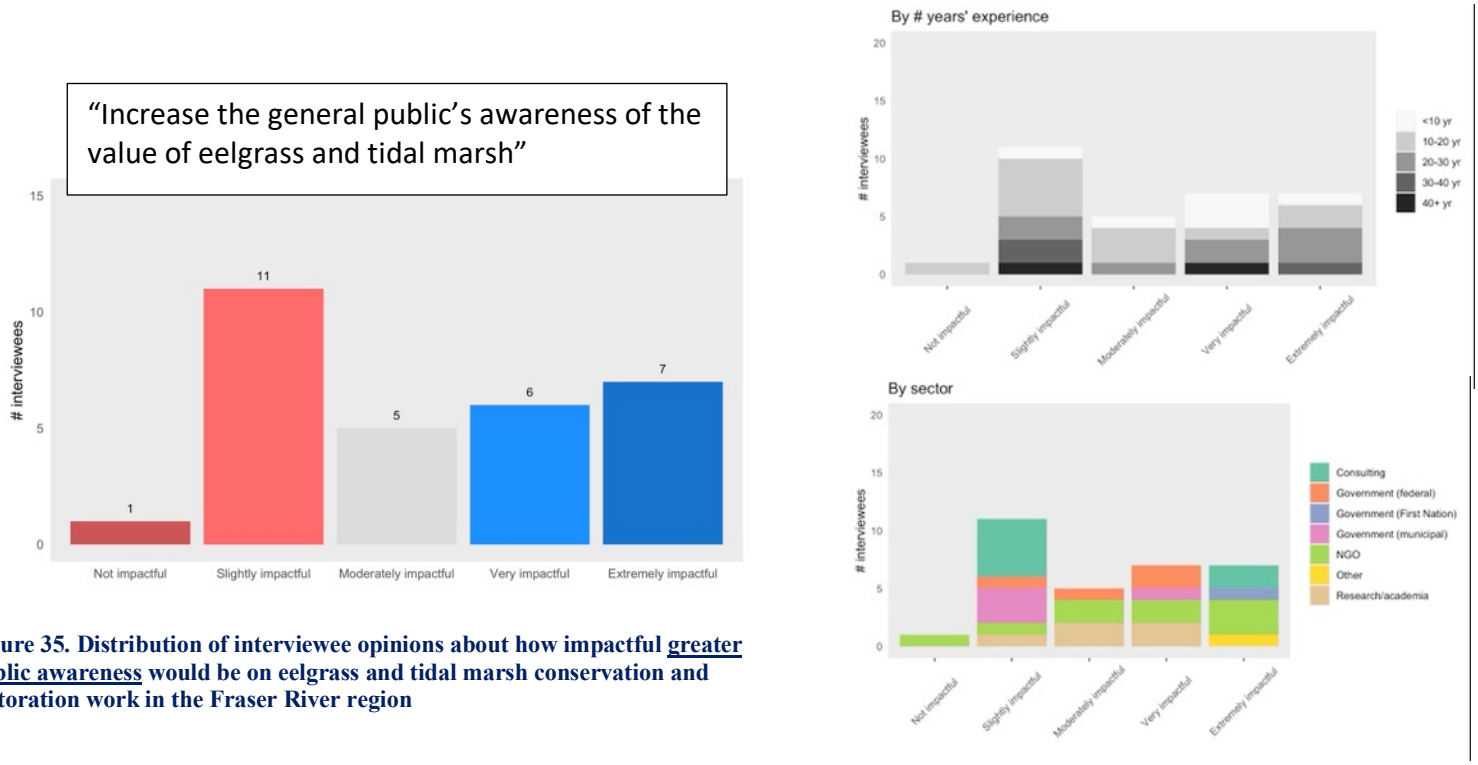


Figure 35. Distribution of interviewee opinions about how impactful greater public awareness would be on eelgrass and tidal marsh conservation and restoration work in the Fraser River region

Comments:

