

Arctic Spatial Data Infrastructure

- A circumpolar mapping initiative -



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EPPR II and UAS Workshop
Seattle



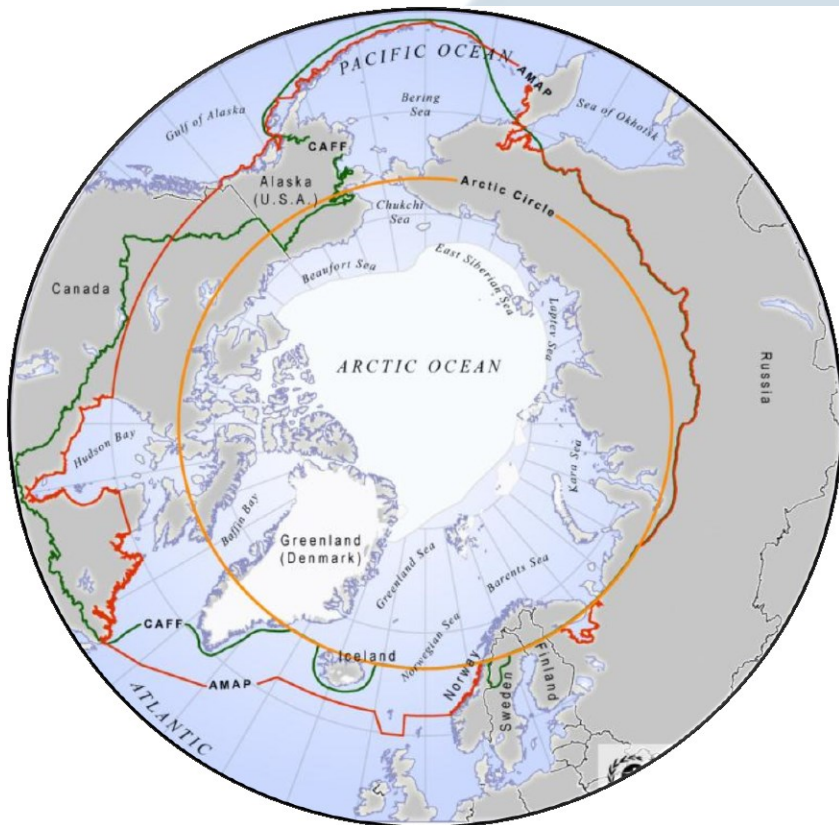
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www.arctic-sdi.org





The Arctic



- 1/6 of the earth's landmass
- More than 30 million km²
- 8 countries
- 24 hours- all time zones



What is a Spatial Data Infrastructure?

is a **coordinated series of agreements** on technology standards, institutional arrangements, and policies that **enable** the **discovery and use** of **geospatial information** by **users** and for purposes other than those it was created for

Kuhn, W. (2005) presentation "Introduction to Spatial Data Infrastructures".



Spatial Data Infrastructure Basics

- Data and metadata are managed by the ***data originator and/or owner***
- Tools and services connect via computer networks to the various sources through a ***common end point***

To achieve the objectives

- ***coordination*** is necessary
- ***standards*** are essential

Steiniger, S., and Hunter, A.J.S. (2012) preprint "Free and open source GIS software for building a spatial data infrastructure".



