

CAFF Monitoring Series
March 2020

ARCTIC FRESHWATER BIODIVERSITY MONITORING PLAN

2020-2021 Work Plan



The Conservation of Arctic Flora and Fauna (CAFF) is a Working Group of the Arctic Council.

CAFF Designated Agencies:

- Norwegian Environment Agency, Trondheim, Norway
- Environment and Climate Change Canada, Ottawa, Canada
- Faroese Museum of Natural History, Tórshavn, Faroe Islands (Kingdom of Denmark)
- Finnish Ministry of the Environment, Helsinki, Finland
- Icelandic Institute of Natural History, Reykjavik, Iceland
- The Ministry of Nature and Environment, Greenland
- Russian Federation Ministry of Natural Resources and Environment, Moscow, Russia
- Swedish Environmental Protection Agency, Stockholm, Sweden
- United States Department of the Interior, Fish and Wildlife Service, Anchorage, Alaska

CAFF Permanent Participant Organizations:

- Aleut International Association (AIA)
- Arctic Athabaskan Council (AAC)
- Gwich'in Council International (GCI)
- Inuit Circumpolar Council (ICC) – Greenland, Russia, Alaska and Canada
- Russian Indigenous Peoples of the North (RAIPON)
- Saami Council

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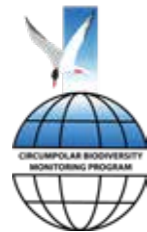
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Table of Content

1. Background	4
2. Introduction	4
3. Project Descriptions	5
Project 1: Promotion and Outreach	5
Project 2: Sample methods – summary for data in the CBMP Freshwater database	6
Project 3: Handbook of standardised methods for Freshwater Monitoring in the Arctic	7
Project 4: Publication, maintenance and development of the CBMP-Freshwater database.....	8
Project 5: Continued reporting.....	9
Project 6: CAFF-AMAP Cooperation.....	10
4. Budget for 2020-2024.....	12
5. Workplan for 2020-2024.....	14
6. References	15

1. Background

The Circumpolar Biodiversity Monitoring Program (CBMP) is the biodiversity monitoring program of the Conservation of Arctic Flora and Fauna (CAFF), the biodiversity Working Group of the Arctic Council. Through their network of scientists, indigenous organizations and conservation groups, CBMP coordinates, collects and synthesizes existing monitoring data from the Arctic States. The data/knowledge syntheses produced by CAFF-CBMP are designed to assist policy- and decision-making at global, national, regional and local levels. The CBMP thereby plays a key role in supporting CAFF's mandate to address the conservation of Arctic biodiversity, to communicate findings to the governments and residents of the Arctic, and to promote practices that ensure the sustainability of the Arctic's living resources. CBMP-Freshwater is one of four CBMP working groups under CAFF and has been led by Canada and Sweden since the inauguration of the group in 2010.

During 2019, CAFF published the State of the Arctic Freshwater Biodiversity Report (Lento et al. 2019), as well as an excerpt of the full report that focused on key findings and advice for monitoring (CAFF 2019). These reports provide the circumpolar, scientific analyses of the changes in Arctic landscapes and their lakes and rivers, and summarize key findings for decision-makers, respectively. Another major product of CBMP-Freshwater was the compilation of the freshwater database, containing all the data that had been collected and harmonized, and that underlie the analyses in the full State of the Arctic Freshwater Biodiversity Report. At this stage it is timely for CBMP-Freshwater to look ahead and plan for the future. Therefore, this report details the work plan for CBMP-Freshwater for the years 2020–2024.

2. Introduction

CBMP-Freshwater aims to align their future work tightly with the overall goals outlined in the CBMP Strategic Plan for 2018–2021 (Christensen et al. 2018). These goals state that the CBMP:

- ▶ Is relevant to Arctic states, Permanent Participants, the scientific community, and northern communities;
- ▶ Supports decision-making and facilitates coordinated monitoring;
- ▶ Is an adaptive monitoring program; and
- ▶ Is sustainable (defined by organizations, capacity, and finances).

