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science for a changing world

Geo Data Portal

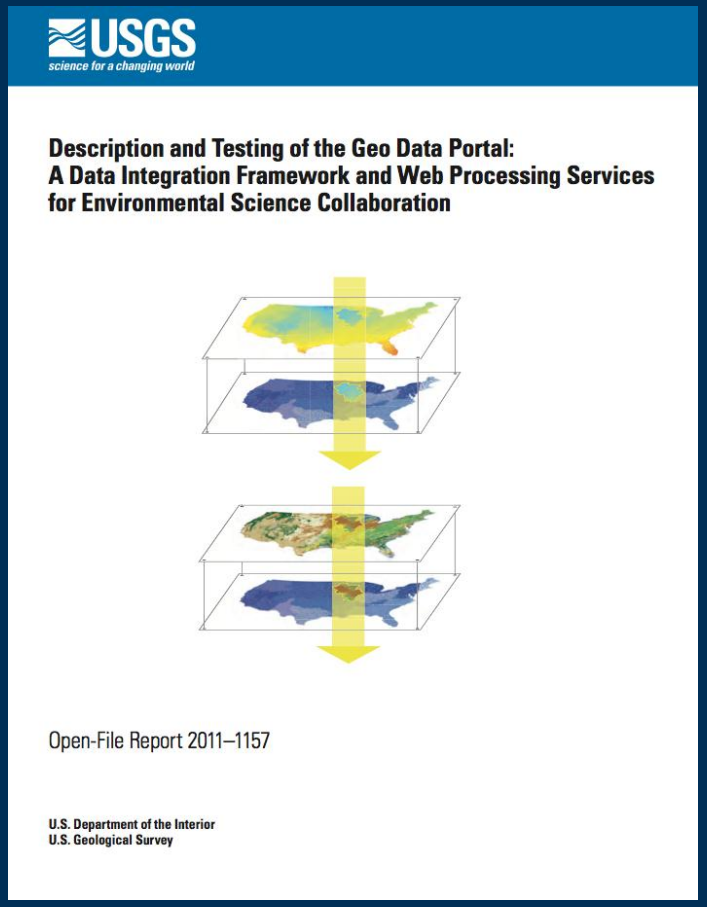
Translating climate data for geographic analysis.

Presented by:

Nate Booth & Adam Terando

29 Aug 2012

U.S. Department of the Interior
U.S. Geological Survey



Agenda

- Project Background
- Geo Data Portal
- Examples
- Summary & Future Plans
- Discussion

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NCCWSC FY09 Project Scope

- Development and Dissemination of High-Resolution National Climate Change Dataset
  - Jaime Collazo, NCSU
  - Lauren Hay, USGS Modeling of Watershed Systems
  - Katharine Hayhoe, Texas Tech
  - Nate Booth, USGS CIDA
  - Adam Terando, NCSU

USGS

NCCWSC FY09 Project Scope

- Development and Dissemination of High-Resolution National Climate Change Dataset
  - Jaime Collazo
  - Lauren Hay
  - Katharine Hayhoe
  - Nate Booth
  - Adam Terando

  GDP Team @ CIDA
  - Dave Blodgett
  - Tom Kunicki
  - Ivan Suftin
  - Jordan Walker
- Motivation: Make it easier to discover what data exists, access it, and process it for analysis