- *"If everyone thought [eelgrass/tidal marsh] was the bee's knees, and it was an absolute crime to do anything to it, yeah that would be impactful. But we've got to have reasonable expectations.* ***Public awareness will never get to that level****, so I have a bit of skepticism."*
- *"I* ***don't think the average public person has time for that or cares*** *about that, unfortunately."*
- *"Something like that's just* ***quick and to the point and very snazzy****, very Bill Nye the Science Guy… that kind of stuff I think goes a long way in communicating to the public about the importance of these environments."*
- *"I just think it* ***helps for support****, because when we're in the early stages of planning projects… if people were more aware of why you're doing the project… why eelgrass is important, I do think that can help get more support."*
- *"The problem is, if, like we really got the awareness,* ***there's [still] all these other systemic issues*** *that need to be resolved. So, yeah, I don't know, like on its own it would only be slightly impactful."*
- *"****Where that really comes through is in the political vote,*** *and like that's the linkage there… For the general public's awareness, like, I think, just getting people to be more aware of the climate and the environment and the importance of it is enough, and to get into the technicalities of each environmental system is not necessarily as valuable."*
- *"[It's] the general public who puts pressure on elected officials, people who control a lot of funding. So, generally a* ***good method of making sure that funding gets flowing*** *where it needs to flow."*
- *"The one thing that changes government's focus and decision making is public pressure…. If you have more public awareness of the issue and willingness to push the government on issues,* ***you're going to have a faster response****."*
- *"It has a role, but* ***it's one step in a multi-step process*** *to achieve actual on the ground change."*
- *"I think government with the stroke of a pen can just be like let's do something different, and that is way more impactful than spending so much money on public education."*
- *"It's a pretty* ***cost-effective way*** *to get things out there."*

Photo: JordanEightySeven, flickr.com/photos/137512247@N04/25933691808

Interviewees' Action Agenda

Interviewees shared many ideas about how WWF-Canada (or other similar organizations) may be able to help accelerate eelgrass and tidal marsh conservation and restoration work. These ideas can be grouped into six categories (Fig. 35). This section will describe specific opportunities suggested by interviewees under each of these categories (see Appendix B for substantiating quotes).

Figure 36. Six categories of ideas from interviewees about how WWF-Canada (or similar organizations) could help accelerate eelgrass and tidal marsh conservation and restoration in the Fraser River estuary and surrounding region

Convening, Coordinating, Strategizing

- **Convene, coordinate, or facilitate discussions of restoration priorities, actions, and coordinating body**
  - Create an overall vision for the estuary. Develop a theory of change, objectives, plans, indicators, targets
  - Reinvigorate and scale up local estuary management planning and roundtables
  - Identify and prioritize potential strategic restoration sites and communicate them to restoration practitioners
  - Convene regular meetings of workgroups to troubleshoot particular issues (e.g., compensation for dredging, disposal at sea)
  - Help to convene a coordinating governance body for the estuary

- **Convene people for knowledge exchange and relationship building.**
  - Organize a week-long conference about the Fraser Estuary with presentations about projects in progress and workshops
  - Support sessions where people can either reestablish or begin relationships
  - Support local organizations who are best situated to do relationship building

- **Convene relationships between current restoration practitioners and others who could support**
  - Engage the corporate sustainability world about nature-related financial risk and push for more open to stakeholder and public engagement.
  - Bring scientists and practitioners together and help them effectively collaborate

Fundraising & matching funds

- **Assist with financial capacity**
  - Providing project funding
  - Providing matching funds to leverage for larger proposals
  - Help fund land acquisition/land purchasing
  - Develop a revolving fund for small-scale projects
  - Grants for students

Science, resource inventory, monitoring

- **Fill research gaps**
  - Cost-benefit analysis to understand the potential costs and efficacy of different restoration techniques
  - Species interactions (e.g., eelgrass and forage fish)
  - Ecosystem services (e.g., habitat provision, economic connection, cultural connection)
  - Suitable restoration locations
  - Carbon sequestration potential / Broaden the scope of scientific inquiry beyond blue carbon
  - Pilot studies to better understand which restoration techniques work

- **Enhance monitoring**
  - Monitor European green crab distribution in the Fraser Estuary
  - Map and monitor eelgrass
  - Identify shore spawning areas for surf smelt and herring
  - Monitor to understand reasons for kelp loss and potential solutions

- **Draw on learnings from other jurisdictions that have attempted green infrastructure projects**
  - Assemble written case studies of innovative projects attempted elsewhere, especially highly urbanized European cities
  - Bring in visitors who have expertise
  - Host a conference or symposium to highlight innovation from around the world in estuary restoration

Outreach & education

- **Education campaign that articulates clear, tangible actions, and helps people understand historic and potential future conditions and threats to the estuary,**
  - Poster boards at government docks
  - Public information meetings
  - Short videos

  - Events that engage diverse audiences (e.g., weekend events for families, school programs)
  - Competitions

Advocacy, letters of support

- **Advocate (to government) for targeted initiatives**
  - Exploring strategies and frameworks to incentivize beneficial uses of dredged materials
  - Developing a "FREMP2.0[3]" coordinating planning and regulatory body for the estuary
  - Establishing governance strategies
  - Policy/legislation changes

- **Provide letters of support**

- **Leverage existing contact networks to advocate for more resources**

Labor & volunteers

- **Recruit volunteers**

- **Participate in working groups**

Summary

This report summarizes findings from 31 interviews with people involved in eelgrass and tidal marsh conservation or restoration in or near the Fraser River estuary. Interviews focused on the key challenges and opportunities to accelerate eelgrass and tidal marsh conservation and restoration. Interviewees' responses varied widely, but generally reflected a perception that some elements that can support acceleration of eelgrass and tidal marsh conservation and restoration in this region may *already* be in place. In particular, interviewees indicated that they thought the scientific understanding, social license, and the regulatory frameworks already in place are sufficient to support this work.

