



Elk River  
Watershed  
Qukin  
ʔamakʔis Collaborative  
Monitoring  
Program

# Interim Monitoring Working Group

## Fifth Meeting - Jan 19, 2023 - Meeting Notes

### Attendance

1. Anne-Caroline Kroeger, Program Manager, *Elk River Alliance*
2. Kaileigh McCallum, Junior Ecologist, *Elk River Alliance*
3. Stella Swanson, Director, *Elk River Alliance*
4. Jon Bisset, *Bisset and associates*
5. Samantha Mertens, Ecosystem Biologist, Database & Community Engagement Coordinator, *Ministry of LWRS*
6. Chris Williams, Aquatic Specialist, *Ministry of FOR*
7. Natasha Neumann, Research Hydrologist, *Ministry of FOR*
8. Margot Webster, Impact Assessment Biologist, *Ministry of ENV*
9. Jon Jeffrey, Hydrometrics Specialist, *Ministry of ENV*
10. Neil Goeller, Unit Head: Groundwater, Hydrometrics & Hydrology, *Ministry of ENV*
11. Jesse Huisman, Director of Engineering & Public Works, *District of Elkford*
12. Chris Hust, Engineering Technologist, *City of Fernie*
13. Andre LeBlanc, Engineering Project Manager, *District of Sparwood*
14. Kara Zandbergen, Project Supervisor - Flood Mitigation and Water Resources, *RDEK*
15. Josh McSkimming, Head Guide, *Kootenay Fly Shop*
16. Paige Thurston, Database and Community Engagement Coordinator, *Living Lakes Canada*
17. Stewart Rood, Professor of Biological Sciences, *University of Lethbridge*
18. Ashlee Jollymore, Consultant, *MacHydro*
19. Nicolas Francoeur-Leblond, Senior Engineer - Water Quality, *Teck Coal*
20. Cait Good, Senior Lead - Aquatic Sciences, *Teck Coal*
21. Jessica Mackie - Water Quality Modelling Manager, *Teck Coal*

### Data accessibility

<b>Action item</b>	The Program Coordinator will lead Partners through a step by step process to improve data accessibility, starting with [1] Program coordinator validating scope of monitoring programs through one-on-one meetings in the month of February. Program Coordinator to document the scope of monitoring programs, including the name of monitoring locations, locations in latitude and longitude, status of operations, last time and first time sampled and purpose of stations for each Partner in the form of spreadsheets to be shared w/ Partners ahead of meeting with them. These one-on-ones will include BC ENV and WSC [2] The Monitoring Working Group reassembling to determine which monitoring programs are relevant to the monitoring questions put forward [3] Partners uploading the relevant data they collect to online portals to make their data readily accessible [4] Program coordinator finding the means to develop github programming package to access relevant data on online portals and derive statistics for indicators' baseline conditions.
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### Online interactive map

<b>Action item</b>	Program coordinator to operate an online GIS-based interactive map for the Monitoring Working Group, building on the existing map developed by Living Lakes Canada ( <a href="#">here</a> ), and adding and cleaning up layers for the map to serve as the Monitoring Working Group's planning tool. Program Coordinator to "run tally" of already readily available online interactive mapping products covering the Quikin ?amak?is, and presenting summary of their strengths and weaknesses, plans for development, and building complementarity w/ these where possible and where this would save on time.
<b>Minutes</b>	<b>[Stewart Rood]</b> Asked why we would build a new map if we can use LLC's? <b>[Anne-C]</b> Responded that one reason being the capacity at Elk River Alliance to do so w/ Kaileigh McCallum, knowing that the capacity at Living Lakes Canada w/ Maggie Finkle-Aucoin is more limited. The proposal is to take over the existing map and customize it further to meet the needs of the Monitoring Working Group, i.e. upgrading, w/ hope to assist w/ planning monitoring programs and continuously customizing this tool to meet the needs of the Monitoring Working Group. <b>[Jon Bisset]</b> Generally in favor of online interactive maps, but showed concerns about duplication of efforts with existing online maps such as Kootenay Boundary Water Tool. Asked for commitment to regularly update the online interactive map to fully serve its purposes as a planning tool.

