

Arctic Freshwater Monitoring Plan Annual Report 2014

Annual report on the implementation of the Circumpolar Biodiversity Monitoring Program's Arctic Freshwater Biodiversity Monitoring Plan



Acknowledgements

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- Directorate for Nature Management, Trondheim, Norway
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- Russian Federation Ministry of Natural Resources, 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, Alaska, Canada and Russia
- Russian Indigenous Peoples of the North (RAIPON)
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Introduction

The Arctic Freshwater Biodiversity Monitoring Plan (CBMP-Freshwater Plan) details the rationale and framework for improvements related to the monitoring of Arctic freshwaters, including ponds, lakes, rivers, their tributaries and associated wetlands. The framework aims to facilitate circumpolar assessments by providing Arctic countries with a structure and a set of guidelines for initiating and developing monitoring activities that employ common approaches and indicators. The CBMP-Freshwater Plan is part of the Circumpolar Biodiversity Monitoring Program (CBMP) of the Conservation of Arctic Flora and Fauna (CAFF) that is working with partners to harmonize and enhance long-term Arctic biodiversity monitoring efforts. A major goal is to facilitate detection and communication of environmental and biological change in the Arctic, and stimulate societal responses to significant trends and pressures.

Developed by the Freshwater Expert Monitoring Group (FEMG) of the CBMP, which was co-led by Canada and Sweden, the CBMP-Freshwater Plan is the result of work undertaken during workshops held in Uppsala, Sweden (2010) and Fredericton, New Brunswick, Canada (2011). Both workshops included freshwater experts with a broad range of expertise as well as FEMG leads for each Arctic nation (Canada, Sweden, Denmark, Finland, Iceland, Norway, Russia (first workshop only), and USA). These workshops included a preliminary assessment of the spatial and temporal coverage of available monitoring data and identified important elements, i.e., stressors, Focal Ecosystem Components (FECs: biotic or abiotic elements, such as taxa or key abiotic processes, which are ecologically pivotal, charismatic and/or sensitive to changes in biodiversity), parameters, and indicators, to be incorporated into the pan-Arctic Freshwater Plan. The mechanistic link between an environmental or anthropogenic stressor and the FECs was identified through "Impact Hypotheses," i.e., predictive statements that outline the potential ways in which selected stressors might impact the structure or function of FECs. Preliminary information on the spatial and temporal coverage of available freshwater monitoring data for FECs was summarized, and will form the basis for the first assessment of freshwaters in the Arctic.

The CBMP-Freshwater Plan was endorsed by the CAFF board in 2012, and represents an agreement among the Arctic nations on the approach to be taken to monitor and assess freshwater biodiversity across the pan-Arctic region. By establishing common approaches for monitoring and assessment, the plan is intended to improve our ability to detect changes to biodiversity and evaluate stressor impacts on a circumpolar scale, thus facilitating more effective management of these systems. The first status and trends assessment of Arctic freshwater biodiversity (planned for completion in 2017) will evaluate existing data and identify gaps in monitoring efforts and scientific knowledge of Arctic freshwaters. This first status and trends assessment will also provide recommendations and guidance for more effective, i.e., coordinated and stressor-targeted, future monitoring activities.



Members of the Freshwater Steering Committee and the CAFF Secretariat after the June 2014 Implementation meeting, Lake Mývatn area, Iceland. Photo: CAFF

Implementation of the CBMP-Freshwater Plan began in December 2012 with the activation of a governing structure establishing the Freshwater Steering Group (Freshwater SG) and national Freshwater Expert Networks (FENs). The Freshwater SG is a continuation of the FEMG, with representation from each Arctic nation, Permanent Participants, and Arctic Council Working Groups (e.g., Arctic Monitoring and Assessment Program). A FEN has been established for each currently participating Arctic nation (Canada, Sweden, Denmark/Greenland, Finland, Iceland, Norway, and USA), with members selected to maximize the coverage of expertise and to incorporate multiple affiliations (e.g., government, academia). FENs are tasked with collecting and analyzing national monitoring data to assess the status of Arctic freshwater biodiversity, detect trends, and determine the causes of any changes. The Freshwater SG is responsible for implementing the CBMP-Freshwater Plan, coordinating and overseeing the work of the national FENs, and developing the first State of Arctic Freshwaters Report in 2017.