However, interviewees also perceived many limitations. Overall, the top challenges and factors interviewees described as limiting their work were predominantly related to four key factors:

Strategy and coordination. Interviewees described what they perceived to be an uncoordinated and inefficient approach to advancing eelgrass and tidal marsh conservation and

[3] "FREMP" refers to the Fraser River Estuary Management Program (Mathewson et al. 2003), which was in place from the 1980s until 2013 (Langer 2019)

restoration. This was underpinned by confusing and sometimes contradictory regulatory mandates, and weak relationships and exchange between organizations working in the field.

Capacity and resources. Interviewees described being resource- and sometimes expertise-limited to develop and implement high-cost conservation and restoration projects in highly altered, urbanized landscapes. They also recognized that agencies are resource-constrained to facilitate expedited project permitting and to monitor and enforce their own regulations.

Disturbances in the nearshore environment. Key disturbances to eelgrass and tidal marsh identified by interviewees that need to be addressed were: herbivory by hybridized Canada geese, invasions of exotic or hybridized plant species, boat wake impacts, erosion and plant mortality from storm and heat wave events (worsened by climate change), and anthropogenic log escape and scouring.

Competition for other land uses. The Fraser River estuary is a highly modified landscape with many historical, ongoing, and emerging ecological stressors that are "locked in" by existing infrastructure or land ownership patterns. Interviewees perceived social inertia and limited political will to shift land use patterns or development trajectories as limiting challenges.

Recommendations

In this section I present my own interpretation – based on 31 interviews – of high-priority and possible next actions to address the above challenges. These recommendations are directed toward the community of practice working on eelgrass and tidal marsh conservation and restoration in the Fraser River estuary for consideration. This list is not intended to be prescriptive, but to rather reflect on what I heard and offer possible solutions to the problems interviewees discussed. These recommended actions do not encompass all worthwhile interventions or actions. Many of these recommendations echo or expand on prior suggestions that could be included a Fraser River Estuary Federal-Provincial Act (Kehoe et al. 2020, Appendix S4) or revised Fraser River Estuary Management Plan (Langer 2019). Some of these actions may already be in progress. The ten actions are to:

1. Mobilize (and compensate) a group of practitioners to develop and propose a vision and recommendations for a coordinated procedure to develop area designations, and review and permit activities and projects in the Fraser River estuary. Key topics for the group to discuss include: how should permitting differ between restoration and development? Should organizations with a successful track record of restoration projects have different permitting requirements than less experienced groups, and who/how would such an arrangement be arbitrated?

2. Convene (and compensate, as appropriate) a multi-stakeholder group led by First Nations and appropriate federal, provincial, and local government agencies and practitioners to assist in the development of a vision, goals, rationale, and strategic plan for management of Fraser River estuary ecosystems. Hire a professional facilitator.

3. Advocate for a dedicated position (perhaps housed at DFO, an NGO, or elsewhere) to create, standardize, and manage an online, centralized clearinghouse of information about nearshore conservation and restoration in the Fraser River estuary and surrounding region. This website could include links to existing resources such as: infographics that clarify jurisdictional roles (e.g., WCEL 2016), instructions for seeking project permits, historical and current strategic planning documents (e.g., Mathewson et al. 2003), field protocols and best practice documents (e.g., site selection - Rao, n.d., planting methods – Thom et al. 2008), funding and partnership opportunities, a directory of key contacts in the region, as well as serve as a place for practitioners to connect with each other. The Restore America's Estuaries website could serve as a starting template (https://estuaries.org/).

4. Contract a graduate student or other temporary worker to gather and consolidate existing knowledge about past conservation, compensation, and restoration projects in the Fraser River estuary and make an online, interactive map of project locations and outcomes. The contractor could begin locating, consolidating, compiling, and building upon existing knowledge (e.g., Kistriz 1996, Stewart et al. 2022, DFO 2012, DFO 2017) on whether past projects have succeeded or failed, and why. The contractor could also create a standardized template for future monitoring to feed into this resources. This map can be used as a resource to identify possible future restoration sites and to avoid repeat efforts in the same place(s) with the same technique(s) as previous failed restoration attempts.