### Theme 3: Ktunaxa

<b>Action item</b>	The next step will be for Yaqit ?a-knuqhi'it's Lands & Resource manager to enter fundraising activities. The fundraising responsibilities, timelines and
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	costs will be laid out with Yaq̓it ʔa-knuq̓i'it as the main applicant on funding applications and Elk River Alliance taking on administration responsibilities to lead funding application activities on behalf of Yaq̓it ʔa-knuq̓i'it.
<b>Minutes</b>	<p><b>[S. Swanson]</b> Presented monitoring questions: “<i>What are the traditional Ktunaxa land and water uses in Qukin ʔamakʔis?</i>” “<i>What are the current Ktunaxa land and water uses in Qukin ʔamakʔis?</i>”, “<i>Where, when and what traditional Ktunaxa land and water uses have declined?</i>” “<i>Where, when and what was lost in Qukin ʔamakʔis?</i>” and “<i>Where and what can be restored?</i>” <b>[Anne-C Kroeger]</b> Presented on behalf of Yaq̓it ʔa-knuq̓i'it's (YQT) lands &amp; resource manager, Jason Gravelle. Reported that in December, YQT refined language and approved of monitoring questions regarding the traditional Ktunaxa land and water uses. Reported that Jason Gravelle has since presented these questions to YQT's Council and obtained Council's approval. Reported that YQT's CAO Garry Yablonski approached consultants Two Eyed Seeing Consulting., who expressed an interest in delivering on these questions. Explained that these consultants were based out of Victoria and were a majority indigenous owned corporate structure that blends the for-profit private structure with the non-profit structure, with 60% of profits actually being directly invested back into indigenous culture and educational programs.</p>

**Theme 1: Extreme flows**

<b>Outcome</b>	Consensus was achieved on spatial boundaries for the monitoring of extreme flows, water temperature and turbidity : these defined as the Elk River surface water catchment boundaries, up to the bridge of highway 93 before the outlet to Lake Koocanusa.
<b>Outcome</b>	Consensus was achieved on temporal boundaries for the monitoring of extreme flows, and associated water temperature and turbidity: the minimum timeline is 10 years but 80 years would be ideal.
<b>Outcome</b>	The Chair asked to postpone the work on groundwater. The group agreed that the state of knowledge on groundwater was insufficient yet undoubtedly very important as groundwater plays an important role in providing cool sustained base flows in the summer months. The group proposed to improve groundwater knowledge step-by-step, starting by improving the understanding of existing programs and improving data accessibility for these [1-4] and then engaging in step [5] the design of additional groundwater monitoring programs.
<b>Action item</b>	Program Coordinator to prepare for future decision-making on data quality objectives (DQOs) for the monitoring program, starting w/DQOs for hydrometric monitoring, on the basis of the RISC Manual of BC Hydrometric

	Standards. Program Coordinator to rely on technical advice from J. Jeffrey and rely on the rationale for and purpose of hydrometric stations.
<b>Action item</b>	Program Coordinator to assemble a “hydrology sub-committee” to address challenges anticipated for the assessment of changes of flow over time, associated w/ “non-stationary” conditions. This sub-committee will be led by A.Jollymore, and include N. Francoeur, J. Jeffrey, and N. Neumann. Data assessment would need to answer the municipalities’ real-world question: “Are rare extreme flow events getting more frequent?” or at the very least answer: “How sure are we of the return period that we are calculating?” Proposed process would be for A.Jollymore to set up an agenda and schedule a meeting for the hydrology sub-committee to develop an approach to non-stationarity and report back to the whole Monitoring Working Group at next March meeting.
<b>Action item</b>	Program Coordinator to assemble a “sediment sub-committee” to resolve the debate around sediment transport indicators: turbidity, TSS or bedload. Include Bill Annable, a Canadian leading expert on this subject matter, C. Good, C. Williams, and J. Bisset.
<b>Minutes re: stream response</b>	<b>[S. Swanson]</b> Presented the proposed monitoring questions: “Are we seeing changes in the frequency and severity of extreme flows?” “Are we seeing temporal and/or spatial changes in water column turbidity?” and “Are we seeing temporal and/or spatial changes in water temperature?” and “If yes: Can we confirm the change?”, “What is the magnitude and extent of change relative to baseline?”, “Are the changes showing consistent trends?” and “Are there correlations with changes/trends in land use or climate?” Commented that in her mind the three stream response indicators (flow, water temp and turbidity) would need to be measured at the same location <b>[Jon Bisset]</b> Asked to establish “data quality objectives” DQOs for monitoring programs so that errors in data are known. Data quality is often lowered by instrumentation errors, poor field methodology and poor planning in terms of monitoring scope over time, with timelines often being too short and data failing the entry criteria to run statistical analyses. Re: Stella Swanson sees the need for a future meeting focused on establishing data quality objectives. <b>[Jon Jeffrey]</b> responded that “DQOs have already been established” for hydrometric programs; these being the BC RISC standards”. Argued that there is no need to aim for grade A data but we should aim to be honest about the quality of the data we collect saying “You don’t need grade A, but at least grade it and be honest about your data quality!”. Argued that the “time-span of 10 years for hydrometric monitoring is good enough” Reminded others that “sometimes okay data is good enough”. Argued that extreme flows low and high flows, and “low flows are easier to monitor” whereas “high flows are harder to monitor” because of safety issues. Argued that “monitoring only water levels in high flow conditions is still

