

North American Environmental Atlas



JPAC Public Session

June Thormodsgard

USGS

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INEGI



Trois pays s'unissent pour cartographier notre environnement à tous



Three countries working together to map our shared environment

Tres países trabajando juntos para cartografiar nuestro medio ambiente

Introduction



At the present time, at least 80% of the decisions taken are based on geospatial information.

On the other side, the geographic phenomena are transboundary, that's why a continental integration of the geographic information is necessary.

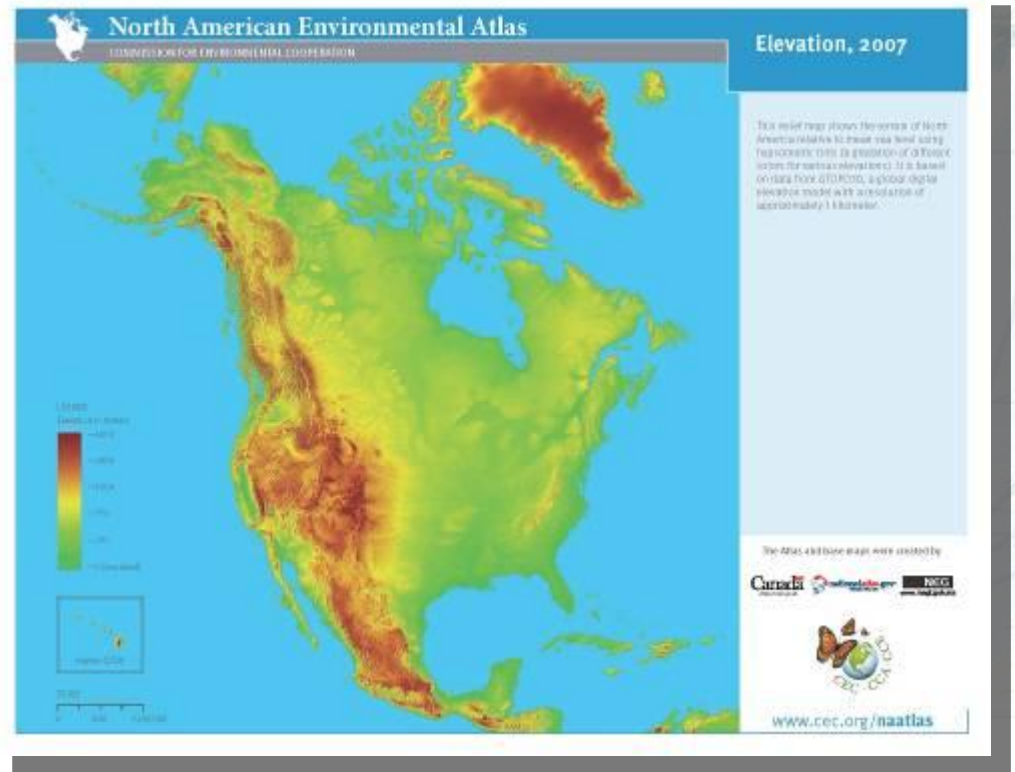
The dissemination of that integrated geographic information has also the same level of importance, considering the different users: specialists, decision makers and the public in general.



Coordinated by the Commission for Environmental Cooperation, since 2003, the construction of the North American Environmental Atlas is based on standards integration that results on the interoperability of the 3 cartographic systems.



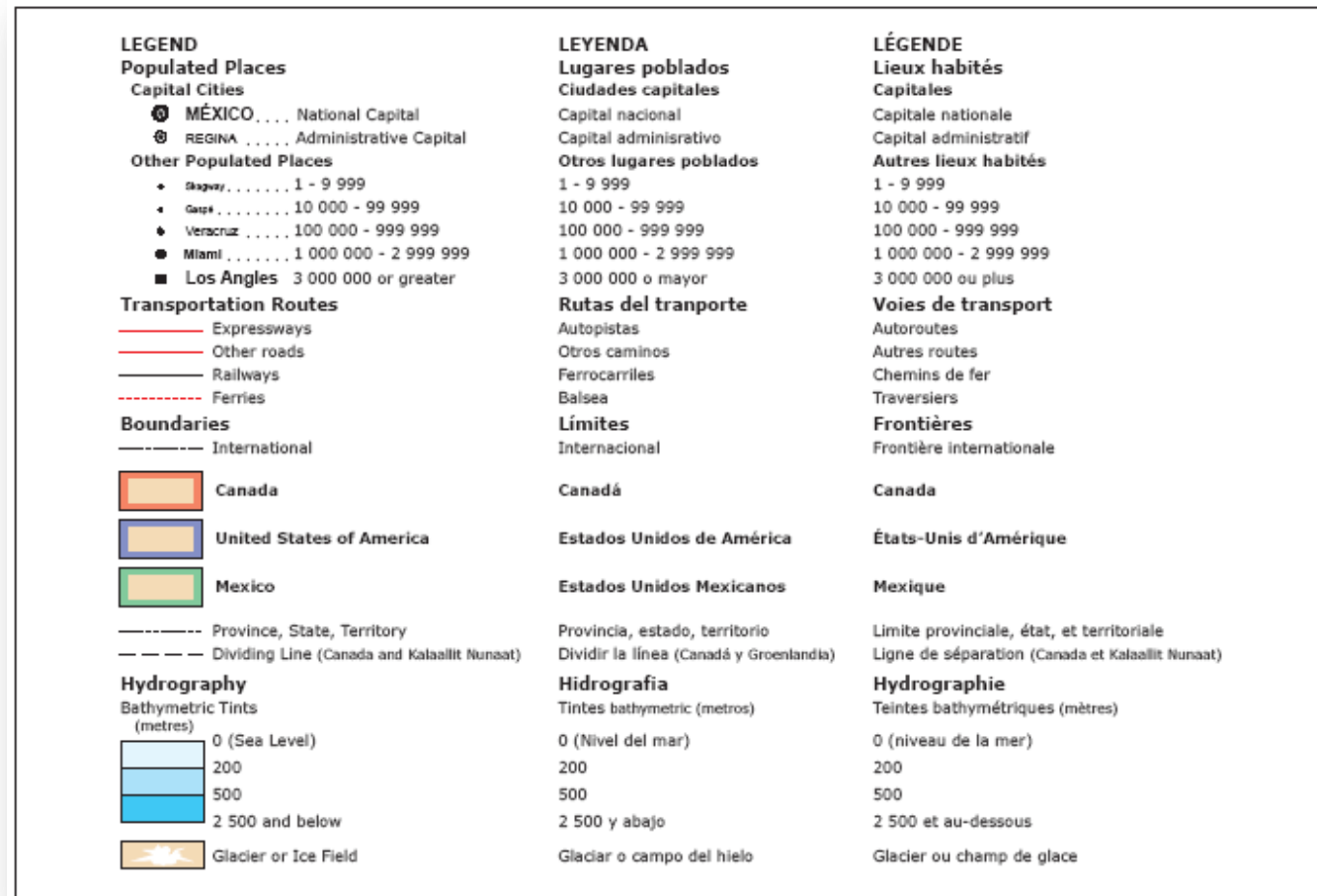
A seamless view of North America.
 The maps and data are harmonized at the borders and consistent across the continent



Base Map



The first product of this tri-national effort was a Base Map

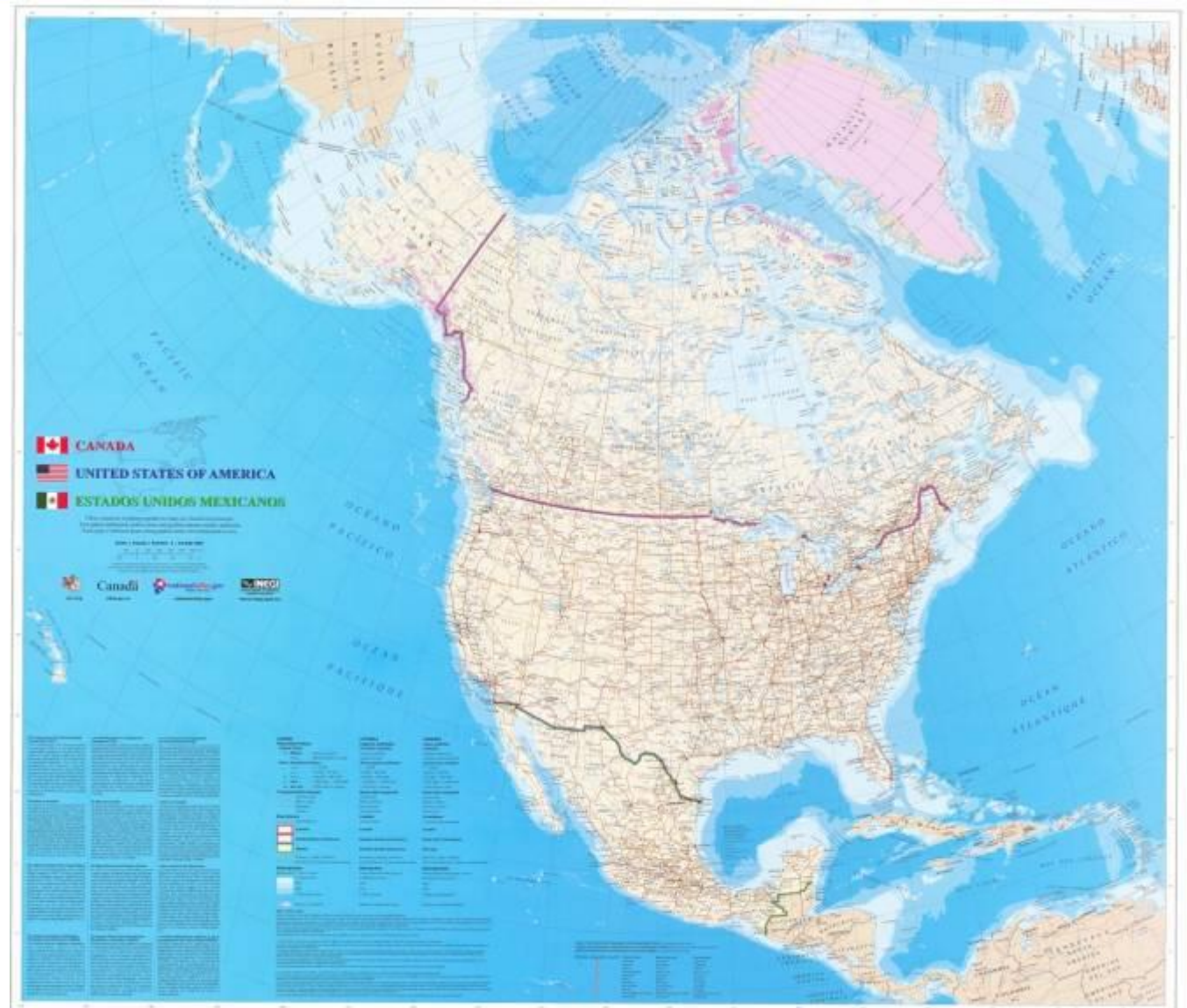


North America base map



This map was prepared and printed at scale 1:10 000 000.

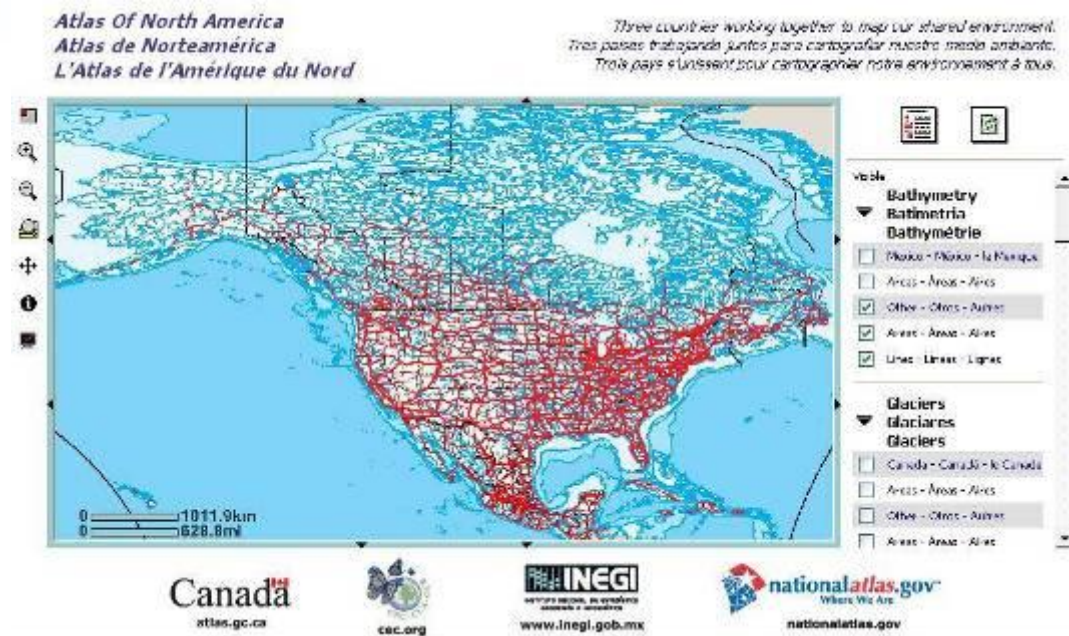
And had a broad and free distribution .



Electronic version by Web services



- Map services implementation:
 - Canada: Cubewerx
 - United States: ArcIMS
 - México: Mapserver
- OpenGeospatial Consortium (OGC) Standards.