Updates from the CBMP-Freshwater Plan Implementation Teams

During the second year of implementation, the national FENs completed the first two of six Freshwater SG projects that were designed to facilitate the completion of a circumpolar assessment of Arctic freshwaters.

- ▶ Project 1, which was completed in December 2014, involved the collection of national metadata summarizing existing paleo, historical, and contemporary monitoring data.
- ▶ Project 2, which is ongoing and will be completed in early 2015, is a summary and analysis of the metadata collected in Project 1 and focuses on the assessment of spatial and temporal coverage of available data.

The metadata (Project 1) and summary reports (Project 2) will form the base of information for the subsequent projects and will be vital to the completion of a circumpolar assessment of biodiversity. Project 3, which started in October 2014, will entail the collection of high-quality monitoring data identified in Projects 1 and 2.



Canadian Co-Chair of the Circumpolar Biodiversity Monitoring Program's Freshwater Steering Group, Joseph Culp, sampling river invertebrates in Cambridge Bay, Canada, August 2014. Photo: Willem Goedkoop

Status of Work Plan

Milestone	Activities & Deliverables	Status
1. Plan published	a. Final plan endorsed by CAFF board	Completed 2012
	b. Plan published by CAFF	Completed 2012
2. Governing structure activated	a. Freshwater SG established	Completed 2013 (awaiting Russian representation)
	b. Adoption of Terms of Reference	Completed 2013
	c. Freshwater SG leads confirmed	Completed 2013
	d. National FENs established and membership recorded	Completed 2013 (awaiting Russian FEN)
	e. Support involvement by all Arctic countries	Ongoing
3. Data management	a. FENs review/revise existing contemporary metadata file and add missing data (Project 1)	Completed December 2014
	b. FENs search for and add data from post-industrial period and pre-industrial (paleo) period to the metadata file (Project 1)	Completed December 2014
	c. Metadata added to Polar Data Catalogue	Metadata were collected in Excel tables in Polar Data Catalogue format. Batch upload of metadata to PDC to be completed in early 2015
	d. FENs create summary maps for the FECs for the contemporary, post-industrial, and pre-industrial (paleo) periods (Project 2)	To be completed in early 2015
	e. FENs complete summary reports describing existing data (Project 2)	To be completed in early 2015
	f. FENs acquire data and conduct QA/QC (FSG Project 3)	Started and ongoing (deadline October 1, 2015)
4. Indicator development	a. Existing data sets identified	Completed December 2014
5. Reporting and coordination	a. 2014 Annual Performance Report submitted to CAFF	Completed December 2014
	b. 2015 work plan submitted to CAFF	Draft completed December 2014 and included in 2014 Annual Performance Report
	c. Scientific Publications	Several in progress. Published papers include: Culp, JM, J Lento, W Goedkoop, M Power, M Rautio, KS Christoffersen, G Guðbergsson, D Lau, P Liljaniemi, S Sandøy & M Svoboda. 2012. Developing a circumpolar monitoring framework for Arctic freshwater biodiversity. <i>Biodiversity</i> , 13:3-4, 215-227 Goedkoop, W, JM Culp, J Lento, KS Christoffersen, S Frenzel, G Guðbergsson, P Liljaniemi, S Sandøy, & M Svoboda. 2013. Biodiversity of Arctic freshwaters: developing the CAFF-CBMP Integrated Monitoring Plan. White paper prepared for the Arctic Observing Summit, Vancouver, BC.
	d. General communications	Brochure and national one-page updates produced by all FENs Poster presented at Joint Aquatic Sciences Meeting in Portland, Oregon, USA May 2014 Special session on Arctic freshwaters organized at Joint Aquatic Sciences Meeting Special session on Arctic freshwaters and Freshwater SG activities organized at Arctic Biodiversity Congress in Trondheim, Norway December 2014