helpful” even if we would not meet high data quality grades. Argued that hourly peak flows will be a challenge to derive as it is hard to apply rating curves to high flows, and results will need to be taken w/ a grain of salt. **[N. Neumann]** Brought up that we are finding ourselves in “non-stationary” hydrological regimes due to weather patterns changing over time, this making “trends” in flows difficult to establish. Encouraged the working group to “get away from trends”. **[A. Jollymore]** Explained [in follow-up one-on-one] that there have been “sufficient changes in our climate so that previous records are no longer a good indicator of what is going to happen in the future”, with a case in point being the “return period calculations for high flows shifting a lot year to year”, and baseline data becoming useless. Explained that some hydrologists think we would need to go as far as pre 1980s to obtain pre-climate change baselines. Explained that the hydrology community still uses regular methods regarding extreme flow events but admits to potential errors. Explained that climate effects to hydrologic regimes were non-linear, making the prediction of climate effects in the future harder. Reiterated that high extreme flows were becoming more common and more impactful, but warned that high flows are hard to get and have higher error. Proposed focusing on the connections between land-use rather than climate-change. Proposed connecting land-use to the hydrological processes that happen on the landscape to get water into the river, using a modeling approach. **[J. Jeffrey]** Suggested a timespan of 10 years is good. **[S. Rood]** Argued that time spans beyond 10 years would be better given Pacific decadal oscillation (PDO) cycles taking ~ 40 years, he recommended including 2 cycles making and argued “the time span would ideally encompass 80 years”. **[N. Francoeur]** Suggested going back as far as the 1970s when establishing flow baseline conditions, which is the start of the Water Survey of Canada record. **[J. Jeffrey]** Argued that the baseline should be started in the last years instead as quality issues arise with data recorded back in time. **[N. Neumann]** Asked the group about their interest in monitoring groundwater. **[P. Thurston]** Announced that Living Lakes Canada is talking to Teck Coal about additional groundwater monitoring activities in the valley as they want to avoid duplication. **[J. Bisset]** Argued that groundwater is important for bull trout, and would propose monitoring existing wells, and taking baby steps to document the existing groundwater monitoring network. Referred to Kaileigh McHudgens who works on groundwater. **[S. Swanson]** Asked if Ministries were planning to assess groundwater. **[S. Mertens]** Responded that there were brief discussions to do so and decided not to assess groundwater. Promised to keep Elk River Alliance updated if groundwater assessment programs were starting to get traction at the Ministry. **[N. Neumann]** Proposed installing shallow groundwater piezometers; these being relatively inexpensive and installing these at strategic locations. **[J. Bisset]** Reminded the group that Carol Luttmer from Living Lakes Canada is working on groundwater monitoring throughout the

