



Collaborative
Monitoring
Initiative



POLIS Project on Ecological Governance

watersustainabilityproject



Watersheds BC

Webinar Summary

Indigenous Knowledge Aspects of Community Based Water Monitoring & Data Management

April 26, 2022, 9:30-11:00am PT

Attendance

There were 208 people in attendance during the live webinar from 427 registered participants. Webinar participants joined from a variety of affiliations including Indigenous (~5%) and non-Indigenous (~9%) Community-Based Water Monitoring Groups, other environmental NGO's (~10%), all levels of government (~5% from local & regional, ~39% from provincial, ~8% from federal, and ~6% from Indigenous), academia (~13%), industry (~1%), and consulting (~10%).

Introduction

The B.C. Collaborative Monitoring Initiative ([CMI](#)) is a partnership between the POLIS Water Sustainability Project, and the BC Freshwater Legacy Initiative and Watersheds BC, both of which are projects of MakeWay. The overall goal of the CMI is to support information sharing across watersheds and catalyze a provincewide community of practice around innovative approaches to water monitoring. Since June 2021, CMI has engaged in a needs assessment survey of Community-Based Water Monitoring (CBM) groups. A key finding of this work was that data management systems development and use poses a significant barrier to success among these groups. With this in mind, CMI created an ongoing “Water Data Management” webinar series to provide information to Indigenous and non-Indigenous CBM groups that will assist in “raising the bar” on how these groups manage their water-related data, with the ultimate goal of having water data that supports a broad range of decision-making related to water planning and management. The webinar series features various aspects of water related data management approaches, systems used, and lessons learned by CBM groups.

CMI's third webinar on water data management, focused on Indigenous-led water monitoring projects and data management systems. The webinar provided a new opportunity to connect a large number of people with each other, and to learn about two different Indigenous related monitoring initiatives, one about an Indigenous Knowledge based data management system ([Trailmark](#) systems platform presented by Beth Keats, co-founder and Research Associate) aimed at providing Indigenous communities with

information to be used in a variety of decision contexts, and the other about a 7 year journey toward an Indigenous led, multi-Nation salmon focused water monitoring system developed by the Upper Fraser Fisheries Conservation Alliance, ([UFFCA](#)) presented by Michelle Tung (Environmental Project Manager), Rebecca Broadbent (Project Coordinator) and Ashley Raphael (Fisheries Technician [Carrier Sekani Tribal Council](#)), including planning, training, operations, geospatial data management system, and decision making components.

In the first presentation, Beth Keats spoke of mobilizing Indigenous Knowledge and the Trailmark app and tool kit ([Mobilizing Indigenous Knowledge in Resource Management Settings A Practical Guide](#)). Beth presented on some of the ways that Trailmark is used by Indigenous communities to record and use Indigenous Knowledge in community-led resource management and monitoring. Billy Mobley, guardian at [T'Sou-ke](#) Nation, gave an example of how they use the software for their Traditional Knowledge work and what they hope to use it for with regard to water monitoring.

The second presentation by Michelle Tung, Ashley Raphael, and Rebecca Broadbent highlighted a case study by Upper Fraser Fisheries Conservation Alliance (UFFCA) linking water quality monitoring and decision-making. UFFCA is an Indigenous technical organization that works to advance the collective interests of Upper Fraser First Nations in fish, fisheries and fish habitat. In 2015, partnering Nations asked the UFFCA to coordinate a watershed-based water quality and quantity monitoring program in the Nechako watershed (approximately the size of Vancouver Island) to support fish and habitat priorities. Seven years later, this program is one of the most extensive Indigenous-led water monitoring programs in B.C. Their young team members have built extensive skills and experience in extreme conditions, and become experts in their field, now providing training and mentoring to other Indigenous groups. The data generated has already been used to support salmon recovery and habitat restoration efforts (emergency enhancement, water storage), and they are now tackling data management to advance Indigenous data sovereignty, and support Indigenous-led decision-making, including the implementation of Indigenous law.