5. Hire a contractor or graduate student to gather case studies of successful, innovative, natural hazard mitigation strategies for coastlines from around the world. This dedicated person could share possible new strategies with practitioners and experts to assess the ecological feasibility of these strategies in the Fraser River estuary. They could also investigate possible liability considerations for engineers and others involved in the case of project failure, and seek information about how people in other jurisdictions overcame these liability concerns. The contractor could deliver this list to a workgroup of practitioners who could identify and prioritize new pilot projects.

6. Create an overarching "Fraser River Estuary Research Institute" administratively housed within University of British Columbia, University of Victoria, or Simon Fraser University consisting of scientists and researchers already working on research about the Fraser River estuary. Key research themes this group could further develop include: understanding and restoring functional processes in the estuary (e.g., how do fish and other species use restored or created habitat?), cumulative impacts, emerging stressors

(e.g., European green crab, causes of kelp disappearance), possible effective governance models and strategies.

7. Convene (and compensate) a multistakeholder group to propose pathways to modernize compensation requirements. Key topics for the group to explore include: required monitoring timeframes, incentives for beneficial use of dredged materials, third-party monitoring and enforcement, bonding requirements and accessing bonds, strategies for allowing off-site compensation, establishing or strengthening Guardian Programs so they have capacity and statutory authority to assist with monitoring and enforcement.

8. Advocate for policy and legislation that will allow for multi-agency funding pool that provides a predictable, long-term (i.e., extending beyond individual political cycles) funding source to large-scale, collaborative projects in the region.

9. Advocate for the Province and Port of Vancouver to review land tenures and allow or incentivize inactive water lot tenures to be converted to a restoration use.

10. Establish a timeline and process for convening a regular “Fraser River estuary meeting” for knowledge exchange and relationship building. This meeting could initially be established on the “off” years between Salish Sea Ecosystem Conferences. Consider selecting a specific theme to workshop at each meeting and allowing for more frequent meetings to occur to address specific needs.

Photo: Robert Ashworth, https://www.flickr.com/photos/90536753@N00/7735898860

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Appendix A. Interview Guide

INTERVIEW GUIDE

I want to start by asking a little bit about your background related to eelgrass and saltmarsh.

Background & Experience

1) Can you briefly tell me about your training, experience, and relationship with *eelgrass and saltmarsh* conservation and restoration?
    a. What sector do you work in?
    b. How long have you been working in this field?

Why protect and restore eelgrass and saltmarsh?
Next, people work on eelgrass and saltmarsh conservation and restoration for many reasons. I want to ask why you choose to involve yourself in this work.

2) What is important to you about conserving and restoring eelgrass and saltmarsh habitat in the Fraser River estuary?

Conservation & Restoration Successes & Mistakes
Next, I'd like to draw on your knowledge and experience. Specifically, I'm interested in discussing what you think has and has not worked well in eelgrass and saltmarsh conservation and restoration work. To start out, let's focus on the positive –

I'd like you to think of an example or examples of successful eelgrass or saltmarsh conservation or restoration work

3) Can you tell me a bit about that work or project(s)?
    a. What factors do you think contributed to their successes?

Next, I want you to think about eelgrass or saltmarsh conservation or restoration work where there were negative outcomes, struggles, or mistakes?

4) Can you tell me a little bit about those projects?
    a. What factors do you think contributed to the negative outcomes?
    b. What were the key learnings from those restoration challenges?

Leverage points to accelerate eelgrass and saltmarsh conservation and restoration
Next I want to ask about what you think the key challenges and opportunities are to accelerating eelgrass and saltmarsh conservation and restoration in the Fraser River estuary. I have a few open-ended questions and two structured activities.

5) In your opinion, what are the challenges or factors that most limit the ability to conserve and restore eelgrass and saltmarsh in the Fraser River Estuary?

Structured activity: Challenges

Next, I want to do a structured activity. For the past several weeks, I have been reading about eelgrass and saltmarsh conservation and restoration efforts around the world. I have developed a set of 12 statements that describe challenges or constraints that people said they face in this work. I want to understand to what extent you think each of these is a challenge that limits eelgrass and saltmarsh conservation and restoration in the Fraser Delta. We will read the 12 statements. For each one I want you to evaluate

6) To what extent do you think this challenge is or is not an important limiting factor for eelgrass or saltmarsh conservation & restoration in the Fraser River Estuary?

[If they don't understand the difference] You can imagine, for example, that some challenges may be true but may not actually be the factor constraining work, because something else is more important.

You can answer each of these questions with one of these 5 options
Not a challenge here
Minor challenge
Moderate challenge
Major challenge
Critical/extreme challenge

…or you can say I don't know/skip.