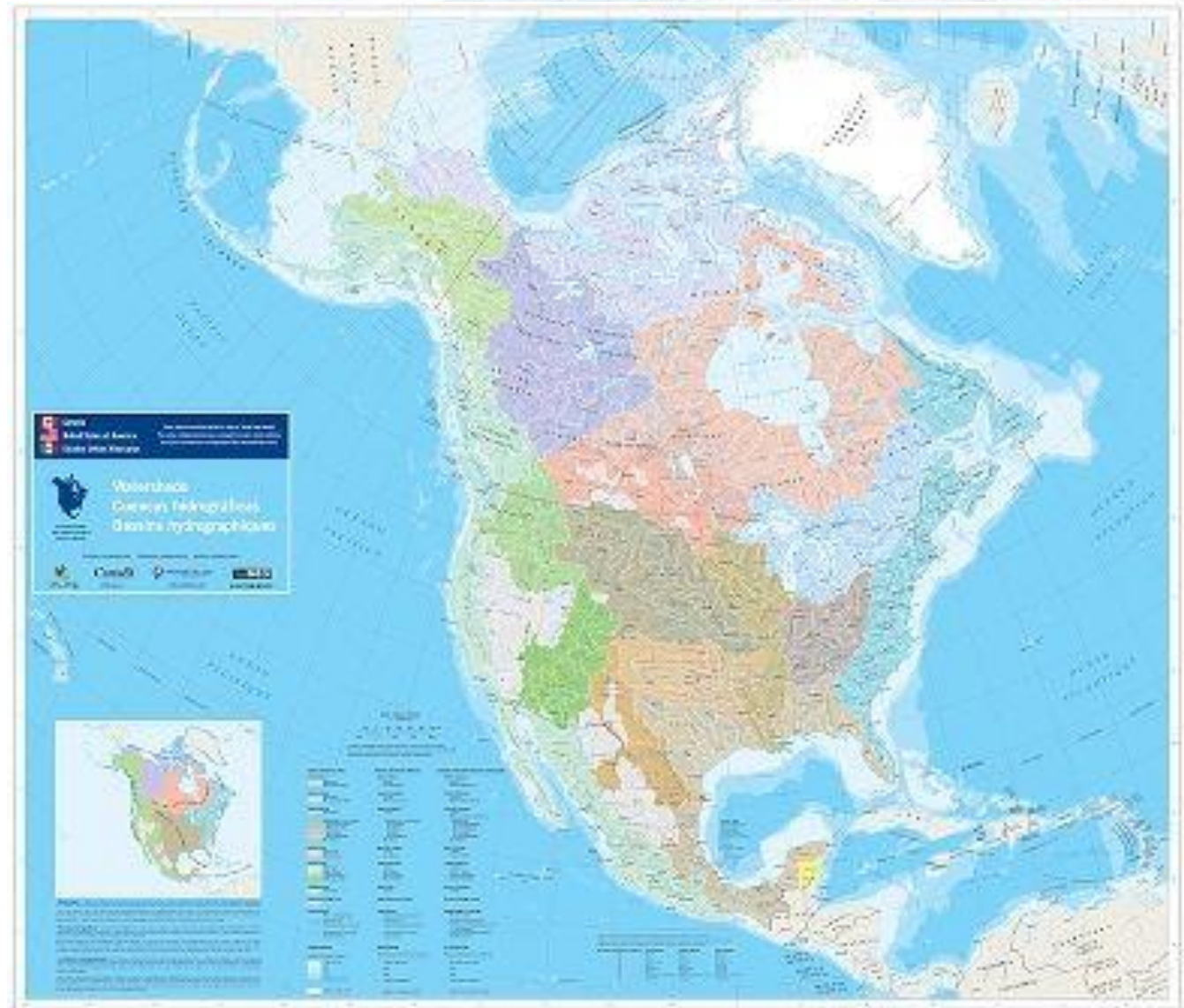


Watershed Map



Also printed at
1:10 000 000
scale.

Presented
during the World
Water Forum in
Mexico city 2006



Availability



A collaborative effort



- CEC's North American Environmental Atlas website launched in 2008.
- This site will be updated soon.

The screenshot shows the CEC.org website interface. At the top left is the CEC logo (a globe with butterflies) and the text 'cec.org'. Below this is a navigation bar with 'Information Tools > Maps'. The main content area features a large map of North America on the left, titled 'Using the North American Atlas Framework'. To the right of the map is a section titled 'Mapping North American Environmental Issues' with a paragraph of text. Below the text is a smaller map titled 'North American Environmental Atlas'.

cec.org

Information Tools > Maps

Mapping North American Environmental Issues

The CEC works with key mapping agency partners in Canada, Mexico, and the United States to promote understanding of significant continental-scale environmental issues through the *North American Environmental Atlas*.

As an initial activity, the National Atlas agencies of Canada, Mexico, and the United States – Natural Resources Canada; Mexico's National Institute of Statistics and Geography; and the U.S. Geological Survey – created harmonized base map layers of North America. These base layers of political boundaries, populated places, roads and railroads, coastlines, lakes and rivers, and other geographic features provide a consistent North American atlas framework for future collaboration.

Using the North American Atlas Framework

North American Environmental Atlas

Bathymetry



Shows the depth in meters for ocean areas covered by the extent of the North American Atlas.

Isobaths (lines of equal depth) are provided for sea level (coastline, with depth = 0), 0-200, 200-500, 500-2500, and greater than 2500 mbsl.

Glaciers and Sea Ice



Shows areas of permanent ice found on North America including Greenland, areas of land found within glaciers, as well as the approximate extent of marine areas in the Arctic covered by permanent polar ice. The sea ice data originated from the Canadian Ice Service and shows the average minimum ice limit over a 30 year period, 1969-1999.

Hydrography



Shows the coastline, major rivers, streams, canals and major lakes and reservoirs.

Major roads, 2004



The roads included are either those that connect major centers of population or selected frontier roads. There are three road classes:

Major roads,
Secondary roads,
and Ferries,

Political Boundaries, 2004



This base layer shows political entities in North America as polygons representing jurisdictional areas, and as lines representing political boundaries including International boundaries, Provincial boundaries and State or territory boundaries.

Populated Places, 2004



The selection of populated places was based on local importance, population size, importance as a cross-border point, and, occasionally, on other factors.

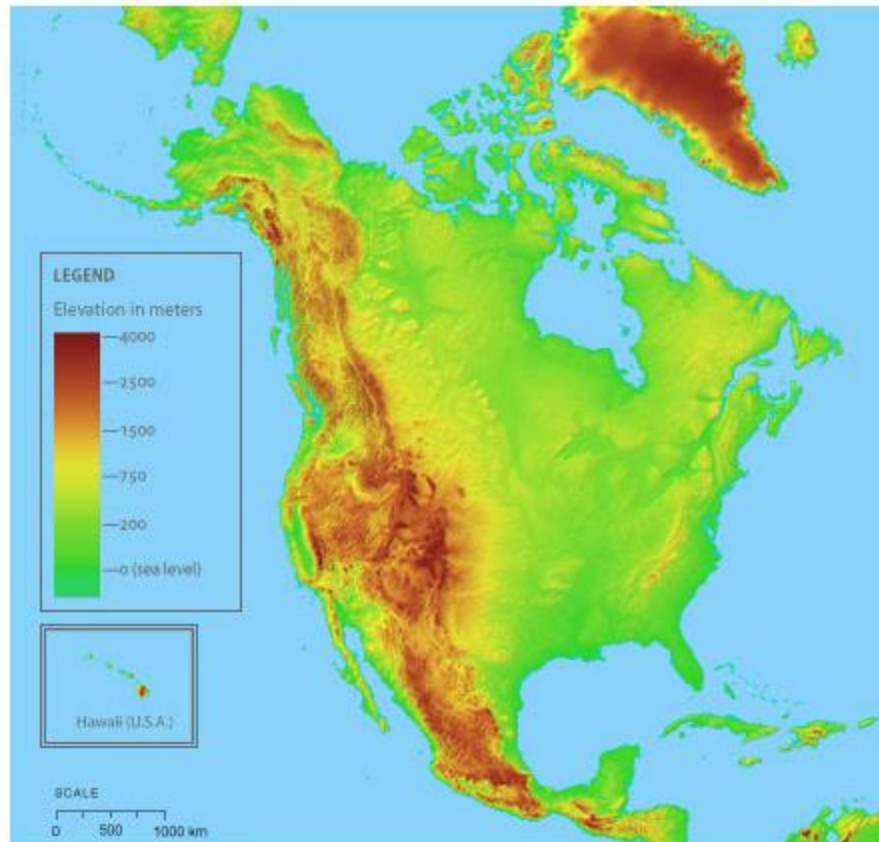
All capital cities (national, provincial, territorial or State) are included for Canada, Mexico, and the United States of America.

Railroads, 2004



This base layer shows the railroads of North America. They include either rail links between major centers of population and major resource railways.

Elevation



- Land
- Elevation
- Seasonal Land Cover Change
- Water
- Biodiversity and Conservation
- Population and Infrastructure
- Human Influence on the Environment

Available for this map layer

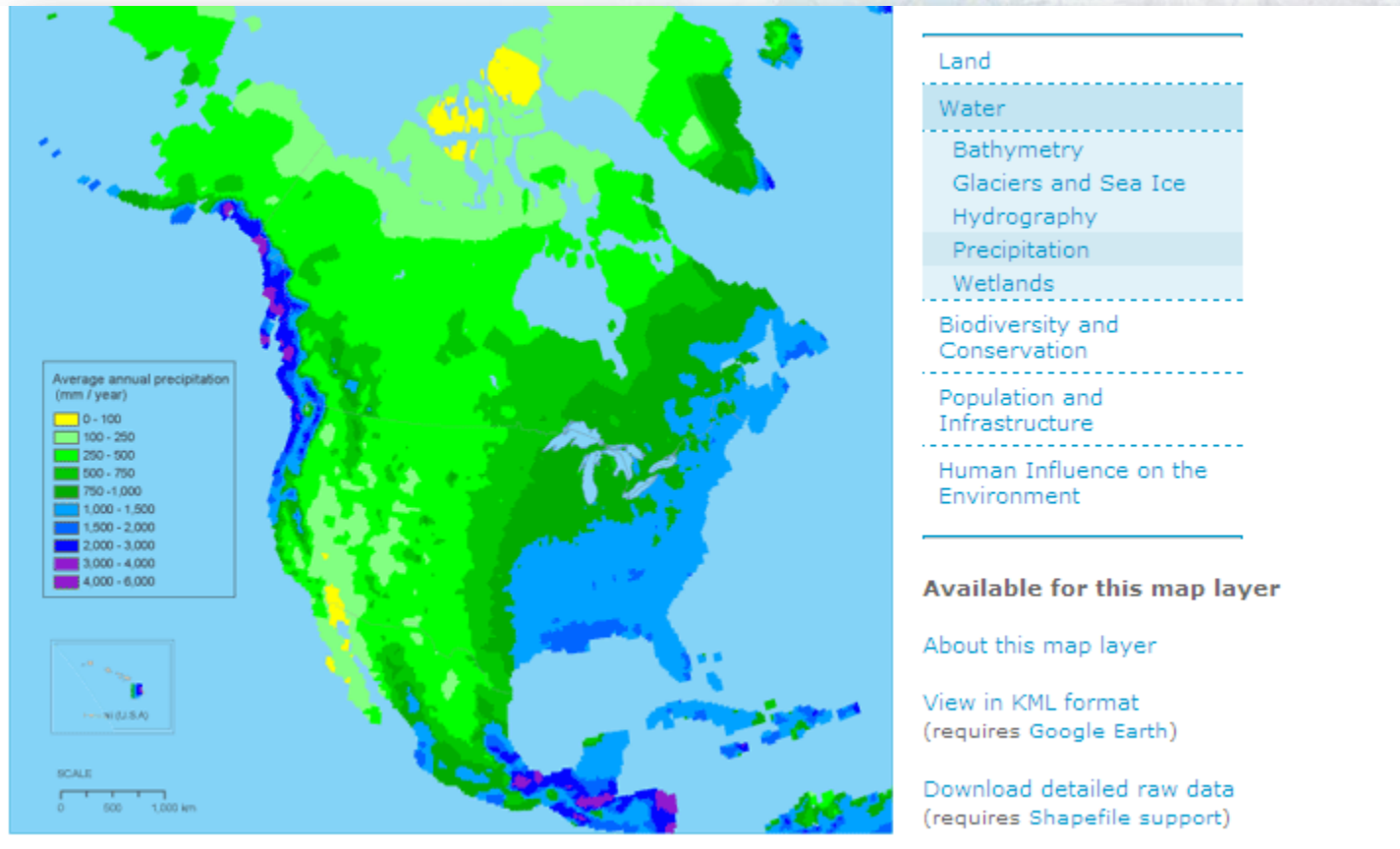
[About this map layer \(view metadata\)](#)

[Download raw data*](#)
(requires GeoTIFF, ASCII, or ERDAS/Imagine support)

* Warning : 77 MB download

Shows the relief of North America using hypsometric tints. The image was created by INEGI using an elevation layer compiled by the National Atlas of the United States®. This North American Atlas base layer is a digital elevation model with resolution of approximately 1 kilometer.

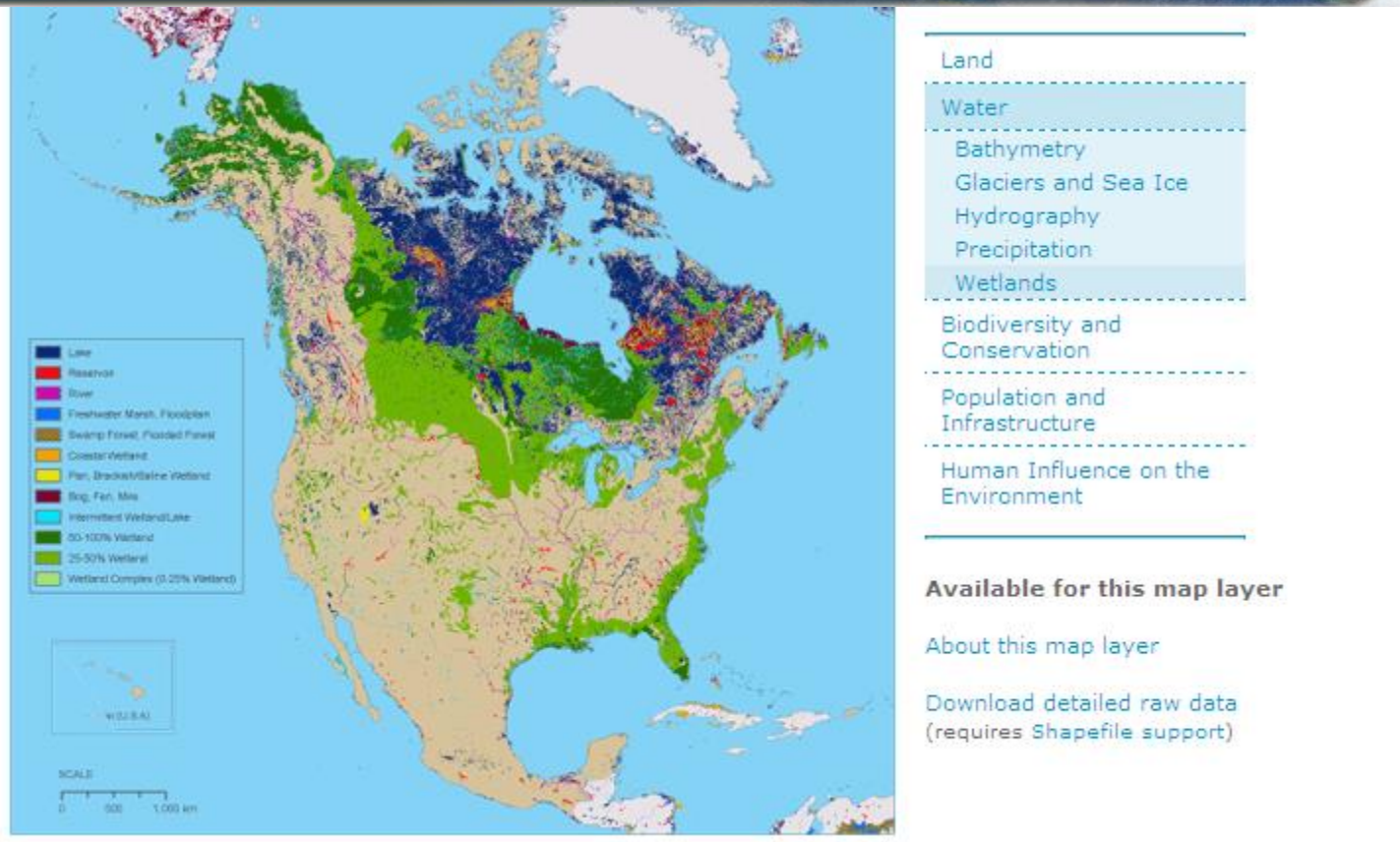
Precipitation



Shows the mean annual precipitation across North America for the period 1951-2000.

Source: Schneider, U.T, Fuchs, A. Meyer-Christoffer and B. Rudolf (2008): [Global Precipitation Analysis Products of the GPCP](#). Global Precipitation Climatology Centre (GPCC), DWD, Internet Publication, 1-12.