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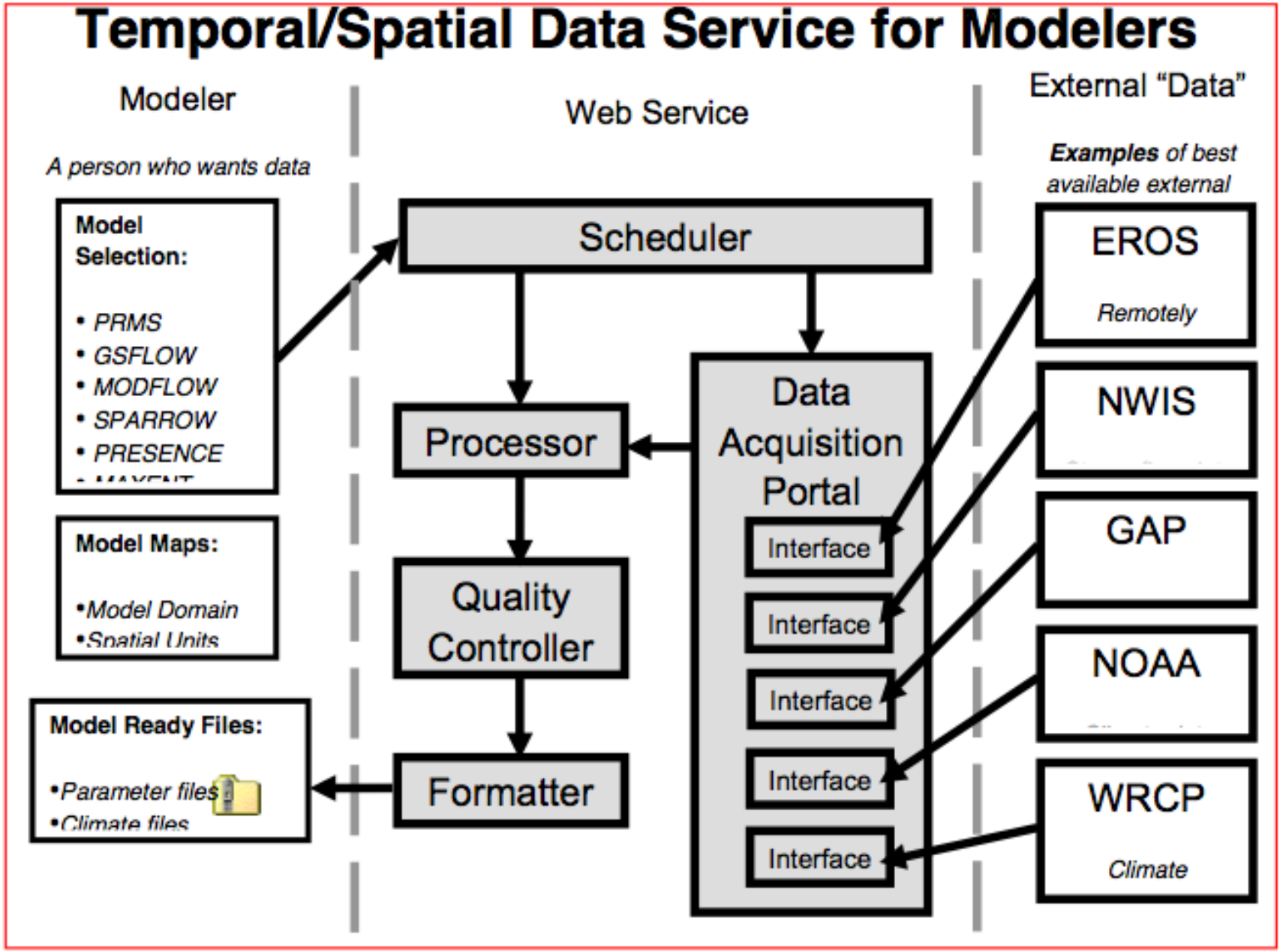
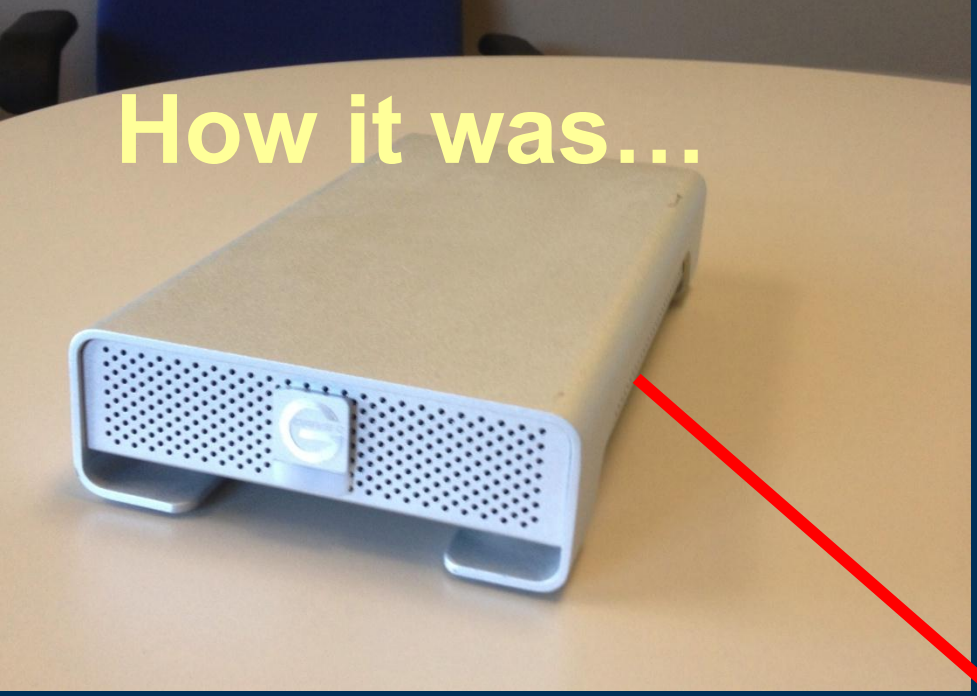


Figure 2. Schematic of Geo Data Portal server inputs, internal data acquisition and provision, and outputs.

How it was…

USGS

How it was…



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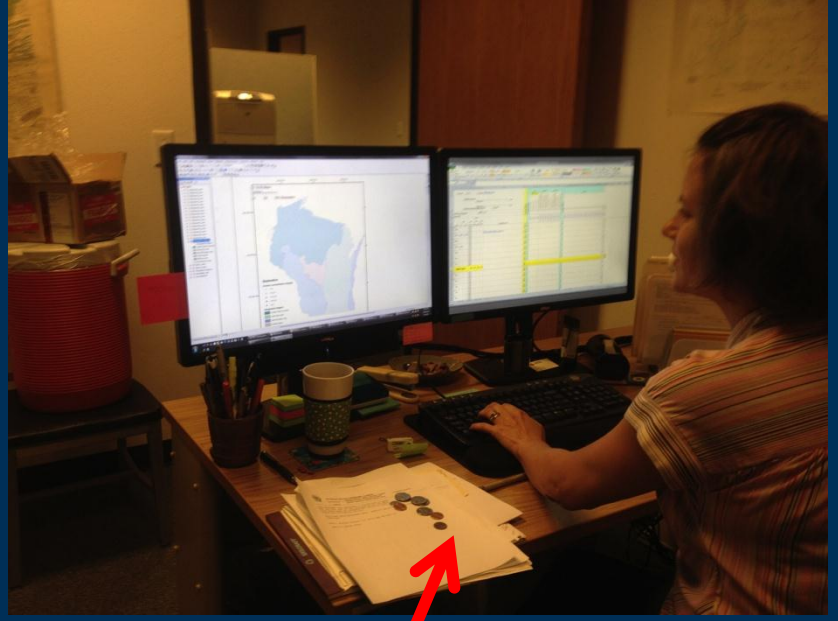

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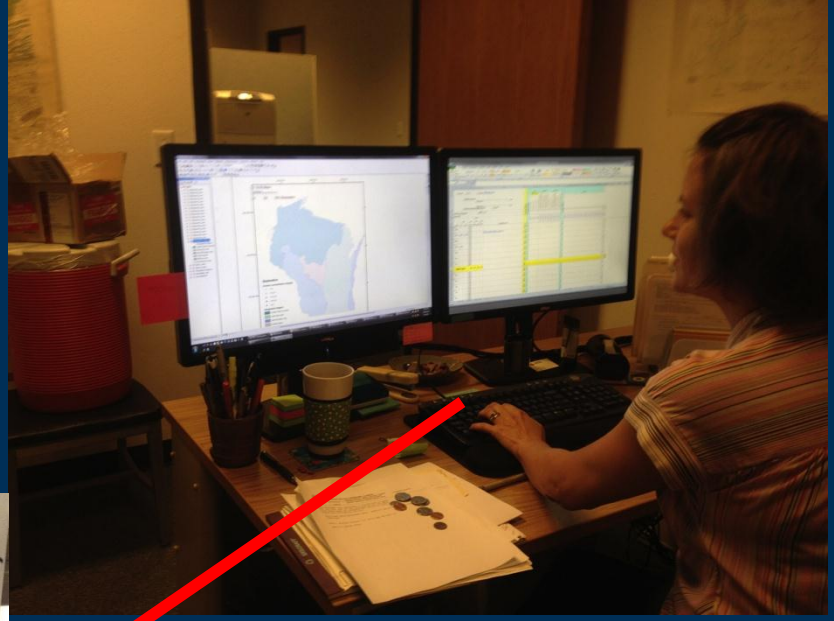