Presentations were followed by participant questions and views on community-based water monitoring data management.

Please complete our Webinar feedback survey: <https://www.surveymonkey.com/r/5KFFPJX>

Guest Speakers

Moderator: Ania Javorski, Collaborative Monitoring Initiative Coordinator

[Part 1 Trailmark Software and Indigenous Monitoring Presentation](#)

Through her role as a founding partner and research associate at Trailmark Systems' Victoria office, Beth Keats has been in the vanguard of the development of technical tools and methodologies to link Indigenous Knowledge with science-based resource management and shared decision-making. Beth has been pivotal in developing end-uses for community-based research programs, tying Traditional Knowledge research to specific applications in impact assessment, cumulative effects studies, and resource management decisions. Her strength and experience are in linking research methodologies with the implementation of Indigenous rights-related case law and policies.

As co-founder and director, Beth leads social science research, communications, and engagement with Indigenous and territorial, provincial and federal government agencies, with a focus on issues of natural resource management and Indigenous rights. She also designs and manages traditional land use and knowledge studies, impact assessment, community-based monitoring, resource use analysis and harvest studies to guide and support complex projects and community and regional-level decision-making. Beth carries out the development of community-based research programs to provide information based on the categories of rights contained in UNDRIP, as well as to implement Traditional Knowledge policy and protocols, and principles outlined by the Impact Assessment Agency of Canada.

Trailmark is a web-based software for communities to collect local expertise about the environment, manage historical and current land use and traditional knowledge information, and monitor environmental change – all in one place. Trailmark offers web-based GIS, mobile data collection, a web survey tool and digital file storage in an integrated, easy-to-use platform. Trailmark is intended to arm communities with valid, high-quality land-use data accessible at any time through a secure, simple web interface.

Trailmark Mobile is an all-in-one mobile data collection app for iOS and Android that lets you collect scientific and cultural resource field data, manage other assets, ground-truth interview results, conduct field surveys, and monitor whatever you want. It's easy to learn, easy to deploy, and there's no need for any data transfer work at the back end. You can create custom data forms in your Trailmark web account and push them out to your smart phone, tablet, or other mobile device. Data collectors can use the simple interface to document land use and observations with rich, real-time data, including voice recordings, photographs, GPS tracks, and more – all in the field. When Mobile users return or are back in cell range or have a Wifi connection, data can be manually synced with your Trailmark web account. With Trailmark Mobile you can also upload spatial features to your mobile base map (e.g. for ground truthing) or automatically send your location data to your web account so others know the real-time location of data collectors in the field.

The Trailmark platform was described in terms of:

- Capabilities: mobile/electronic information gathering, housing, and interpreting many types of quantitative and Indigenous Knowledge based information gathered by Indigenous communities, geospatial capabilities for discovery, location context and integration across data/information types
- Adherence to principles of data sovereignty (ownership, control, access/sharing/use)
- An example presented by Billy Mobley of how the T'sou-ke Nation is using the Trailmark platform in their Guardian program - marine use studies in which old and new information is linked through georeferencing to provide a picture of changing environmental conditions.

[Part 2 UFFCA Water Monitoring Presentation](#)

Michelle Tung is a settler, born and raised on the west coast, who followed her passion for biology and salmon all the way up the Fraser, and for the last decade has worked on behalf of Upper Fraser First Nations to advance their priorities in fish and fisheries. A career highlight has been overseeing the growth of the UFFCA water quality program, and with it the skills and expertise of her young colleagues! Michelle splits her time as a UFFCA project manager, and Fisheries Strategic Lead for the T'silhqot'in National Government.

Rebecca Broadbent is from Nadleh First Nation and is the water monitoring project coordinator for the UFFCA. She studied Natural Resources and Forest Technologies at the College of New Caledonia. In her professional career she has been focusing on water monitoring and management, ecosystem-based studies and fish habitat restoration projects. In her spare time Rebecca enjoys learning about traditional medicines with her kids.