This is intended to be a quick exercise to get your general impressions of these challenges. We can discuss any of them in more detail at the end if you'd like.

CATEGORY	CHALLENGE	#	Not Extreme Skip
Site availability	There are few suitable sites for eelgrass or saltmarsh restoration	1	○ ○ ○ ○ ○ | ○
Disturbance to sites	Eelgrass and saltmarsh conservation and restoration sites are disturbed by humans and other species (e.g., via trampling, herbivory, uprooting, competition)	2	○ ○ ○ ○ ○ | ○
Funding	Available funding is insufficient to plan and implement long-term eelgrass and saltmarsh conservation and restoration projects	3	○ ○ ○ ○ ○ | ○

	Existing funding is too restricted, inflexible, or siloed (e.g., lack funding for monitoring or opportunistic property acquisition for funding)	4	
Values	Recognition is poor among the public about what seagrass and saltmarsh are and their importance	5	
	Decision-makers do not prioritize eelgrass and saltmarsh compared to other land uses	6	
Existing knowledge	Scientific understanding of eelgrass is inadequate to support environmental management actions	7	
	Uncertainty about project outcomes makes it difficult to get resources and support for eelgrass and saltmarsh project implementation	8	
Collaboration and agreement	Stakeholders and rights-holders do not agree about where and/or how to protect and restore eelgrass and saltmarsh	9	
	Stakeholders and rights-holders do not coordinate, share ideas, work together on eelgrass and saltmarsh restoration	10	
Regulation & enforcement	Existing regulations make it difficult to implement eelgrass and saltmarsh conservation and restoration projects	11	
	There is low enforcement of existing regulations to protect eelgrass and saltmarsh conservation and restoration	12	

Great, thank you for doing that exercise. It looks like your top ones were [Summarize back to them]. Does that accurately represent your opinion of the biggest challenges here? Do you have any additional comments or thoughts about challenges to eelgrass and saltmarsh conservation and restoration?

<u>Levers to accelerate eelgrass and saltmarsh conservation and restoration</u>

Now I want to move to a more forward-looking conversation focused on the opportunities you think exist to overcome the challenges we have discussed.

<u>Opportunities/Solutions</u>

7) If you were in charge of accelerating eelgrass and saltmarsh conservation and restoration in the Fraser River Estuary, what would you do?

You have already touched on this a bit, but I want to explicitly ask about where you think existing work needs to be scaled up, and where we need an entirely different approach. So, I have a two-part question:

8) [INCREMENTAL CHANGE] What work that people are already doing to conserve and restore eelgrass and saltmarsh do you think should be continued and/or scaled up in the future?

9) [TRANSFORMATIVE CHANGE] In what areas do you think we need to depart from existing strategies and do something different to achieve eelgrass and saltmarsh conservation and restoration?

Structured questions about opportunities

Next, I want to do the second activity, which is similar to the first one. I have put together 12 statements about strategies for accelerating conservation and restoration eelgrass and saltmarsh that are derived from literature. I want to understand whether or not you think each of the strategies would actually be impactful in the Fraser River estuary. For each one I want you to evaluate:

10) To what extent do you think this strategy would or would not be an impactful way to accelerate saltmarsh and eelgrass conservation and restoration work in the Fraser River Estuary?

[Prompt, if needed] The goal here is to distinguish between ideas you think would really make a big difference here, and those that you think would not.

You can answer each of these questions by selecting one of 5 options [show them a scale] that you think the idea would have:
Not at all impactful
Slightly impactful
Moderately impactful
Very impactful
Extremely impactful

You can also say you don't know or you want to skip any question.

Lever	Leverage point	#	Not at all Extremely Skip
Unleash values	Increase the general public's awareness of the value of eelgrass and saltmarsh	1	
	Increase user groups' (e.g., boaters, shoreline owners) understanding and willingness to reduce impacts (e.g., residential development impacts, and pollution)	2	

Knowledge	Increase scientific understanding of eelgrass/saltmarsh ecosystems	3	
	Increase monitoring of sensitive or vulnerable shoreline to detect early warnings of decline	4	
Capacity	Increase resources (e.g., staff, funding) to develop, implement, and manage restoration projects	5	
	Make funding applications, reporting, and permitting for eelgrass and saltmarsh restoration and conservation simpler and easier	6	
Coordination across sectors and jurisdictions	Increase exchange of ideas, data, and resources among those working on eelgrass and saltmarsh	7	
	Formalize shared decision-making and regulatory authority with First Nations	8	
	Establish a clear regional vision and plan for eelgrass and saltmarsh restoration	9	
	Establish a well-functioning participatory process for soliciting public input on eelgrass and saltmarsh plans and projects	10	
Environmental law and implementation	Prohibit or more strongly regulate shoreline and marine activities and infrastructure that degrade eelgrass and saltmarsh areas (e.g., shoreline armouring, industrial development, overwater structures, anchoring, dredging)	11	
Infrastructure improvements	Invest in "green" infrastructure or infrastructure improvements, such as living dikes, light-penetrating docks, marked navigation channels, and areas protected from erosional processes	12	

Great, thank you for doing that exercise. It looks like your top ones were [Summarize back to them]. Does that accurately represent your opinion of the most promising opportunities? Do you have any additional comments or thoughts about opportunities to accelerate eelgrass and saltmarsh conservation and restoration?

