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Implementing Biocultural Frameworks for Water and Fish Habitat Assessment

Recommendations Paper for the Canadian and British
Columbian Governments



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About the Project Team

This recommendations paper is an outcome of a collaborative initiative between the First Nations Fisheries Legacy Fund and the Centre for Indigenous Fisheries at the University of British Columbia. The two teams worked together throughout the pilot project to develop and implement a Biocultural Indicator Framework. **The project team would like to acknowledge the community collaborators from the six FNFLF First Nations who provided time, knowledge, and ideas in support of the pilot project and the development of this paper.**

The First Nations Fisheries Legacy Fund (FNFLF) is a collaboration of the ḡícáy (Katzie), ḡʷa:ńłəń (Kwantlen), kʷikʷəłəm (Kwkwetlem), xʷməθkʷəyəm (Musqueam), sčəwaθən məsteyəx (Tsawwassen), and səlilwətał (Tseil-Waututh) First Nations working together in the spirit of snəwəyətł (traditional teachings with a central focus on sustainability and long-term planning). The mandate of the FNFLF is for the six First Nations to work together to protect, conserve and restore the health of aquatic species and ecosystems of collective concern where there has been, or may be, impact from urbanization, industrialization, and infrastructure development. Through partnership, capacity development, and collaborative conservation, the FNFLF supports the six First Nations being more meaningfully involved in stewardship projects, increases informed decision-making, and supports member First Nations to achieve their environmental and sustainability goals in the lower stáləw (Fraser River) and Burrard Inlet. Learn more at <https://fnfisherieslegacy.ca>

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The Centre for Indigenous Fisheries (CIF) is a unique research group at the University of British Columbia, made up of a community of Indigenous scholars and allies that place the needs and interests of Indigenous Peoples at the core of their work. The CIF's mission is to support Indigenous-led care for culturally significant fish and fisheries by working towards a reality where Indigenous rights and knowledge systems are prioritized and respected. The CIF is committed to conducting collaborative and just science by engaging in and restoring healthy relations between fish, people, and place. This collaborative team aims to be a hub, amongst many, for Indigenous fisheries science, knowledge sharing, and learning, by working alongside an expansive network of rightsholders and stakeholders. Through their work, the CIF has and will continue to generate capacity for Indigenous communities and scholars to direct fisheries research in ways that uphold, honour, and recognize Indigenous rights and knowledge systems. Learn more at www.cif.fish



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Executive Summary

Water management in Canada remains rooted in colonial ways of thinking about science and the natural environment, creating a knowledge gap due to the exclusion of Indigenous Knowledge Systems from water monitoring processes. As a result, water quality continues to decline, with harmful effects on fish, fish habitats, and many other aquatic organisms. Reconciliation in water management will require a fundamental system shift to create space for innovative approaches that include First Nations Peoples and Indigenous Knowledge Systems.

In order to address knowledge gaps in water management, Indigenous and Western knowledge systems can be woven together in biocultural indicator frameworks to more holistically understand and address the threats facing water and fish habitat. Biocultural indicator frameworks are made up of locally important indicators including both biocultural indicators and Western science based indicators. Biocultural indicators have been used by Indigenous Peoples to monitor, understand, and steward their lands for millennia [1] and are rooted in the ecological knowledge of local peoples; as a result, they will be different for each region and the challenges faced. **This recommendations paper presents suggestions for how the Canadian and British Columbian governments can collaborate with First Nations to include Indigenous Knowledge Systems in water management, using biocultural indicator frameworks.**

The First Nations Fisheries Legacy Fund (FNFLF) and Centre for Indigenous Fisheries have co-developed and implemented a Biocultural Indicator Framework with the six FNFLF First Nations: ḱíćáý (Katzie), ḱʷa:ńłáń (Kwantlen), kʷikʷə́łəm (Kwikwetlem), xʷməθkʷəy̓əm (Musqueam), sćəwaθən məsteyəx (Tsawwassen), and səliłwətał (Tsleil-Waututh). The Framework was developed through a collaborative workshop series with community members and staff from the FNFLF First Nations. Western science and Indigenous Knowledge components of the Framework were assessed through ecological fieldwork, small group interviews, and an online survey at pilot watersheds. Following the implementation of the Framework, a set of recommendations for the use of biocultural indicator frameworks was developed based on discussions with workshop participants and engagement with community members from First Nations across British Columbia (BC).