Ashley Raphael is from Saik'uz First Nation. She has been working on fisheries and water management projects in the Nechako watershed for over a decade and is a founding team member on the UFFCA water monitoring program. Ashley is an excellent problem solver in the field and knows how to keep crew morale high even when it is freezing cold and long days. In her downtime Ashley enjoys creating First Nations beadwork.

UFFCA described capacity and competency building in the context of a partnership arrangement among a number of Upper Fraser basin Indigenous groups (see <https://upperfraser.ca/members.html>) and their individual monitoring needs related to cumulative effects management, and key monitoring components. There are now up to 7 years of data at 21 stations in the Upper Fraser basin. Details of the presentation included:

- Key issue: sustained funding. Some years there has been no outside funding, other years some, but not enough. Startup capital costs were in the \$100K range, with overall initial cost in the \$250K range.
- Progress on Indigenous groups taking control of water issues in their territories (e.g. Development and Implementation of the Yinka Dene Surface Water Policy)
- Understanding of basin specific and shared priorities and challenges
- Filling knowledge gaps (e.g. water quality, water quantity and aquatic habitat) across numerous Upper Fraser sub-basins (e.g. lack of knowledge of conditions of small streams, understanding of landscape and climate change and effects on fish habitat) through culturally appropriate work, and consistent presence in the watershed (“eyes and ears” for the Nations)
- Expansion of the monitoring system (e.g. developing real time monitoring stations and systematic approaches to documenting a variety of changes)
- Constant training and learning, building expertise as knowledge holders, and outreach/education among communities regarding monitoring priorities and activities, involvement of elders
- Information gathered is being used for emergency fish population enhancement (release strategies), water storage regulation to support fish (e.g. Nithi dam, proposed Burns Lake weir), restoration and habitat enhancement planning and forest rebuilding.
- Data management: obtained funding to acquire a lifetime subscription to Aquarius geospatial tools, and ongoing work to create an Indigenous owned data management system.

Questions and Answers

Part 1

1. How does Trailmark take into account the data sovereignty of Nations?

Trailmark was built to support Indigenous Nations in achieving data sovereignty and data governance. We developed it out of the need for a secure platform that is cloud based, password protected, and has user permission levels and customizable data licensing. Trailmark uses Canadian AWS servers for data storage. Each Trailmark Cloud account is private to an individual Nation, and each account is controlled by an administrator from the individual Nation. Data stored in Trailmark is owned by the subscriber. The

administrator can add/remove individuals to access the account, and assign the types of access the individual can have, and the types of activities they can do in the system (guest, participant, researcher/interviewer, administrator). All data stored in Trailmark can be exported anytime. Data is owned and controlled by the subscriber. Trailmark provides storage to keep it safe, daily data back-ups, and the tools to control access, create permissions, and access this data in-house through easy-to-use search functions, visualizations, and analysis tools.

2. Can you share more about the data sharing agreements and the principles of data control, access, ownership? Does Trailmark support the development of data sharing agreements? Is there any feedback from Nations that have used Trailmark regarding data sharing agreements specifically?

When Nations possess and control their own hub of rich information, they need to also develop capacity to manage this data, control who can access it, as well as define the terms through which it will be shared with other parties. With this infrastructure, Nations can also establish governance parameters such as that data from all research conducted in their territories must be stored with the Nation in a format they can access. While the software is built to be the information hub, the consulting part of our company has assisted many Nations with developing their own data sharing and traditional knowledge gathering protocols to reflect the principles of data control, access and ownership. This is a key step in mobilizing this knowledge in decision-making and we assist Nations in this goal.

Further, Nations that sign-up for Trailmark enter into a software-as-a-service agreement with us that contains parameters around the confidentiality of data and data protection between Trailmark and the Nation.