Milestone	Activities & Deliverables	Status
	e. Freshwater SG members secure funding from country authorities to support implementation of plan according to Table 13 of the CBMP-Freshwater Plan	Funding opportunities continue to be explored for each country; details on funding provided below
	f. Freshwater SG meetings (in-person or teleconference)	11 teleconferences held during 2014 (January, February, March, April, May, June, August, September, October, November, and December). One in-person meeting held in Akureyri, Iceland in June, 2014.
	g. National FEN meetings (in-person or teleconference)	First in-person meetings for FENs in Canada, Finland, Sweden, and USA held in 2014. In-person meetings for FENs in Denmark, Iceland, and Norway ongoing.
	h. Scientific publications	In progress and see CAFF website
	i. 2015 Work Plan	Preliminary plan presented below; plan to be finalized at 2015 Annual Meeting (April 2015)

The Freshwater SG work has been coordinated through monthly telephone meetings (except in July) where progress and directions of work were communicated. Country one-pagers, i.e. information flyers that inform about the status of work, were produced for each of the countries. Members of the Freshwater SG have been active in organizing Arctic freshwater sessions at two major congresses, i.e. the Joint Aquatic Science Meeting of ASLO/SFS in Portland (May 2014) and at the Arctic Biodiversity Congress in Trondheim (December 2014). Moreover, the co-leads of the Freshwater Steering Group, Willem Goedkoop & Joseph Culp, presented an update the status of work in CBMP-freshwater at the CAFF-meeting in Cambridge Bay, Canada, 25–27 August 2014.

Freshwater Steering Group Update

Membership

The Freshwater Steering Group (Freshwater SG) continued to be co-led by Canada and Sweden in the second year of implementation. National representatives were:

- ▶ Joseph Culp (Canada; Environment Canada and Canadian Rivers Institute, University of New Brunswick),
- ▶ Willem Goedkoop (Sweden; Swedish University of Agricultural Sciences),
- ▶ Kirsten S. Christoffersen (Denmark/Greenland; University of Copenhagen and the University Centre in Svalbard),
- ▶ Petri Liljaniemi (Finland; Ministry of the Environment),
- ▶ Guðni Guðbergsson (Iceland; Institute of Freshwater Fisheries),
- ▶ Steinar Sandøy (Norway; Norwegian Environmental Agency), and
- ▶ Christian Zimmerman (USA; USGS Alaska Science Center).

The Freshwater SG also had participation in the second year of implementation from

- ▶ Jan René Larsen (Arctic Monitoring and Assessment Program).

The Freshwater SG is lacking representation from Russia, and is endeavoring to resolve this issue.

Challenges

The most significant challenges to the Freshwater SG in the second year of implementation were securing funding and ensuring representation from all Arctic nations. These are ongoing issues, and efforts will continue to be made in 2015 to overcome these challenges.

1. Funding

Freshwater SG members are responsible for securing funding for FEN operations each year. In the second year of implementation, Freshwater SG members secured modest funding from national sources to cover the FEN budget, which included inaugural meetings and metadata collection. With increasing project responsibilities and additional meetings, there is a need to obtain additional funding to meet a larger budget in the years leading to the completion of the 2017 State of Arctic Freshwaters report. In particular, FEN Project 3 and an Inter-FEN workshop in 2015 will require more significant sources of funding. FEN Project 3 requires collection of data identified in Projects 1 and 2, organization and management of those data in a national database, and quality assurance/quality control of the data. The complexity of this project will require additional assistance in many countries, and funding will be required to secure that assistance. The Inter-FEN workshop, which is planned for October 2015 in Copenhagen, is intended to bring together FEN members from all participating nations to discuss and finalize a coordinated approach to national State of Arctic Freshwater reports and brainstorm potential scientific outputs that could result from international collaborations. This meeting will require funding to cover venue costs and local logistics in addition to travel costs for all attendees (Freshwater SG and FEN members from each country). Freshwater SG members will continue to apply for funding from national and international organizations, seeking assistance from the CAFF Secretariat and national CAFF representatives where appropriate.

2. Representation

Early efforts of the FEMG to design the CBMP-Freshwater Plan were strengthened by participation from members of all Arctic nations. However, there is currently no formal Russian representative on the Freshwater SG nor a Russian FEN, despite a need for Russian participation in the implementation and assessment process. The Freshwater SG will continue to work with members of the CBMP and CAFF in 2015 to secure Russian representation, assist in the formation of a Russian FEN, and ensure full participation of all Arctic nations in the implementation process. Beside these efforts we will also explore the possibilities to get Russian freshwater experts involved in CBMP-freshwater through a bi-lateral project financed by the Swedish EPA.