This Recommendations Paper focuses on implementing biocultural frameworks with BC First Nations, whom we engaged with during its development. The recommendations can be applied more broadly with Indigenous communities across Canada but should only be done so if supported by those communities. Biocultural indicator frameworks are place-based; therefore, the development and implementation of a biocultural framework will be unique to each community.

The recommendations focus on the following themes:

1. **Improving flexibility in Canadian and BC government when collaborating with First Nations.**
2. **Building capacity for First Nations to lead water stewardship work.**
3. **Ensuring that biocultural indicator frameworks suit regional and community contexts.**
4. **Recognizing and uplifting Indigenous Knowledge Systems.**



Introduction

Overview of Issue

Western and Indigenous perspectives on the value of water are often at odds, which has caused a disconnect in conversations and management related to the stewardship of aquatic habitats. Western practices currently dominate aquatic resource and habitat management in Canada and continue to exclude Indigenous Knowledges and cultural values. This exclusion has created a knowledge gap that limits the effectiveness of Canadian water and fish management. Western water management methods alone are unable to address and remedy the threats faced by waters and key fish stocks, such as wild Pacific salmon. **This knowledge gap can be addressed by weaving together Indigenous and Western knowledge systems to create a more holistic understanding of water health and stewardship and promote social, cultural, economic, and ecological resilience.** One way to weave together knowledge systems is to develop and incorporate biocultural indicator frameworks into watershed health monitoring. Biocultural indicator frameworks consist of both biocultural and western science based indicators. Biocultural indicators utilize local cultural perspectives to bridge existing gaps in evaluating measures of success [2].

Water connects all living things and has been stewarded since time immemorial by Indigenous Peoples around the world. Today, water and fish habitat across BC continue to be altered by urbanization, industrialization, and resource extraction. Ecosystem functionality for people and aquatic species has declined as a result of these ecologically harmful activities. In the Lower stáləw (Fraser River) region, continuous agricultural, residential, and industrial expansions and activities have had harmful effects on culturally and ecologically important waters and fish habitats. The survival of wild Pacific salmon is closely tied to water quality and is now threatened by damage to habitat and spawning grounds, loss of river connectivity, and pollution of the stáləw. The damage suffered by the stáləw, and many other important waterways across BC, is severe and must be addressed through collaboration with First Nations and the inclusion of Indigenous Knowledge Systems.

Canadian and BC governments have committed to reconciliation with Indigenous Peoples through the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and the BC Declaration on the Rights of Indigenous Peoples Act (DRIPA) [3, 4]. Much work needs to be done to identify reforms required to begin the process of bringing the BC Water Sustainability Act [5] into conformity with DRIPA. **Reconciliation in water management will require a fundamental system shift to create space for innovative governance, knowledge, and decision-making approaches that include Indigenous Peoples and their unique knowledge systems and rights.**

Purpose of this Recommendations Paper

This paper identifies ways in which the Canadian and BC governments can meaningfully incorporate Indigenous Knowledge Systems in water and fish habitat management, by integrating biocultural indicators into water health assessment practices through the use of biocultural indicator frameworks. The use of biocultural indicators in combination with conventional Western scientific measures of water health can lead to more holistic and effective ways of assessing, understanding, and monitoring water and riparian habitats.

The recommendations presented are each necessary for the process of weaving knowledge systems to be effective and meaningful. The intention of these recommendations is to improve overall water and fish habitat management practices and support Canadian and BC government reconciliation with First Nations and with the land.