3. For community use, is there a Trailmark usage/licencing cost?

Yes, there is a cost associated to support data storage, daily data back-ups, and tech support. Licensing is pay-as-you-go (monthly or yearly) and there is an option to pause and make dormant the account if needed. The cost ranges between 3000-7000 per year depending on the amount of data you have and the number of features you'd like to use. There is a free version you can download to give it a try before you subscribe. We are available to meet and hear about your needs, answer questions, and show you around the system at no cost.

4. Follow-up: If a Nation wanted to take their data off of the Trailmark system or if the system were to go offline, would the raw data/maps be available to them?

Yes, you can download all your data from Trailmark anytime. Trailmark has had zero downtime since we built it 8 years ago and we consciously push out software updates and bug fixes every two weeks.

5. I am curious, what does Trailmark utilize for geospatial data? Does it use ArcGIS or other similar software? I recently learned of ArcGIS storybook and am curious how they relate.

Trailmark uses Mapbox built into the system. You can upload geospatial data from ArcGIS, or export data to ArcGIS or other GIS systems like QGIS. It imports and exports both .shp files and .kmz/.kml. We are exploring the creation of a storymapping feature with one of our Indigenous partners.

Part 2

6. How many groups are involved in this program?

We work with the Carrier Sekani Tribal Council which has seven members. We have stations in six of those territories, one is more remote. It has their own program plus two more. Nine communities altogether.

7. Can you provide an approximate annual \$ budget?

Our budget has ranged from zero (that would be the last few years) to the start-up costs were a few hundred thousand dollars. The first year just the equipment alone will run you a hundred thousand dollars just for the basic equipment that you need to do discharge and collect basic information. I would say the first year, I'm going to guess was upwards of a quarter million dollars. And then really tapered off as we've moved more to maintenance as I said, we had a couple years where our budget was zero. We did it through cobbling together time and effort through the UFFCA and all the other organizations contributing their time, expertise, and their knowledge to keep things going. It's really ranged and it's a good question. It's a challenge because we don't have regular funding.

8. What protocols for water quality sampling do you follow?

We use the [Manual of British Columbia Hydrometric Standards](#) and the [BC Field Sampling Manual](#) (Part E).

9. What is the frequency of monitoring for the various sites? Do folks mobilize themselves to these areas or get supported by UFFCA? or perhaps everything is collected by remote data loggers?

The crew visits these sites at a minimum of twice each year during the open water (no ice) season. In a typical year they usually visit each site 4-5 times. The crew mobilizes themselves to site and mileage is reimbursed. This is either personal vehicles or trucks from partnering Nations. There are data loggers that continuously collect data at these sites, but the crew also visits each site multiple times per year to collect manual measurements. The continuous data collection does not mean anything without being correlated and/or checked against the measurements they take on site.

10. Indigenous peoples have often had to express themselves in ways that conform to the institutions and practices of western knowledge systems rather than to their own beliefs, values, and practices. Do you have any examples of projects or programs where Indigenous Peoples have developed/revitalized their own systems that center Indigenous ways of knowing and being?

A project that has been one of my number one favorites as part of the of UFFCA has to support Rebecca's Community [Nadleh](#), Ashely's community [Saik'uz](#) and [Stellat'en](#) First Nation in their implementation of the [Yinka Dene Uza'hné surface water law](#) - an expression of Indigenous values for water. Indigenous law for the first time put into writing and into English and then translated for the Western audience. If you look at that very brief document, it is basically a step-by-step guide to government and industry on how do you implement Indigenous law? How do you work with us in a way that follows our laws and the work that we continue through the UFFCA as a bit of a coordinator, working with and to support Saik'uz, Stellat'en and Nadleh to develop tools so that they implement the law consistently. The Yinka Dene water law in short is a system of classifying water bodies or watersheds according to conservation and use Etc. These territories are very close and have a lot of overlapping territory. How can you build tools that really allow the law to be best implemented using best

information that will result in the best outcomes. So that's probably one of the more obvious examples that I'm directly involved in.

