CAFF
Conservation of Arctic Flora and Fauna

INTER ⇄ ACT

Work Package 7: Improving and harmonizing biodiversity monitoring workshop report

International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT)
Aarhus University, Copenhagen, Denmark April 25-26, 2018

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

ARCTIC COUNCIL

Work Package 7: Improving and harmonizing biodiversity monitoring International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT)

Aarhus University, Copenhagen, April 25-26, 2018

1 Overview 1
1.1 WP7 Goals 1
1.2 WP7 Deliverables: 2
2 Workshop 2: 2
2.1 RFS Mapping Database 2
2.2 RFS Monitoring plan 3
2.3 RFS Climate station 3
2.4 RFS Data Management Plan 4
2.5 User manual 4
Annex 1: List of remote sensed products derived for Arctic (as defined by CAFF Boundary) 5
Annex 2: Workshop participants 5
Annex 2: The Circumpolar Biodiversity Monitoring Program (CBMP) 6
Annex 3: The International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT) 6

1 Overview

The *International Network for Terrestrial Research and Monitoring in the Arctic* (INTERACT) is an EU funded initiative working towards building capacity to help identify, understand, predict and respond to environmental changes across the Arctic.

INTERACT Work Package (WP) 7 "*Improving and harmonizing biodiversity monitoring*" is led by the Conservation of Arctic Flora and Fauna (CAFF) Arctic Council Working Group. The overall goal of WP7 is to test the circumpolar Freshwater and Terrestrial Arctic biodiversity monitoring plans of CAFF's cornerstone program, the Circumpolar Biodiversity Monitoring Program (CBMP), at INTERACT stations."

The goal of the CBMP monitoring plans is to harmonize and integrate efforts to monitor the Arctic's living resources through a network of scientists, governments, Indigenous organizations, and conservation groups. Through this harmonization and integration, the monitoring plans facilitate more rapid detection, communication, and response to the significant pressures affecting the circumpolar world.

1.1 WP7 Goals

The objectives of WP7 are to:

- Establish an efficient working interface between CBMP and INTERACT;
- Test CBMP Freshwater & Terrestrial Plans in the field
- Identify how data from INTERACT stations can feed into Arctic Council Assessments

To achieve these objectives, WP7 is undertaking a series of tasks (each building upon the other) resulting in a series of products which can be used to help facilitate implementation of CBMP plans in the field.

1.2 WP7 Deliverables:

- Data management plan for the Icelandic Rif station (RFS) in connection with the Arctic Biodiversity Data Service (ABDS) for the selected focal ecosystem components.
- User manual for implementing CBMP at INTERACT stations.
- A report describing the flow of data from the field to Arctic Council assessments, monitoring and reporting activities.
- Please see WP7 Phase 1 report (accessible on project log-in website) for more detailed status on WP7 tasks.

2 Workshop 2:

As part of INTERACT WP7 a group comprising experts from Canada, the Kingdom of Denmark, Iceland, Sweden and the US met on April 25-26 in Copenhagen to help improve and harmonize biodiversity monitoring in the Arctic by pooling resources and experiences (Annex 2). This workshop helped in moving work forwards by reviewing the status of the WP7 deliverables and whereby advice and experience from Canadian High Arctic Research Station (CHARS), Zackenberg Research Station and the leads of the CBMP Freshwater and Terrestrial biodiversity monitoring groups informed the development of RFS; completion of the RFS monitoring plan; and development of a data management plan for RFS.

WP7 Outcomes (status):

- **Workshop report** providing an overview of the meeting and its outcomes, i.e. decisions and actions and responsible parties for each action;
- **Project website** including a meeting login site where all WP7 documents and presentations from the workshop can be accessed [https://caff.is/interact];
- **RFS Monitoring plan** finalised;
- **RFS Mapping database** and first change analysis completed;
- **RFS Data Management Plan** agreement on approach and next steps; and
- Initial discussions as to the format and content of the **user manual for implementing CBMP** at INTERACT stations.

2.1 RFS Mapping Database

At the 2017 WP7 workshop it was agreed that conducting change mapping was a critical first step in the preparation for testing CBMP plans in the field. In order to facilitate change analysis an RFS mapping database was developed comprising both vector and raster data. This includes layers focused on roads, rivers, lakes, contours, habitat types and landcover. In addition, a suite of change indicators were developed for the Arctic (as defined by CAFF Boundary) making over two decades of available for time series analysis i.e. baseline assessment and change detection (see Annex 1). Six of these indicators addressing the terrestrial ecosystem were applied to RFS both for the intensive and extensive monitoring areas (Fig 1). Results for both areas were the same with statistically significant trends detected only for the:

- Normalized Difference Vegetation Index (NDVI) showing that the RFS area is greening: and
- Land Surface Temperature for December is getting colder.