Traditional knowledge (TK) is an important source of information for understanding Arctic biodiversity and developing effective conservation strategies and facilitating their successful implementation. Bringing together Indigenous Knowledge and science appropriately requires resources and strong intent. The Circumpolar Biodiversity Monitoring program calls for the increase efforts to better utilize different sources of information and support the involvement of TK holders and indigenous peoples from the inception of projects through analysis of information and data, and to build a strong and diverse network of experts – experts from science, TK, and local knowledge.

Additionally, Goal 1 of the CBMP Strategic Plan 2018-21 is that the CBMP should be relevant to the Arctic States, Permanent Participants, the scientific, and local knowledge communities, and other partners. The CBMP Strategic Plan 2018-21 also states that the CBMP should include TK when possible (Objective 1.3). The Freshwater group will work to include TK their work and enhance outreach to the permanent participants .

At their October 2019 Scoping Workshop in Uppsala, Sweden, the CBMP-Freshwater Steering Group produced a workplan for the coming 5 years that consists of six specific projects, each with well-defined work items and deliverables that are in line with the strategy of CBMP and provide concrete steps towards achieving the goals of the CBMP. The workplan is a living document, the CAFF Board will evaluate progress and update to reflect changing priorities on a regular basis based on overall priorities of the CBMP.

These projects address (i) promotion and outreach, (ii) a summary report of sample methods used in Arctic countries, (iv) a handbook of monitoring methods, (v) the publication, accessibility and continued updating of the freshwater database, and (vi) collaboration with AMAP. All six projects will contribute to making the work of CBMP relevant in multiple ways, thereby increasing the CBMP's adaptiveness, and providing the basis for science-based decision-making. Below follows a description of each of these projects (including a budget, specific deliverables, and terms of reference) that sets the agenda of CBMP-Freshwater for the coming years and contributes to the role of CAFF as the lead organization tackling Arctic Biodiversity issues.

3. Project Descriptions

Project 1: Promotion and Outreach

Objectives

To support and encourage national Arctic monitoring and research programs and increase the impact of the CBMP-Freshwater's work on national and international scales by increasing visibility of the work through promotion of the results/ highlights of the SAFBR, as well as the recommendations from the SAFBR (regarding harmonized monitoring, sampling locations, etc.).

Tasks

1. **Produce promotional material specific to each country that presents nationally relevant key findings of the SAFBR.**
 - 1.1 Define the target audience for each country and identify what it is that they need. Meet with policymakers and managers to find out what questions they have and how our work could address these questions and management targets.
 - 1.2 Extract the major findings of the SAFBR that are relevant to each country.
 - 1.3 Develop a plan for each country to communicate these major findings in a way that addresses reporting demands for policy makers. This could include: Presentations; Press releases; Short 1-2 page documents with graphics and little text; and Policy briefs released through the CAFF Secretariat.
2. **Promote harmonized monitoring of Arctic freshwaters:**
 - 2.1 Define the target audience, including regional/national/international organizations and communities that conduct monitoring and identify what it is that they need. Consider approaching national/international funding organizations to suggest that using these harmonized methods should be a recommendation for funded researchers.
 - 2.2 Develop a plan for each target audience to share and promote the harmonized sampling method handbook (results of Project 3).
3. **Promote the use of and continued expansion of the database**
 - 3.1 Define the target users and contributors for the database. Consider approaching national/international funding organizations to suggest that funded researchers submit data to the freshwater database or that the funding organizations provide access to data that they archive.
4. **Promote sampling in hot and cool spots for data and/or diversity:**
 - 4.1 Define the target audience, which includes organizations/researchers/communities who are conducting monitoring in each country.
 - 4.2 Identify data and/or diversity hotspots and cool spots (or characteristic/uncharacteristic sites) and locations of rapid change that we feel should be the focus of continued or new monitoring. Extract using database coverage and findings of the SAFBR/special issue.
 - 4.3 Develop a plan to approach target audience and recommend where sampling should take place
5. **Promote CBMP-Freshwater products and results to international organizations and for international assessments:**
 - 5.1 Define the international organizations who are conducting relevant assessments and/or creating reports that the CBMP-Freshwater work can support.
 - 5.2 Develop a plan and timeline for approaching target audience to suggest incorporation of CBMP-Freshwater findings.