11. In addition to your water monitoring, are you developing programs for preservation, enhancement, and conservation of your watersheds as a result of this program?

That's a huge range of things and the short answer is yes. I wouldn't say it's directly a result of this work. This work has gone in tandem with so many things that Rebecca and Ashley's communities have been working on. They signed this ground-breaking reconciliation agreement. There's been tremendous work being done by their individual Nations and collectively to advance many of those things and the connections with this water. I mean, we are definitely still just a small water program, and generate a very specific kind of information, but we definitely see the linkages between this baseline information. You need to know what's happening in your territory and how it can support the many other things that are happening. I know that with Saik'uz, they are doing tremendous work on forestry rebuilding, restoration, and habitat planning. Tremendously innovative work. The region is really looking at forestry rebuilding initiatives.

My community of Saik'uz, we're definitely working on rehabilitating our forests. A big part of that is being First Nations led, we have monitors who go out on the land regularly to help that process. It's so important for our people to be on the land, collecting this data for our people.

12. Do you produce discharge data under ice conditions or beaver conditions?

I believe the first couple of years we did but we haven't in a couple of years. There was a time where we didn't have a lot of funding, so we did bare bones kind of collections and we had to prioritize certain streams for a period of time. I'm sure we'll end up doing more ice conditions soon, but not at this time.

13. Is any of work to develop a data management strategy connected to the First Nations Information Governance Center?

We do not have connections to the First Nations Information Governance Center.

14. What is the role of elders in the overall operating of the program?

When we can, we do get Elders to come out when we're doing anything at the Endako and Burns Lake East sites. We have the trapline holder and well, both Pius and Robert Charlie come out and assist us with anything that we could get them to help us with. They enjoy coming out and helping us. We try to involve them when we can. When we had more reliable funding, we had the resources to be able to engage much more proactively with every single Community we work with and the last few years plus Covid has made that more difficult, but we are grateful for the opportunities to [HWI](#). And one of the things we're really want to focus on the next year is really reengaging those direct relationships with the communities and getting them out in the field with us.

15. Can you share the name of the Indigenous Values for Water program that you just spoke of?

The Yinka Dene 'Uza'hne' Water Law - this is the water management regime enacted by Nadleh Whut'en and Stellat'en in 2016, and adopted by Saik'uz First Nation soon after. Please see the link below for details and resources.

<http://carriersekani.ca/yinke-dene-uzahne-guide-to-surface-water-quality-standards/>

16. Can you provide a summary of the data management system that is used by UFFCA for the water quality/quantity monitoring program?

We are in the process of adopting a data management system – it is a software specific to water quality and quantity, called “Aquarius”. We have access to this software because the UFFCA applied for and won a lifetime subscription to this software, that would typically not be affordable/accessible for an indigenous, non-profit organization.

Chat content of note:

- Terrestrial Cumulative Effects Initiative (TCEI) and the Aquatic Habitat Restoration Fund (AHRF) are current funding opportunities for Indigenous-led projects related to mainland freshwater and terrestrial cumulative effects and fish habitat restoration.
- Okanagan Nations Watershed s program is very similar, and there may be opportunities for learning from each other (see <https://www.syilx.org/projects/>)

Webinar Poll Results

1. What type of affiliation are you from?

- a) Indigenous Community-Based Water Monitoring Groups (~5%)
- b) Non-Indigenous Community-Based Water Monitoring Groups (~9%)
- c) other environmental NGO's (~10%)
- d) Local & Regional Government (~5%)
- e) Provincial Government (~39%)
- f) Federal Government (~8%)
- g) Indigenous Government (~6%)
- h) Academia (~13%)
- i) Industry (~1%)
- j) Consulting (~10%)

2. Are you aware of the Trailmark data management system?

- a) Have not heard of it (~74%)
- b) Heard of it – have not used it (~18%)
- c) Our organization uses the Trailmark app (~3%)
- d) Interested in learning more about it (~9%)

Which features of Trailmark are you most interested in hearing about?