<u>Governance structures</u>

The next topic I want to ask you about is governance – which refers to the institutional arrangements, processes, and systems that control management of eelgrass and saltmarsh areas. Existing research has suggested that new governance models may be needed in the Fraser River estuary. I'm wondering, in your opinion:

11) What do you think is and is not working well about how eelgrass and saltmarsh areas in the Fraser River Estuary are currently controlled/managed?

a. How do you think governance of eelgrass and saltmarsh in the Fraser River Estuary could be improved?

The last topic I want to ask about is that I mentioned earlier that I am doing these interviews as part of an internship with WWF-Canada. They are hoping to build up a larger program to support eelgrass and saltmarsh conservation restoration work in the Fraser River Estuary, but they are still trying to figure out exactly how they might be able to help. We are wondering,

12) Do you have ideas or opinions about how an organization like WWF-Canada could best support existing efforts and help scale up eelgrass and saltmarsh recovery in the Fraser River Estuary? Is there anything that you think WWF-Canada definitely should NOT plan to do?

Wrap-up

I have just a couple of final wrap-up questions.

13) Knowing that the purpose of this part of the conversation was to get your open-ended opinions about the biggest challenges and opportunities in estuary restoration in the Fraser Delta, is there anything important we did not yet discuss?
14) Do you have recommendations for anyone else we should talk to?
15) May I follow up with you if I have additional questions?

Appendix B. Interviewee quotes about potential roles for WWF-Canada

Interviewees shared many ideas about how WWF-Canada (or other similar organizations) may be able to help accelerate eelgrass and tidal marsh conservation and restoration work. These ideas can be grouped into six categories (below). This Appendix provides substantiating quotes for the list of specific opportunities suggested by interviewees as presented in the report body.

Convening, Coordinating, Strategizing:

- "That's a really key role that WWF-Canada can play in **bringing together folks to discuss what are restoration priorities**, going through those priorities, and then going out to funders, bringing in the money."
- "**Organize a week-long conference** all about the Fraser Estuary. Have a series of presentations about projects in progress and then have a series of workshops working through -- what are the needs of the estuary? And creating a vision for the estuary from that. I think you would get broad participation and that could lead into, you know, ongoing discussions about, what are our conservation objectives? … You could really break that into more regular meetings of key groups and kind of stoke the flames… There's an opportunity to support [compensation for dredging]. same with disposal at sea…. WWF-Canada could play a role in… **facilitating discussions and workshopping them with the key decision makers**."
- **"**I could see WWF playing kind of **coordinating role** of bringing people together [for] knowledge exchange and sharing."
- "I think a theory of change which **engages both the Nations in terms of resourcing and supporting, developing objectives and plans** is one opportunity."
- "**Engaging the corporate sustainability world** in terms of, 'how do they bring in this kind of thinking around nature-related financial risk?' and thinking about eelgrass and marsh habitat as key values at risk to loss from development from building built infrastructure. Engaging with the Green Marine conversation about that coastal habitat of Ports and identifying the values, getting the Port to identify those values within that certification process and maintain those, and then also start to look to engage a broader swath of stakeholders. So, **pushing that corporate sector to be more open** to stakeholder and public engagement."
- "It would be good to have … an **idea of different sites** ahead of time that could be worked on. Why they're beneficial, and then what you could potentially do is go and share these sites with others and say, 'Hey, these are different areas that could be restored. Who's interested in helping with this? How could make it happen?' And then develop that working group approach from there. But I think it's key to first have locations in mind."
- "WWF might want to start by **supporting ways for people to come together**…. Start by sessions where people can either reestablish or begin relationships…. Start with a robust conversation that leads to good planning and then that planning takes off into specific actions."

