



ANNUAL MONITORING PLAN 2020

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1.0 INTRODUCTION AND BACKGROUND

1.1 Morice Water Management Area

The Morice Water Management Area (MWMA) was established as part of the Morice Land and Resource Management Plan with the intent to protect the hydrological integrity, water quality, water quantity, and fisheries of the upper Morice River watershed in Wet'suwet'en traditional territory (MAL 2007). Overarching objectives for the MWMA included the development of an area-based water management plan and a water monitoring program. Initial objectives of the water monitoring program were to establish baseline data for the development of water quality objectives and guidelines.

A framework for water monitoring and assessment for the MWMA was prepared in June 2008, and initial monitoring was conducted by the Office of the Wet'suwet'en (OW) in the summer of 2008, and the MWMA Multi-Year Operational Plan for water monitoring was created in 2009 (Gordon and Associates Ltd. 2009). Since 2008, there have been independent monitoring activities undertaken in the watershed by the Province, the Office of the Wet'suwet'en, and industry. These programs have focused largely on monitoring potential impacts from past disturbance or collecting baseline water quality data. While these efforts constitute a substantial amount of work accomplished within the watershed, there was need for a longer-term, scalable, and consistent program that could adapt with developing partnerships and provide opportunities for additional resources over time.

1.2 Morice Water Monitoring Trust

The Morice Water Monitoring Trust (MWMT) was established in 2012 to enable longer-term monitoring of the MWMA and establish a path forward for addressing objectives and guidelines. The MWMT is directed through its Trust Agreement to be responsible for monitoring the implementation and effectiveness of BC / Wet'suwet'en government-to-government agreements, and related natural resource management activities, plans, and policies in the MWMA (the 'Morice Plans').

One of the primary purposes of MWMT is to gather baseline data within the MWMA to determine if water quality is sufficient to maintain the well-being of the Wet'suwet'en (in relation to fish and drinking water). The 2009 MWMA Operational Plan provided a well-structured framework for water quality monitoring and was instrumental in the development of the MWMT Monitoring Framework—a working document that provides operational guidance by defining and categorizing the anticipated risks/pressures in the watershed and sub-units, goals and objectives specific to each category, and tasks required to successfully address objectives.

In 2015, MWMT developed a Strategic Direction Plan that focused on five Core Values: Water Quantity, Water Quality, Sediment Quality, Fish and Habitat Productivity, and Information Sharing (MWMT 2015). The initial focus of watershed monitoring program was to establish a scientifically valid baseline of water quality data that accounts for natural variation. The role of the MWMT is to collect information related to the goals and objectives for the Morice Water Management Area and communicate this information to the Trustees, decision makers, and others as appropriate.

1.3 Summary of Previous MWMT Field Programs

One of the main objectives of the MWMT is to collect baseline data on the aquatic health necessary to support salmon and other fish, including water quality, water quantity, biology, geomorphology and connectivity data, which collectively inform indicators of natural resource sustainability and ecosystem health identified in the Morice Plans. The following briefly summarizes MWMT field programs conducted to date:

- Between 2015 and 2017 sampling was conducted at various time steps at five sites within the MWMA with most monitoring effort being of short-term and spatially limited measurements.
- In 2019 MWMT initiated a 5-in 30-water quality program at eight sites within the MWMA (winter and summer programs).
- In 2019 the monitoring program expanded to include the Core Values of Water Quantity and Fish Habitat and Productivity:
 - Two hydrology stations were established at Maxan Creek and Gosnell River.
 - Fourteen Canadian Aquatic Biomonitoring Network (CABIN) sites were sampled using the Sequencing the Rivers for Environmental Assessment and Monitoring (STREAM) DNA (eDNA) protocols. This occurred through three different field programs: MWMT (8 sites), OW (three sites), and Ministry of Environment (three sites) The three Ministry of Environment sites were also sampled using the traditional CABIN protocols for comparative purposes. .

In 2018, a report was prepared for the MWMT that summarized and analyzed water quality data from the MWMT (2015-2017) and data from the BC environmental Monitoring System (EMS) database representing 37 additional sites monitored between 1996 – 2017 (Oliver 2018). The report provided several recommendations for potential additional questions and monitoring strategies that were considered in the development of the 2020 monitoring program. The full report can be accessed from the Morice Trust website <http://moricetrust.ca/reports.php>

2.0 ANNUAL MONITORING PROGRAM- 2020

Each year an Annual Monitoring Plan (AMP) is developed to set out the year’s proposed activities and budget which are created from the MWMT Monitoring Framework and is consistent with the MWMT Agreement. The 2020 AMP documents and generally describes monitoring programs that will be implemented by the MWMT, either independently or through partnerships. The Plan also contains considerations regarding integration between disciplines, and annual reporting recommendations.