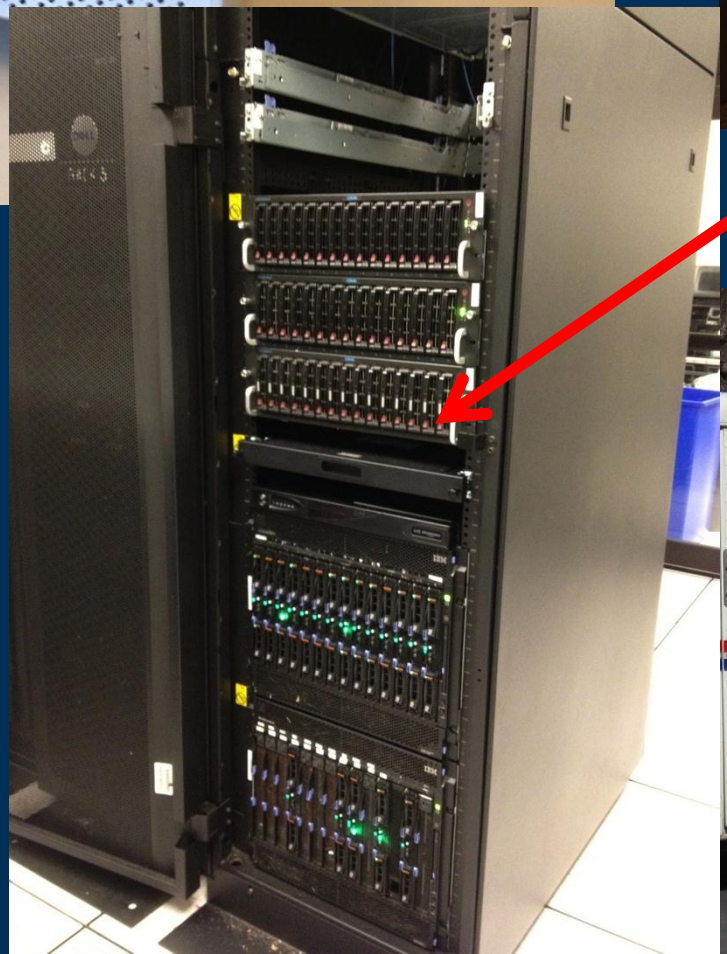

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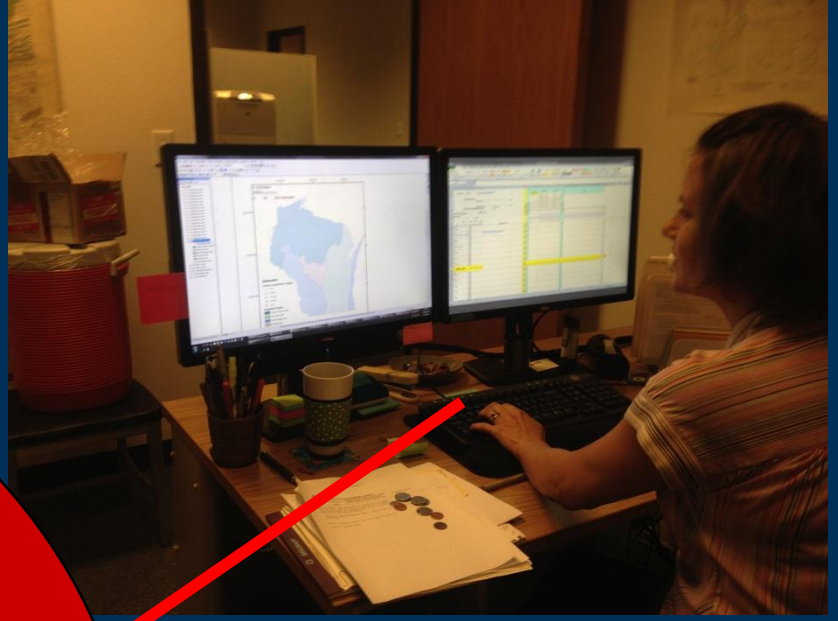
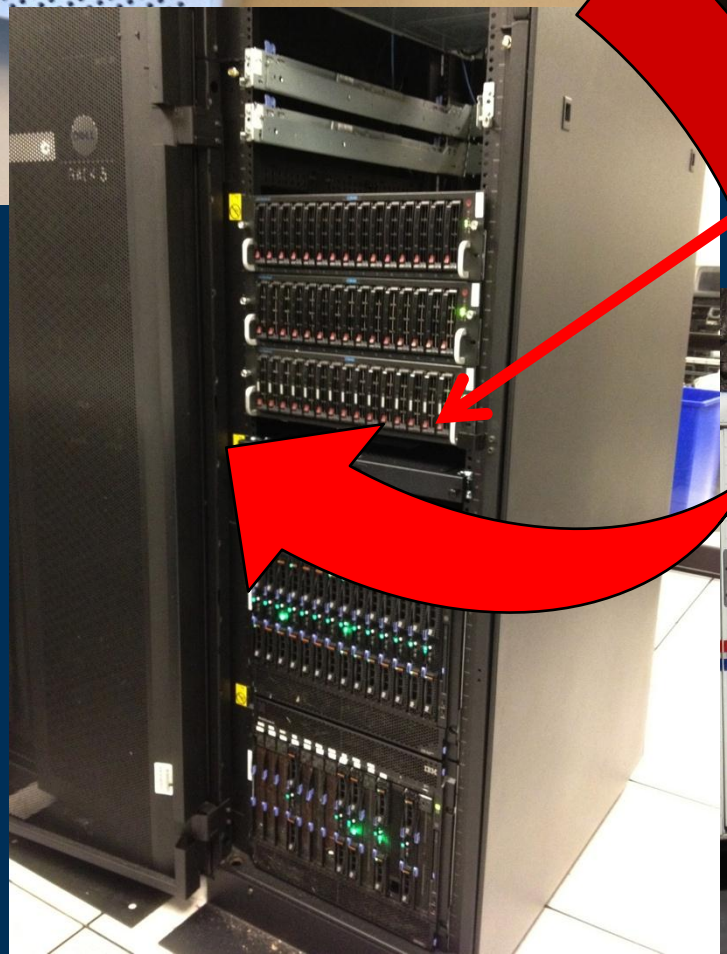
How it was…