Decisions and next steps:

- Change analysis will also be conducted for coastal and marine indicators at RFS;
- Consider closer exploration of the statistically significant greening and land surface temperature trends found in RFS;
- Change analysis for all indicators to be run for CHARS & Zackenberg;
- CHARS & Zackenberg to provide shapefiles defining the areas for these analyses;
- Arctic DEM Icelandic 20m DEM for RFS to be included within RFS mapping database; and
- Land use data to be compiled for inclusion within the mapping database.

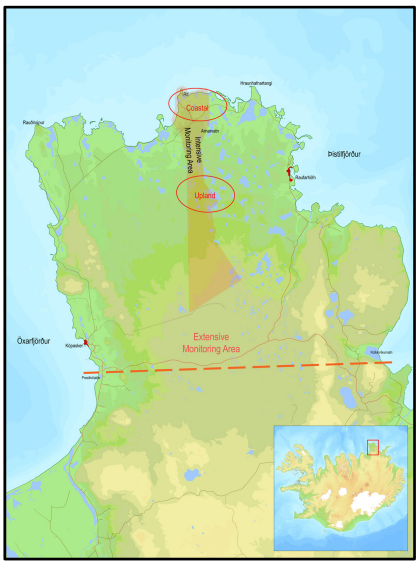

Fig 1: RFS Monitoring areas

2.2 RFS Monitoring plan

The draft RFS Monitoring plan was first reviewed during the 2017 WP7 workshop. It was revised based upon input received and circulated for final review and approval at the April 2018 workshop.

Decisions and next steps:

- It was agreed that the monitoring plan will be revised based upon input received, layed out, published and finalized as version 1.
- Version 1 of the monitoring plan will contain a note that the following items will need to be further defined in the next version of the monitoring plan:
    - Conceptual model;
    - Placement of monitoring plots;
    - Improved access to upland area;
    - utilization of the climate gradient from coast to upland area;
    - How to minimize disturbance due to monitoring e.g. need for boardwalks, tracking activities etc
    - RFS Clients, their needs and requirements and how best to serve them;
    - Use of technology e.g. drones and photography
- Version 2 the monitoring plan will be developed for 2020.

2.3 RFS Climate station

There are two climate stations located within the extensive RFS monitoring area, both situated on the coast. Therefore, it was advised to locate the third climate station in an inland terrestrial area. This would facilitate use of the climate gradient from coast to upland area within RFS monitoring activities.

Decisions and next steps:

- RFS will discuss possibilities for locating the climate station inland with the Icelandic Meteorological Institute.

2.4 RFS Data Management Plan

The goal of this Data Management Plan (DMP) is to ensure that data on selected Focal Ecosystem Components (FECs) defined within CAFFs collected at RFS are documented, made accessible, and preserved for future use via the Arctic Biodiversity Data Service (ABDS).

The DMP will provide descriptive details of the data collection and processing procedures to be applied at RFS and will comprise the following components:

- Data Management Principles: describing the data management principles and guidelines for management of data from RFS;
- Data collection: describing data collection, storage and processing at RFS.
- Data handling: describing how data from RFS will be delivered to the ABDS

Decisions and next steps:

- The DMP should focus just on baseline managing being conducted by RFS. It should not seek to archive data from all research activities conducted by others but ask for these data to be made accessible and provide the access details to RFS;
- CHARS data management principles and guidelines to be used to inform RFS principles and guidelines. CAFF Sec to make first draft in advance of the August workshop;
- A data management workshop is scheduled for August 14-16, in Akureyri focusing on making a first draft of the DMP. Workshop participants will include: Zackenberg and CHARS Data Managers; RFS and CAFF Secretariat;
- Upon completion of workshop draft DMP to be circulated for WP7 review and is scheduled to be finalised for 30th September; and
- The DMP needs to be generic enough that it can apply to stations other than RFS.

2.5 User manual

First discussion was held on how to structure the user manual and what it will contain.