River Laxá, Lake Mývatn area, Iceland. Photo: Willem Goedkoop/SLU

Freshwater Expert Network (FEN) Update

a. Canada



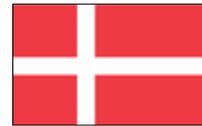
Membership

Canadian membership continued as in 2013-14 and represented leading arctic scientists from government, academia and non-government organizations. Members include Joseph Culp (Lead, Environment Canada and Canadian Rivers Institute), Jennie Knopp (Inuvialuit Settlement Region-Community Based Monitoring Program), Jennifer Lento (Canadian Rivers Institute, University of New Brunswick and APECS), Donald McLennan (Canadian High Arctic Research Station), Michael Power (University of Waterloo), Milla Rautio (Université du Québec à Chicoutimi), Jim Reist (Fisheries and Oceans Canada), Heidi Swanson (University of Waterloo) and Fred Wrona (Environment Canada and University of Victoria).

Accomplishments and Challenges

The Canadian FEN met in Ottawa in February and December 2014 to discuss objectives, progress on Canadian FEN products, and the potential to establish CBMP-Freshwater monitoring in Canada. It is notable that the nascent Canadian High Arctic Research Station (CHARS) currently is the catalyst for ongoing monitoring of Canadian Arctic freshwaters. They completed searches for relevant data and produced maps showing the spatial distribution of information for Focal Ecosystem Components across the Canadian Arctic. These data originate from various federal, territorial and provincial monitoring programs and university research programs. The primary challenge for the Canadian CBMP-FEN remains the ongoing search for secure funding to support the Canadian FEN as the current funding model requires annual renewal of support. Funding to support the acquisition of Traditional Ecological Knowledge remains a challenge and should be addressed in future years.

b. Denmark and Greenland



Membership

The Danish FEN consists of the following freshwater experts: Senior researcher Torben L. Lauridsen (Dept. of Bioscience – Arctic Research Centre, University of Aarhus), Ass. Professor Dean Jacobsen (Department of Biology, Freshwater Biology, University of Copenhagen), Senior researcher Nikolaj Friberg (Norwegian Institute for Water Research, Oslo, Norway), Senior Scientist Ole Geeertz-Hansen (Greenland Institute of Natural Resources, Department of Birds and Mammals), Senior Scientist Frank F. Riget (Department of Bioscience - Arctic Research Centre, University of Aarhus) and Professor Kirsten S. Christoffersen (Dept. of Biology, Freshwater Biology, University of Copenhagen).

Accomplishments and Challenges

There have been no physical meetings in 2014 but a meeting in November 2013 outlined activities for 2014. This included: 1) searching for relevant data in especially the “grey” literature i.e. expeditions reports, monitoring data and in-house publications in the respective FEN members institutions, and 2) a kick-off initiative to sample a small number of streams from 3 areas in Greenland (Zackenbergl, Nuuk and Disko) with the aim to include those in the database. Activity 1 is ongoing. Activity 2 has been accomplished during August-October where a total of 13 streams were sampled by FEN-members. Some of the samples for chemical parameters have been analyzed and the remaining will be done in 2015. The invertebrate samples need to be analyzed by a specialist and funding for this is needed. The FEN also needs to compile and analyze paleolimnological data for the database as well as discussed relevant scientific output.

c. Finland



Membership

The members of Finnish Expert Network have not changed since the end of 2013 and include Petri Liljaniemi (lead, Ministry of the Environment), Jaakko Erkinaro (Finnish Game and Fisheries Research Institute), Laura Forsström (University of Helsinki), Jani Heino (Finnish Environment Institute), Seppo Hellsten (Finnish Environment Institute) and Satu-Maaria Karjalainen (Finnish Environment Institute).