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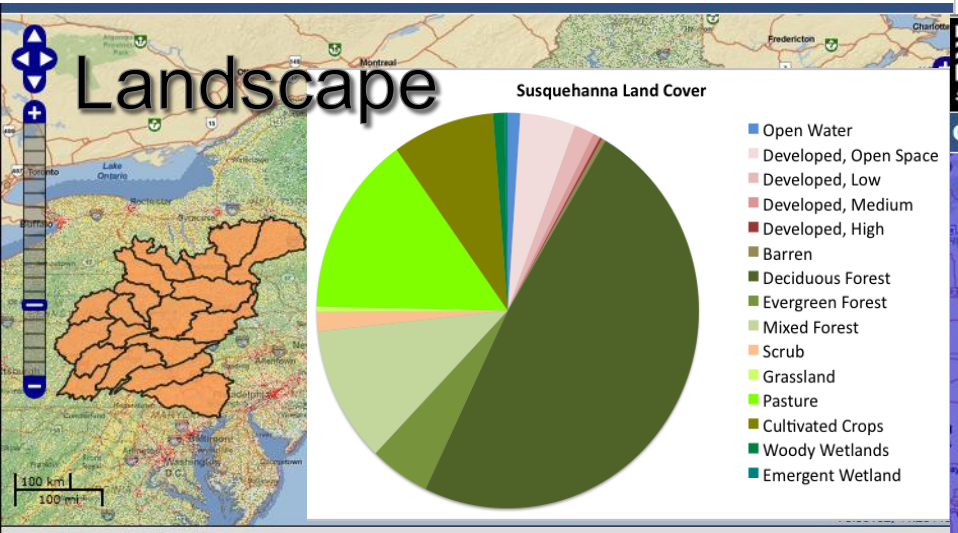
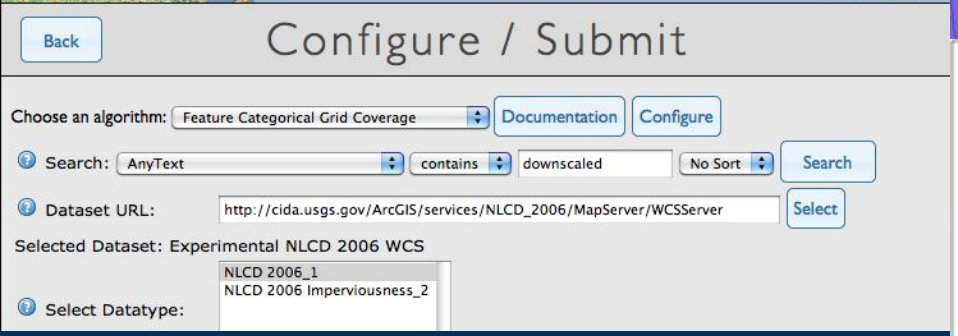
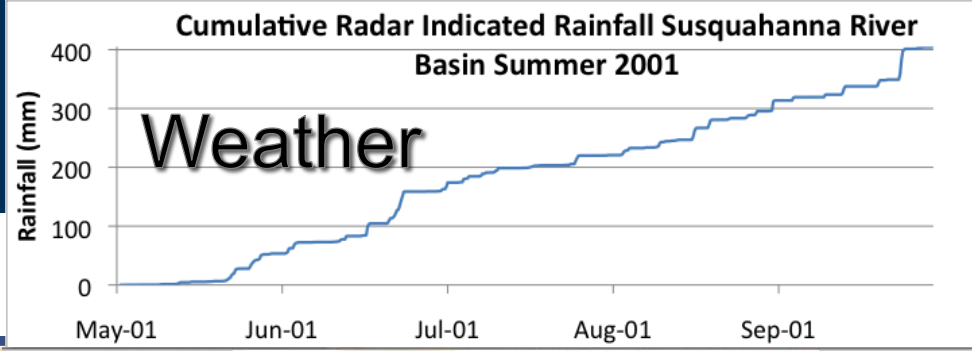
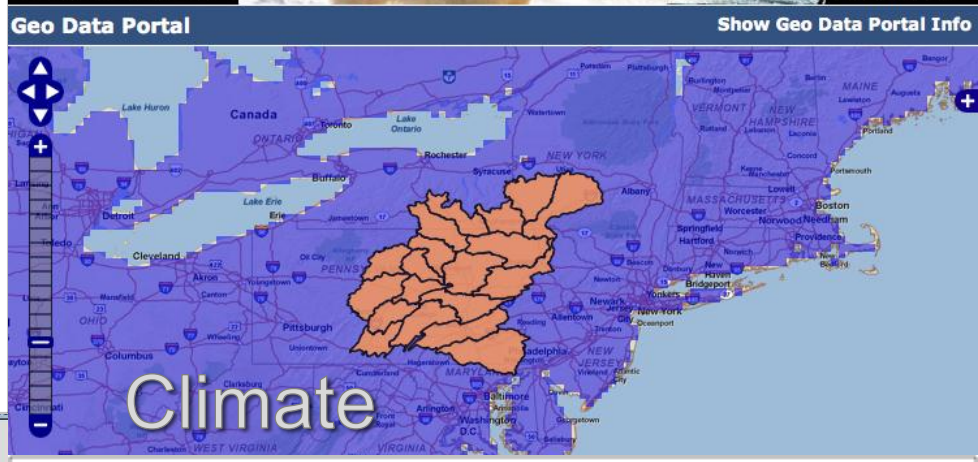
Geo Data Portal