- **“**They shouldn't necessarily try to do the relationship building, they should **support local organizations who are better situated to do that relationship building**… build upon the resources and the networks that exist, rather than expecting that there's nothing and coming in and being like ‘We're going to do this thing.’”
- **“**I don't know if they could have a roll in that coordinating body and helping to get everyone together to develop a broader plan…. kind of a **facilitating, convening role** to bring people together.”
- **“Develop a plan**…. that blueprint, that foundational document, for ‘Here are your opportunities to really affect change’ … **Prioritizing those areas** and then **getting that information out there** to the restoration practitioners on the ground, or the government agencies or other stakeholders and rights-holders.”
- **“**Coming out … with some **indicators, some targets**… this is good thing to do, but no one's really backing it up with like actual targets. To say like this is what we need by this year. Not that targets are the be all and end all…, but at least you know it gives something to put people accountable for, and to see if we're on track or how far off we are.”
- **“**If there was **support to help and scale up these estuary management plans and roundtables** that are that aren’t functioning currently, reinvigorate them and help them to sort of stabilize and grow that could have a really great effect…. Especially when there's a strong First Nations component… and same with the local nonprofit community.”
- **“**If there's support for like scientists to be able to communicate with nonprofit, environment organization and government, that's really where we can get a lot done…. Anything they can do that works to **get those groups together and effectively collaborate**.”
- **“**I could see WWF being a **good facilitator**, I mean there's someone who has a lot of connections and has worked with a lot of these groups and… Hakai would be honestly sort of one of those groups as well.”
- **“Getting the ball rolling on that idea of a framework**…. Getting that organized and put together is likely to be a large task so if WWF has the abilities and the staff and the resources to put towards something like that that would be I think a really good way…. Even if it just gets all those groups talking to each other… and thinking about it in a regional context rather than just their individual interest areas that would be hugely helpful. Some kind of like convening role, maybe to help us think about what could go into regional framework…. Anything that will create connections and anything that would create that just get a better sense of community and not have that sense of competition with each other, you know in these in these areas would be terrific.”
- **“**I guess convening and like creating this community of practice… supporting a community of practice that that doesn't try to do everything.”

Fundraising & matching funds

- **“**A hard thing for NGOs to do, particularly, [is] going after big money. So, WWF-Canada **bringing in the money** to support us doing these projects.”
- **“**Providing **matching funds** to kind of bump up… so there's already money on the table… from these other organizations these nonprofits. It elevates the project status [to funders] …, because they know that there's already grassroots support.”

- **“**It's great to bring people together and talk about this stuff, but we do that a lot already, and so **we really just need the money** to go do things.”
- **“**It would be helpful to see some money, because nothing's more… powerful [than] like, ‘Hey, like we're stepping up with ten million dollars…” …to set out a vision for, like, a one hundred million dollar investment. Maybe part of that, like ten million can get matched by twenty million [from] the Province and twenty from the Feds, and then twenty from the Port, and then all of a sudden, now it's a nice one hundred million dollars program…. Putting your money where your mouth is helps people take it seriously.”
- **“If** WW has sort of support and funding to be able to kind of fund an existing initiatives that would be that would be helpful to kind of come in as a funder.”
- **“**If WWF-Canada has an investment branch… then looking at partnering with other like whether it's First Nations or other NGOs, or whatever, to like buy these lands.”
- **“**I don't know if they have money… if they have money to offer they could **have some sort of fund that groups can apply to to do smaller scale projects**, even things like invasive plant removal projects.”

Science, resource inventory, monitoring

- “[What] really needs to be done for the restoration side of things [is] the **cost-benefit analysis given different restoration techniques…** what are the true costs? …Government is looking for that and needing that.”
- **“**I think WWF needs to **broaden the scope [beyond blue carbon]**. Decarbonising is important, but… biodiversity is incredibly important. When we talk about the carbon, we're kind of taking that out of the picture… I think we need to put it back in.”
- **“**Linking the eel grass with [WWF’s forage fish] work would be worth doing so that people understand **WWF’s role to be more sort of like nearshore-based** and looking at like the interaction of species, rather than just like species specific programming. That's always appreciated when people are like ‘Oh you're taking a more holistic approach.’ … I wouldn't like over emphasize the blue carbon role. I would probably emphasize all of the ecosystem services like the habitat provision… to you know these species that we eat and have that economic connection and cultural connection with.”
- **“**I know that people are worried about climate change and everything and people like the **blue carbon angle, but I'm not sure that's necessarily the best angle.**”
- **“Investing in science and research**, whether that’s to decide the **best suitable locations**… understand carbon sequestration potential… **Collaborations with researchers and grants for students**.”
- **“**There's enough science to figure out how to do salt marsh and eelgrass stuff, but kelp is a different story…. That's another place where I think a lot more research investment is going to be needed to **figure out a why [kelp is] missing and what we can do about it**. And I think similar to that, but probably a little bit less … would be the **shore spawning areas for surf smelt and herring** and things like that.”
- **“**Anything that can be done to support scientific understanding and supporting you know pilot studies…. What really works? What pilot studies do we need to do? ... Anything that can be done to provide guidance and advice to those who are undertaking these projects

and to **better understand what works and how to go about it**. And then, particularly on the Fraser, obviously you can learn a lot from **what's been done elsewhere in the world**… but really what works in this specific environment?"