Items to consider

- The user manual to consist of a series of components each building upon the other:
    - Sample monitoring plan (RFS)
    - Data Management Plan
    - Data dissemination (how data moves from a station to the ABDS)
- This will be a focus of the 2019 workshop

Annex 1: Remote sensed products derived for Arctic (as defined by CAFF Boundary)

Product	Data Source and Product Name	Temporal Selection	Spatial Resolution	Product
Land Surface Temperature (LST), Day	MODIS MOD11C3	Monthly, 2000-2017	0.05 deg (~5,600m)	Land Surface Temperature (LST), Day
Percent Snow Covered Area	MODIS MOD10CM	Monthly, 2000-2017, March-October	0.05deg (~5,600m)	Percent Snow Covered Area
Normalized Difference Vegetation Index (NDVI)	MODIS MOD13C1	16-day; May-September, 2000-2017	0.05deg (~5,600m)	Normalized Difference Vegetation Index (NDVI)
Enhanced Vegetation Index (EVI)	MODIS MOD13C1	16-day; May-September, 2000-2017	0.05deg (~5,600m)	Enhanced Vegetation Index (EVI)
Green Up Date	MODIS MCD12Q2	Yearly, 2001-2014	500m	Green Up Date
Senescence Date	MODIS MCD12Q2	Yearly, 2001-2014	500m	Senescence Date
Growing Season Length	MODIS MCD12Q2	Yearly, 2001-2014	500m	Growing Season Length
Burned Area	MODIS ABBA	Yearly, 2001-2015	500m	Burned Area
Soil Moisture	AMSR-E, Aquarius, SMAP			Soil Moisture

Annex 2: Workshop participants

- Donald McLennan, CHARS research station
- Erica Oberndorfer, CAFF-ASC Fellow
- Niels Martin Schmidt, Zackenberg research station
- Mora Aronsson, Swedish University of Agricultural Sciences and CBMP Terrestrial co-lead
- Hólmgrímur Helgason, CAFF secretariat
- Hrönn Guðmundsdóttir, Rif station manager
- Jonas Koefoed Rømer, Zackenberg research station
- Kári Fannar Lárusson, CAFF secretariat
- Sarah Longan, North Slope Science Initiative and CBMP co-Lead
- Starri Heiðmarsson, Icelandic Institute of Natural History, CBMP Terrestrial co lead and Rif board
- Tom Christensen, Aarhus University and CBMP co-Lead
- Tom Barry, CAFF secretariat
- Willem Goedkoop, Swedish University of Agricultural Sciences and CBMP Freshwater co-Lead
- Þorkell Lindberg Þórarinsson, Northeast Iceland Nature Research Centre and Rif board

Annex 3: The Circumpolar Biodiversity Monitoring Program (CBMP)

The Circumpolar Biodiversity Monitoring Programme (CBMP) Circumpolar Biodiversity Monitoring Program (CBMP) is a cornerstone program of the Conservation of Arctic Flora and Fauna (CAFF) Arctic Council Working Group. It is an international network of scientists, government agencies, Indigenous organizations and conservation groups working together to harmonize and integrate efforts to monitor the Arctic's living resources.

The CBMP is developing four coordinated and integrated Arctic Biodiversity Monitoring Plans to help guide circumpolar monitoring efforts. Results will be channeled into effective conservation, mitigation and adaptation policies supporting the Arctic. These plans represent the Arctic's major ecosystems: Marine; Freshwater; Terrestrial; and Coastal

The CBMP facilitates Arctic biodiversity conservation and the sustainable use of the region's natural resources. Its goal is to facilitate more rapid detection, communication, and response to significant biodiversity-related trends and pressures. It does this by:

- Harmonizing and enhancing Arctic monitoring efforts, thereby improving the ability to detect and understand significant trends; and,
- Reporting to, and communicating with, key decision makers and stakeholders, thereby enabling effective conservation and adaptation responses to changes in Arctic biodiversity.

Annex 4: The International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT)

INTERACT is an infrastructure project under the auspices of SCANNET, a circumarctic network of currently 79 terrestrial field bases in northern Europe, Russia, US, Canada, Greenland, Iceland, the Faroe Islands and Scotland as well as stations in northern alpine areas. INTERACT specifically seeks to build capacity for research and monitoring in the European Arctic and beyond, and is offering access to numerous research stations through the Transnational Access program.

Funded by the EU, INTERACT has a main objective to build capacity for identifying, understanding, predicting and responding to diverse environmental changes throughout the wide environmental and land-use envelopes of the Arctic. This is necessary because the Arctic is so vast and so sparsely populated that environmental observing capacity is limited compared to most other latitudes.

INTERACT is multidisciplinary: together, the stations in INTERACT host thousands of scientists from around the world who work on projects within the fields of glaciology, permafrost, climate, ecology, biodiversity and biogeochemical cycling. The INTERACT stations also host and facilitate many international single-discipline networks and aid training by hosting summer schools.

INTERACT station managers and researchers have established partnerships that are developing more efficient networks of sensors to measure changing environmental conditions and the partnerships are also making data storage and accessibility more efficient through a single portal. New will communities of researchers are being offered access to terrestrial infrastructures while local stakeholders as well as major international organizations are involved in interactions with the infrastructures.

Further information can be found on the project website: https://caff.is/interact