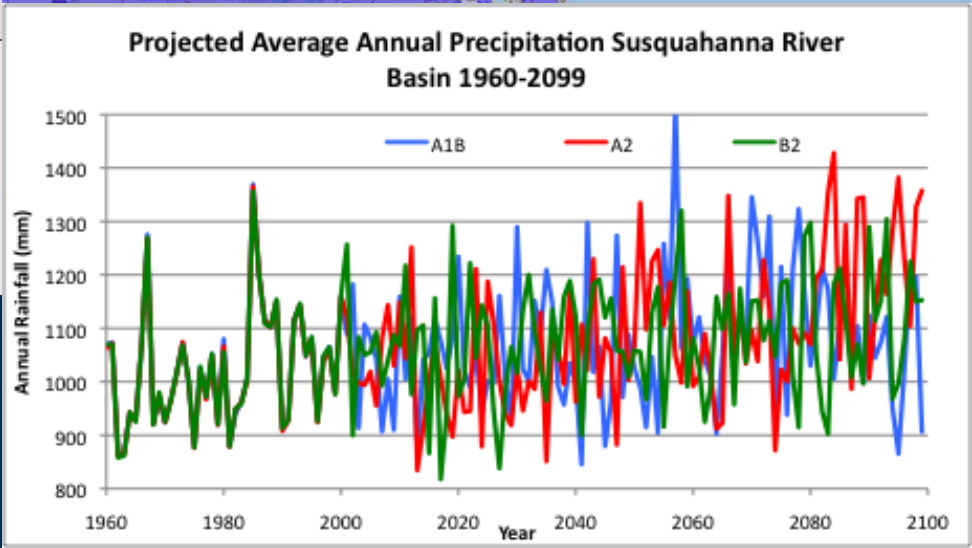
Access and process environmental data from multiple organizations and agencies.











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journal homepage: www.elsevier.com/locate/cageo

The Geoprocessing Web

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[b] Institute for Geoinformatics, University of Muenster, Weseler Strasse 253, 48151 Muenster, Germany
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ARTICLE INFO

Article history:
Received 23 February 2012
Received in revised form
19 April 2012
Accepted 21 April 2012

Keywords:
Geoprocessing Web
Geospatial Web service
Web processing service
Real-time geospatial information
Volunteered geographic information
Semantic web

ABSTRACT

As Web services technology has matured in recent years, an increasing amount of geospatial resources and processing functions are available in the form of online Web services. Consequently, effective and efficient data processing methods for geospatial information extraction and knowledge discovery over the Web are a major challenge for research and industry. The Geoprocessing Web, which consists of light-weight protocols, crowd-sourcing capability, and the capability to process real-time geospatial data sources provided by sensors, enables distributed, interoperable and collaborative processing of geospatial data for information and knowledge discovery. This paper provides a comprehensive overview about the state-of-the-art architecture and technologies, and the most recent developments in the Geoprocessing Web.

1. Introduction

With the advancement of Earth observing and sensing technologies, the volume of geoscientific data has increased tremendously in the past decade and is expected to keep growing continuously. This increasing is reflected by the anticipated operating satellite systems acquiring high-resolution remote-sensing data or by novel crowd-sourcing systems which make in-situ data available and support citizens as scientists. For example, the National Aeronautics and Space Administration (NASA)'s Earth Observing System (EOS) satellites alone collect 1000 terabytes annually (Clery and Voss, 2005). These collected data are diverse regarding their spatial and temporal properties as well their quality. As more information and knowledge is transformed from geospatial data, their value increases. While millions of people across the world are interacting with geospatial data via online tools such as virtual globes (Nature, 2006), geospatial exploration in existing applications is limited to data sharing and viewing. The integration of different data sources by the means of Web-based geoprocessing to acquire further information has not yet been explored thoroughly. Instead, users spend a lot of time on installing and learning a variety of software on local machines, searching for and collecting the geospatial data from a variety of sources, and preprocessing and analyzing the data on local machines. This "everything-locally-owned-and-operated" paradigm makes the analysis and application of geospatial data very expensive and time-consuming. Moreover, these resources are locked in silos and cannot be shared and integrated across organizations and communities. As a result, data analysis becomes a privilege owned by some well-educated domain-specific users, and much data may not been analyzed sufficiently. These traditional methods of analyzing data fall far short of today's increased demands for geospatial information and knowledge.

Interoperability and accessibility of geoprocessing resources improve the application of geospatial data in various domains and help to increase the geospatial knowledge available to society. This interoperability is achieved by common standards whereas accessibility to particular resources is enabled by the Web. Both aspects are supported by Web services technology, which has matured in recent years. Web-based distributed geospatial computing and large networks of collaborating applications is the next step in the evolution of geoprocessing (Kiehle et al., 2007). To address the demands of geoprocessing in distributed environments like the Web, the combination of conventional analysis functions and advanced computing technologies requires new technical infrastructure, domain-specific models and methodologies to support advanced data-mining tools and online community collaborations (Nature, 2008). The Geoprocessing Web provides architecture, standards and tools to meet these requirements. Some are Service-Oriented Architecture (SOA), light-weight protocols, crowd-sourcing capability and the capability to process and deliver real-time geospatial data provided by sensors. The Geoprocessing Web is changing the way in which

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E-mail address: pzhao@gmu.edu (P. Zhao).

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http://dx.doi.org/10.1016/j.cageo.2012.04.021

Please cite this article as: Zhao, P., et al., The Geoprocessing Web. Computers & Geosciences (2012), http://dx.doi.org/10.1016/j.cageo.2012.04.021

NSF Earthcube

Science and Society Transformed by Data

- **Modern science**
  - Data- and compute-intensive
  - Integrative, multiscale
- **Multi-disciplinary collaborations to address complexity**
  - Individuals, groups, teams, communities
- **Sea of Data**
  - Age of Observation
  - Distributed, central repositories, sensor- driven, diverse, etc

Reference: Cliff Jacobs, NSF September 2011

Geo Data Portal Approach

- Understand common data analysis and modeling patterns
- Base software on community best practices and data standards for reusability
- Provide capabilities through various tools – website, GIS, Python, etc.
- Optimize software for dealing with Big Data over the network

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Standards

Information Type	Example	Transfer Standard	Acronym	Implementation
Discovery Metadata	ISO 191## Standards	Catalog Service for the Web	CSW	GeoPortal/GeoNetwork
Polygon Vector Features	Shapefiles	Web Feature Service	WFS	ArcServer/GeoServer
Feature Time Series	Geodatabase	Sensor Observation Service	SOS	In Development (Will present at OGC in Sept.)
Gridded Time Series	netCDF-CF	Opensource Project for a Network Data Access Protocol	OPeNDAP	THREDDS
Geographic Grids	geoTIFF/GRD	Web Coverage Service	WCS	Arcserver/GeoServer