Columbia Basin, with recent work in the Upper Columbia to help deliver the [CHARS](#) project. **[S. Swanson]** Proposed to understand groundwater at a later point as she felt the group was not ready yet to do so in early years. **[S. Swanson]** Asked the group about spatial boundaries. **[S. Rood]** Proposed to include Lake Koochanusa as selenium from Elk River is pushed into Lake Koochanusa, and Elk River is flashier than the other tributaries to Lake Koochanusa, affecting Libby Dam disproportionately. **[P. Thurston]** Announced Living Lakes Canada plans to expand its hydrometric monitoring activities into Lake Koochanusa **[S. Swanson]** Presented her preference to start with Elk River tributaries for the early years and moving into Lake Koochanusa at later stages **[J.Bisset]** Indicated that Lake Koochanusa is already extensively monitored. **[C.Good]** Suggested sticking to tributaries for now, starting small, knowing that the Lake is hard to sample, and requires seasonal sampling. **[P. Thurston]** Commented that she liked the focus of this group and may be best to stay smaller in our geographic scope. **[J.Bisset]** Explained that sampling logistics for Lake Koochanusa require bigger equipment and more training and safety procedures. **[S. Rood]** Proposed seeing the monitoring work on Lake Koochanusa as complementary but keeping it separate. **[J.Mackie]** Disclosed that Teck Coal is researching the hydrogeological relationship of the Elk River to Bayne's lake w/ active investigations planned for Baynes lakes area, but nothing ready yet. **[S. Swanson]** Summarized the group's consensus on spatial boundaries of those of the Elk River surface water catchment and up to the Highway 93 bridge before the river discharges into Lake Koochanusa. **[S.Swanson]** Asked the group about needs for additional sampling stations on the mainstem? On tributaries? On lakes? **[N.Francoeur]** Suggested to reinstall the historical hydrometric station formerly operated by Water Survey of Canada on the Elk River below Weary Creek close to the bridge crossing the Elk River, as it has  $\cong$  20 years of historic record that could be used for baseline assessments. **[J.Bisset]** Responded that renewing a prior Elk gauge makes sense but concerned about technical challenges to reinstall gauge at that location because of the bedrock base. **[S. Rood]** Provided update that he has already met with BC 'Environment' and Water Survey of Canada together with others to provide the recommendation to install a BC ENV - WSC gauge on the Wigwam River. Stewart's proposal has now advanced to the decision-making level, which relies on funding and approvals from both of these two governments *share* responsibility for long-term gauges. **[J.Bisset]** Added that he is aware of a historic station at the Wigwam just upstream from the confluence with Ram Creek, and to his best guess, this gauge was established by Crestbrook Forest Industries inc. based out of Cranbrook w/ field work completed by Westslope Fisheries between about 2000 and 2005 and Kari Stewart Smith from Canfor might have that hydrometric data. **[C.Good]** Added that Teck Coal also had a historic station on Wigwam to collect biological data e.g. water quality, benthic tissue, and benthic community structure. **[J.Bisset]**

	<p>Argued for the monitoring of tributaries that have perennial streams, i.e. continuous flow of surface water throughout the year in at least parts of their catchment, are threatened to become dewatered/ephemeral/intermittent in the future, and play a resiliency component for aquatic species. <b>[J. Jeffrey]</b> Promised to bring the group’s recommendations for two additional stations on Wigwam River and Elk River below Weary Creek to the Water Survey of Canada whom he has regular contact with. <b>[J. Bisset]</b> Sold on flow and temperature monitoring but “not sold on turbidity” explaining that turbidity is hard to measure in the field and data often hard to use to “get to TSS”. Suggested perhaps monitoring the “bedload” instead i.e. the depth of deposited sediments on spawning grounds - instead of turbidity, and proposed involving Dr. Bill Annable to provide best advice on turbidity. <b>[S. Swanson]</b> Suggested creating a sediment sub-committee to solve the controversy around turbidity. <b>[J. Bisset]</b> Explained that the province has been looking at high water temperatures in the summer for angling closures and mentioned that “anglers understand water temperature in terms of the number of “angling closure days” which are becoming longer.</p>
<p><b>Minutes: re: stressors: land use</b></p>	<p><b>[S. Swanson]</b> Presented land-use stress indicators, explaining that “the aim for land-used indicators is to align w/ Ministry” in their interim protocol for the assessment of the condition of aquatic ecosystems <b>[S. Mertens]</b> Explained that peak flow is defined as a stressor and is calculated based on three main metrics: surface runoff generation, surface flow attenuation, and the equivalent clearcut area, or ECA, with ECA being the roll up of surface runoff generation and surface flow attenuation to get the estimate of the total hydrologic response potential. <b>[J. Bisset]</b> Proposed additional indicators on “riparian and wetlands”, asking for updates of historic wetland and riparian surveys, as well as indicators on “species at risk” (SAR) and “invasive species” <b>[N. Neumann]</b> Proposed additional indicators on “streambank erosion”, “stream morphology” and stream channelization. <b>[S. Rood]</b> Proposed the additional indicator of “railway and roadway armouring” knowing these constrain the middle section of the Elk River on both sides converting the dynamic meandering river system into a restricted armored river.</p>
<p><b>Minutes: re: stressors: climate</b></p>	<p><b>[S. Swanson]</b> Presented proposed climate-based stressors, emphasizing that “snow-water-equivalent (SNE) is the most important climate-based indicator”. <b>[A. Jollymore]</b> Explained that SNE is telling us how much water is sitting on the land - it is the amount of liquid water that would be released if snow were to melt instantaneously - how much water is sitting on the landscape - the water reservoir that is waiting to melt at spring freshet <b>[N. Neumann]</b> Proposed adding the “snow covered area”, in particular the extent of the watershed that is covered in snow at peak flow or at the start of the peak flow period. Proposed adding the “proportion of precipitation that falls as snow” - knowing that water in snow gets stored, while rain is immediately available.</p>