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Deliverables

For each item listed above:

- ▶ Deliverable 1: List(s) of the target audience to be contacted
- ▶ Deliverable 2: Communication plan for how target audiences will be contacted
- ▶ Deliverable 3: Material that will be communicated to target audiences

Timeline

- ▶ Work will be ongoing from 2019-2020.

Link(s) to CBMP strategic plan

- ▶ **Goal 1:** The CBMP is relevant to the Arctic States, Permanent Participants, the scientific and Traditional and local knowledge communities, and other partners.
- ▶ **Goal 2:** CBMP results support decision making and facilitate coordinated monitoring.

Project 2: Sample methods – summary for data in the CBMP Freshwater database

Objectives

To identify predominant sampling methods used across the Arctic by summarizing the sampling methods described in the SAFBR and CBMP-Freshwater database.

Tasks

1. **Create summary tables of all sampling methods for each FEC, based on the methods described in the CBMP-Freshwater database:**
 - 1.1 For each country and each FEC, indicate the number of samples collected using each method, to provide information about how commonly used each method is across the Arctic. This should be similar to tables in Buss et al. (2015).
2. **Create a summary report in the CAFF monitoring series with sample method tables and a short introduction and description:**
 - 2.1 In the introduction, state that the methods described provide an update to the Monitoring Plan, here describing the actual data collection that has taken place in the Arctic.
3. **Develop a manuscript that summarizes sampling methods in the Arctic and makes recommendations for a standardized protocol for each FEC, based on predominant methods (following Buss et al. (2015) paper on benthic macroinvertebrates; also check Goedkoop et al. (1998):**
 - 3.1 Discuss limitations of methods that are most commonly used (i.e., do they optimize biodiversity collection?).
 - 3.2 Include lessons learned from intercalibrations (e.g. EU Water Framework Directive) and existing Arctic monitoring programs.

Deliverables

- ▶ Deliverable 1: Methods summary table for each FEC
- ▶ Deliverable 2: CAFF report summarizing sample methods
- ▶ Deliverable 3: Manuscript describing predominant methods across the Arctic and noting recommendations for protocols based on predominant methods

Timeline

- ▶ CAFF Monitoring Series Report: 2019-2020
- ▶ Primary publication: 2020-2021

Link(s) to CBMP strategic plan

- ▶ **Goal 2:** CBMP results support decision making and facilitate coordinated monitoring

Project 3: Handbook of standardised methods for Freshwater Monitoring in the Arctic

Objectives

To promote consistent and harmonized monitoring protocols for Arctic lakes and rivers by providing authorities, research station managers and researchers with recommended, standardized monitoring protocols that update the recommended protocols from the Freshwater Monitoring Plan and that are based on the predominant methods used in the Arctic countries (as evidenced by the CBMP-Freshwater database)

Tasks

1. **Choose standard operating procedures (SOPs) for each FEC based on the Project 2 sample method summary:**
 - 1.1 Include section on emerging technologies to be considered as additions to the monitoring protocols.
 - 1.2 Divide SOPs into basic (minimal) and enhanced monitoring categories to emphasize what is critical to monitor (i.e. depending on the questions addressed)
2. **Decide on recommendations for developing a long-term sampling strategy:**
 - 2.1 Develop recommendations on sampling habitat, season of sample collection, spatial distribution of sample sites, inclusion of supporting environmental variables, etc.
 - 2.2 Provide general recommendations of the selection criteria for long-term monitoring sites (e.g., aligning with established stations, long-term sites, etc.).
 - 2.3 If possible, identify strategies for the early detection of new and/or alien (invasive) species
3. **Develop Methods Handbook document with descriptions of sampling strategy and chosen protocols for each FEC, to be published as CAFF monitoring series report and/or website.**

Deliverables

- ▶ Deliverable 1: CAFF report and/or website

Timeline

- ▶ Follows from Project 2 (2021)