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Open Geospatial Consortium | OGC(R)

www.opengeospatial.org

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- Defense & Intelligence
- Emergency Response & Disaster Management
- Geosciences & Environment
- Government & Spatial Data Infrastructure
- Mobile Internet & Location Services
- Sensor Webs
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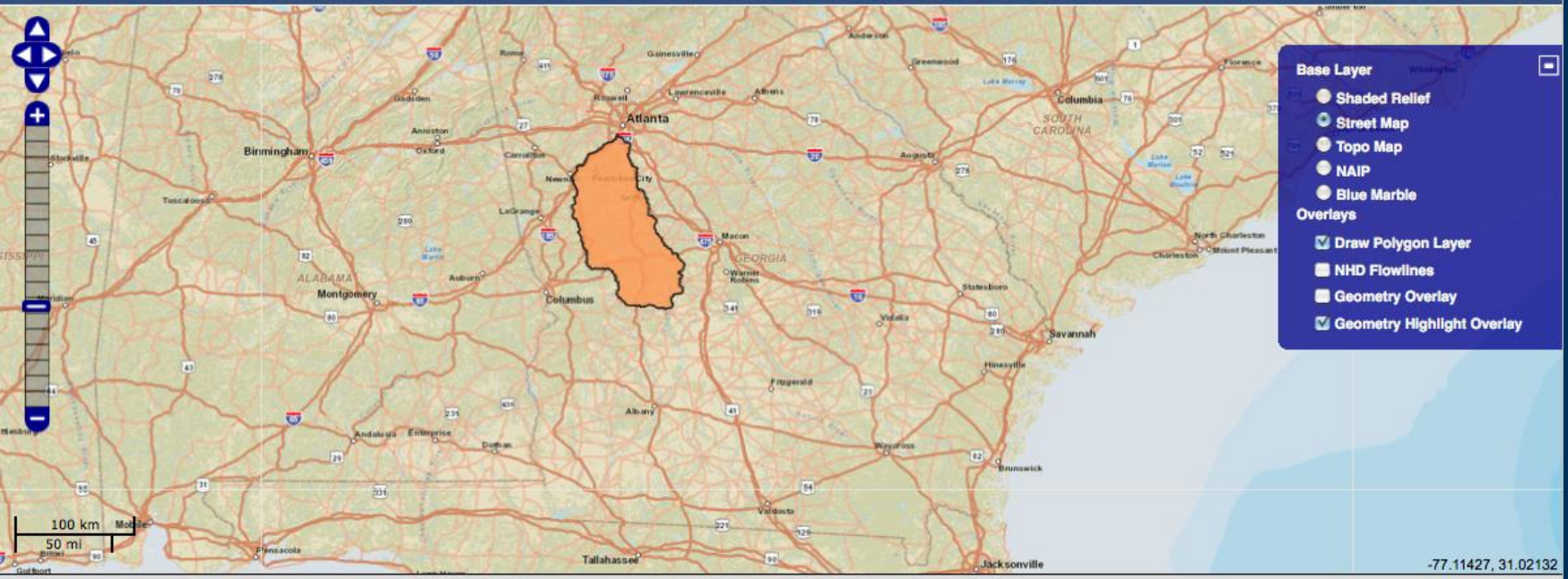

Specify Area of Interest

Next

Upload Shapefile or Draw a Polygon

Available Areas of Interest:

- sample:FWS_LCC
- upload:GA_State_NAD1983
- upload:OKCNTYD
- sample:simplified_HUC8s
- upload:sp
- upload:test_sciencebase(1)

Available Attributes:

- REGION
- SUBREGION
- BASIN
- SUBBASIN
- HUC_2
- HUC_4

Available Attribute Values:

- Upper Elkhorn
- Upper Flint
- Upper Fox
- Upper French Broad
- Upper Frio
- Upper Genesee

Choose a data set

Total records returned: 1 - 5 (of 6) || next >>

1. **Title:** USGS Dynamical Downscaled Regional Climate - V1.0
   Abstract: Note: Their are numerous unique datasets available from this research project. A full list of datasets is available here: http://cida.usgs.gov/climate/hostetlerprojections.jsp Clicking the links at that page will bring you to the Geo Data Portal with that dataset selected as a source for processing. Abstract: We have completed an array of high-resolution simulations of present and future climate over Western North America (WNA) and Eastern North America (ENA) by dynamically downscaling global cl ...
   Full Record

2. **Title:** Parameter-elevation Regressions on Independent Slopes Model Monthly Climate Data for the Continental United States.
   Abstract: This dataset was created using the PRISM (Parameter-elevation Regressions on Independent Slopes Model) climate mapping system, developed by Dr. Christopher Daly, PRISM Climate Group director. PRISM is a unique knowledge-based system that uses point measurements of precipitation, temperature, and other climatic factors to produce continuous, digital grid estimates of monthly, yearly, and event-based climatic parameters. Continuously updated, this unique analytical tool incorporates point data, a ...
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   Abstract: This archive contains fine spatial-resolution translations of 112 contemporary climate projections over the contiguous United States. The original projections are from the World Climate Research Programme's (WCRP's) Coupled Model Intercomparison Project phase 3 (CMIP3) multi-model dataset, which was referenced in the Intergovernmental Panel on Climate Change Fourth Assessment Report.
   Full Record

4. **Title:** **Provisional** Alaska Daily Downscaled Climate Projections by Katharine Hayhoe
   Abstract: Further documentation about this dataset is available here: http://cida.usgs.gov/climate/hayhoe_projections.jsp Disclaimer: These data are preliminary and are subject to revision. They are being provided to meet the need for timely "best science" information. The assessment is provided on the condition that neither the U.S. Geological Survey nor the United States Government may be held liable for any damages resulting from the authorized or unauthorized use of the assessment. This daily downscal ...
   Full Record

5. **Title:** **Provisional** - 12km-CONUS Daily Downscaled Climate Projections by Katharine Hayhoe
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   Full Record