The recommendations were developed in collaboration with the six FNFLF First Nations: ḱíćáý (Katzie), ḱʷa:ńłəń (Kwantlen), kʷikʷə́łəm (Kwikwetlem), xʷməθkʷə́yəm (Musqueam), sćəwaθən məsteyəx (Tsawwassen), and səlilwətał (Tsleil-Waututh) First Nations. Recommendations were shaped by the experiences of the project team as well as by ideas shared in a workshop with First Nations across BC. **This paper focuses on those First Nations in BC with whom we engaged. The recommendations may be applicable more broadly to Indigenous Peoples across Canada but should only be done so if supported by and in coordination with those communities.** The recommendations can be used as a first step to guide the process of incorporating biocultural indicator frameworks into watershed policy and management.



FNFLF First Nation community members visiting Surrey Bend Park. Photo: Kate Mussett



Developing the Recommendations

Background on Biocultural Indicators

Biocultural indicators consider the health of aquatic ecosystems through cultural values, experiences, and place-based relationships contained in Indigenous Knowledge Systems [1]. They have been used by Indigenous Peoples to monitor, understand, and steward their lands for millennia [1] and are rooted in the ecological knowledge of local peoples; as a result, they will be different for each region and the challenges faced. Themes of biocultural indicators can include relationships of local people to a place, the extent to which a particular species is used for ceremonial purposes, or the ability of a place to support economic activities [1]. Biocultural indicators can be used to integrate Indigenous and cultural values into environmental decision-making by treating experiences and relationships with the environment as data sources [1]. Canadian watershed health assessments can be strengthened by integrating biocultural indicators with conventional Western science metrics to gain a more holistic understanding of environmental health.

Lower stál'əw (Fraser River) Pilot Project

The Biocultural Indicator Framework project with the six FNFLF First Nations in the Lower stál'əw was largely influenced by work previously done by the Māori in Aotearoa (New Zealand) to develop a Cultural Health Index (CHI) [6]. In New Zealand, the right of tangata whenua (people of the land) to take part in water management is ingrained in legislation [6]. Resource management agencies must recognize and provide for the cultures and traditions of Māori relating to ancestral lands, water, sites, waahi tapu (sacred sites), and other taonga (treasured possessions) [6]. Through collaborative research, Māori Peoples and the New Zealand Ministry for the Environment developed a CHI for the assessment of freshwater resources that was based on Māori cultural values and knowledge [6].

Building off of this work, the FNFLF and CIF co-developed a water monitoring framework that incorporates Indigenous Knowledge and cultural values through a locally-informed Biocultural Indicator Framework. The Framework is a tool the FNFLF First Nations can use to assess the health and status of water and fish habitat in the Lower stál'əw through a combination of culturally-relevant indicators and Western science. The Framework was developed in collaboration with ḱíćəy (Katzie), ḱʷa:ńłəń (Kwantlen), kʷíkʷəłəm (Kwikwetlem), xʷməθkʷəyəm (Musqueam), sćəwaθən məsteyəx (Tsawwassen), and səlilwətał (Tsleil-Waututh) First Nations community members and staff. Virtual workshops and interviews were held to determine biocultural indicators of fish habitat and water health and to determine healthy and unhealthy watersheds within the traditional territories of the six Nations for pilot sites. Based on community member guidance, indicators were grouped into themes for water assessment, first for use by the project team and in the future by the FNFLF First Nations communities.

Lower stáləw Pilot Project (continued)

Indicators were assessed through data collection methods that wove together Indigenous and Western knowledge systems. Biological health was assessed using environmental DNA (eDNA) sampling and analysis methodologies. Physical health was assessed using Sequencing the Rivers for Environmental Assessment and Monitoring (STREAM) sampling and analysis methodologies [7]. The biocultural, or culturally-informed indicators; Access, Ways of Engaging, and Care-Taking, were assessed through small group interviews and a survey distributed to FNFLF First Nations community members. The survey facilitated knowledge-sharing by posing numerical and categorical questions to quantify aquatic health based on each biocultural theme.