	<p>[S. Rood] Suggested “using April 1st” as a reference point in the timeline to compare snow indices across years as this reference point is used in the U.S. [N. Francoeur] Mentioned the availability of “gridded climate products” e.g. “<a href="#">DayMet</a>”, which interpolate data from discrete weather stations and can be useful, some also considering satellite imagery [N. Neumann] Recommended using the climate and snow pillow stations “outside of the watershed”, for instance the Alberta and Montana snow pillows along the continental divide would be useful and would be available under the “SnowTel” database. [A Jollymore] Argued that “<a href="#">SnoDas</a>” was a useful product that covers the Elk Valley and built on station data plus satellite remote sensing data plus modeling work, but should still be used with caution. [N. Neumann] Recommended monitoring “soil temperature” which is relatively low-cost and may inform climate change impacts to ecosystems. [P. Thurston] Living Lakes Canada interested in soil temp monitoring for climate change impacts.</p>
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**Theme 2: Fish habitat**

<p><b>Outcome</b></p>	<p>The Chair decided to focus on physical drivers of fish habitat in the early years and postponed the work on the biological responses of fish to changes in their physical habitat.</p>
<p><b>Minutes</b></p>	<p>[S. Swanson] Presented fish habitat monitoring questions: “Are flows meeting the needs of fish in all seasons and all life stages for fish?” “Are turbidity levels meeting guidelines for the protection of fish habitat for salmonids, including Westslope cutthroat trout and mountain whitefish?” “Are water temperatures staying within the tolerance range for Westslope cutthroat trout and other salmonids such as mountain whitefish and bull trout?”, “Are water quality parameters staying within BC water quality guidelines for the protection of aquatic life?”, “Are benthic invertebrate communities staying within reference conditions (abundance and species diversity)?” [J. Bisset] Commented that the proposed questions were not fish habitat questions <i>per se</i>. Proposed to separate questions aimed at understanding the physical drivers and processes important to fish habitat and those aimed at biological responses. [S. Swanson] Proposed refining fish habitat questions later on. [C. Good] Was open to share knowledge on the non-lethal sampling methodology for fish tissue if this was eventually becoming of interest [J. Mackie] Supported ICP-MS metal scan for water quality monitoring as this is the standard suite making comparison easier. Did not support the routine analysis of mercury in water samples, as this is being monitored by Teck Coal in a trigger approach and mercury has not been an issue so far. [J. Bisset] Proposed to monitor contaminant loading in tissue sampling: i.e. monitor the contaminant bioaccumulation in country foods. Was interested in building on Heather Lamson’s work, for opportunistic sampling of otoliths (ear bones) in fish</p>



	<p>mortalities to obtain eDNA and map the genetics (% hybridization) of species: Westslope Cutthroat Trout, Bull Trout, Burbot and Mountain Whitefish. Sampling of fish mortalities may be done by Outfitters and Yaqit ?a-knuqhi'it Land Guardian program. Proposed building on the Ministry's work on PIT tag/recapture to understand the fish's growth, length and age.</p>
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**Partners' involvement**

<p><b>Action item</b></p>	<p><b>[S. Swanson]</b> Presented three possible levels of involvement for Partners, with Level 1 - Implementation partners, Level 2 - Contributing partners and Level 3- Knowledge holders. Partners consult higher management in their organizations to decide what their desired level of involvement would be and get back to Program coordinator in February.</p>
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