Integrated flood management for climate, salmon, agriculture, and community resilience in the Lower Mainland

EXECUTIVE SUMMARY

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August 2022

Disclaimer

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

This project was conducted under the mentorship of MakeWay and Watershed Watch Salmon Society staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of MakeWay and Watershed Watch Salmon Society or the University of British Columbia.

Territory Acknowledgement

The author acknowledges that much of the work for this project took place on the unceded ancestral lands of the Syilx.

The intention is that this work will, in some way, support Coast Salish First Nations from Tsawwassen to Seabird Island to aid in protecting their communities and cultures from the disproportionate impacts they suffer from both flooding and loss of salmon and ecosystems.

Introduction

At the end of one of the most prolific salmon rivers in the world, the lower Fraser watershed contains over 1,500 km of crucial habitat inaccessible to salmon due to inappropriate flood control structures (Resilient Waters, 2022). Besides, the community still suffers from the socio-economic consequences of flooding in the wake of implementing traditional single-benefit flood management approaches. There is a dire need to implement alternative management approaches considering the multiple benefits of a wider spectrum of stakeholders and affected people. The main objective of this project is to develop proficient examples of regulatory and jurisdictional systems for integrated floodplain management (IFM) that proactively consider climate change, ecosystems, indigenous rights, and flood risk.

Background

A significant portion of fish habitats in the Lower Fraser Watershed became inaccessible to salmon due to over 150 pieces of ageing flood control structures, affecting hydrologic connectivity between the river and floodplains. Extensive systems of dikes, pump stations, and floodgates adversely impacted the lateral movement of salmon across the Lower Fraser floodplains. In addition, the legacy of extensive river-edge diking in the Lower Mainland disproportionally affects indigenous communities through the associated socio-economic consequences, such as locating their communities in at-risk areas, reducing storage capacity of floodplains, and decreasing salmon runs (District of Squamish & Kerr Wood Leidal, 2017; Fraser Basin Council, 2021). Climate change has also exacerbated the circumstances via more severe riverine floods and sea-level rise in the area (Fraser Basin Council & Ebbwater Consulting, 2021).

Research Approach

This study conducted a literature review and developed several examples of integrated and collaborative flood management governance regimes practising more holistic management approaches to obtain multiple benefits through wildlife-friendly and efficient solutions to floods. Three case studies of IFM were reviewed to elaborate on the development and implementation of IFM-based approaches and present some valuable experiences from real-world programs and

associated local projects. Two case studies in the United States (i.e., Floodplains by Design and Yuba Watershed) and one case study in New Zealand (i.e., Ōtākaro/Avon River Regeneration Corridor Plan) were reviewed. Each of the case studies provided unique challenges and solutions that can inspire a new way of managing for floods in the Lower Mainland.

However, other IFM-based programs and their associated projects around the world can also be considered for evaluation in future studies to add to the knowledgebase around IFM implementation.

Summary

Incorporating IFM through a risk-based approach has been recognized as one of the most promising alternatives to traditional and hazard-based flood management approaches (Fraser Basin Council & Ebbwater Consulting, 2021; TNC, 2016). While the traditional approaches significantly rely on purely structural protection in single-benefit projects, IFM focuses on nature-based alternatives along with wildlife-friendly engineering solutions within multi-benefit projects. IFM aims to reduce flood risk while having a holistic vision to collaboratively support major local and provincial values, such as agriculture, fisheries, vibrant economy, climate change resilience, and environmental justice (TNC, 2014, 2016). IFM reaches a shared vision among numerous stakeholders and affected communities that can lead to a set of actions building trust and mutual respect for the values of all involved entities. The built trust through the outcomes of the initial actions can engage more entities to achieve greater benefits for a wider range of stakeholders within larger-scale areas (Ecology, 2021; Floodplains by Design, 2016).

This review outlines the broader concept and requirements of an effective regional-scale IFM and the interconnected relationship between IFM's regional and local levels. The major challenges in IFM implementation and potential associated solutions were also reviewed based on the hands-on experiences of practicing IFM. The study summarizes significant steps and considerations to facilitate IFM as well as overarching concepts needed to practice IFM as a widely accepted norm. Several constructive strategies were gathered in this study to restore and protect fish and wildlife habitats while preserving agricultural lands. These strategies looked at the integration of multiple

purposes and collaboration between numerous entities with historical conflicts to create a shared vision. In one case study the aim was to regenerate an abandoned area by considering the predominantly natural character of the land and the local indigenous values for sustainable management (Regenerate Christchurch Board, 2019).

Investigation of case studies showed that multi-sector collaboration considering equally important values within IFM can lead to comprehensive and efficient solutions to flood risk and ecosystem issues. To implement an IFM-based approach, it is necessary to

- change the "entrenched pathways" towards the application of traditional approaches;
- build trust among all influential stakeholders and affected communities through a shared vision with specific objectives and measurable performance metrics;
- secure multi-source funding to develop plans and implement associated projects; and
- practice an adaptive management system by establishing a neutral backbone organization (Floodplains by Design, 2016; Fraser Basin Council, 2021; TNC, 2016).

Reviewing specific projects and examples of IFM implementation explicitly indicated the benefits of IFM. The reviewed documents successfully implemented specific strategies to attain multiple benefits of flood risk reduction, agriculture protection, and fish and wildlife habitat restoration. These strategies include:

- replacement of river edge dikes with setback dikes to increase floodplain storage capacity, recharge groundwater, and enhance side-channel habitat and river connection;
- replacement of conventional floodgates with new self-regulating floodgates enhancing fish migratory access while keeping the same level of flood protection;
- relocation and enhancement of ditches and their associated culverts blocking fish passage;
- establishment of agricultural conservation, habitat conservation, and flowage easements to simultaneously maximize using floodplains as fish and wildlife habitats and minimize the conversion of agricultural lands;
- modification of some agricultural treatments to enhance fish and wildlife habitat, such as organic farming treatments, wetland crop rotation, and orchards' floors inundation;

- regulation of upstream flow rates based on the required monthly flow regime to preserve the fish populations downstream while providing other sectors with sufficient water;
- seasonally inundation of rice fields with various treatments to create off-channel habitat for Chinook salmon while keeping agricultural lands functional;
- the use of engineering log jams through the placement of woods to reduce water velocity, increasing slow-edge fish habitat; and
- enhancement of native vegetation pattern through planting trees, shrubs, and/or willow stakes, restoring wildlife habitat (California DWR, 2014; King County, 2021; TNC, 2017; Water Education Foundation, 2009; Yuba County RWMG, 2018).

However, some of these strategies should be incorporated consistently with effective land-use planning and following an agreement with landowners. Properly compensating owners for short-term and long-term economic losses may be essential (California DWR, 2014).

Overall, informing a cross-sector network about better flood management practices throughout the Lower Mainland may broadly improve the community, salmon, agriculture, and ecosystem resilience to flooding and climate change. This study provides informative examples of IFM and potential solutions to the current issues in the Lower Mainland that can be used by a wide range of local, provincial, and federal flood control authorities and practitioners to manage flood risk in a wildlife-friendly and collaborative manner.

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