Link(s) to CBMP strategic plan

- ▶ Goal 2: CBMP results support decision making and facilitate coordinated monitoring
- ▶ Goal 3: The CBMP is an adaptive monitoring program



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Project 4: Publication, maintenance and development of the CBMP-Freshwater database

Objectives

To finalize and publish the CBMP-Freshwater database in the CAFF Arctic Biodiversity Data Service (ABDS) and to facilitate and fund the ongoing addition of data to the database and contribute to the sustainability of this database. A second objective is to realize the benefits of the CBMP-Freshwater database and promote its use and continued growth over time in order to make it a key data source for future evaluations of Arctic biodiversity changes

Tasks

1. **Finalize and publish the CBMP-Freshwater database in the ABDS:**
 - 1.1 Create a list of data sources/providers that must be contacted to obtain data sharing permissions before data can be added to the ABDS.
 - 1.2 Contact data sources/providers to request permission to include data and/or metadata on the ABDS and set up open data agreements or attributed data agreements (CAFF/FSG).
 - 1.3 Add metadata and data to ABDS (CAFF/FSG).
 - 1.4 Add indication in ABDS of sites/data included in the special issue papers (CAFF/FSG)
2. **Facilitate the addition of data to CBMP-Freshwater database using current, manual methods (as used for the SAFBR) to fill gaps and extend time series:**
 - 2.1 Identify additional available data that could be added to the database, with an emphasis on filling spatial gaps and adding to time series e.g., additional national monitoring data (every 2 years?), German diatom data from Russia, European diatom database, paleolimnological data from Europe, old studies/surveys, data from other people who have come forward, etc.
 - 2.2 Give data a priority for processing based on the gaps that they fill.
 - 2.3 Obtain permission for putting data in ABDS as well as using data for future analyses when obtaining data from source.
 - 2.4 Process data for inclusion in database.
 - 2.5 Promote or encourage external users to add data to the CBMP-Freshwater database on the ABDS:
 - 2.5.1 *FSG and CAFF Secretariat to work together on ensuring templates are set up for external users to submit data to the database.*
 - 2.5.2 *Suggest to research stations, monitoring authorities, and researchers that they add their monitoring data to the database through the ABDS [ties in with Project 1]*
 - 2.5.3 *Develop a set of QA/QC criteria and conduct QA/QC assessment of submitted data*
3. **Long-term efforts to streamline the ongoing addition of data to CBMP-Freshwater database:**
 - 3.1 Establish a CBMP-Freshwater (or CAFF) working group (data curation unit) to oversee database construction and maintenance.
 - 3.2 Develop interfaces with monitoring authority databases to facilitate/automate database expansion.
 - 3.3 Consider other interface to simplify adding data from other data sources (e.g, journal article databases, etc.).

Deliverables

- ▶ Deliverable 1: CBMP-Freshwater database integrated into ABDS
- ▶ Deliverable 2: Additional data in the CBMP-Freshwater database/ABDS, filling spatial and temporal gaps
- ▶ Deliverable 3: Creation of database working group
- ▶ Deliverable 4: Development of data interfaces

Timeline

- ▶ Finalize database and integrate into ABDS, October 2019-December 2020
- ▶ Add data to database to fill gaps/extend time series: 2021 onwards
- ▶ Creation of database working group: 2023
- ▶ Development of data interfaces: 2023 onwards

Link(s) to CBMP strategic plan

- ▶ **Goal 1:** The CBMP is relevant to the Arctic States, Permanent Participants, the scientific and Traditional and local knowledge communities, and other partners
- ▶ **Goal 2:** CBMP results support decision making and facilitate coordinated monitoring
- ▶ **Goal 3:** The CBMP is an adaptive monitoring program
- ▶ **Goal 4:** The CBMP is sustainable (defined by organization, capacity and finances)

Project 5: Continued reporting

Objectives

To assess ongoing change in the status and trends in freshwater biodiversity of FECs across the circumpolar Arctic (or specific regions where major change has been observed) and add to the awareness of change in Arctic freshwaters/waterscapes by highlighting specific key results and messages.