Arctic SDI

A cooperation between the mapping agencies of

Canada

Denmark including Greenland and Faroe Island

Finland

Iceland

Russia

Sweden

USA

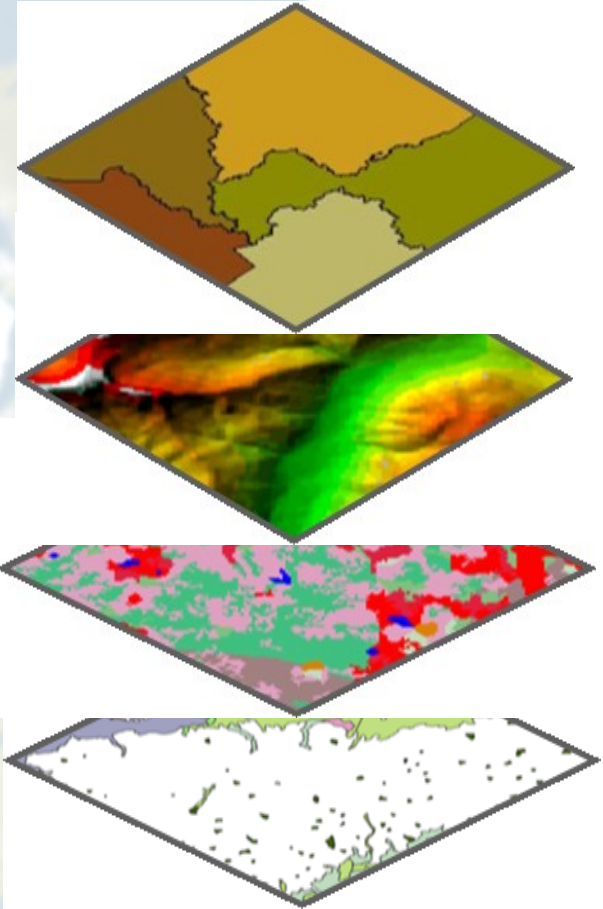




Main Content of the Arctic SDI

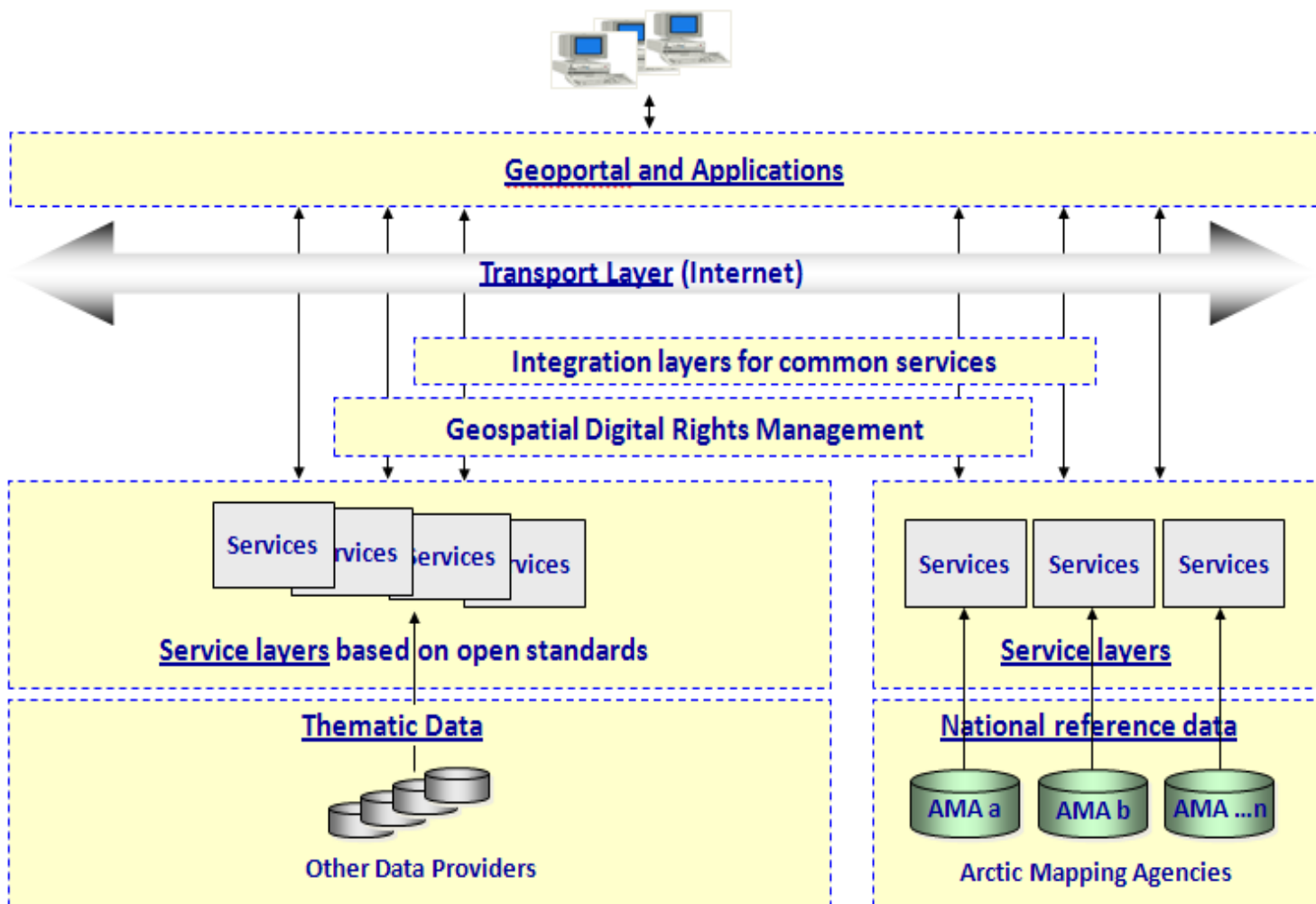
The Arctic SDI is an infrastructure that provides a web portal with easy access to:

- A geoportal for geospatial data viewing and discovery
- A searchable metadata catalogue
- Authoritative reference data as a Web Map Service (WMS)
- Thematic data (birds, icecover, ship routes, land cover change, flora etc.)