Initial results of the pilot project indicated that weaving Indigenous and Western knowledge systems together in one holistic assessment framework allowed for a better understanding of water health than Western science systems alone [8]. Access was identified as a key overarching theme of the Framework that considered access to data collection locations, people, fish, place, laboratory space and equipment, and funding for work and analyses. Results from the Biocultural Framework and water health assessments will continue to evolve as the tool is used and refined further by the FNFLF First Nations communities.

While the co-developed Framework is specific to use in the Lower stáləw region, the process for co-developing biocultural indicator frameworks can be applied more broadly across BC and Canada. **Implementing this process offers an opportunity to build more holistic and inclusive ways of monitoring water and fish habitat health, ensuring the ecological wealth of lands remains available for future generations.** The FNFLF and CIF co-developed a Biocultural Indicator Manual [9] to support the implementation of similar frameworks more broadly.



The Biocultural Framework illustration was created by nicole marie burton. It shows the five indicators selected in the pilot project (Access, Care-Taking, Physical Health, Biological Health, and Ways of Engaging) interwoven in a basket to encompass a locally-informed understanding of aquatic health.

Recommendations

Biocultural indicator frameworks offer an opportunity to meaningfully weave Indigenous and Western knowledge systems together in water assessment and monitoring practices. They present a process for a more holistic analysis of watershed health that is unique to each community and each region. The incorporation of biocultural indicators in a watershed health monitoring framework holds significant potential to change the way that water monitoring is conducted across Canada. Canadian and BC governments can support the implementation of this process to work towards collaborative environmental management with First Nations.

The FNFLF and CIF recommend that biocultural indicator frameworks be developed and implemented across Canada to improve water and fish management practices and policies.

The recommendations are intended to guide the process of developing biocultural indicator frameworks and are based on experiences from the Lower stá'ł'w Pilot Project. Each recommendation is one piece of a whole process to implement biocultural indicator frameworks; that is, they are interconnected and cannot be used without the others. **Biocultural indicator frameworks should only be implemented if supported and co-developed by Indigenous communities in the area.**

The following set of four recommendations was developed based on conversations with the six FNFLF First Nations during the Lower stá'ł'w Pilot Project and conversations with members of First Nations communities across BC during a workshop held in December 2022 .

The recommendations focus on the BC First Nations whom we engaged with. Recommendations can be applied more broadly across Canada if supported by the local Indigenous communities. These recommendations should not be used as an exhaustive list of all that needs to be done when developing a biocultural indicator framework or when collaborating with Indigenous communities.



Lower Alouette River, BC.



Enable First Nations Processes

Challenge

First Nations are often frustrated with rigid plans and limited timelines that they can encounter when working with Canadian and BC governments on water and fish habitat stewardship. Developing and implementing biocultural indicator frameworks requires knowledge exchange, extensive discussion of environmental conditions, and consideration of impacts on whole ecological systems in the present and future [10] – all of which take time for First Nations communities. This contrasts with government processes, which are often hierarchical and focus on the shorter term. Canadian and BC government practices of fast-paced and siloed environmental assessment work are often at odds with First Nations decision-making processes and Indigenous Knowledge Systems.

Recommendation #1

Enable First Nations decision-making processes in fish and water stewardship by improving flexibility in Canadian and BC government processes, workplaces, institutions, and culture.

Explanation

Canadian and BC governments can collaborate successfully with First Nations in the development of biocultural indicator frameworks by enabling culturally-appropriate processes and supporting First Nations' sovereignty. It is important to increase flexibility and adaptability within established processes before, during, and after collaboration with First Nations communities.

Uplifting First Nations decision-making processes involves dedicating time and space for respectful relationship-building before projects begin. Canadian and BC government staff can build trusting relationships with First Nations communities by taking time to communicate openly, to develop clear expectations and mutual understandings, and to be transparent about interests and intentions. Through relationship building, Canadian and BC governments can gain a better understanding of a First Nation's capacity and identify areas where additional support may be needed to ensure that community members can participate meaningfully in framework development and ultimately fish, water and fish habitat stewardship.