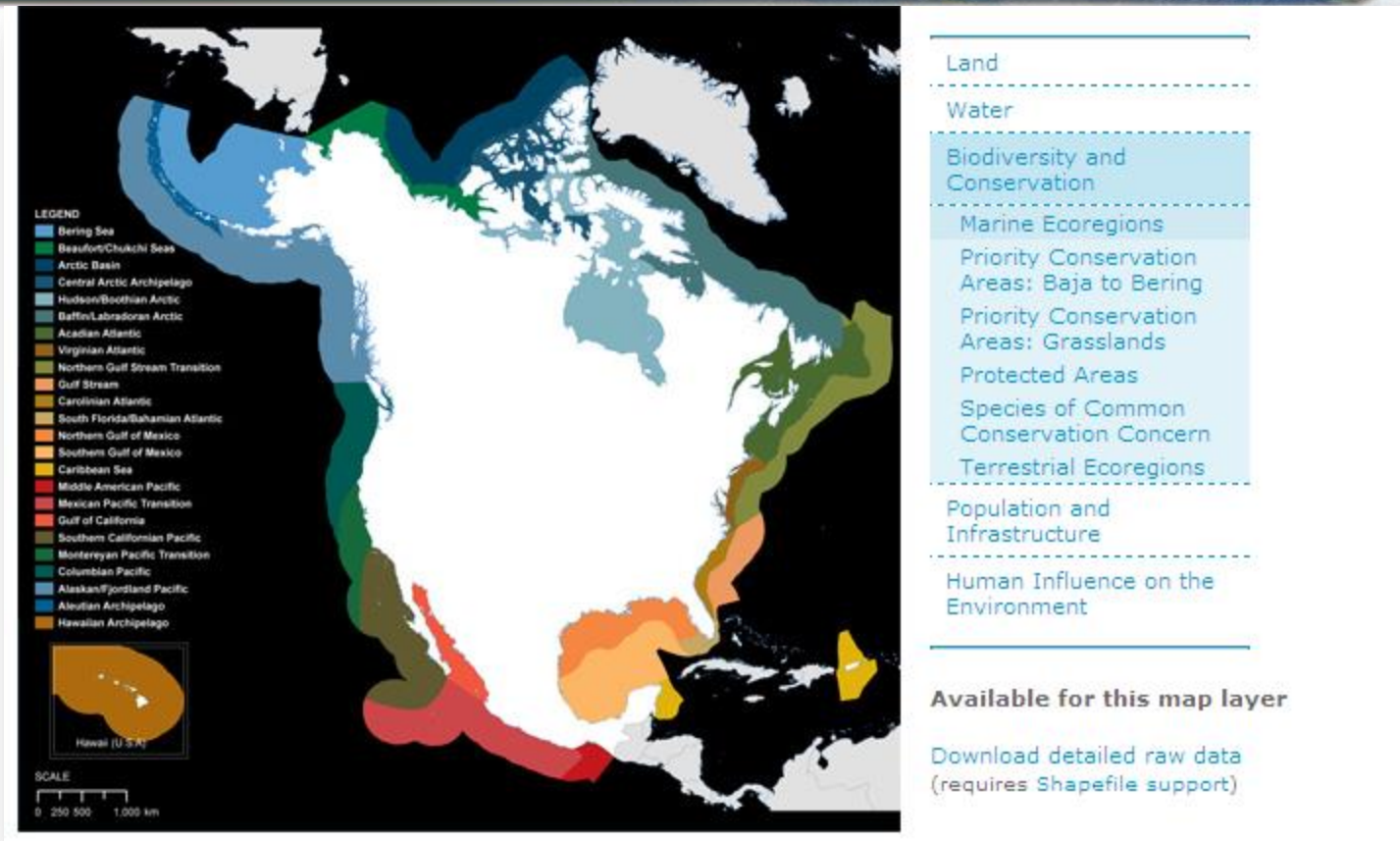
Wetlands



Represents different wetland types, as well as lakes and rivers. The map was made using the Global Lakes and Wetlands Database (GLWD).

Source: Lehner, B. and P. Doll. 2004. Development and validation of a global database of lakes, reservoirs and wetlands. *Journal of Hydrology* 296/1-4: 1-22. [Global Lakes and Wetlands Database](#) available through WWF

Marine Ecoregions 2008



The marine ecoregions are areas of general similarity in terms of physiographic, oceanographic and biological characteristics. These ecoregions are constructed as a spatial framework with three nested levels.

Priority Conservation Areas: Baja to Bering, 2005



The Baja to Bering region is a region with high priority for biodiversity conservation. This map shows the 28 marine priority conservation areas in the region. These priority areas include highly productive fishing groups, coral gardens, globally unique reefs, marine mammal hotspots, coastal lagoons, and areas of incomparable biodiversity.

Priority Conservation Areas: Grasslands, 2005

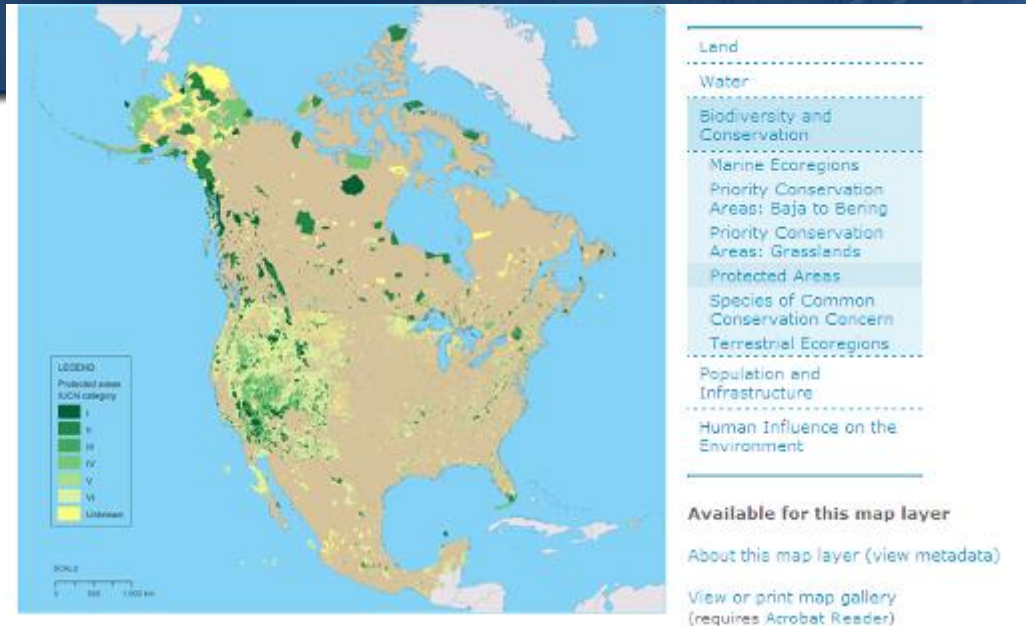


Shows the grasslands priority conservation areas. GPCAs are defined as areas of tri-national importance due to their ecological significance and threatened nature.

The 55 GPCAs were identified by biodiversity experts through research and workshops co-organized by the CEC in 2004.

North American Grassland Priority Conservation Areas: Technical Report and Documentation; Grasslands: Toward a North American Conservation Strategy

Protected Areas, 2008



A protected area is an “area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means” (IUCN). This map shows the protected areas of North America that are managed by national, state, provincial, or territorial authorities; categorized according to their management objective:

I: Strict nature reserve/wilderness area

II: National park

III.- Natural monument

IV: Habitat /species management area

V: Protected landscape/seascape

VI: Managed resource protected area

Unknow: Primary management objective is not known

Species of Common Conservation Concern, 2008

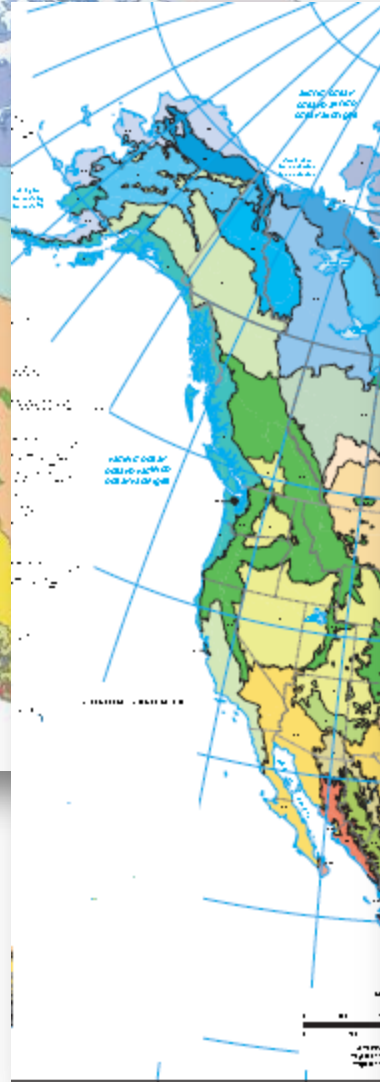
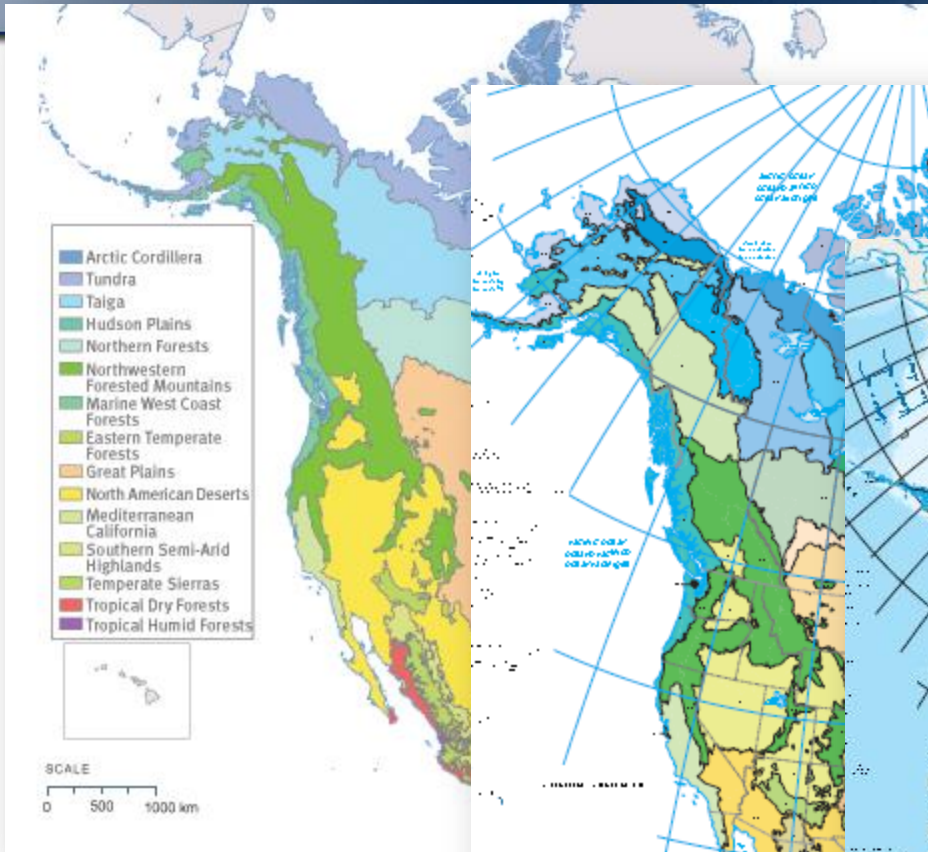


This layer provides range maps for a group of important migratory, transboundary and endemic species selected among the continent's wild flora and fauna.

Based on maps provided by [NatureServe](#), the ranges of two species are shown: the Ferruginous hawk (*Buteo regalis*) and the Pink-footed shearwater (*Puffinus creatopus*).

Range maps for 33 other species are also available in this map layer.

Terrestrial Ecoregions, 2006



Terrestrial Ecoregions, 2006



Ecological regions are areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. They serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and components.

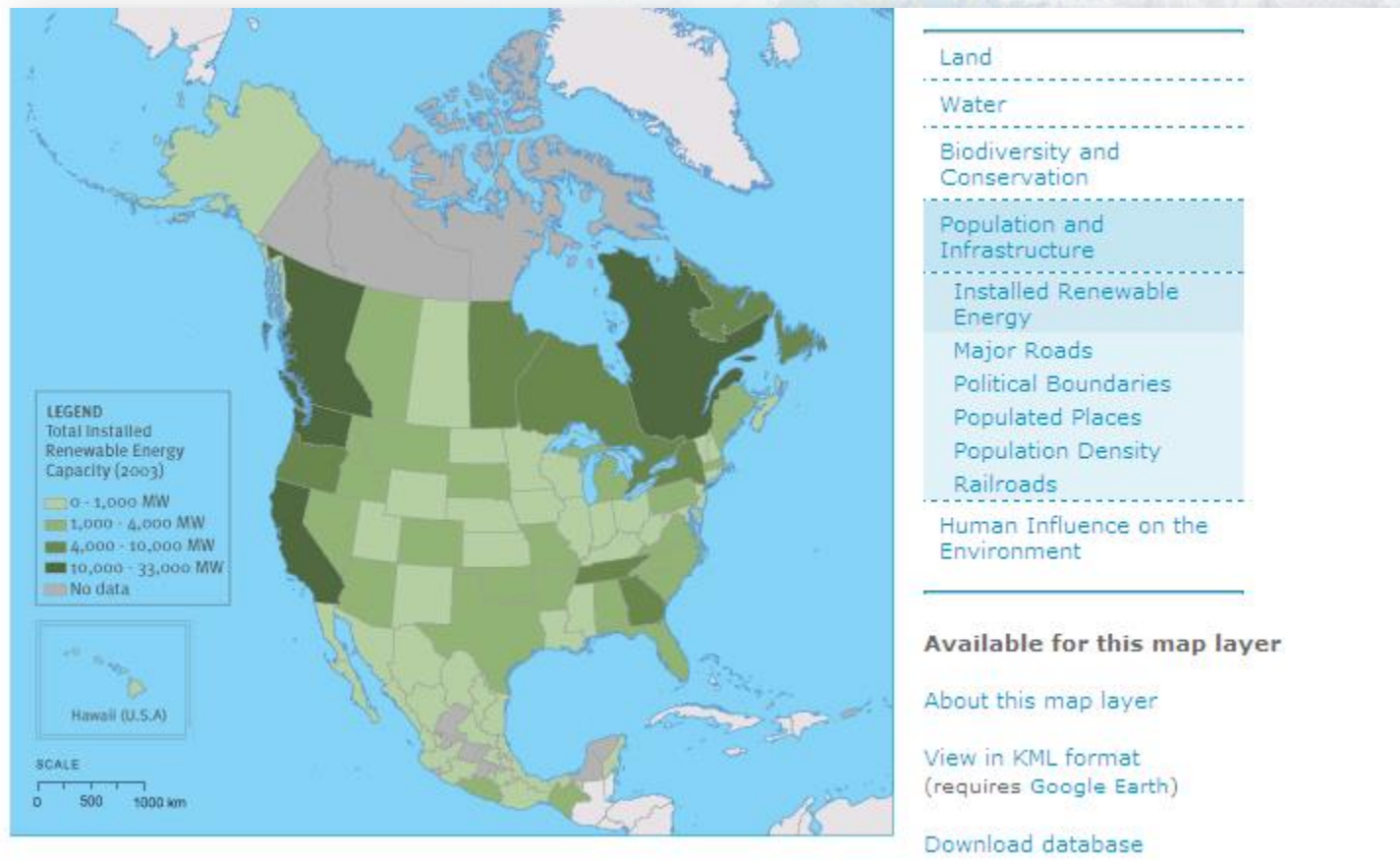
There have been recognized different levels:

Level I is the coarsest level, dividing North America into 15 broad ecological regions.