Architecture of the Arctic SDI





1:250k Basemap from National Mapping Agencies

The screenshot displays a web browser window with the following elements:

- Browser Tabs:** Arctic SDI Guest - ASDI view, 159.162.102.133/oskari-map, myUSGS 4.0- AHTWG, https://webforms.us..., Calendar - Calendar, USGS AK GIS Workin..., od, tod, tom: Todoist, TOMIS | Sign In, Alaska Map Plannin...
- Map Interface:** A detailed topographic basemap of a region in Sweden, showing roads, water bodies, and terrain. The map is centered around the area of Gäddede and Gäddedeån.
- Search and Login:** A search bar and a login section with fields for Username and Password, and a Log in button.
- Map Layers:** A sidebar on the left with sections for SEARCH, MAP LAYERS, SELECTED LAYERS, MY DATA, and CREATE MAP.
- Coordinate Box:** A box on the right side of the map showing coordinates: North Pole LAEA Europe, N: -3302738, E: 434201.
- Scale:** A scale bar at the bottom left of the map showing 10 km and 5 mi.

Location Search

Search

Location	Area	Type
Angoon	Hoonah-Angoon Census Area, United States	city, village,...
Barrow	North Slope Borough, United States	city, village,...
Bethel	Bethel Census Area, United States	city, village,...
Cordova	Valdez-Cordova Census Area, United States	city, village,...
Dillingham	Dillingham Census Area, United States	city, village,...
Eagle	Southeast Fairbanks Census Area, United States	city, village,...
Haines	Haines Borough, United States	city, village,...
Homer	Kenai Peninsula Borough, United States	city, village,...
Juneau	Juneau City and Borough, United States	city, village,...
Kenai	Kenai Peninsula Borough, United States	city, village,...
Ketchikan	Ketchikan Gateway Borough, United States	city, village,...
Kotzebue	Northwest Arctic Borough, United States	city, village,...
Nenana	Yukon-Koyukuk Census Area, United States	city, village,...
Nome	Nome Census Area, United States	city, village,...
Palmer	Matanuska-Susitna Borough, United States	city, village,...
Petersburg	Wrangell-Petersburg Census Area, United States	city, village,...
Seward	Kenai Peninsula Borough, United States	city, village,...
Sitka	Sitka City and Borough, United States	city, village,...
Skagway	Skagway Municipality, United States	city, village,...

Search Results

Nenana
Yukon-Koyukuk Census Area, United States
city, village,....
[Close](#)

200 km
200 mi

North Pole LAEA Europe
N: 4867050
E: 3701226



Metadata Search

Arctic SDI Guest - ASDI view x

159.162.102.133/oskari-map

Apps Bookmarks Inbox - rdanderson... Quicktime Time and... USGS WebEx Enterp... DOI Remote Access DOI Access Portal - ... myUSGS 4.0- AHTWG https://webforms.us... Calendar - Calendar USGS AK GIS Workin... od, tod, tom: Todoist TOMIS | Sign In Alaska Map Plannin...

Search

Location Search Metadata Search

Search Results [Edit search options](#)