Canadian and BC governments will need to be flexible, adaptable, and responsive to the needs of each First Nations community involved in developing a biocultural indicator framework. This may entail adjusting expectations for deliverables, relaxing timelines, and providing additional cultural learning support for staff. Genuine commitment to reconciliation and collaboration with First Nations will be a process of learning and adapting to First Nations worldviews and processes as they relate to Canadian and BC government work. This work can complement obligations that the Canadian government already holds under UNDRIP Articles 19 and 32 to obtain the free, prior and informed consent with Indigenous Peoples [3].



Build Capacity for First Nations to Lead Stewardship

Challenge

First Nations have been, and remain, the stewards of their lands since time immemorial. However, they are often at a disadvantage compared to Canadian and BC governments in terms of capacity to carry out water health assessments and monitoring in their traditional territories. Colonial policies that separated First Nations Peoples from their cultures and from culturally-appropriate education continue to impact the capacity of First Nations communities today to train and hire community members for stewardship work. Extra challenges also remain for First Nations youth in post-secondary education which could lead to careers in water and fish habitat stewardship. The disadvantage in internal capacity is compounded by inconsistent external resourcing for stewardship work within and by First Nations communities. As a result of reduced capacity, individuals from outside of the community are often hired on short-term contracts to carry out water assessment and monitoring work. This can hinder internal capacity-building by First Nations.

Recommendation #2

Support First Nations to lead and implement biocultural indicator work within their communities and traditional territories.

Explanation

Biocultural indicator framework initiatives can and should be led by First Nations communities. Canadian and BC governments can uplift and engage in biocultural indicator initiatives by supporting internal capacity-building for First Nations. Investments in First Nations community capacity contribute to the longevity of water stewardship by building upon millennia of experience and supporting the intergenerational transfer of knowledge and responsibilities. First Nations youth, in particular, benefit when Indigenous science is empowered and Western science is accessible in educational spaces. Engaging and educating First Nations youth is a key component of building the capacity for First Nations to lead water and fish habitat stewardship into the future, through such means as biocultural indicator work.

The type and amount of support needed will vary for every First Nations community. The support needed for capacity-building may include training opportunities, access to physical assets and resources, access to data and collaborative spaces, and consistent financial resourcing. Existing water monitoring initiatives led by First Nations are likely related to culturally relevant indicators of water health; these efforts can be built up with equitable resourcing and support. In every case and with all biocultural indicator work, the ultimate objective is to enable First Nations leadership and ownership of the initiative.

Recognize Regional Context

Challenge

BC is home to over 200 First Nations, each with distinct identities, cultural values, and community dynamics. Water management and monitoring activities that do not align with expressed local needs have limited long-term benefits and can cause more harm than good. Attempts made by the Canadian and BC governments to apply “one-size-fits-all” water monitoring solutions have encountered resistance and frustration because they do not fit the specific context and needs of each First Nations community and watershed.

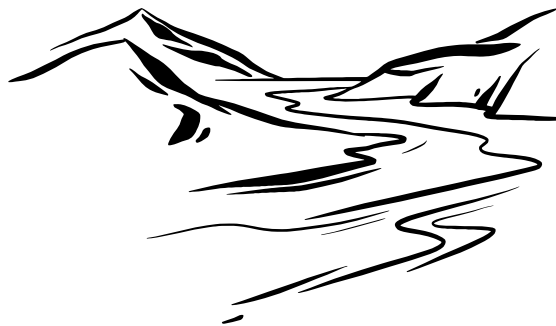
Recommendation #3

Ensure biocultural indicator work is shaped by First Nations to be region- and community-specific.

Explanation

Biocultural indicator frameworks are place-based processes and should be used as a starting point for developing local solutions, rather than a blueprint. Biocultural indicators are informed by cultural values and Indigenous Knowledge unique to each community, and as such cannot be applied broadly. The challenges faced by water and fish vary across Canada and BC with geographical differences, differing degrees of urbanization, type of industry, impacts of climate change, and many additional factors.