Accomplishments and Challenges

The activities of the group have been restricted by the small project budget. The FEN completed a list of monitoring projects and studies carried out in the Finnish subarctic areas and continue to make additions to the list as necessary. Identification of existing datasets is nearly completed, but the collection and storing of the data

will continue. The challenges for the data compilation include the varying data formats and the lack of digital data for older material. Old data must be digitized manually which requires considerable labor and funding for salaries.

d. Iceland



Membership

There are four experts in the Icelandic FEN: Arni Einarsson, (Myvatn Research Station) Hilmar Malmquist, (Icelandic Museum of Natural History) Jon S. Olafsson, (Institute of Freshwater Fisheries) and Gudni Gudbergsson (Institute of Freshwater Fisheries) who is also a member of the CBMP freshwater steering group.

Accomplishments and Challenges

The Icelandic FEN had two formal meetings in 2014. The FEN compiled and analyzed historic and paleolimnological monitoring datasets for the Freshwater CBMP Project 2. In 2014 the Icelandic SG took part in a Freshwater SG meeting in Akureyri, Iceland. There was a contribution from an Icelandic FEN member at the CBMP session of the Joint Aquatic Sciences Meeting, in Portland Oregon and also at the freshwater session at the Arctic Biodiversity Congress in Trondheim, Norway.

e. Norway



Membership

The members of the Norwegian FEN are similar to 2013 and include Steinar Sandøy (lead, Norwegian Environmental Agency), John Brittain (Coordinator, University of Oslo and Norwegian Water Resources & Energy Directorate), Marit Mjelde (Norwegian Institute for Water Research), Ann Kristin Schartau (Norwegian Institute for Nature Research), Jan Idar Solbakken (Sami University College) and Martin Svenning (Norwegian Institute for Nature Research, FRAM - High North Research Centre on Climate).

Accomplishments and Challenges

During 2014 the Norwegian FEN met twice, once in February and again during a three-day workshop in May. The FEN searched for metadata to produce an overview of existing data from freshwater in the Norwegian Arctic by searching the literature, national databases and through direct interviews of scientists and managers. There are data series on all FECs, varying in time length and quality, both from the Arctic area of mainland Norway and from the high Arctic in Svalbard. Based on these metadata, maps showing the geographical location of the datasets will be produced. The FEN also created a set of criteria for quality assurance assessment of the datasets. A primary challenge for the group will be the organization of these data as well as their preparation for analysis. This portion of the work will be time consuming and it will be a challenge to gain the economic resources necessary to complete these tasks.

f. Sweden



Membership

The Swedish FEN consists of the following freshwater experts: Jan Karlsson (Umeå University, Department of Ecology and Environmental Science), Johan Östergren (Swedish University of Agricultural Sciences – SLU, Department of Aquatic Resources), and of Maria Kahlert and Tobias Vrede (both SLU, Department of Aquatic Sciences and Assessment). Willem Goedkoop, the Swedish co-lead for CBMP-freshwater, leads the Swedish FEN.

Accomplishments and Challenges

A two-day FEN-workshop was held in Uppsala in November 2014 during which the FEN worked on CBMP assignments and compiled historic and paleolimnological data, and discussed possibilities for scientific output. The Swedish FEN had a late start, as funding was not available until summer 2014. This compressed the timeline of the work that needed to be done for CBMP. However, we can catch up on this during 2015 if continued funding is available. The fact that early contemporary and historic data are available only in old reports and publications is a challenge that questions the use of these data.

g. USA



Membership

In 2014, there were no changes in membership of the US FEN and members include: Christian (U.S. Geological Survey - Fish) and Matthew Whitman (Bureau of Land Management - Fish), Christopher Arp (University of Alaska Fairbanks – Hydrologic and Ice Regimes), Benjamin Jones (U.S. Geological Survey – Remote Sensing), and Trey Simmons (National Park Service – Benthic Invertebrates). In 2015, the US FEN is seeking participants with expertise as needed to complete data gathering and analyses.

Accomplishments and Challenges

The US FEN met via teleconference to gather metadata and begin report preparation. Lack of secured funding to support FEN activities continued to be an issue in 2014.