The following subsections describe the components of the 2020 monitoring program. A detailed budget is provided in **Section 3.0** and a schedule is provided in **Section 4.0**.

2.1 Task 1 - Program Management

2.1.1 Trust Project Coordination

Project management activities include those functions that are necessary for the effective delivery of MWMT projects. Administrative project management duties will be performed by Northwest Research and Monitoring Ltd. (NWRM). Program management tasks include:

- Prepare Trustee meeting agendas, facilitate meetings, and take minutes. Six Trust meetings will occur each year:
 - Quarterly Trustee meetings to discuss regular MWMT operations. Meetings will occur the second week of each quarter.
 - One annual financial meeting with the RBC Securities Financial Manager.
 - One annual vision/strategic planning meeting.
- Prepare and update Trust management documents as directed by Trustees (present bank balance monthly, budget, quarterly variance and expense reporting – to be presented at quarterly Trustee meetings).
- Manage Trust expenditures as defined by the AMP.
- Develop 2021 Annual Monitoring Plan in collaboration with the Trustees:
 - Provide initial description of projects and cost estimates.
 - Facilitate discussion in relation to project selection.
- Advise Trustees as necessary on strategic and operational planning.
- Coordinate MWMT programs with other programs occurring in 2020.
- Research grant and partnership opportunities, and coordinate and write funding proposals.
- Liaise and collaborate with relevant stakeholders to strengthen existing and build new relationships.
- Continue water quality monitoring within the MWMA in partnership with the OW Fisheries staff (see section 2.2.2).
- Continually improve, adapt and implement the safety protocol and procedures. Operate as the Safety Manager.
- Overall field coordination tasks including, but not limited to:
 - ordering required supplies and keeping an inventory.
 - Scheduling sampling sessions with OW Fisheries staff and other stakeholders.
 - coordinating shipping of samples to laboratory.
- Overall data coordination and warehousing.

2.2 Task 2 – Agreement Monitoring

As mentioned in Section 1.2 above, one of the purposes of the MWMT is to monitor the implementation and the effectiveness of any British Columbia/Wet’suwet’en government-to-government agreements, and related natural resources management activities, plans, and policies in the Morice Water Management Area (the “Morice Plans”).

The objective of this task is to conduct land use scoping within MWMA and the budget for this task is \$3,000. If future funding becomes available, the Trust would like to increase the work on agreement monitoring task.

2.3 Task 3 – Field Programs

The 2020 field programs align with the Water Quality, Water Quantity, and Fish and Habitat Productivity Core Values.

2.3.1 Program Advisor

The Program Advisor will assist NWRM in:

- Planning field programs.
- Filling in as a backup field crewperson when required.
- Providing technical advice, such as, but not limited to:
 - General technical reviews.
 - Annually reviewing all MWMA/MWMT literature and supporting documents and updating as necessary.
 - Ensuring project objectives and goals are being pursued and/or achieved.
 - Ensuring all data and procedures are up to provincial standards.
 - Adaptively managing the program to respond to varying water quality data, budget, and stakeholder influences.

2.3.2 Water Quality

The focus of the 2020 water quality program will be to collect additional data via 5-in-30 day summer low flow period monitoring at least three sites (Gosnell, Shea and Crystal creek sites) in the MWMA. The field sampling will be conducted by OW Fisheries technicians.

Potential data gaps were identified in the existing water quality dataset and the 2020 program aims to fill those gaps by sampling at only three of the eight 5-in-30 sites. The additional data will aid in the completion of the formal assessment report that will be submitted to Ministry of Environment and Climate Change Strategy (ENV) as part of the process for developing Water Quality Objectives (WQO’s) for the MWMA.

2.3.3 *Water Quantity*

The water quantity (hydrology) program will involve monitoring both stage and discharge throughout 2020 / 2021. Stage is measured continuously by the pressure logger that was installed with the hydrology station in 2019; while discharge is measured through a series of field trips and discrete field measurements. The International Standards Organization (ISO) recommends that 10-15 discharge measurements are captured, throughout the natural range of flows including low, mid, and high flows, in order to build a robust rating curve (ISO, 2011).

A rating curve is the relationship between water surface elevation (stage) and the stream volume (discharge). This is a dynamic relationship that reflects the shape of the stream in two-dimensions. A rating curve is used to convert continuous stage data, that is collected by the hydrology station (pressure logger), into stream discharge (hydrograph). Depending on the rigor of the hydrology program, development of a rating curve usually takes one to three years.