Tasks

1. **Create a short update to the SAFBR (similar to SWIPA 2019 update: 14-18 pages with photos and graphics):**
 - 1.1 Indicates direct responses by countries/monitoring authorities to SAFBR (Lento et al. 2019) advice for future monitoring, including any monitoring changes implemented by the countries, as well as general trends in biodiversity status (possibly from routine reporting in, for example, Nordic countries).
 - 1.2 Review monitoring activities of each country and update accordingly (e.g., update the spatial monitoring coverage, as well as the FECs sampled by each country, relative to what is reported in the SAFBR).
 - 1.3 Where possible, review country-specific reporting of monitoring results to update trends reported in the SAFBR.
2. **Engage with Freshwater Expert Networks (FENs) to develop a report that follows from and responds to AMAP assessments by detailing biotic responses to abiotic trends and changes in the physical/chemical habitat:**
 - 2.1 Following the release of the next AMAP report (2021), hold a scoping workshop with freshwater expert network members (and experts external to FENs, as needed) as well as representatives from AMAP to discuss and assess the potential biotic responses to trends described in the AMAP assessment
 - 2.1.1 *Link this to impact hypotheses by relating AMAP's findings to the appropriate hypotheses as described in the Monitoring Plan.*
 - 2.1.2 *As possible, use existing data and findings to support predictions of biotic response*
 - 2.2 Together with experts, develop a report that details biotic responses to the changing physical chemical habitat, at the catchment scale or larger OR produce a journal article summarizing key workshop findings (article possibly co-produced by CAFF-AMAP)
3. **Develop indicator reports (e.g., 2 pages per FEC), as possible, by re-analysing SAFBR data with expanded spatial and temporal coverage:**
 - 3.1 Analyse new data that are added to the CBMP-Freshwater database (Project 4) to evaluate alpha and beta diversity spatially and temporally with expanded data.
 - 3.2 Relate trends in expanded dataset to the AMAP report and the response report in Task 2
 - 3.3 Develop indicator reports (about 2 pages, with figures, maps, and pictures) for each FEC that has expanded data.

Deliverables

- ▶ Deliverable 1: Short SAFBR update (e.g., SWIPA 2019 update)
- ▶ Deliverable 2: Expert workshop to discuss and assess the implications of AMAP reports on biodiversity (biological responses)
- ▶ Deliverable 3: Report on biotic response to a changing abiotic environment (possible joint CAFF/AMAP effort)
- ▶ Deliverable 4: Indicator report(s) for each FEC related to updates to the database and expanding spatial and temporal coverage (indicator report(s))

Timeline

- ▶ SAFBR Update, December 2021
- ▶ Expert Workshop, May 2022
- ▶ AMAP Response Report, May 2023
- ▶ Indicator reports, 2024-2025

Link to CBMP strategic plan

- ▶ **Goal 1:** The CBMP is relevant to the Arctic States, Permanent Participants, the scientific and Traditional and local knowledge communities, and other partners.
- ▶ **Goal 2:** CBMP results support decision making and facilitate coordinated monitoring.
- ▶ **Goal 3:** The CBMP is an adaptive monitoring program.