Financial Report



Freshwater scientists arrive to field work site in Cambridge Bay, Canada via helicopter. Photo: Willem Goedkoop/SLU



The Arctic sun casts tall shadows of Joseph Culp, Mike Power and Willem Goedkoop in Cambridge Bay, Canada. Photo: Willem Goedkoop/SLU

Status of Funding for 2014 and Outlook for 2015

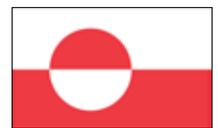
a. Canada

Environment Canada supported Canada's Freshwater Steering Group participation on the project and provided funding (approx. USD\$70K) for Freshwater SG secretariat support through a grant to the Canadian Rivers Institute (CRI). Secretariat funding expires at the end of Fiscal Year 2015-16 and needs to be addressed in upcoming budget discussions. The Canadian High Arctic Research Station (CHARS) provided approximately USD \$40K to have the CRI and the Canadian Polar Commission search for and document all available sources of Canadian metadata for Projects 1 and 2 (i.e., finding data sources on freshwater focal ecosystem components). For 2015, the Canadian FEN will be seeking the current Environment Canada contribution plus an additional USD\$50K to subsidize acquisition of data, analysis and travel associated with the Inter-FEN writing workshop in October 2015. This workshop will provide the primary information for the State of the Arctic Freshwater Biodiversity Assessment.



b. Denmark and Greenland

Funding for 2014 was secured by transferring part of the 2013-budget (approx. USD\$30K) to 2014. A joint application from all national CBMP-group leads to cover basic activities in 2015 was submitted to the Danish Environmental Research Agency in November 2014. The applied amount for the Freshwater SG and FEN activities is USD\$32K. The outcome is expected in spring 2015.



c. Finland

In 2014, Finnish Ministry of the Environment supported Freshwater CBMP-work by granting funding of USD\$6K. The funding was intended for the meeting costs of Finnish FEN. However, meetings have been postponed to 2015. The sum of USD\$12K has been applied to cover the salary and meeting costs in 2015.



d. Iceland

The total travel costs of the Icelandic SG and FEN in 2014 (USD\$9.9K) were covered by the Icelandic Institute of Natural History's (IINH) budget, The Institute of Freshwater Fisheries with a support from the CAFF office. The contribution and work of the Freshwater SG member and Icelandic FEN members is according to the budget of their institutes. No secure funding is available for 2015, although the IINH has a budget to cover 1-2 Steering Group meetings. As for the previous years, the FEN has not had specific funding in 2014 from the Icelandic government for involvement and work in the projects for CBMP-freshwater. The FEN relies on external funding and the courtesy of the FEN members' Institutes for the work scheduled for 2015, as well as for access to available data. The Icelandic FEN's contribution to the scheduled joint FEN will depend on external funding.



e. Norway

The Ministry of Environment (MoE) supported the Norwegian activities of the Freshwater SG in 2014 by funding travel and meeting costs for the Freshwater SG-meeting and for the two meetings in the Norwegian Freshwater Expert Network (FEN). The work-hour costs for the FEN-members were partly supported by the MoE in addition to internal financing in the participating institutes. The total budgets available from the MoE for the Norwegian FEN-work for 2014 were approximately USD\$60K. The work-hour costs for the Freshwater Steering Group-member from Norway are covered by the Norwegian Environment Agency (NEA).



The work of the Norwegian FEN will continue in 2015. NEA will apply for USD\$85-100K from the MoE for the work in 2015. Other potential funding sources will be considered for the FEN-work.

f. Sweden

Swedish FEN and CBMP work was financed with some USD\$53K by the Swedish Agency for Marine and Water Management (SWAM), and additionally supported by the “authority support”, i.e. university funding aimed at supporting SWAM and the Swedish EPA with specific expertise in water issues provided by the Department of Aquatic Sciences and Assessment. We expect similar funding during 2015. Extra funding may, however, be needed to bring the Swedish FEN to the upcoming inter-FEN workshop in Denmark (planned for October 2015).



g. USA

There was no specific funding in 2014 for involvement in the Freshwater SG from US authorities. The US Geological Survey provided in-kind personnel support for Freshwater SG member activities. In 2015, US Geological Survey will continue to provide in-kind personnel support and travel support so the US representative can participate in Freshwater SG meetings and activities.



h. Others (as applicable)

The CAFF-secretariat is coordinating an application for CBMP-freshwater to the Nordic Council of Ministers. The funding applied for is particularly needed to cover costs associated with the inter-FEN workshop in Denmark that the Freshwater Steering Group is planning for October 2015, i.e. for the venue and for travel support.