Name

- Permafrost decay rates for frozen peatlands in northern Quebec, CAFF [i](#) [x](#)
- Distribution of the eiders. [i](#) [x](#)
- Number of marine mammal species in Arctic marine regions, Conservation of Arctic Flora and Fauna (CAFF) [i](#) [x](#)
- Circumpolar map of all polar bear subpopulation - Davis Strait, Conservation of Arctic Flora and Fauna (CAFF) [i](#) [x](#)
- Sites of existing river biotic and abiotic data in the CAFF designated zone., CAFF [i](#) [x](#)
- CBMP Arctic Marine Areas (AMAs), CAFF [i](#) [x](#)
- Species richness of marine mammals, Conservation of Arctic Flora and Fauna (CAFF) [i](#) [x](#)
- Mean trophic levels in seven sub-Arctic and Arctic Large Marine Ecosystems, Conservation of Arctic Flora and Fauna (CAFF) [i](#) [x](#)
- Distribution of Arctic Char species, CAFF [i](#) [x](#)
- Large Marine Ecosystems (LMEs) of the Arctic area, CAFF [i](#) [x](#)
- Terrestrial monitoring sites as identified in CBMPs terrestrial monitoring plan, CAFF [i](#) [x](#)
- Eight Arctic Marine Areas, Conservation of Arctic Flora and Fauna (CAFF) [i](#) [x](#)
- Circumpolar map of all polar bear subpopulation [i](#) [x](#)
- Circumpolar map of all polar bear subpopulation - Chukchi Sea, Conservation of Arctic Flora and Fauna (CAFF) [i](#) [x](#)
- Alternative delineations between Canadian polar bear subpopulations, Conservation of Arctic Flora and Fauna (CAFF) [i](#) [x](#)
- Regions used to enumerate Arctic marine mammal species, Conservation of Arctic Flora and Fauna (CAFF) [i](#) [x](#)

200 km
200 mi

North Pole LAEA Europe
N: 3220464
E: 2837772

Dataflow "Full" Arctic SDI

Data Collection (Feeds)

Action



Decision support

Visualization

View Download Registries Processing Services

Data Storage

A Short History

Arctic SDI discussions have been ongoing for a number of years

1990s **GITBarents**, Finland, Norway, Russia and Sweden

2007 **Yellowknife Declaration** - GeoNorth Conference

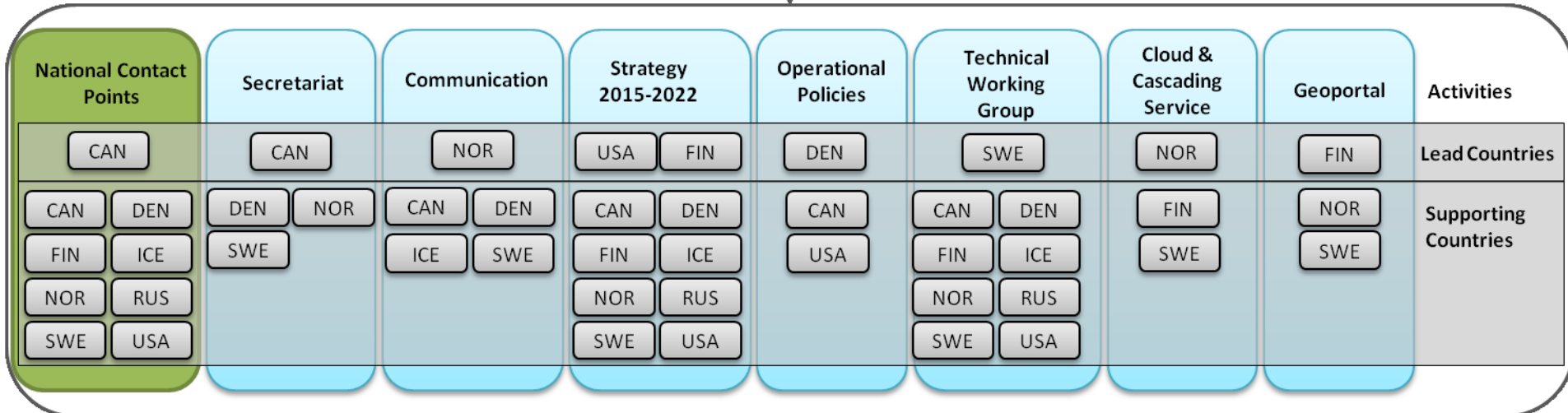
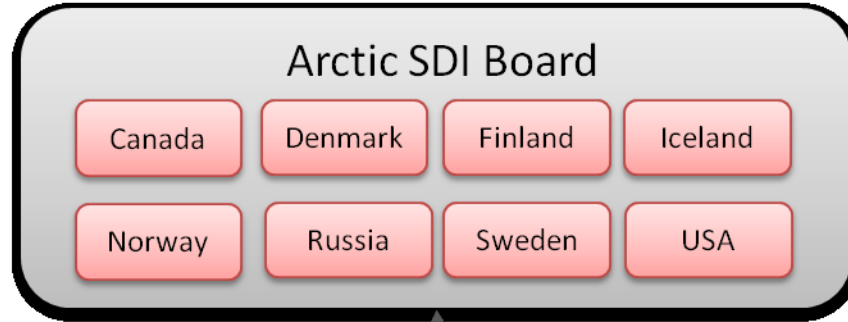
2009 Formal **Arctic Council** support – SAO meeting