The 50 level II North American ecological regions provide a more detailed description of the large ecological areas nested within the level I regions and are useful for national and sub-continental overviews of ecological patterns.

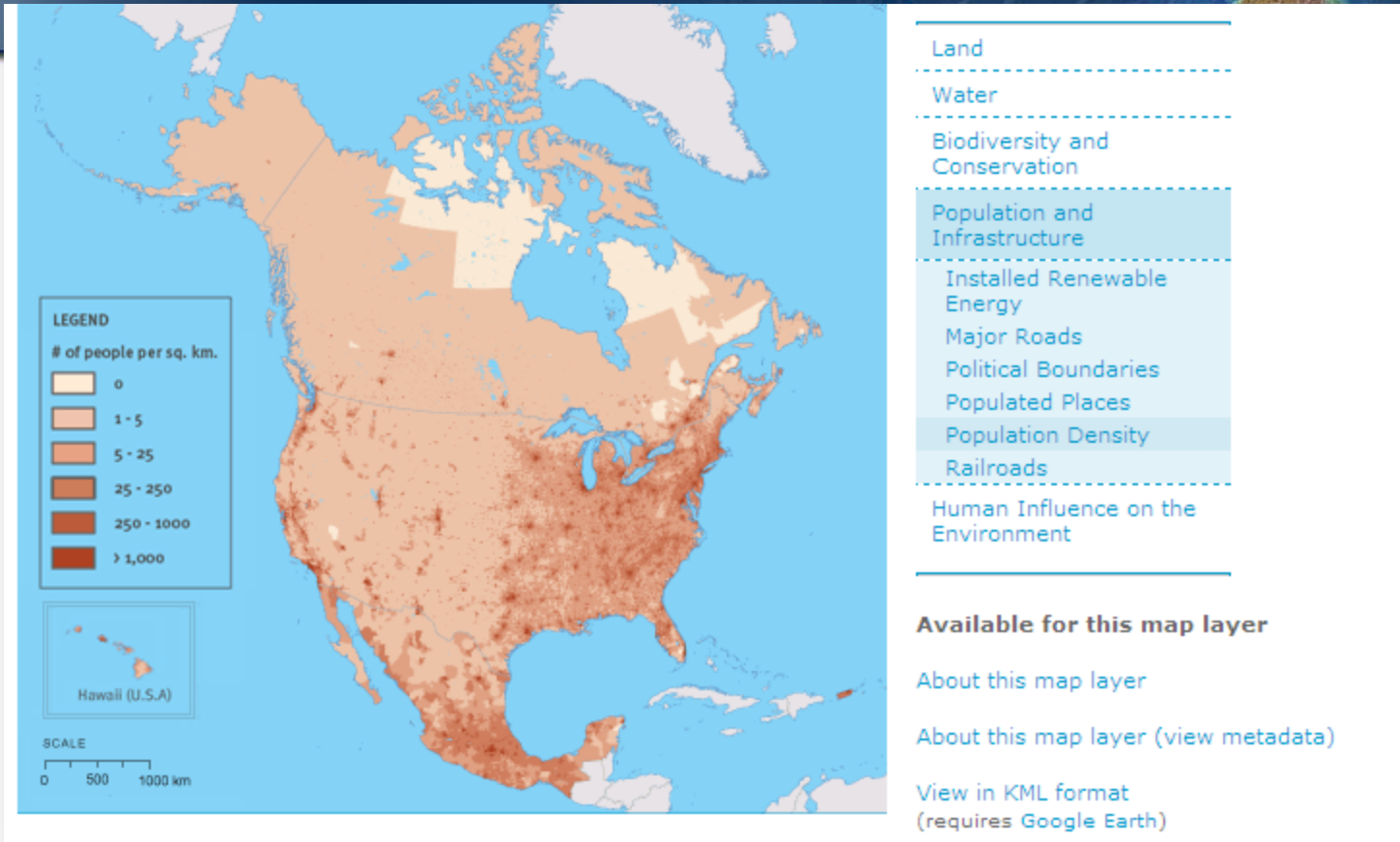
The 182 level III ecological regions, smaller ecological areas nested within level II regions, enhance regional environmental monitoring, assessment and reporting, as well as decision-making.

Installed Renewable Energy, 2003



This map shows the total installed renewable energy capacity for states, provinces, and territories of North America as of 2003. The renewable energy sources included in the data are biomass, geothermal, hydropower, solar and wind.

Population Density, 2007

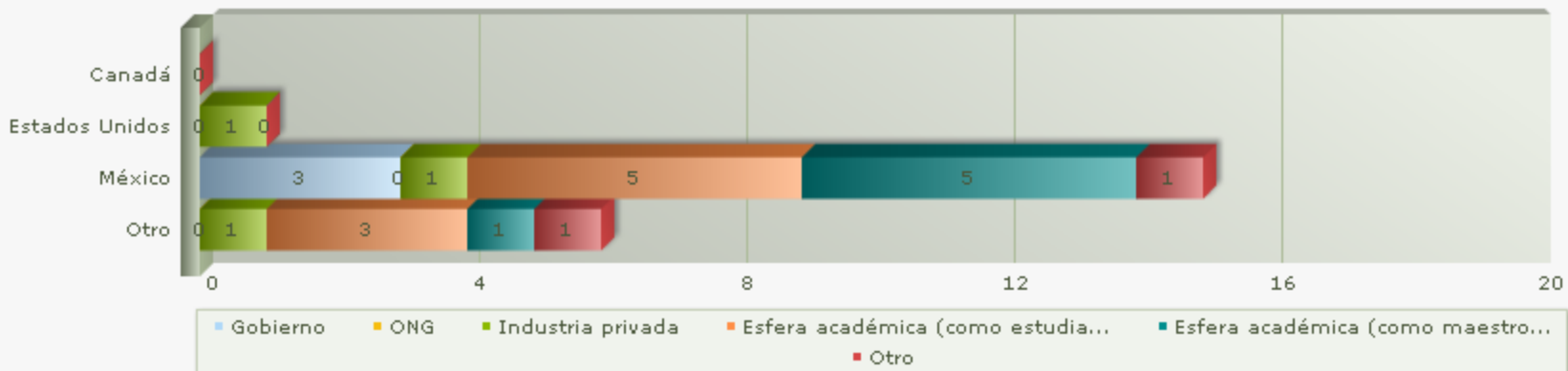
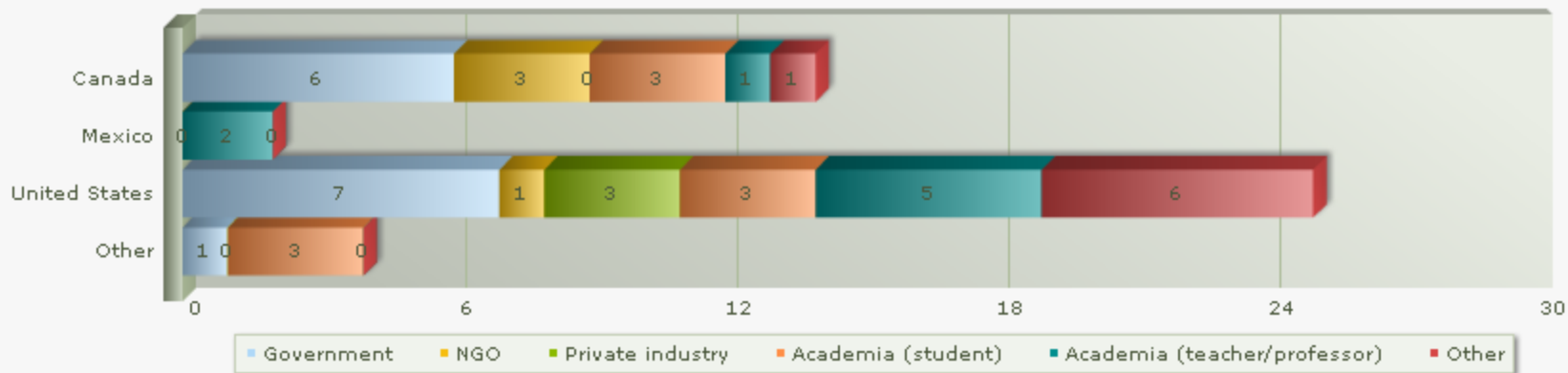


Shows population density of North America for the year 2000 in number of people per square kilometer. The data layer was compiled by the Center for International Earth Science Information Network (CIESIN) and Centro Internacional de Agricultura Tropical (CIAT).

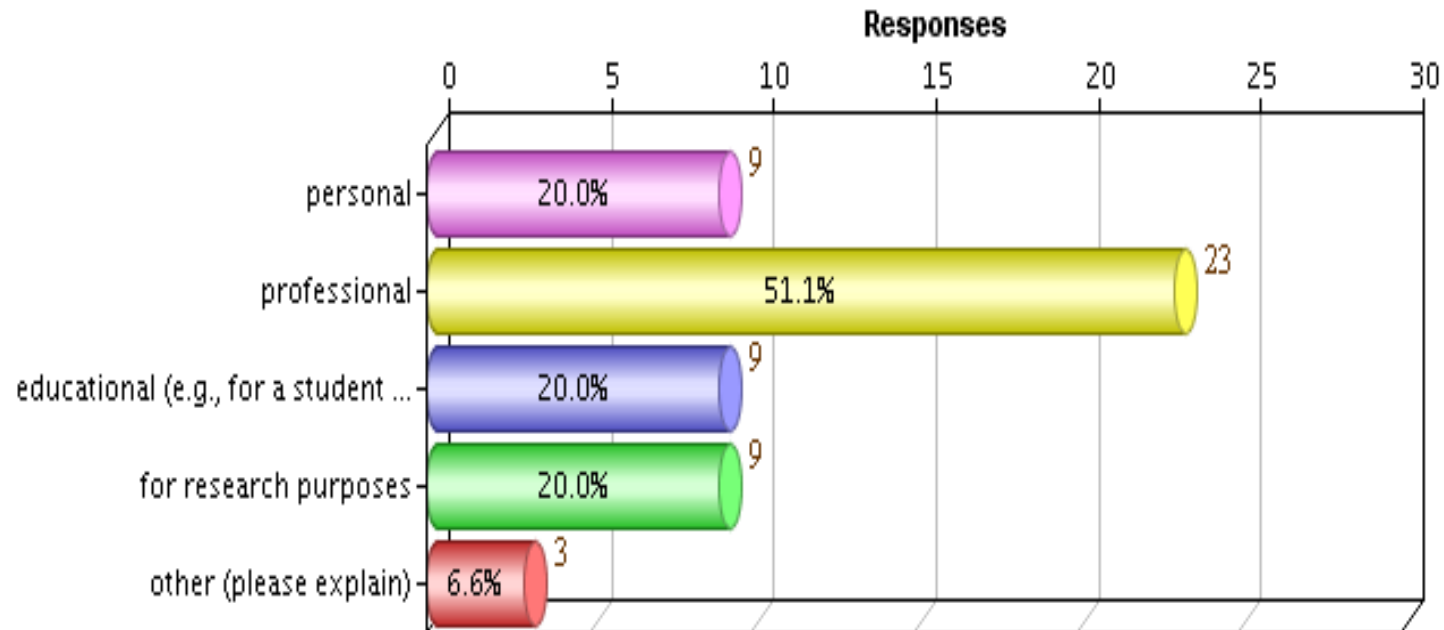
Outreach



Where do you work and what sector do you work in ?

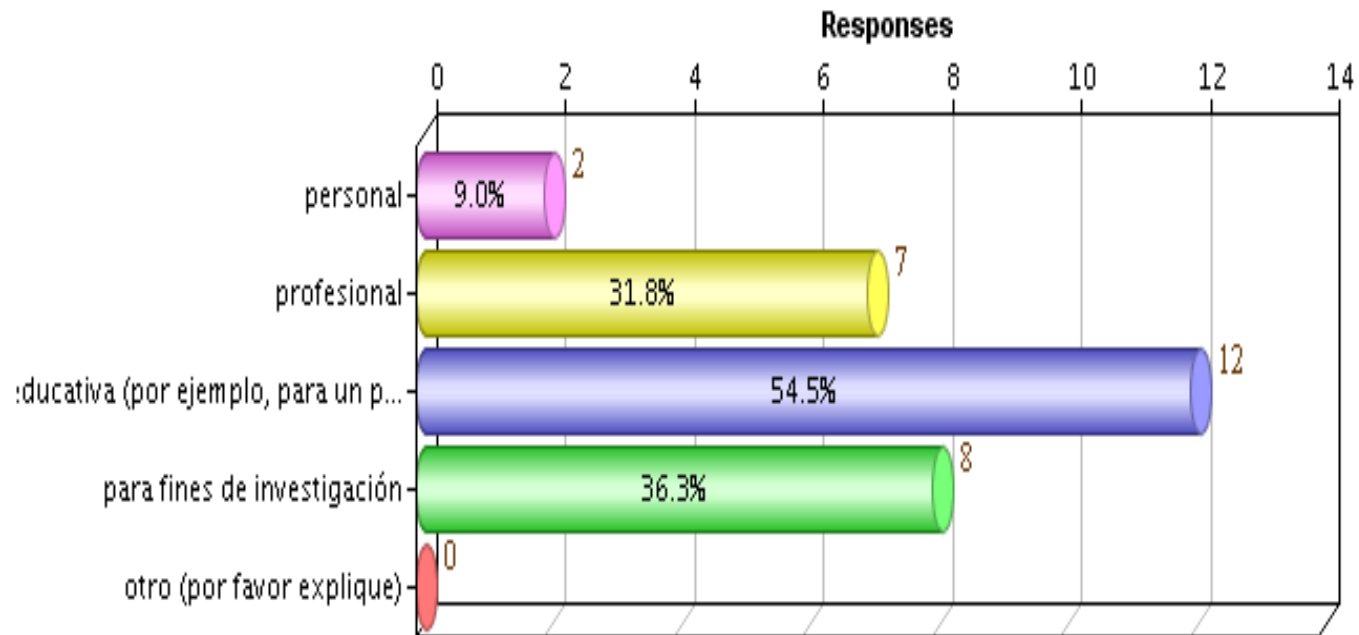


What is the nature of your visit? Canada and US



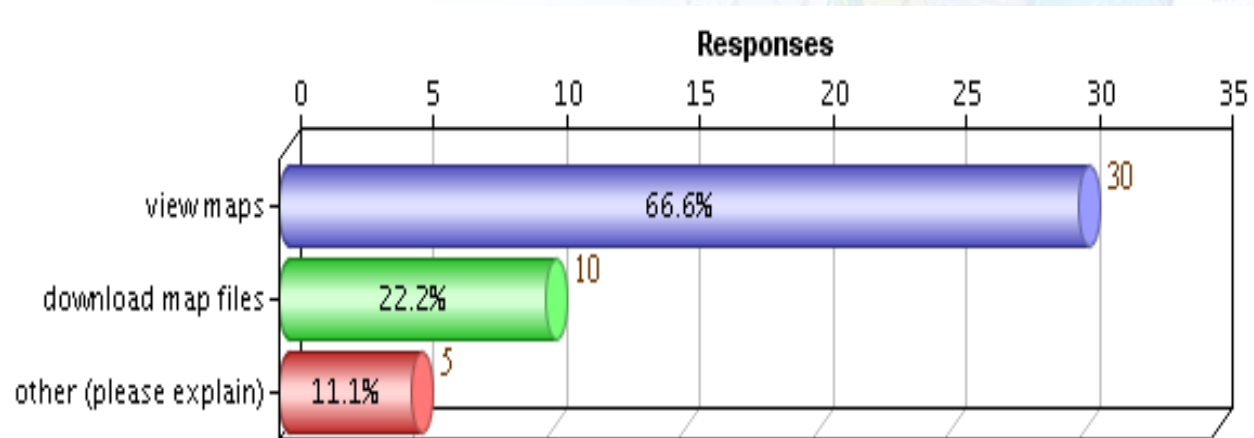
Total Number of Responses for this Item: 45