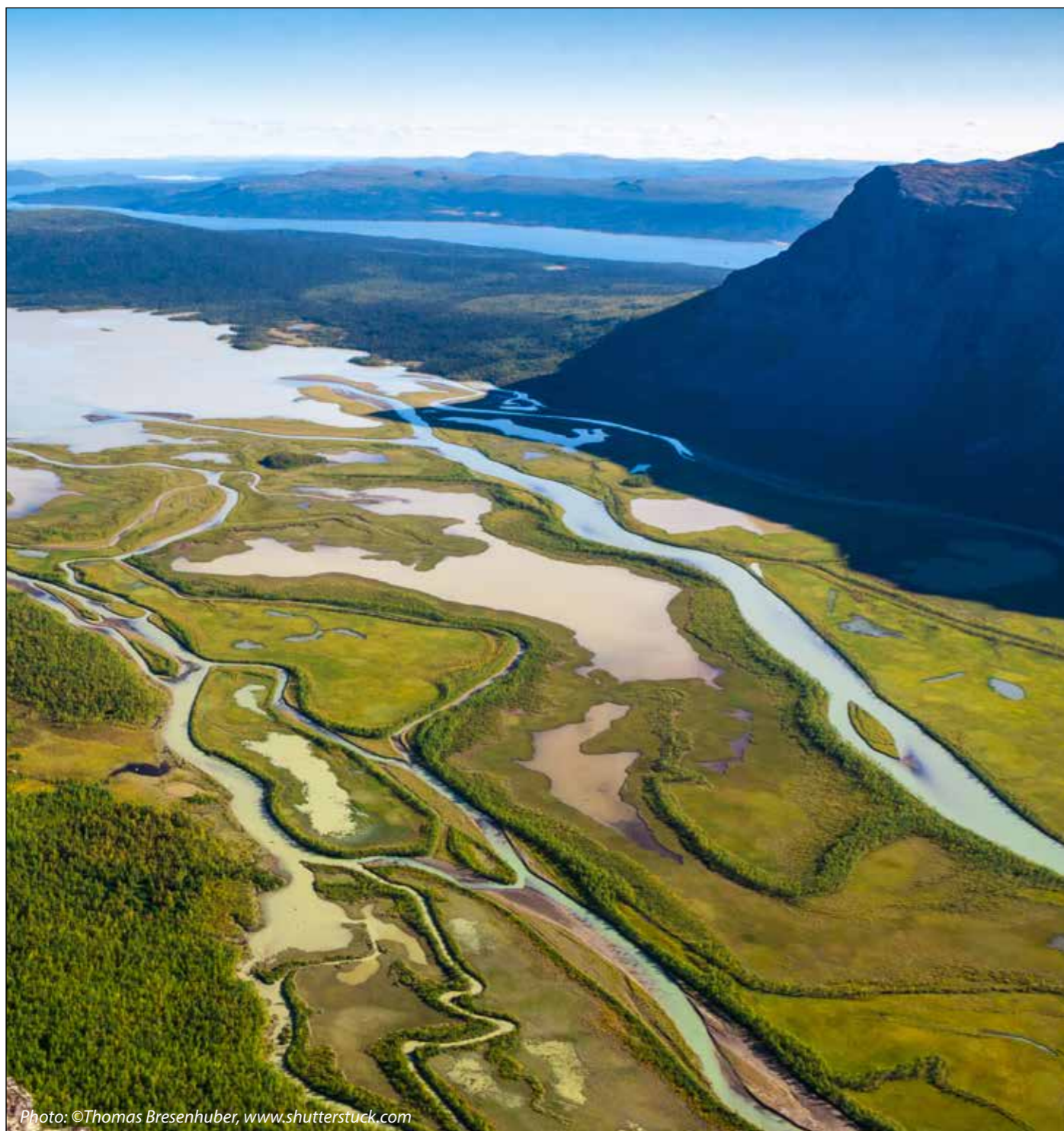


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Project 6: CAFF-AMAP Cooperation

Background

AMAP performs monitoring and assessments of the physical/chemical environment of the Arctic and has data on changes in climate (including permafrost thaws), hydrology, cryosphere, and contaminant levels. AMAP, however, rarely addresses the effects of these changes in the physical/chemical environment on the biodiversity (species, assemblages) of Arctic ecosystems. These changes in climate, permafrost, and hydrology affect the habitat of aquatic organisms, for example by changes in ice regimen, temperature stratification of lakes, and increasing the sediment loads of rivers. CBMP addresses monitoring and data on status and trends on the central Biotic elements in the ecosystem – the Focal Ecosystem Components (FEC). Information about the abiotic parameters and drivers in the ecosystem, such as climate, permafrost and contaminants, is essential, to get and understanding of potential changes in FEC status and trends. The strength of CBMP-AMAP collaboration lies in the linkage of changes in the physical/chemical environment to that in the biodiversity of freshwaters (and terrestrial ecosystems). Joint knowledge compilations between these two Arctic Council working groups provides means for integrated assessments.