2011- the Arctic SDI project launched by the 8 National Mapping Agencies with CAFF acting as a link to the SAOs

The foundation for the Arctic SDI is the legally non-binding “Memorandum of Understanding” (MOU) signed by participating NMAs in 2014



Arctic SDI Organizational Structure





Aim and Vision of Arctic SDI

Aim: To provide politicians, governments, policy makers, scientists, private enterprises and citizens in the Arctic **access to geographically related Arctic data**, digital maps and tools to facilitate monitoring and decision making

Vision: An Arctic SDI – based on sustainable co-operation between mandated national mapping organizations – which will **provide for access to spatially related reliable information over the Arctic** to facilitate monitoring and decision making



Users, Stakeholders and Data Providers

- Arctic Council
- Working Groups: CAFF, EPPR, PAME, AMAP
- Academic institutions in the Arctic
- Government and governmental authorities
- Media, citizens, NGOs,...



Benefits

How can the Arctic SDI serve the AC WGs?

- Can be used for visualizing the work of the Arctic Council and their WG
- Supporting stakeholders in meeting their goals and objectives by using reliable, interoperable, authoritative geospatial reference data from the National Mapping Agencies of the Arctic
- Provides a reference data basemap for viewing thematic datasets
- Providing stakeholders with a tool for more robust management and manipulation of data thus supporting monitoring and decision making
- Can be used to provide access to WG data through both the geoportal and metadata catalog



Project Framework and Phases

Establishing Phase 2011/2014

- Memorandum of Understanding, 2014
- Simplified Governance
- Reference Model
- Working Groups Established

Structuring Phase 2010/2011

- Arctic Council Links
- Project Management
- Technical Group
- Steering Committee

Operational Phase 2014/2015

- Geoportal
- Metadata Catalogue
- Web Map Service- National Mapping Data
- Thematic Data Provider Partnerships- CAFF

SDI Engagement Phase 2015/2020

- Leverage Global/National SDI Communities
- Stakeholder Engagement and Requirements
- From Strategy to Roadmap to Projects
- SDI Interoperability
- Resource Allocation and Business Models
- Voluntary Resource Commitment to Tasks
- Performance Metrics
- Standards Coordination

2014 – Status

- Geoportal
- Metadata Catalogue
- Web Map Reference Data Service 1:250.000
- CAFF thematic data
- Strategic Plan 2015 – 2020
- Senior Arctic Official - invitation to start dialogue with all Arctic Council Working Groups

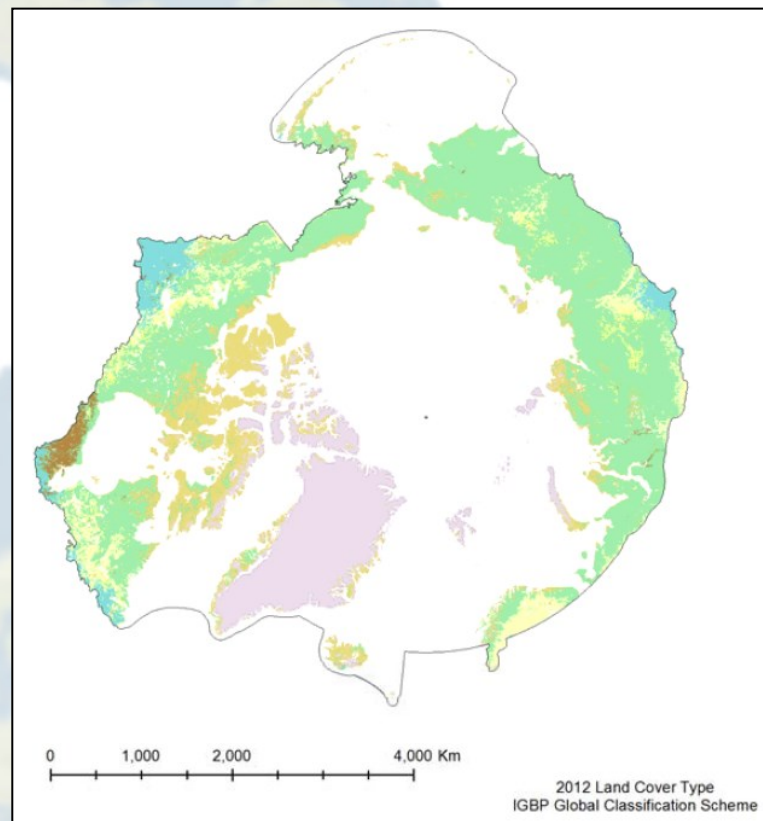


WG Example:

CAFF - Earth Observation Products

CAFF commissioned Michigan Tech to develop circumpolar earth observation products from MODerate resolution Imaging Spectroradiometer (MODIS) sensor

- Approximately 6,000 files across 12 products
- Time-series from 2002
- 36 spectral bands
- 250, 500, 1000m resolutions
- 55 tiles at 250m to cover CAFF defined pan-Arctic extent
- Lambert Azimuthal Equal Area Polar Projection



Product	Resolution	Time Series
Normalized Difference Vegetation Index and Enhanced Vegetation Index	0.05 deg (~5600 m)	16-day; May-September, 2000-2013
Land Cover Dynamics (Vegetation Phenology)	500m	2001 - 2010
Land Cover Type	0.05 deg (~5600 m)	2001 - 2012
Land Surface Temperature	0.05 deg (~5600 m)	Monthly; Feb. 2000 - present
Albedo	0.05 deg (~5600 m)	16-day; Feb. 2000 - present
Snow Covered Area	0.05 deg (~5600 m)	Monthly; March 2000 - present
Land Water Mask	0.05 deg (~5600 m)	Monthly; March 2000 - present
Sea Surface Temperature, Nighttime	4 km	Monthly; June 2002 - present
Marine Chlorophyll a	4 km	Monthly; June 2002 - present
Coloured Dissolved Organic Matter	4 km	Monthly during March to Oct. period; Jun 2002 - present
Marine Primary Productivity	9 km	Monthly; July 2002 - present



Arctic SDI Role in CAFF Project

- Arctic Spatial Data Infrastructure (Arctic SDI) enables geospatial data discovery and sharing through Geoportal and Metadata Catalogue
- Data are housed and Web Mapping Services (WMS) are served from CAFF
- WMS were added to Arctic SDI Geoportal and dataset metadata were harvested into the Arctic SDI Metadata Catalogue
- Distributed Arctic SDI effort supporting all project components including assistance from Canada, Iceland, Sweden, Finland and Norway

CAFF – EOP Available on Arctic SDI Geoportal

The screenshot displays the Arctic SDI Geoportal interface. On the left, there is a sidebar with navigation options: SEARCH, MAP LAYERS, SELECTED LAYERS (1, 2), MY DATA, and MAP PUBLISHING. Below these are fields for Username and Password, and a Log in button. The main content area is titled 'Map Layers' and features a search bar and a list of layers. The 'CAFF (8)' section is expanded, showing the following layers:

- CAFF Albedo
- CAFF CDOM
- CAFF Chlorophyll
- CAFF LandCoverType
- CAFF PrimaryProductivity
- CAFF SeaSurfaceTemperature
- CAFF SnowCoveredArea
- CAFF Vegetation

The map itself shows the Arctic region with a color-coded overlay representing the CAFF PrimaryProductivity layer. The map includes labels for various countries and regions: United States, Canada, Greenland, Iceland, Finland, Sweden, Norway, Denmark, Poland, Ukraine, Russia, China, Hong Kong, Kazakhstan, and St. Pierre and Miquelon. A scale bar at the bottom left indicates 1000 km and 500 mi. The bottom of the screen shows a Windows taskbar with various application icons and a system tray with the date and time: 2:16 PM, 12/2/2014.



Future Examples

- Access to relevant and updated **thematic geospatial** information covering the entire circumpolar region
- Visualizing the work of the Arctic Council and its WGs
- Possibilities for governmental authorities and decision makers to always have access to receive relevant and updated information
- Daily use of the project's web map services in schools and universities in the Arctic and elsewhere.
- Possibilities for media to receive relevant and updated information
- Possibilities to foster cooperation with industry on Arctic issues



How Can You Contribute ?

- Provide digital access to your thematic data
- Manage your data according to international standards for data
- Demand standards to be applied by partners producing or distributing your data
- Update the metadata information for your data in the metadata catalogue
- Visit the Arctic SDI website to learn more



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Thank You!!

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