What is the nature of your visit? México



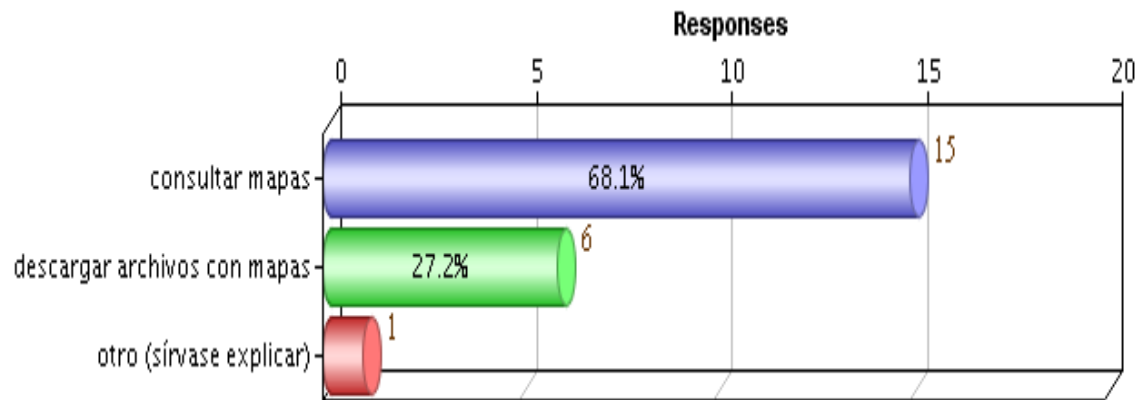
Total Number of Responses for this Item: 22

What do you plan to do today? Canada an US



Total Number of Responses for this Item: 45

What do you plan to do today? México



Total Number of Responses for this Item: 22

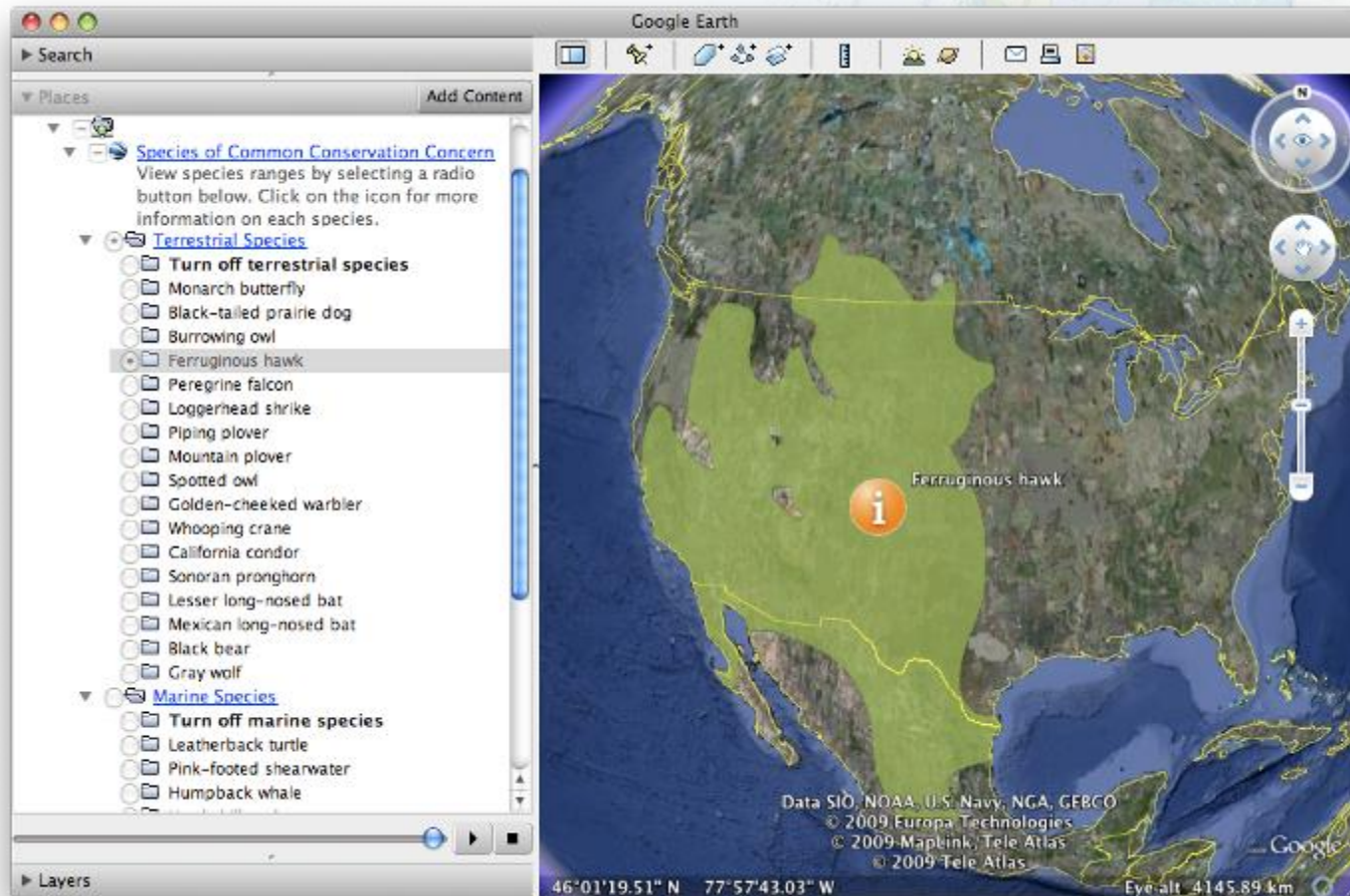
Perspectives



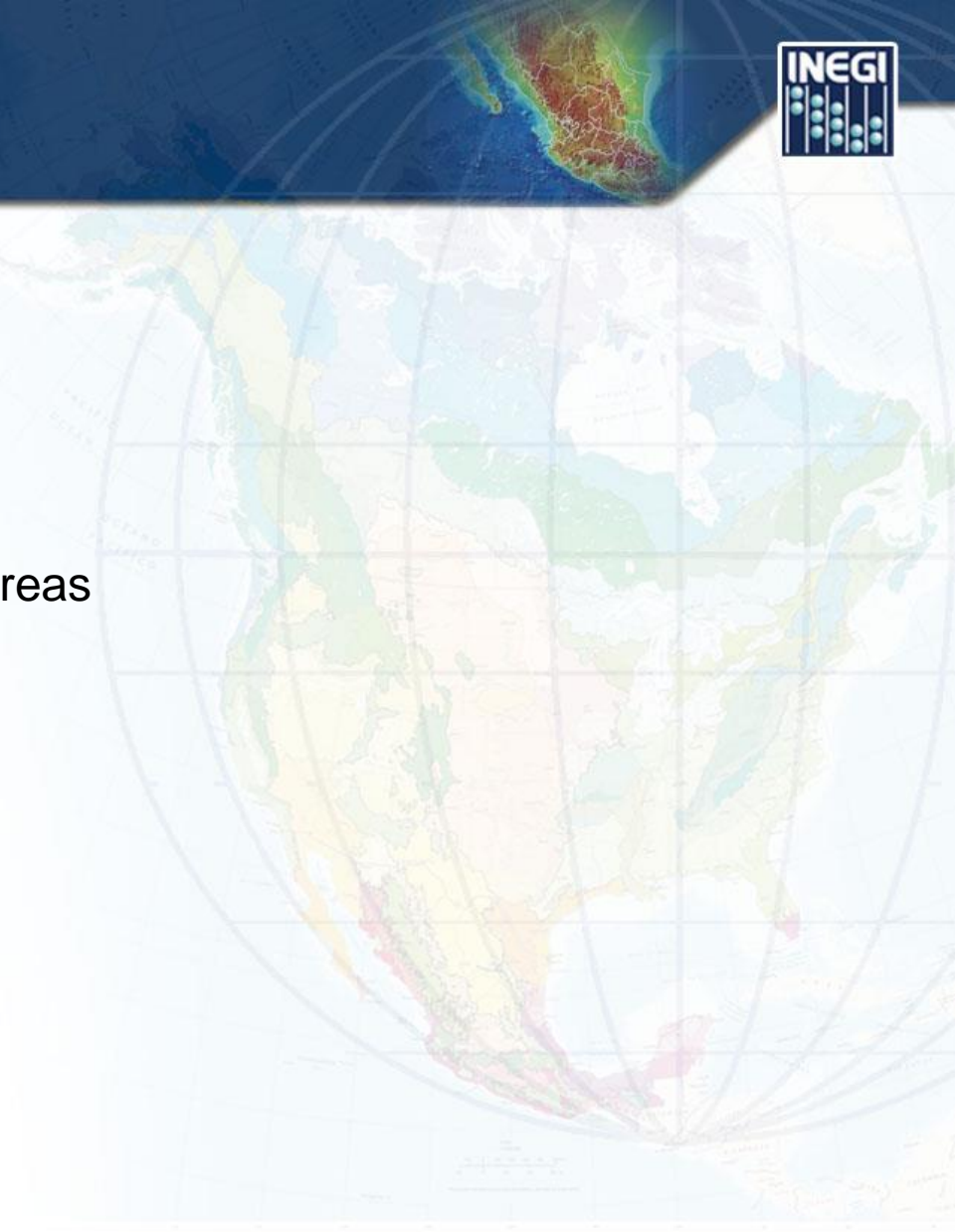
A forum for continental mapping initiatives



A tool to explore and understand our shared environment

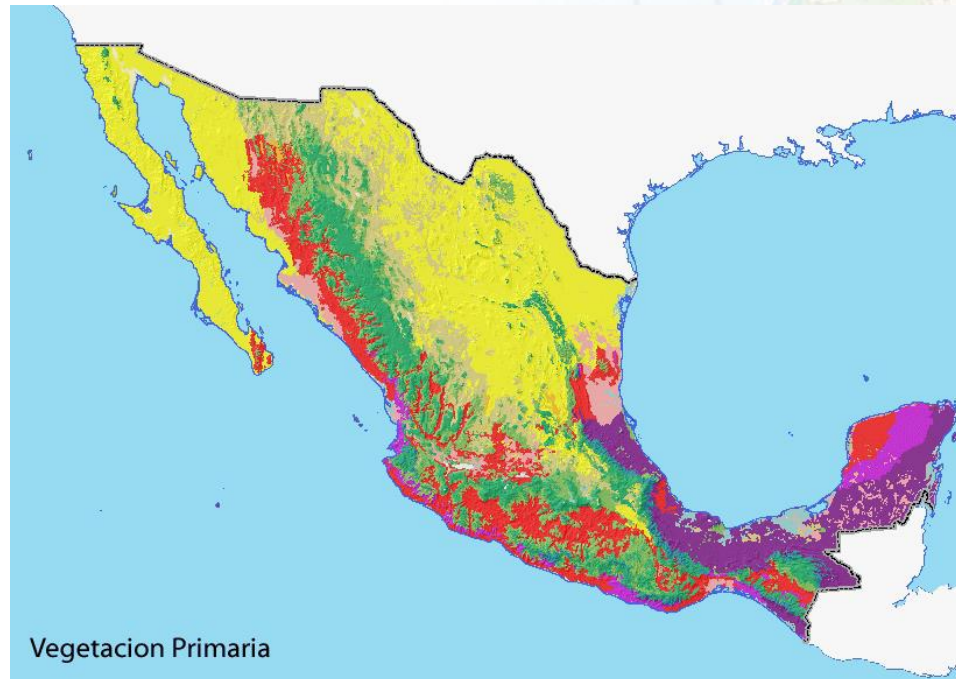


- Watersheds
- Marine protected areas
- Aquifers
- Industrial pollutants
- Power plants
- Hazardous waste



- Land Cover Monitoring System

A global prototype that marks the difference between the traditional cartography and a dynamic monitoring system.