Aerial photograph of freshwater ecosystems in Northern Canada. Photo: Willem Goedkoop/SLU

Budget

Note: the costs in USD outlined in the table are focused on new efforts to harmonize freshwater biodiversity monitoring, data management and reporting. They do not reflect the actual ongoing monitoring costs.

Milestone	Activities & Deliverables	Total Cost (USD)	Cost Details	Responsibility
1. Governing and operational structure activated	a. 2013 Inaugural meeting of CBMP-FSG b. Annual meeting of CBMP-FSG	50K (10 people at 5K each) plus 5K venue costs per year	Meeting costs (travel support for CBMP-FSG members and venue costs) and conference call costs	Arctic nations for travel support for their members. Lead FSG country for venue costs.
2. Data management structures established	a. Data nodes and hosts, web-entry interfaces, and data standards established	2013: 30K (data node establishment) 2014 onwards: 10K per year (data node management)	Web-entry interface and web-based databases and nodes and data entry manuals established	CAFF CBMP Office
	b. Data nodes linked to web portal and analytical tools developed	2013 onwards: 20K (web portal maintenance)	Data Portal linked to data nodes via XML, and canned analysis tools developed	CAFF CBMP Office
	c. Metadata added to Polar Data Catalogue	2013 onwards: 0K (in-kind support from PDC and CAFF Data Manager)	Metadata entry by University of Laval and CAFF Data Manager free of charge	CAFF CBMP Office
3. Indicator development	a. Identification of existing data sets and historical data, and collection of metadata (Project 1). Spatial and temporal assessment of data coverage for national report (Project 2)	2013-2014: 30-60K per country	Costs for 1 person for 3-6 months per country (depending on country).	Arctic nations
	b. Aggregation of existing data, national and regional dataset compilations, QA/QC, data agreements, and formatting (Project 3)	2014-2015: 30-60K per year per country	Costs will vary depending on state of national datasets. Costs for 1 person for 3-6 months per year per country (depending on country).	Arctic nations
	c. Description of sampling methods for each country and completion of circumpolar report summarizing sampling methods (Project 4)	2015: 5-10K per country	Costs for 1 person for 1-2 month per country (depending on country).	Arctic nations
	d. Analysis of indicator baseline status for each nation, summarized in national report (Project 5)	2015-2016: 30-60K per year per country	Costs for 1 person for 3-6 months per year per country (depending on country).	Arctic nations
	e. Dataset compilations archived	Minimal cost (10K). CAFF Data manager staff time.	All datasets compiled and used to be archived at CAFF Secretariat.	CAFF Secretariat
	f. Accumulation of links to national/ regional protocols, identification of inter-calibration needs, and definition of indicator comparison limits (Project 4)	2014-2015: 30K	Costs for 1 person for 3 months.	CBMP-FSG

Milestone	Activities & Deliverables	Total Cost (USD)	Cost Details	Responsibility
4. Reporting	a. Annual performance reports and work plans	0K - costs reflected above	Performance report/work-plan layout and digital publication	CBMP-FSG
	b. Compilation of national reports to create State of Arctic Freshwater Biodiversity Report	2016-2017: 50K (10 people at 5K each) plus 5K venue costs per year	Meeting costs (travel support for CBMP-FSG members and venue costs) and conference call costs	Arctic nations for travel support. Lead FSG country for venue costs.
5. Program Review and adjustments	a. Review of parameters and sampling approaches.	0K – costs reflected above.		CBMP-FSG
	b. Independent review of data management approach, analysis, and reporting using performance measures	30K every 10 years starting in 2016	Contract independent review of Monitoring Program	CBMP Office
TOTALS		2013: 35-65K per country 2014-2016: 65-125K per year per country		