In an effort to expedite rating curve development for the two MWMT hydrology stations, there will be a focused effort to characterize mid to high flows across the 2020 spring freshet. As high flows are often the most difficult to capture, an acoustic doppler current profiler (ADCP) will be used during the spring freshet to efficiently accomplish this task. This focused effort will produce between 5-9 (of the 10-15) of the rating points (stage-discharge measurements) in the first spring. With 5-9 high flow rating points and 2-4 flow low flow rating points in the first year, the rating curve may be robust enough to develop a preliminary hydrograph after the first year of monitoring.

2.3.4 *Fish and Habitat Productivity*

The Core Value of Fish and Habitat Productivity will be addressed with a program to initiate characterization the current distribution of sockeye salmon in Wet'suwet'en traditional territory, including the upper Bulkley River and tributaries of the Morice River, and catalogue potentially extirpated populations. This work will involve visiting spawning grounds and nurse lakes of each of these populations. Water samples for eDNA analysis will be collected at each site and fresh tissue samples using non-invasive live techniques will be obtained when fish are present. Such information can be used to quantify fisheries interceptions, and for monitoring these populations in the Skeena Tye Test Fishery, as well as assess the potential for strategic re-introduction programs of potentially extirpated populations.

2.4 **Task 4 – Data Management & Reporting**

The data management and reporting task aligns with the Information Sharing Core Value.

2.4.1 *Annual Data Management*

Survey data will be scanned, uploaded and organized to a secure cloud-based project management platform after each survey. Data will be processed and managed through standard QA/QC procedures.

We will adopt a standardized approach to long term data archiving, analysis, interpretation and reporting. Templates will be developed for data compilation and reporting and will include provisions that address dealing with an evolving monitoring program.

2.4.2 Reporting

Glacier Change Work

The glacier change work the Trust has embarked on with Skeena Fisheries Commission (SFC) and Coast Mountain College (CMC) is divided into three "Work Points" which will lead to having projections to 2100 of the evolution of meltwater flows primarily to the Atna / Morice lake drainage and the Nanika drainage, and secondarily to other main tributary drainages to the Morice River. The three Work Points are:

1. Watershed Morphometry – spatial analysis of elevation, hypsometry, slope, aspect, and land-cover characteristics related to the watershed. Deliverables include morphometric data for each sub-basin, all spatial data layers produced and a short report synthesizing the methods and results.
2. Current Glacier Inventory – complete a current (based on most recent, useable Landsat 8 imagery) glacier inventory of all glaciers within watershed detailed in Work Point 1. Deliverables include complete, current morphometric data for all glaciers in watersheds of concern, all spatial data layers produced and a short report synthesizing methods and results. Anticipated delivery date: October 2020.
3. Glacier Change to 2100 – Modeled changes in glacier extent and meltwater contributions of watersheds of concern as defined in Work Point 1. Deliverables include projected glacier extent and meltwater contributions, and a report detailing methods and results. Anticipated delivery date: March 2021.

Within the 2019 AMP budget Work Point 1 (Watershed Morphometry) was completed and Work Point 2 (Current Glacier Inventory) was initiated. As the CMC Researcher and students are proceeding with the SFC portion of the remaining work this year, it makes sense to continue the MWMT portion of the work concurrently. Completing the work for the Upper Morice drainages concurrently with the work for the other drainages being paid for by the SFC, will allow the Trust to plan an additional multidisciplinary phase together with SFC. This phase will combine the flow predictions to 2100 with other physical, chemical and biological data to produce valuable information about how Sockeye and other salmon species in these drainages are likely to fare as headwater glaciers continue to retreat over the coming decades. This kind of information is key to making durable decisions in the context of Sockeye Recovery Planning, and other related work (e.g. potential Water Sustainability Act planning pilot).

The 2020 AMP budget amount of \$5,000 for the continued glacier change work will allow for CMC to complete Workpoint 2 and Workpoint 3.

Annual Summary Memos

Annual summary memos with survey results will be prepared and distributed to the Trustees and stakeholders by end of February 2021. The water quality and the hydrology summary reports will include:

- Descriptions of monitoring activities.
- Maps (showing where monitoring activities have taken place).
- Data analysis and interpretations using standard templates.
- Raw data appended.

Water Quality Formal Assessment Report

In support of the development of WQO's for the MWMA, a formal assessment report for water quality will be submitted to ENV by end of February 2021.