Tracking North American Land Cover Change



cec.org

North American Land Change Monitoring System

- Tri-national collaboration of 5 federal government institutions and CEC
- Launched in 2006
- Long-term goal: develop an operational system for monitoring land cover change for the continent

Produced in partnership with: Elaborado en colaboración con: Réalisé en partenariat avec:

www.inegi.org.mx www.gob.mx www.confor.gob.mx www.nrcan.gc.ca www.usgs.gov

With support from: Con el apoyo de la: Avec l'appui de:

atlas.gc.ca nationalatlas.gov



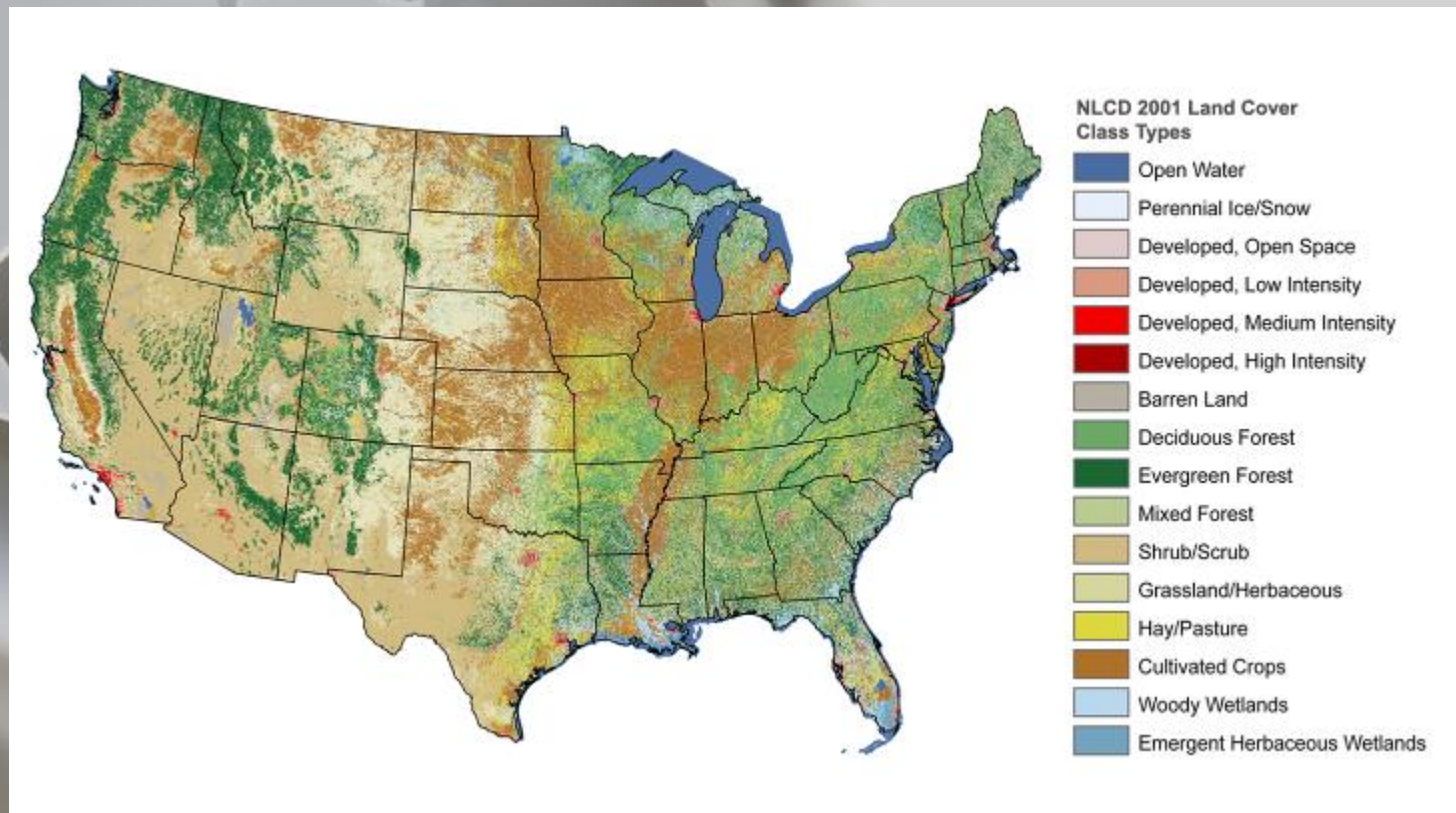
North American Land Change Monitoring System

Designed to meet
North America's needs

- Common strategy and framework to generate consistent results across the continent
- Developed with expertise from all three countries

Existing land cover products from North American countries

Differing methods and uses



Land cover complexity in Mexico



North American Land Change Monitoring System

Designed to meet
North America's needs

Canada Boreal Forest



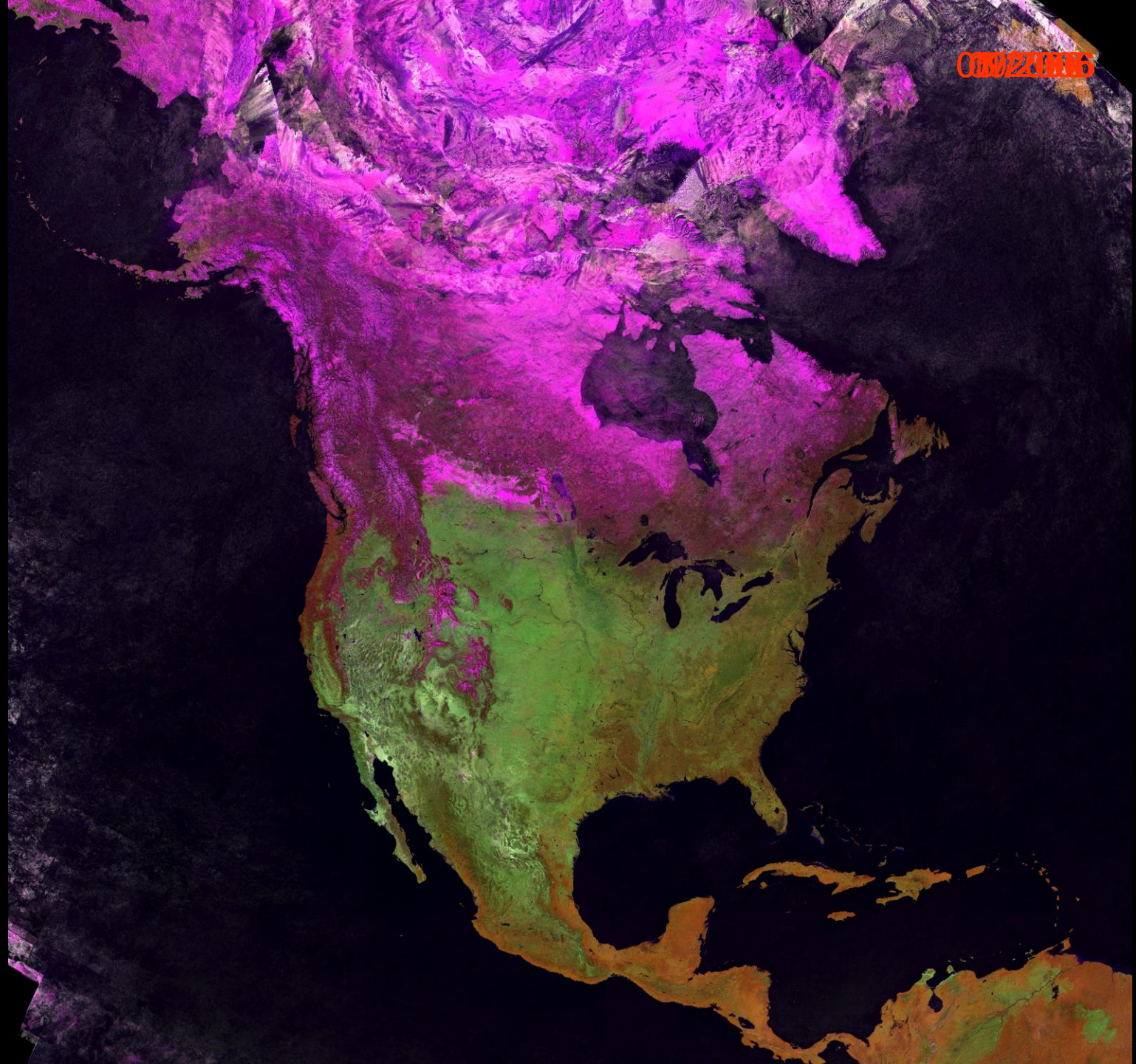
U.S. Broadleaf Forest



Mexico "Cactus" Forest



07/2006



Land C



Crop
Suelo
Terre



Tropical or sub-tropical shrubland
Matorral tropical o subtropical
Arbustaire tropicale ou
subtropicale



Tropical or sub-tropical broadleaf
deciduous forest
Bosque de latifoliadas caducifolio
tropical o subtropical
Forêt de feuillus caducifoliée tropi
ou subtropicale

Legend

- Tempera
- Tropical
- Tropical
- Tempera
- Mixed F
- Tropical
- Tempera
- Arctic o
- Tropical
- Tempera
- Arctic/s
- Tundra
- Wetland
- Cropland
- Barren Lands
- Urban
- Water
- Snow and Ice
- Arctic or sub-arctic herbaceous-lichen-dwarf shrub

T
Tund
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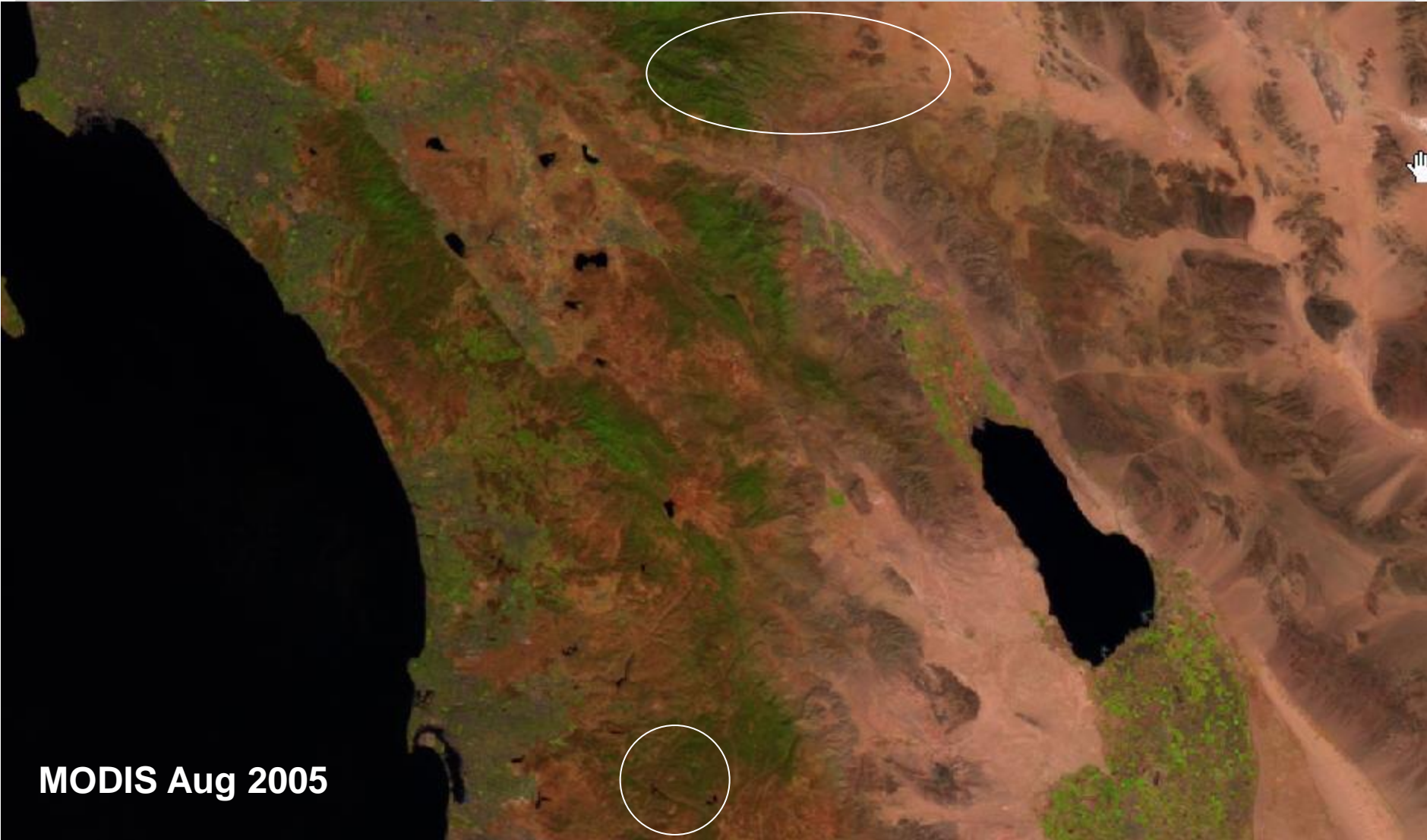


North American land change monitoring

Change detection

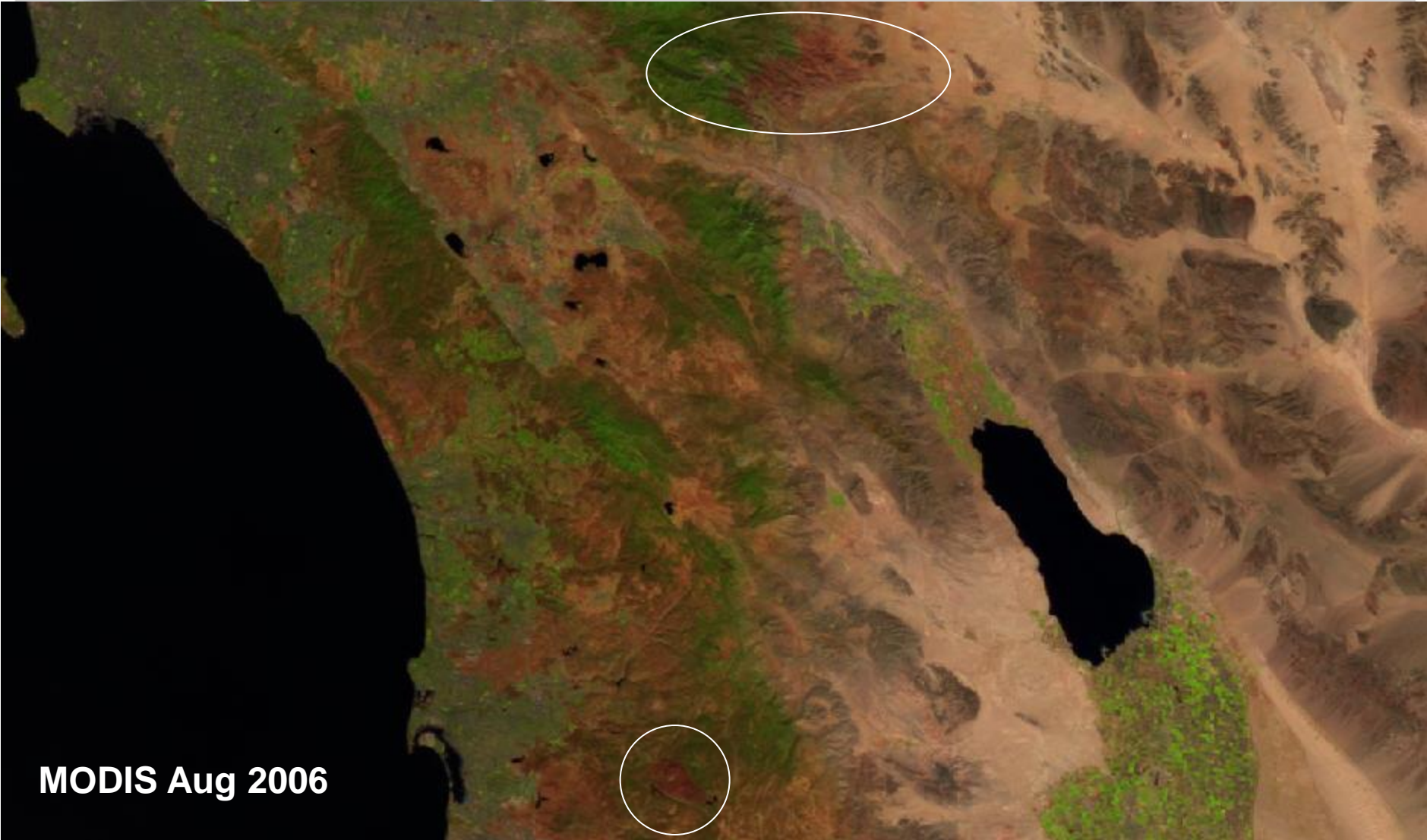


Change Detection (Forest Fire)