Objectives

To facilitate collaboration with AMAP by contributing to a chapter in AMAP's 2021 report and by engagement of Freshwater Expert Networks and key AMAP representatives in a joint workshop to assess the potential biotic response to trends described in recent AMAP assessments (Project 5), and to further facilitate collaboration with AMAP by promoting increased communication between CBMP-Freshwater and AMAP, and discussing potential additional co-productions in the future. **The Freshwater Group will coordinate its work with AMAP in dialogue with the CAFF Board.**

Tasks

1. **Facilitate participation by AMAP on FSG teleconferences:**
 - 1.1 Start calls with an update on AMAP-CBMP collaboration, and invite AMAP and Terrestrial group representatives to join the call for this initial 10-15 minutes
2. **Ensure collaboration with AMAP on chapter for 2021 report**
3. **Engage Freshwater Expert Networks (FENs) and key AMAP representatives in a workshop setting to assess the potential biotic response to trends described in recent AMAP assessments (Project):**
 - 3.1 Incorporate the idea of catchment-based analysis
 - 3.2 Incorporate impact hypotheses from Monitoring Plan (p. 40) to focus the work:
 - 3.2.1 *Identify what we would like to see as the focus, and identify any potential feedback mechanisms that could be covered*
4. **Ensure Standardized Methods Handbook (Project 3) indicates the potential to make use of abiotic data collected/accumulated by AMAP and the potential to co-locate monitoring locations with AMAP.**
5. **Consider requests for joint AMAP-CBMP assessments as time and resources allow.**

Deliverables

- ▶ Deliverable 1: CBMP-Freshwater input to AMAP chapter in 2021 report

Timeline

- ▶ General interaction (task 1): ongoing
- ▶ Chapter in 2021 report: 2019-2021
- ▶ Workshop engagement: See Project 5
- ▶ Standardized Method Handbook: See Project 3

Link(s) to CBMP strategic plan

- ▶ **Goal 1:** The CBMP is relevant to the Arctic States, Permanent Participants, the scientific and Traditional and local knowledge communities, and other partners
- ▶ **Goal 2:** CBMP results support decision making and facilitate coordinated monitoring
- ▶ **Goal 3:** The CBMP is an adaptive monitoring program

5. Workplan for 2020-2024

Project/ Milestone	Activities & Deliverables	Timeline
0. SAFBR published	a. SAFBR endorsed by CAFF board b. SAFBR published by CAFF c. SAFBR printed for distribution	Completed 2019 Completed 2019 2020
1. Promotion and Meetings	d. Publication of special issue papers a. Scoping workshop for implementation phase 2 b. FSG Annual meeting c. Presentations at national and international meetings and conferences d. Promotion of SAFBR findings e. Promotion of harmonized monitoring f. Promotion of the Freshwater Database	Ongoing through 2020 Completed 2019 May 2020 Ongoing Ongoing 2019-2020 Ongoing
2. Sampling Methods	a. FSG summarizing sampling methods from Freshwater Database b. CAFF Report summarizing sampling methods c. Journal article about Arctic sampling methods	April 2020 December 2020 December 2021
3. Protocol Handbook	a. CAFF Freshwater Sampling Protocols Handbook	December 2021
4. Freshwater Database	a. Identify data sources and obtain data permissions for current data b. Integrate Freshwater Database into ABDS c. Identify and obtain additional data to be added to Freshwater Database d. Harmonize data and process for inclusion in Freshwater Database e. Creation/Implementation of database working group f. Development of database interfaces	October 2020 December 2020 Ongoing through December 2022 January 2021 through December 2023 January 2023 through December 2024 Ongoing from 2024
5. Reporting	a. 2019 annual performance report submitted to CAFF b. 2020 work plan submitted to CAFF c. Creation of short SAFBR update d. Expert workshop to discuss follow-up to AMAP assessment e. Report on biotic response to changing abiotic environment f. Analysis of new Freshwater Database data g. Indicator report(s) for each FEC related to database updates	January 2020 January 2020 December 2021 TBD 2022 December 2023 2023 through October 2024 March 2025

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