Annual Monitoring Report

A brief MWMT Annual Monitoring Report will be prepared that summarizes the activities / field programs completed and will explain any deviations from the activities described in the AMP (as needed). The field program summary reports will be appended to this brief report. The MWMT annual report will be submitted to the Trustees and stakeholders by end of March 2021.

2.5 Task 5 – Communication and Extension

2.5.1 Website Maintenance

The MWMT website will be updated in 2020. This will include a revamp of the existing site and a change in platforms to allow for the website to be updated internally. It is important that the MWMT maintains an updated and current website to meet the obligations towards the extension of our research, and to better communicate our results.

2.5.2 Charity Accounting Set-up

It is anticipated that Canada Revenue Agency will approve the registration of MWMT as a charity by May 2020. Charitable status requires regular reporting, meetings and filings with CRA that will modestly increase our annual expenditures and time has been included in the 2020 annual budget to reflect this.

2.6 Contingency

2.6.1 Bulkley Valley Research Centre Fee for Service

A contingency in the amount of \$6,500 has been included in the 2020 budget to cover Bulkley Valley Research Centre (BVRC) fees. The contingency amount is scalable and is dependent on when charity status is granted. The \$6,500 assumes another full year of paying BVRC services and is a conservative annual estimate based on previous BVRC billing which have been between \$5,000 and \$10,000 annually (fee-for-service) for the administration tasks associated with paying MWMT invoices.

3.0 BUDGET

Funding for the 2020 Annual Monitoring Program is provided by the MWMT Revenue Trust Account and external agencies (i.e., ENV) The budget provided below in **Table 1** is based on high end projections for the field work and some programs may cost less.

Table 1. Budget for the 2020 Annual Monitoring Program

Tasks	Cost
Task 1 Program Management	
Trust project coordination	\$15,000.00
Task 2 Agreement Monitoring	
Land use scoping	\$3,000.00
Task 3 Field Programs	
Program Advisor	\$4,000.00
Water Quality - MWMA water quality monitoring (5-in-30 summer low flow) at three sites*	\$19,000.00
Hydrology - hydrometric rating curve	\$25,000.00
Fish and Habitat Productivity - Characterize the current distribution of sockeye salmon in Wet'suwet'en traditional, territory, and catalogue potentially extirpated populations (includes reporting)	\$10,000.00
Task 4 Data Management & Reporting	
Annual data management (data entry, compilation, formatting, QA/QC)	\$5,000.00
Glacier Change Work Points	\$5,000.00
Water Quality Assessment Report*	\$5,000.00
Annual Summary Reports: 1) Water Quality summary memo; 2) Hydrology summary memo; 3) MWMT Annual Monitoring Report	\$5,000.00
Task 5 Communication and Extension	
Website maintenance	\$2,000.00
Charity accounting set-up	\$3,000.00
Contingency	
Bulkley Valley Research Centre (BVRC) Fee for Service ¹	\$6,500.00
Sub-total	\$107,500.00
BC Ministry of Environment and Climate Change Strategy Funding Contribution *	(\$7,000.00)
Total	\$100,500.00

¹ BVRC contingency may not be required as CRA charity status is moving forward as of June 2020. This amount is scalable and is dependent on when charity status is granted. The \$6,500 assumes another full year of paying for BVRC services and is estimate based on previous annual BVRC billing.

* BC MOE funding will be applied towards the Water Quality 5-in-30 laboratory analysis costs and preparation of the Water Quality Assessment Report.

4.0 SCHEDULE

The following outlines the proposed schedule for the 2020 field monitoring program and associated reporting. The final field schedule would be developed in collaboration with the OW and we will make every effort to ensure the final schedule coordinates efficiently with the OW Field Fisheries staff availability.

	Q1 - 2020			Q2			Q3			Q4			Q1 - 2021		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Water Quality															
Water Quantity (hydrology)															
Fish and Habitat Productivity															
Data Management															
Reporting															

5.0 REFERENCES

- Gordon and Associates Ltd. 2009. Morice Water Management Area - Multi-Year Operational Plan. <<http://moricetrust.ca/reports.php>>.
- MAL. 2007. Morice Land & Resource Management Plan, Prepared by the Ministry of Agriculture and Lands (MAL) Integrated Land Management Bureau. <<https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/skeena/morice-lrmp>>.
- MWMT. 2015. Morice Water Monitoring Trust (MWMT) Strategic Direction - Draft.
- Oliver, A. 2018. Analysis of water quality monitoring in the Morice Water Management Area. Prepared for the Morice Water Monitoring Trust. <<http://moricetrust.ca/reports.php>>.