MODIS Aug 2005

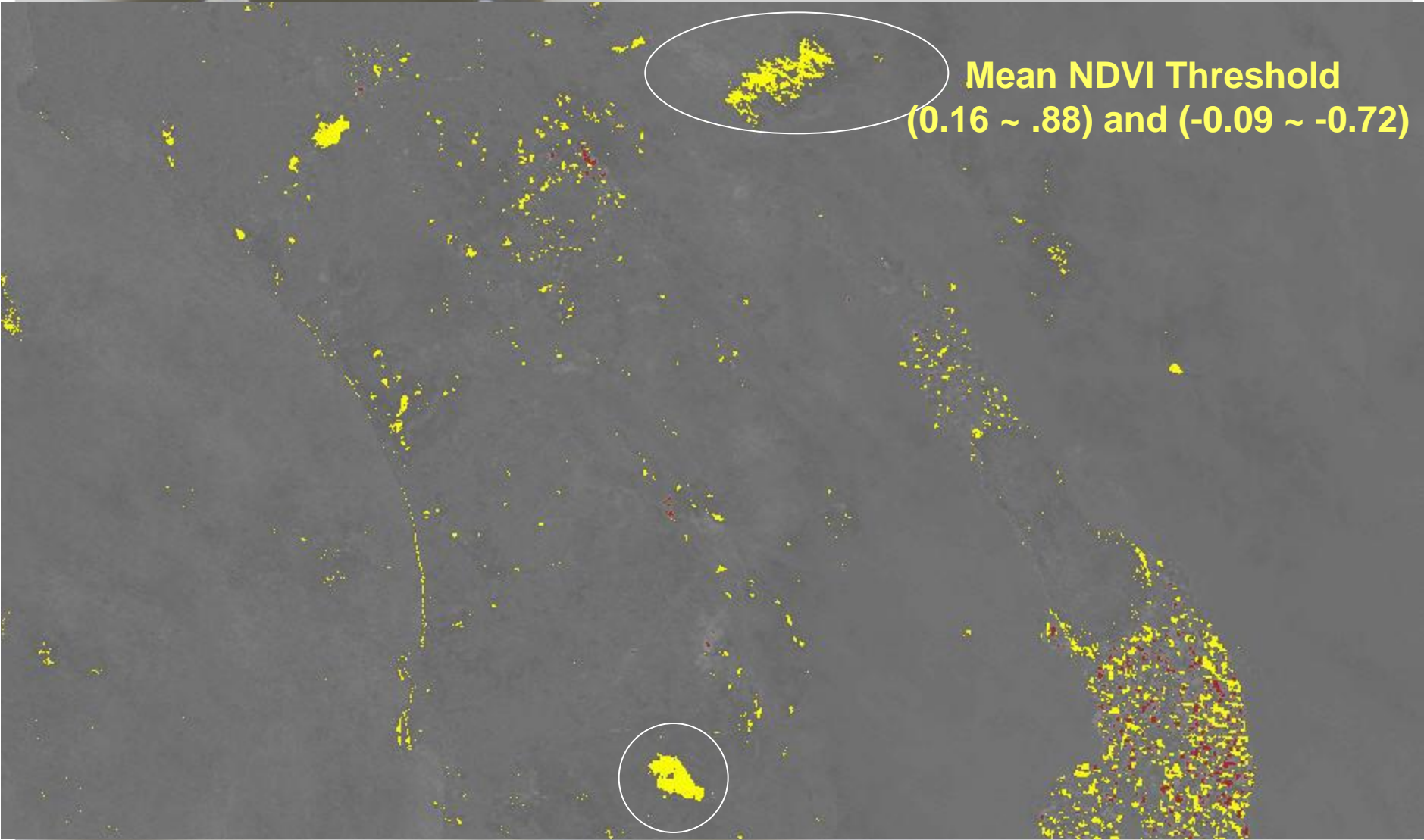
Change Detection (Forest Fire)



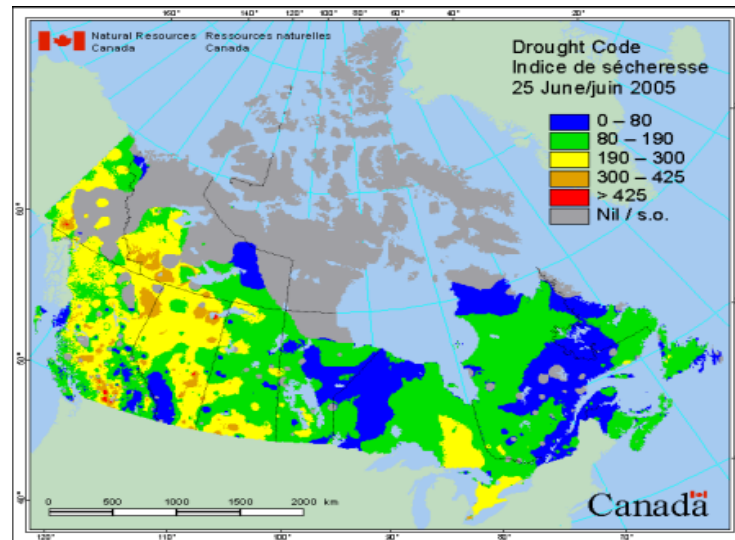
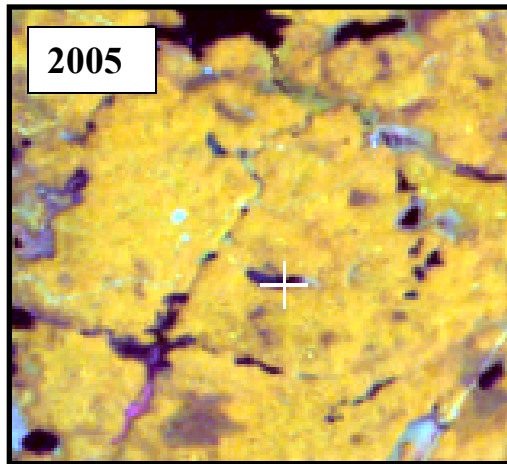
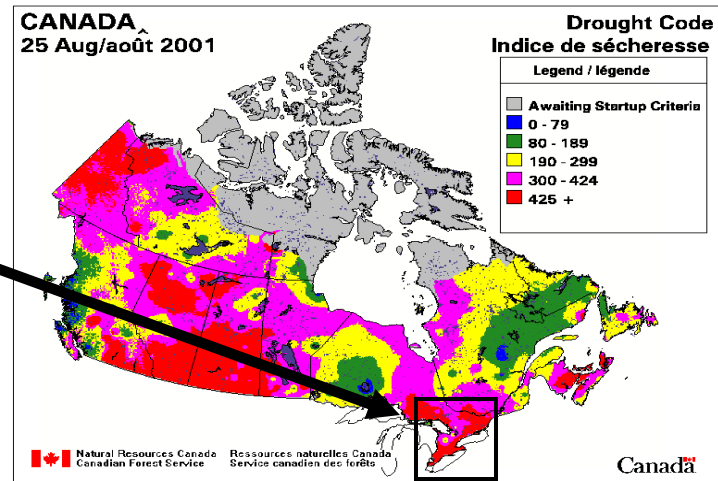
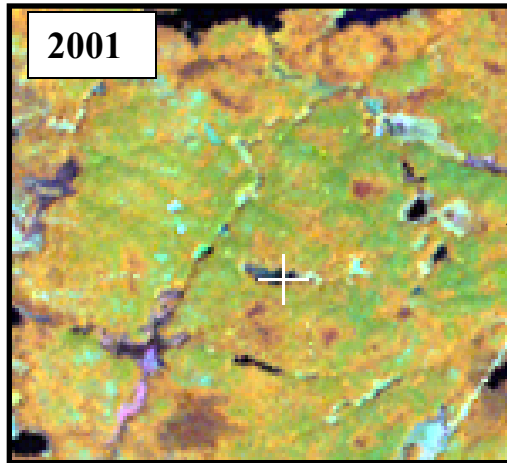
MODIS Aug 2006

Change Detection (Forest Fire)

Mean NDVI Threshold
(0.16 ~ .88) and (-0.09 ~ -0.72)

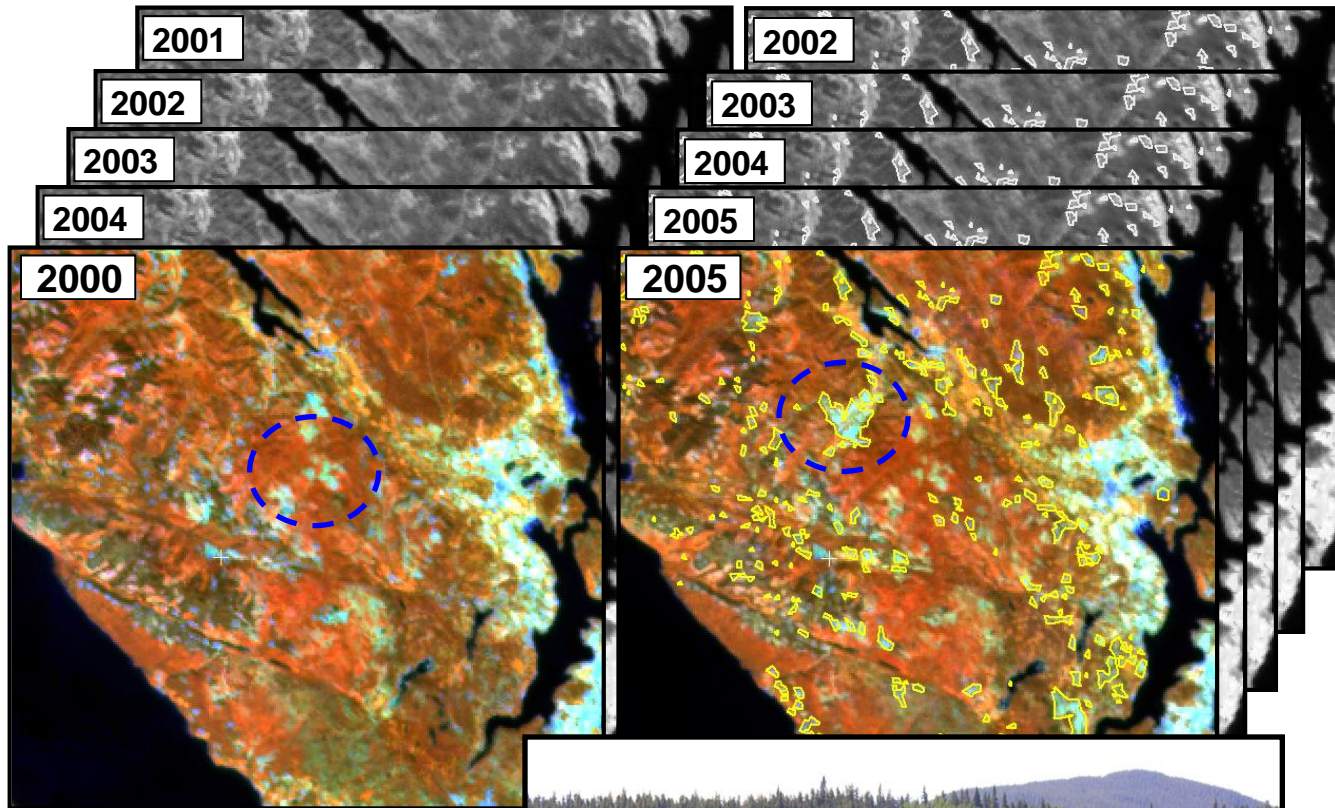


Drought Effects

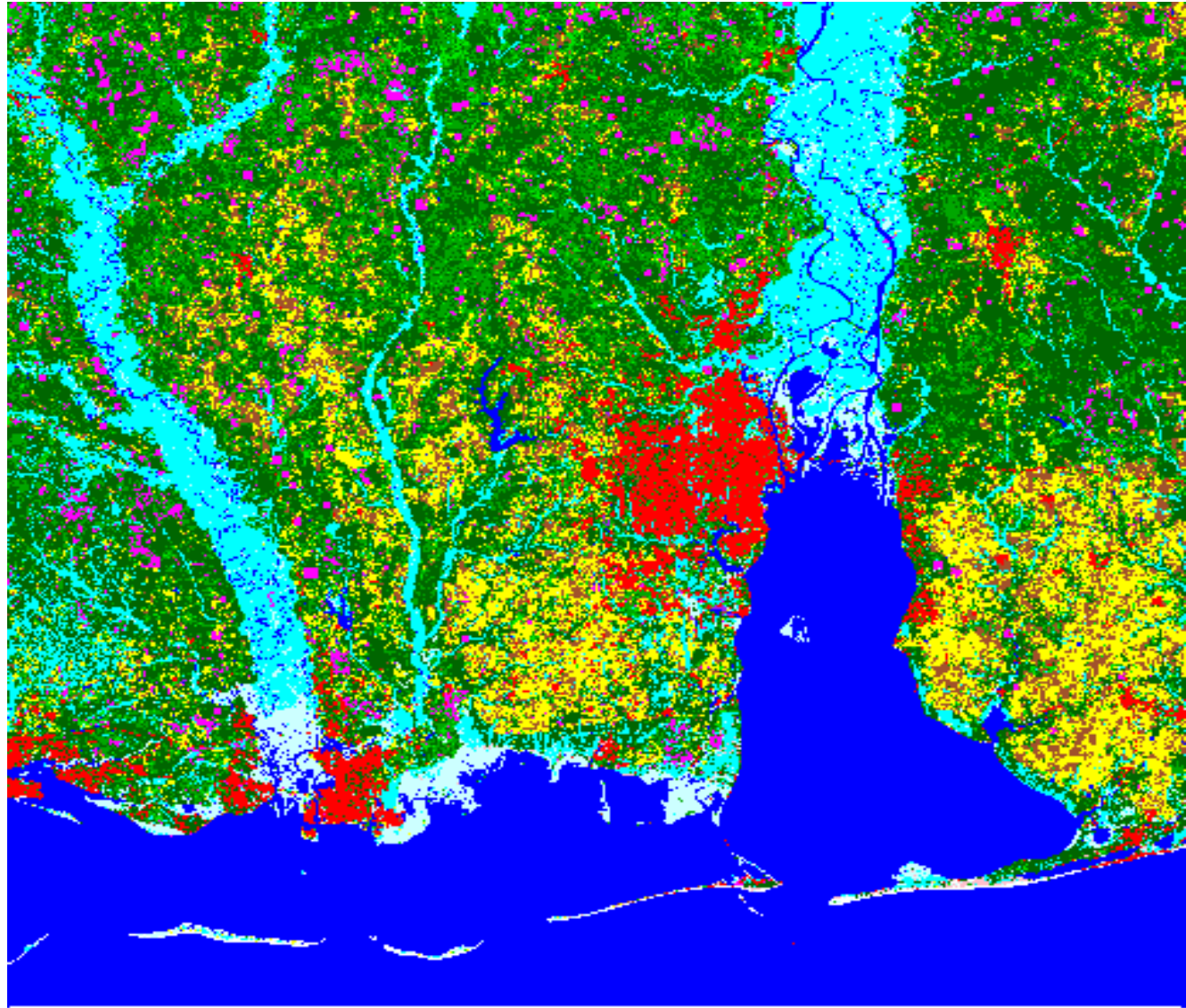
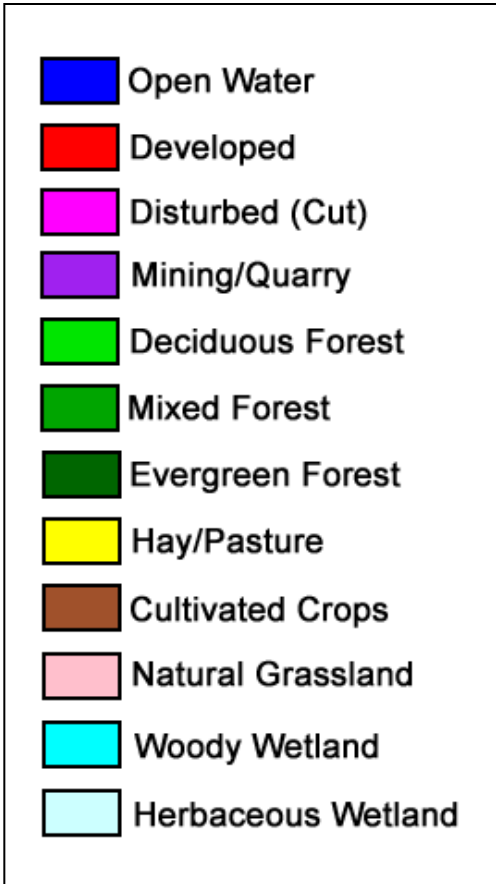