Water and fish stewardship programs and biocultural indicator frameworks need to be adaptable to region-specific values, concerns, priorities, and practices. When informed by local peoples, biocultural indicator frameworks can incorporate language, protocols, and cultural values that reflect the regional and First Nation-specific context. Biocultural indicator frameworks can be made region- and community-specific by ensuring that the development and use of biocultural indicators are guided and implemented by each First Nations community.





Recognize Indigenous Knowledge Systems

Challenge

Indigenous Knowledge Systems are based on millennia of experience and a deep connection to place. Knowledge comes directly to First Nations Peoples from the land and the water, which they then use to understand and make decisions about ecosystems [8]. Indigenous Knowledge Systems are living bodies of knowledge that understand water health to encompass much more than water chemistry and biological markers. Indigenous Peoples have a long history of successfully managing healthy ecosystems with place-based solutions that keep their communities fed and prosperous [7]. Many of these ecosystem stewardship practices continue in the present day.

Indigenous Knowledge Systems have yet to be recognized as equal to Western science in many Canadian and BC decision-making institutions and processes. When First Nations engage in external projects, Indigenous Knowledge is often not incorporated in a way that upholds First Nations values and sovereignty. Frameworks for knowledge coexistence and collaboration such as Etuaptmunk (two-eyed seeing) have only recently gained traction in Western academic spaces [11].

Recommendation #4

Apply appropriate weighting and consideration to Indigenous Knowledge Systems and Western science in water and fish management by developing biocultural indicator frameworks.

Explanation

Indigenous Knowledge Systems and knowledge-holders must be valued as a legitimate knowledge source and decision-making mechanism. Indigenous Knowledge resides within community members and community infrastructure and can only be interpreted by community members [8]. Science that incorporates Indigenous and Western knowledges as complementary components can create holistic solutions and inform water stewardship through collaboration. Biocultural indicator frameworks can be a first step in doing this and offer a platform to hold both knowledge systems with equal weight.

Canadian and BC governments can lead the uptake of biocultural indicator frameworks by upholding professional standards for incorporating Indigenous Knowledge Systems. External engagement with Indigenous Knowledge Systems can become extractive and disconnected from the Indigenous Peoples to whom the knowledge belongs. A professional standard for working with Indigenous Peoples should uphold Indigenous Knowledge sovereignty and honour Indigenous Knowledge Systems. The standards for obtaining permission to use data and citing sources in Western science should be extended to recognize Indigenous Knowledge Systems, places, and people. As well, resources could be made more easily available internally and to external organizations to uplift Indigenous Knowledge Systems and cultural awareness across industries. An example resource is the guide developed by the Kitasoo/Xai'xais Stewardship Authority to support research processes with First Nations [12]. Treating Indigenous Knowledge with value will create opportunities to transform water stewardship across Canada.

Concluding Remarks

The many challenges of colonial institutions, barriers in education and training, and reduced First Nations capacity have maintained a gap in knowledge and solutions to improving watershed health across BC and Canada. The FNFLF and CIF have developed a Biocultural Indicator Framework that enables the six FNFLF First Nations to assess and monitor water health in the Lower stál'əw in a way that incorporates cultural values and concerns. The biocultural indicator framework process can be applied broadly by Canadian and BC governments and First Nations communities to incorporate Indigenous Knowledge Systems into water and fish management. Canadian and BC governments can act on UNDRIP and DRIPA commitments, respectively, by supporting First Nations to lead biocultural indicator work in their communities and traditional territories. Biocultural indicator work should only occur when supported by Indigenous communities in the area.


By respecting and weaving together knowledge systems, uplifting First Nations communities to lead stewardship, and decolonizing decision-making, Canadian and BC governments can join Indigenous Peoples in ensuring healthy waters and fish habitat for the future.



UBC CIF graduate student recording observations during ecological fieldwork. Photo: Nicole Jung

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