- a) Mobile data collection (~49%)
- b) Community engagement mapping surveys (~54%)
- c) Archive, organize and search past research recorded information (~38%)
- d) Indigenous knowledge and oral history mapping (~50%)
- e) Web mapping - bringing together various spatial datasets in a searchable way (~26%)

3. Does your data management system include any of the following:

- a) Indigenous Knowledge (~19%)

- b) geospatial capabilities (~44%)
 - c) integration with any other data systems (~28%)
 - d) "off the shelf" software as a service platform (~11%)
 - e) custom designed/built platform (~29%)
 - f) amalgamation of available software products (e.g. R or other statistical software, MS Word, Excel, etc.) (~25%)
 - g) I do not use a data management system (~38%)
4. Does your existing data management system meet your current needs?
- a) Yes, our existing data management system meets our needs (~26%)
 - b) No, need to improve our existing data management system (~74%)

Are you are planning to:

- a) Upgrade to a more capable system (~52%)
- b) Include Indigenous Knowledge (~57%)
- c) Get more training in data management planning (~44%)
- d) Get more training in data management system development and operation (~42%)

Resources

Find the ancestral place name of where you live - <https://native-land.ca/>

[Exploration of Indigenous Knowledge in Community-Based Monitoring Initiatives: Challenges](#)

[and Recommendations](#) - Thesis by Beth Keats

[Indigenous Knowledge Mobilization](#) - This page explains practical guidelines for sharing your results if you are a researcher working within an Indigenous community, with Indigenous methodologies or if you are just curious as to how to begin to approach sharing knowledge ethically within these situations.

[A Community Guide to Protecting Indigenous Knowledge](#) Simon Brascoupé and Howard Mann Editor: Edwinna von Baeyer June 2001.

[Laying the Groundwork: A Practical Guide for Ethical Research with Indigenous Communities](#)

[Indigenous Corporate Training](#) - provides training to get everyone Working Effectively with Indigenous Peoples® in their day-to-day jobs and lives.

Resources that are helpful for learning what it means to be culturally sensitive when engaging with Indigenous communities. This is one example of a publicly available resource:

<https://indigenouawarenesscanada.com/>

OCAP training to understand important factors when working with Indigenous data (including data collected in partnership with Indigenous groups). <https://fnigc.ca/ocap-training/>

For general knowledge about Indigenous history, culture, issues in Canada, "Indigenous Canada" is a free web course from UofA, appropriate for anyone in Canada. <https://www.ualberta.ca/admissions-programs/online-courses/indigenous-canada/index.html>

Data collection and management software and apps:

- ArcGIS • ArcGIS Storymaps • ArcGIS Survey 123 • Avenza Maps Pro • Coast Tracker • Community Knowledge Keeper (CKK) • CyberTracker • Device Magic • DropBox • EarthRanger • EMSA Initiative • EpiCollect5 App • Fat Map • Fulcrum • GeoCaching • GeoKeeper • Google Drive • Google Earth Pro • inReach • iNaturalist • KoBo tools • Microsoft Excel • Nunalit • Open Data Kit (ODK) • SIKU • SMART Conversation

Other Relevant Webinars:

[Water Data Management: Planning & Sharing](#)

[Water Data Management for Regional Community-Based Water Monitoring Groups](#)

[Pooling Water Knowledge: Strengthening B.C.'s Water Monitoring](#)

[Strengthening Monitoring and Reporting for B.C.'s Waters](#)

[What's Beneath the Surface? Insights into Collaborative Water Monitoring Data and Decision-Making](#)

[Living Lakes Canada Webinar Series: "Why Care About Water Data?"](#)

[Data Tools and Information Management for Indigenous Guardians](#)

[Indigenous Data Management Webinar Series: What is Research Data Management?](#)