- **"European green crab** in the Fraser Estuary… [the response has] been very, very piecemeal and we know that this issue will completely decimate the eelgrass in the region if it goes unchecked…. That's a gap that's not being filled right now…. There's something holes being plugged in the boat, but barely."
- **"**One thing that WWF [could do is] having an elite, expert, how-to-do-stuff… sort of like another conference…. Trying to get beyond the norm or breaking, taking the lead… pushing the envelope… **bringing in someone who has expertise**."
- **"**Case studies are really useful. So, take the best-case studies for tidal march or eelgrass and you know have just **case studies of innovative stuff**…. Giving us confidence that some of these things work."
- **"**There's clearly need for targeted research… **Even something as basic as mapping** where the damn stuff is would be helpful and somebody monitoring that…. That needs to be done and WWF has that track record to get the funding to do that, you know, and have the scientific chops to do it."

Outreach, education

- **"**More in terms of people being aware, whether it's like **short videos** like explaining like why eelgrass is important, what sort of like habitat they provide for different species."
- **"Public information meetings**… and **poster boards at the government docks** talking about the values of eelgrass."
- **"**The other piece is just… increasing that awareness for the public and for various levels of government around like 'Here's what needs to happen,' like **clear, tangible actions…** framed in such a way that it's digestible by the public, digestible by politicians, and like the mid-level bureaucrats can actually say 'Yeah, that makes sense.'"
- "WWF being quite a recognized acronym… Could have **campaign** to bring up the importance of tidal marsh and eelgrass…. [and highlighting] cool things that live there."
- **"Programs that engage whole families**… Saturday or weekend **events."**
- **"**I think was Puget Sound Water Authority and they took the cigarette tax and they had a funding competition and they gave money out to all sorts of NGOs…. The creativity and the off the wall stuff was pretty mind boggling"
- **"**What are we doing for **inner city kids**? A lot of ecological conservation stuff is pretty you know affluent people."
- **"**Larger NGOs… can really help on the **education and awareness building** side, because they have the communication tools and resources and networks to be able to do that."
- "Capturing the big international name… When WWF focuses on something, that comes off as being really important…. When they put their focus on something, a lot of people look…. For WWF-Canada in a supportive role, I think it would be really **capturing minds and imaginations** of what the estuary was and what the estuary could be and… the threats, and you know, helping really **shine a light** on that on an international level and propping up the

Fraser River estuary as an international piece of habitat…. But you know doing it in a way that recognizes that there's a lot of other groups that are doing the work."

- "Maybe they can play a role in terms of **educating the public and the politicians** and folks on the you know why is this important, why is biodiversity important in these types of habitats, what are their ecosystem benefits…. WWF is you know, world renowned, respected in terms of conservation…. What about doing even things like **getting into schools** and talking… about the importance of conservation restoration of these habitat types."

Advocacy, letters of support

- "WWF-Canada, there's a role for advocacy as well. with different levels of government and trying to get support for things like a **compensation for dredging framework** or a **FREMP2.0,** like really pushing decision makers, saying, not letting them up saying this is a priority or these other things you know so there's an advocacy opportunity there."
- "They can act as a **lobby group to try to get the governance side up and running**."
- "It would give us much more clout if we could say we have WWF behind us… that would be the best they could do, rather than giving some money to an NGO like ours, we don't need that. We can do our own fundraising. It is the **support and the solidarity**, which is needed…. WWF should come into **political lobbying**…. they know who WWF is…. they listen to them because, they are a thorn in their side."
- "When we receive **letters of support** that helps us get the funding. Letters help."
- "**Drum up more political support**…. [WWF] they're a big organization, they probably have good contacts. So, you know, really continue telling the politicians to keep investing…. using those connections that they have to like bring some more money."
- "And then the **advocacy to make the changes to policy and legislation**, and maybe that's in partnership with like West Coast Environmental Law."
- "I don't have a good idea of what WWF-Canada's position and relationships are with the different government agencies, if it was in a position of positive influence, I would say advocacy about regulatory change, like the tools and points of leverage that the Federal and provincial governments can utilize. That is helpful."

Labor & volunteers

- "I don't know what WWF, how involved they like to be in projects, whether they have **volunteers**… it just depends on whether they have **human resources** to do certain things."
- "**Be more visible,** maybe in participation on some of the working groups that are around…. Make themselves more visible, maybe in how they work and how they can support."