Dataset metadata

Identification Information

Title:	Parameter-elevation Regressions on Independent Slopes Model Monthly Climate Data for the Continental United States.
Individual name:	Christopher Daley
Organisation name:	Oregon State University
Abstract:	This dataset was created using the PRISM (Parameter-elevation Regressions on Independent Slopes Model) climate mapping system, developed by Dr. Christopher Daly, PRISM Climate Group director. PRISM is a unique knowledge-based system that uses point measurements of precipitation, temperature, and other climatic factors to produce continuous, digital grid estimates of monthly, yearly, and event-based climatic parameters. Continuously updated, this unique analytical tool incorporates point data, a digital elevation model, and expert knowledge of complex climatic extremes, including rain shadows, coastal effects, and temperature inversions. PRISM data sets are recognized world-wide as the highest-quality spatial climate data sets currently available. PRISM is the USDA's official climatological data.
Aggregation DS Identifier:	Unidata Common Data Model
Aggregation Type:	Grid
Keywords:	Atmospheric Temperature, Air Temperature Atmosphere, Precipitation, Rain, Maximum Daily Temperature, Minimum Daily Temperature, PRISM Climate Group
Acknowledgment:	PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, Accessed Jan 2012.
License:	Freely Available: The PRISM Climate Group, Oregon State University retains rights to ownership of the data and information.

Data Creator – Point of Contact

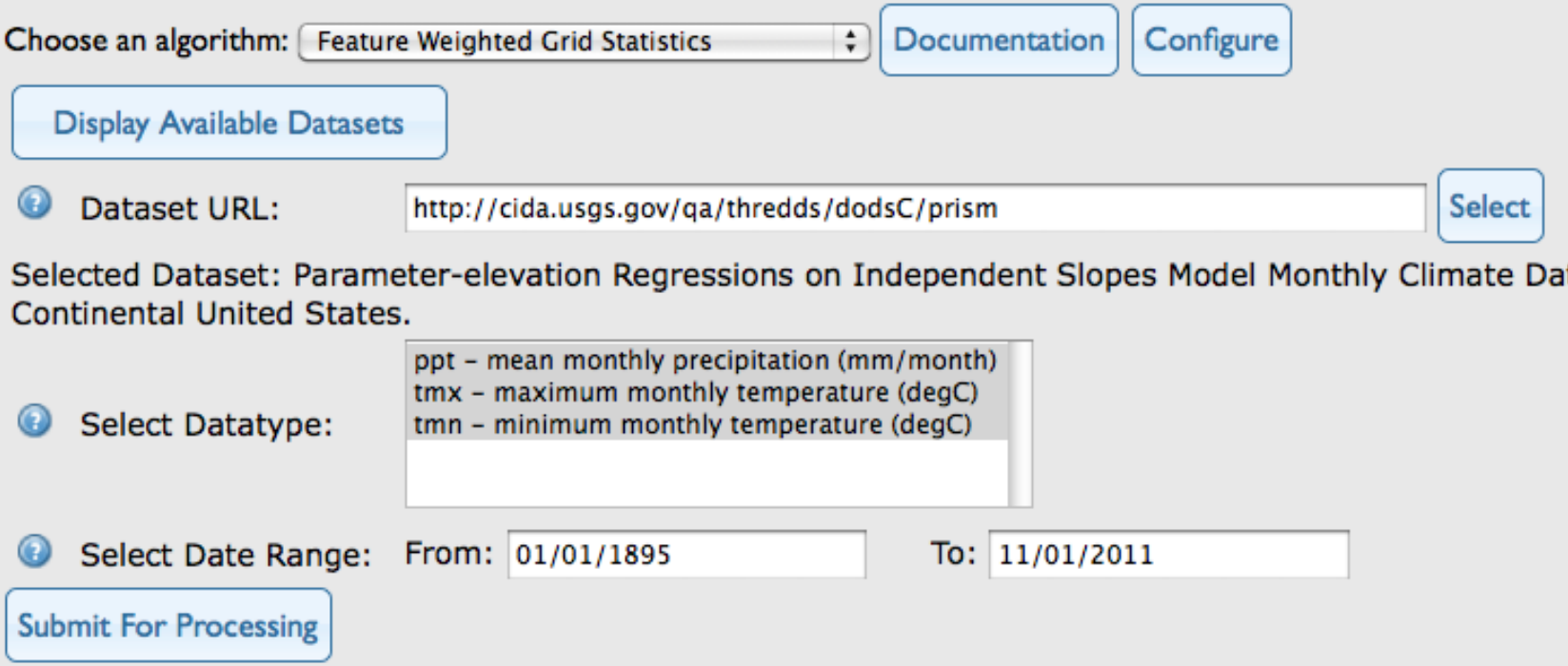
Creator name:	Christopher Daley
Creator E-Mail:	daley@nacse.org
Institution:	Oregon State University

Geographic box

North bound latitude
49.937503814697266

West bound longitude
-125.02083587646484

East bound longitude
-66.52082824707031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Feature Weighted Grid Statistics
Documentation
Configure
Display Available Datasets
Dataset URL:
http://cida.usgs.gov/qa/thredds/dodsC/prism
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Selected Dataset: Parameter-elevation Regressions on Independent Slopes Model Monthly Climate Data for the Continental United States.
Select Datatype:
ppt – mean monthly precipitation (mm/month)
tmx – maximum monthly temperature (degC)
tmn – minimum monthly temperature (degC)
Select Date Range:
From:
01/01/1895
To:
11/01/2011
Submit For Processing