Example of Change Detection (1-5 year)

250m spatial resolution



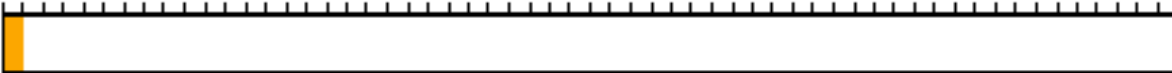
1992 to 2050 Projected Change: Mobile, Alabama



1992

2020

2050





North American land change monitoring

Environmental applications

- Monitoring and forecasting change in essential climate variables
- Monitoring land-based carbon sequestration
- Biodiversity change
- Quantifying ecosystem change, including change due to forest fires and insect infestations
- Weather and climate modeling
- Reporting needs

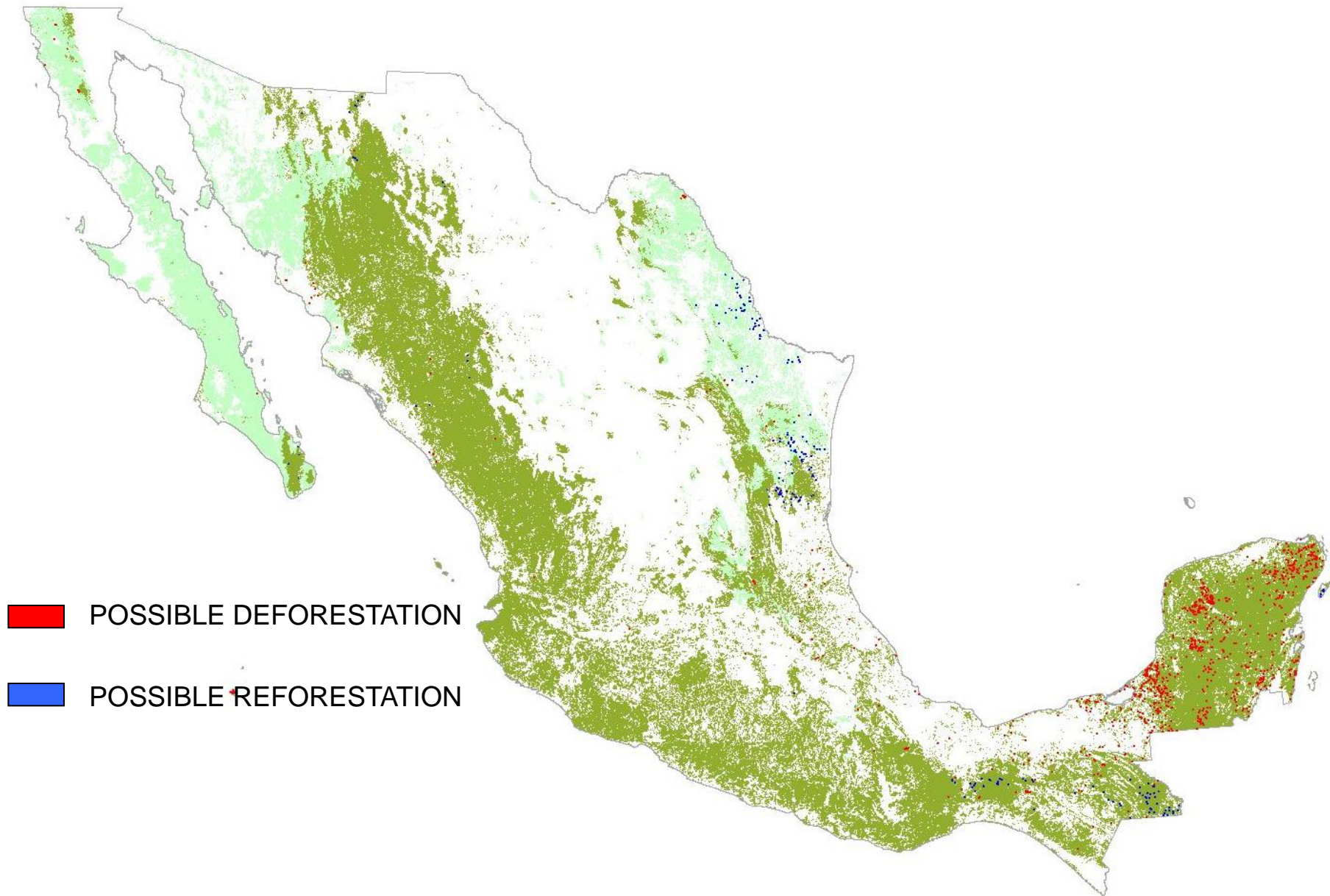


North American land cover change data applications

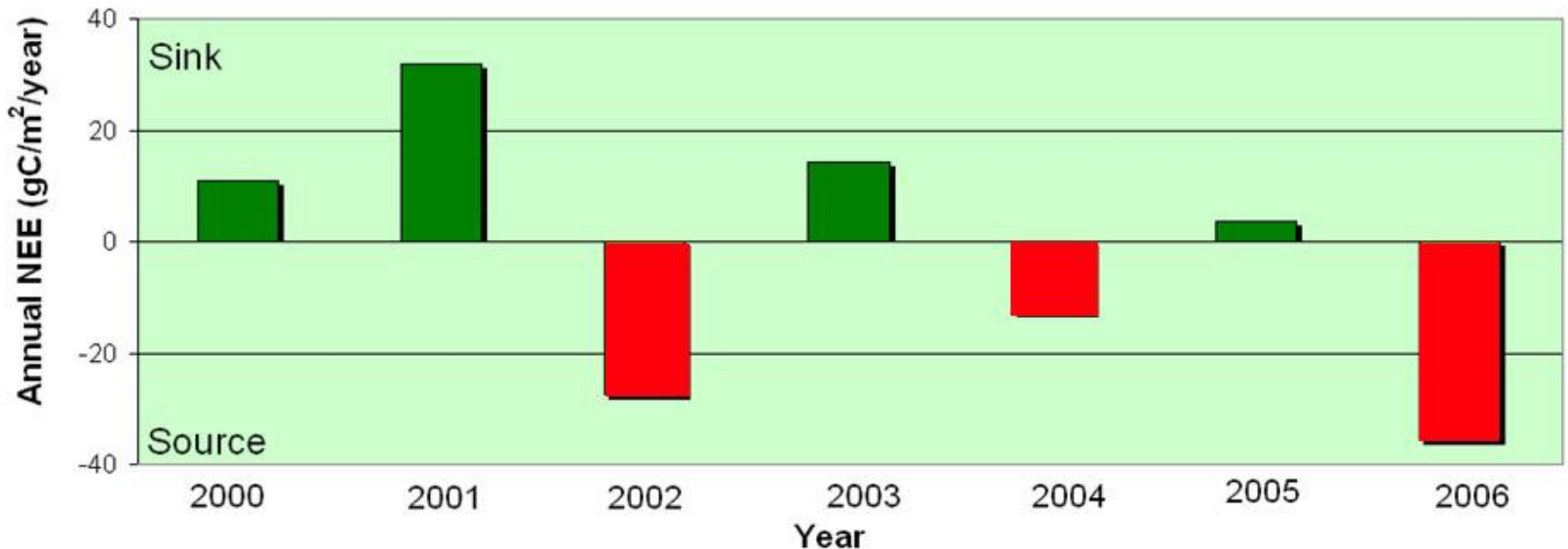
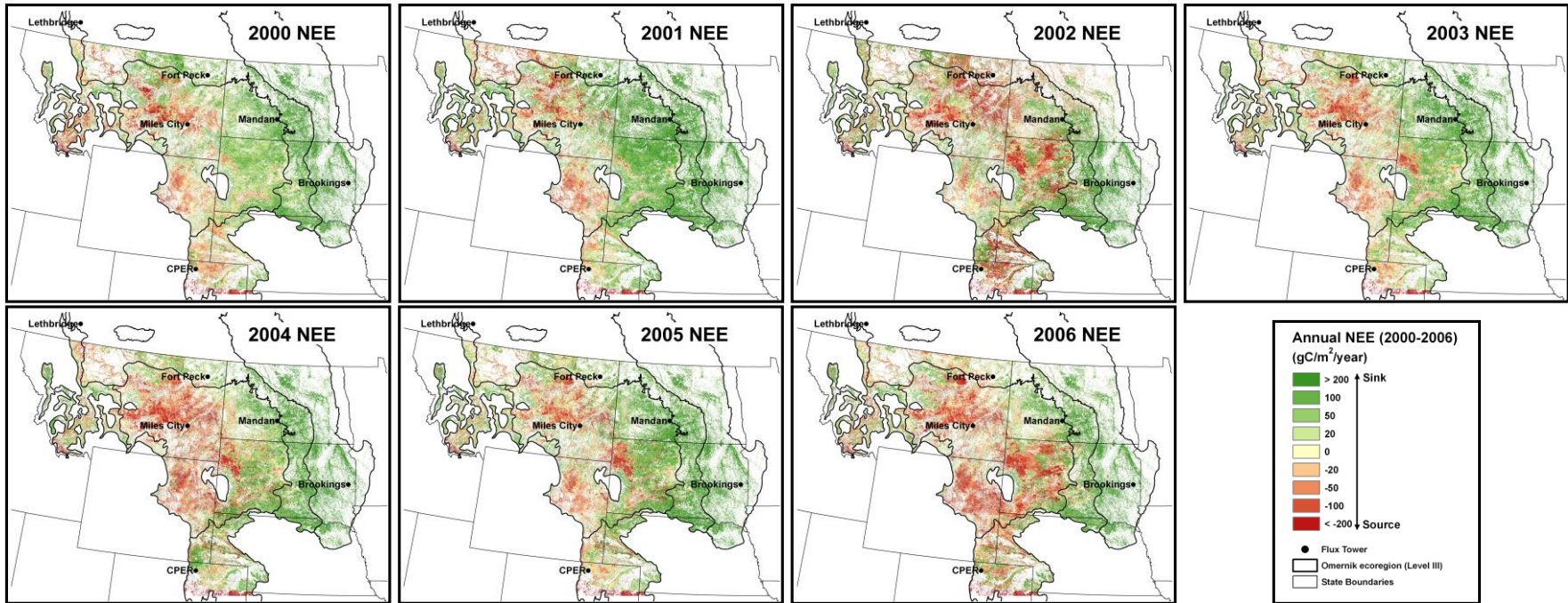
Carbon biological
sequestration monitoring



Deforestation/reforestation



Interannual variability of carbon sources and sinks



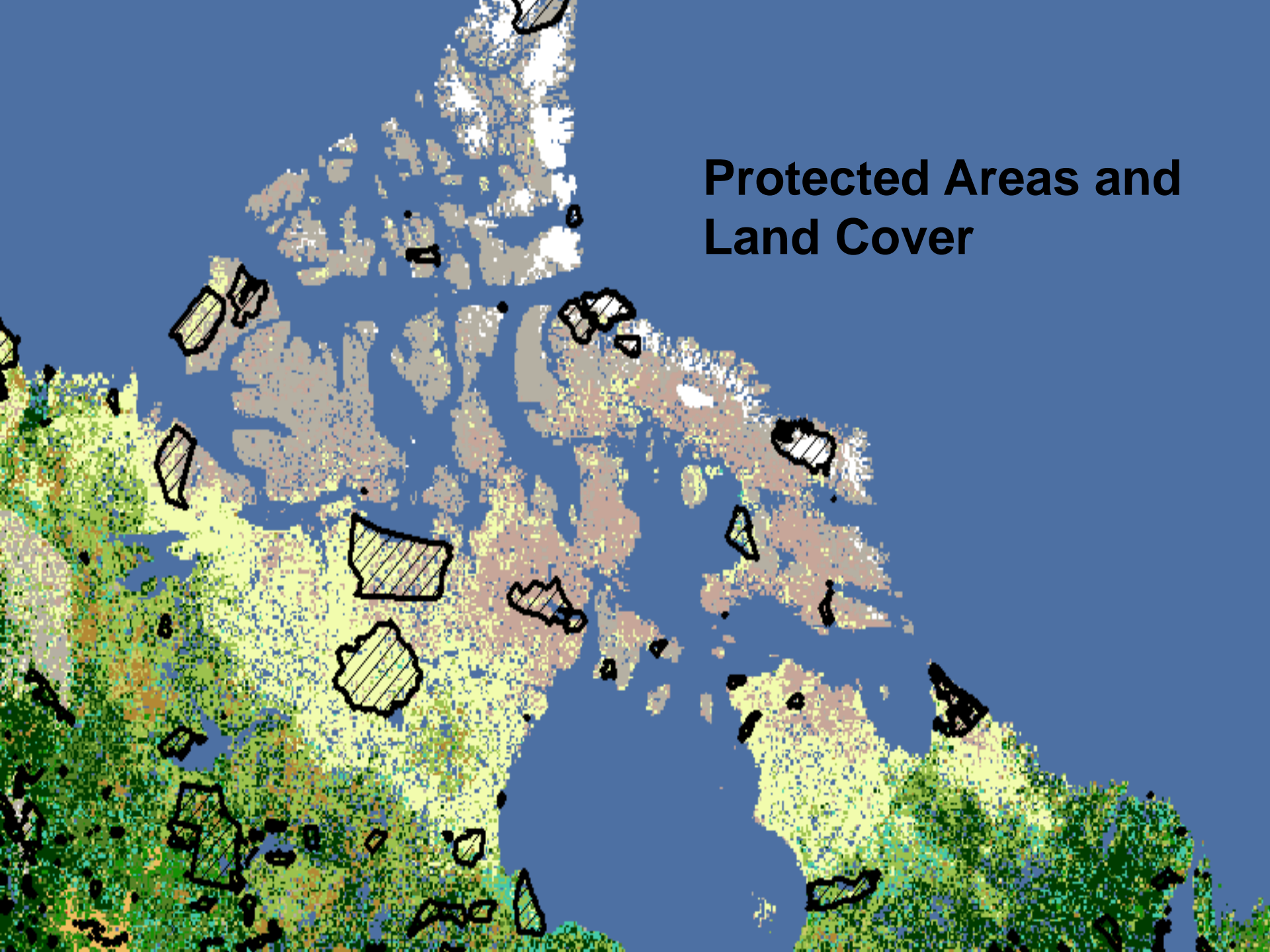


North American land cover change data applications

Biodiversity Change



Protected Areas and Land Cover





North American Land Change Monitoring System

Future directions

- Providing new insight for North American environmental decision-makers
- Revealing trends across the continent
- Illuminating critical areas of change
- Need to include more agencies within each country
- Need for long-term institutional support and commitment



MERCI
THANK YOU
¡ GRACIAS !

Three countries. One environment.