Looking Ahead

The second year of implementation of the CBMP-Freshwater Plan was primarily spent collecting information about the data that will form the basis for the national and circumpolar assessments of the state of Arctic freshwaters. Under the direction of the Freshwater SG, the national FENs took significant steps towards the assessment of national trends by collecting existing freshwater monitoring data for the pre-industrial, post-industrial, and contemporary time periods and completing summary reports detailing the spatial and temporal coverage of those data in fulfillment of Projects 1 and 2. In the coming year, the national FENs will work to collect monitoring data that were identified as high quality in the Project 2 summary reports and conducting quality assurance/quality control on those data for Project 3. These activities are vital to the implementation of the CBMP-Freshwater Plan, as data collected in 2015 will be used by the FENs to assess the status and trends in freshwater biodiversity in the national state of Arctic freshwaters reports that will be completed in 2016. To ensure a coordinated assessment of these data, the Freshwater SG will organize an inter-FEN workshop in October 2015 to bring together members of all the national FENs. This workshop is intended to promote discussion and collaboration among the national networks while finalizing the outline and approach for national assessment reports. The Freshwater SG will support the national FENs in their 2015 efforts by securing funding for data collection activities and for the inter-FEN workshop, and by working to increase involvement by all Arctic countries, Permanent Participants, and CAFF working groups during the coming year.

The Freshwater SG will work to enhance recognition of the CBMP-Freshwater Plan through general communications, scientific publications, and contributions to national and international efforts. Freshwater SG members will increase and coordinate their efforts to secure funding from national and international organizations to cover the costs of the time and travel associated with the inter-FEN workshop and the implementation of the CBMP-Freshwater Plan. The Freshwater SG and FENs will also seek collaborations with organizations such as the Association of Polar Early Career Scientists (APECS) to enhance capacity and facilitate project completion.

A draft work plan for 2015 is presented below; work plan details will be finalized by the Freshwater SG during their annual meeting in April 2015. The proposed budget for this work plan follows that which was presented in the CBMP Freshwater Plan, with specific details to be determined at the Freshwater SG annual meeting.

Work Plan for 2015

Milestone	Activities & Deliverables	Timeline
1. Plan published	a. Final plan endorsed by CAFF board	Completed 2012
	b. Plan published by CAFF	Completed 2012
2. Governing structure activated	a. Freshwater SG established	Completed 2013 (awaiting Russian representation)
	b. Adoption of Terms of Reference	Completed 2013
	c. Freshwater SG leads confirmed	Completed 2013
	d. National FENs established and membership recorded	Completed 2013 (awaiting Russian FEN)
	e. Support involvement by all Arctic countries	Ongoing
3. Data management	a. FENs review/revise existing contemporary metadata file and add missing data (Project 1)	Completed 2014
	b. FENs search for and add data from post-industrial period and pre-industrial (paleo) period to the metadata file (Project 1)	Completed 2014
	c. Metadata added to Polar Data Catalogue	March 2015
	d. FENs create summary maps for the FECs for the contemporary, post-industrial, and pre-industrial (paleo) periods (Project 2)	To be completed early 2015
	e. FENs complete summary reports describing existing data (Project 2)	To be completed early 2015
	f. FENs acquire data and conduct QA/QC (FSG Project 3)	October 2014 - October 2015
	g. FENs summarize sample methodology in data and create recommendations (Project 4)	October 2014 - October 2015
	h. FSG determines areas of sampling methodology compatibility and incompatibility and creates recommendations for sample methodology and frequency (Project 4)	October 2015 - February 2016
	i. FENs assess freshwater monitoring data for national State of Arctic Freshwaters report (Project 5)	October 2015 - September 2016
4. Indicator development	a. Existing data sets identified	Completed 2014
5. Reporting and coordination	a. 2014 annual performance report submitted to CAFF	January 2015
	b. 2015 work plan submitted to CAFF	January 2015
	c. General communications	Ongoing
	d. Freshwater SG members secure funding from country authorities to support implementation of plan according to Table 13 of the CBMP-Freshwater Plan	Ongoing
	e. Freshwater SG meetings (in-person or teleconference)	Ongoing
	f. National FEN meetings (in-person or teleconference)	Ongoing
	g. Inter-FEN workshop (international meeting of all FENs)	October 2015
	h. Scientific publications	Ongoing

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