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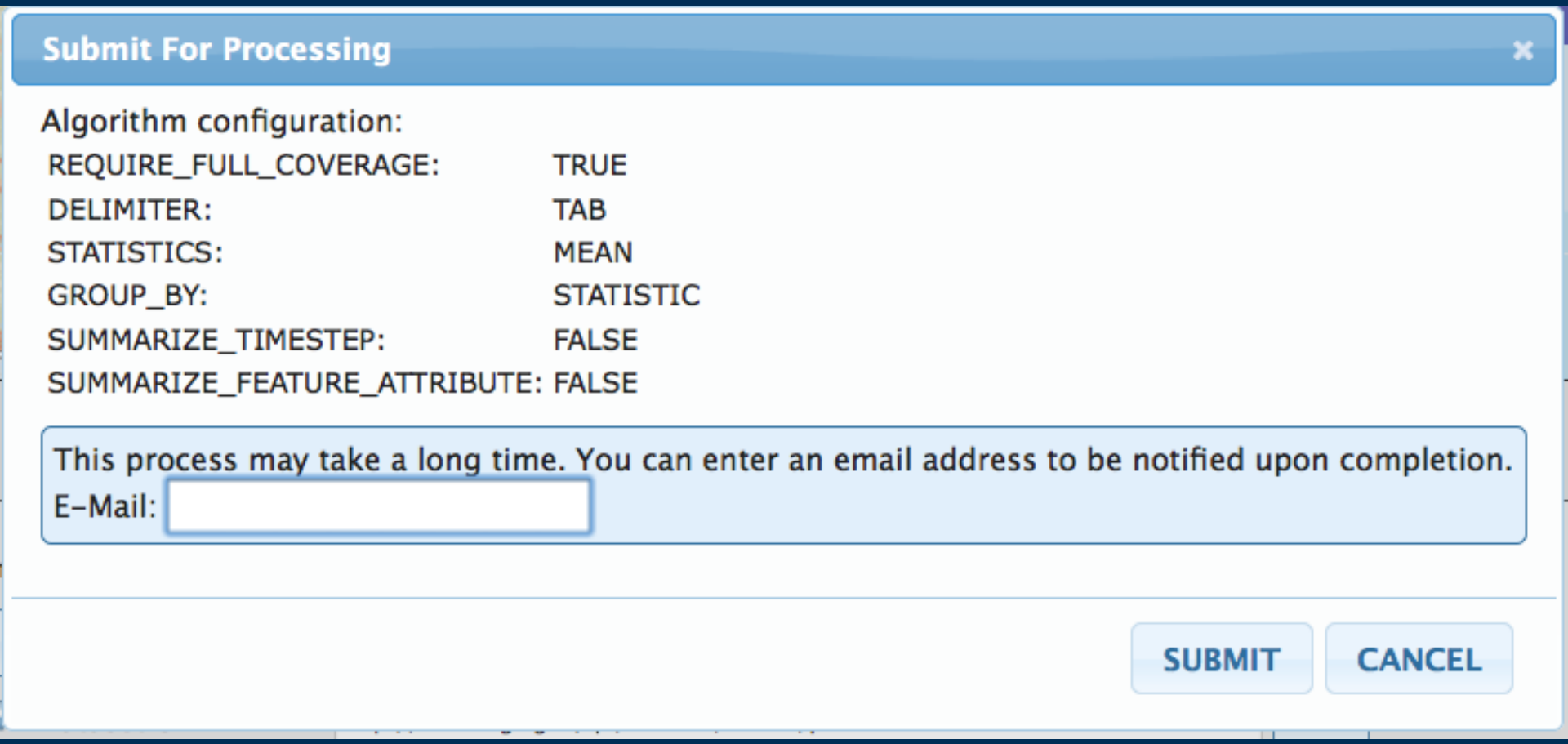
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STATISTICS: MEAN
GROUP_BY: STATISTIC
SUMMARIZE_TIMESTEP: FALSE
SUMMARIZE_FEATURE_ATTRIBUTE: FALSE
This process may take a long time. You can enter an email address to be notified upon completion.
E-Mail:
SUBMIT
CANCEL

USGS

Processing Complete — Inbox

Delete Junk Reply Reply All Forward Print To Do

From: gdp_data@usgs.gov
Subject: **Processing Complete**
Date: August 21, 2012 9:15:10 AM CDT
To: David Blodgett

The processing has completed on your request. You can retrieve your file at
http://cida.usgs.gov/climate/gdp/process/RetrieveResultServlet?id=584127939095255374 3OUTPUT.dafbafd0-541d-456c-8188-5b3f1309d042

Process Information Follows:

Process Information:

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Process Version: 1.0.0
Process Full Name: gov.usgs.cida.gdp.wps.algorithm.FeatureWeightedGridStatisticsAlgorithm
Process Created: 2012-08-21T09:12:10.721-05:00
Process Status: Process successful

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Data: dods://cida.usgs.gov/qa/thredds/dodsC/prism
Input: DATASET_ID
Data: ppt
Input: DATASET_ID
Data: tmx
Input: DATASET_ID
Data: tmn
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Input: TIME_END
Data: 2011-11-01T00:00:00.000Z
Input: REQUIRE_FULL_COVERAGE
Data: true

Datasets Currently Available

USGS

1. **Title:** Great Lakes Coastal Forecasting System Nowcast/Lake Michigan Nowcast History 2D
   Abstract: Great Lakes Coastal Forecasting System Nowcast Lake Michigan Nowcast History 2D
   Full Record

2. **Title:** Great Lakes Coastal Forecasting System Nowcast/Lake Superior Nowcast History 2D
   Abstract: Great Lakes Coastal Forecasting System Nowcast/Lake Superior Nowcast History 2D
   Full Record

3. **Title:** Great Lakes Coastal Forecasting System Nowcast/Lake Erie Nowcast History 2D
   Abstract: Great Lakes Coastal Forecasting System Nowcast/Lake Erie Nowcast History 2D
   Full Record

4. **Title:** Great Lakes Coastal Forecasting System Nowcast/Lake Ontario Nowcast History 2D
   Abstract: Great Lakes Coastal Forecasting System Nowcast/Lake Ontario Nowcast History 2D
   Full Record

5. **Title:** Great Lakes Coastal Forecasting System Nowcast/Lake Huron Nowcast History 2D
   Abstract: Great Lakes Coastal Forecasting System Nowcast/Lake Huron Nowcast History 2D
   Full Record

6. **Title:** Experimental SSURGO Derived Hydrologic Soil Properties
   Abstract: Products generated according to nrcs standards presented here:
   http://soildatamart.nrcs.usda.gov/documents/SSURGODataPackagingandUse.pdf
   Full Record

7. **Title:** Experimental NLCD WCS
   Abstract: This is an experimental Web Coverage Service representation of the National Land Cover Dataset. The original source of this data is http://www.mrlc.gov
   Full Record

8. **Title:** Experimental National Elevation Dataset DEM WCS
   Abstract:
   Full Record

9. **Title:** River Forecasting Center Quantitative Precipitation Estimates - National Mosaic
   Abstract: Radar indicated-rain gage verified and corrected precipitation estimates for the continental United States. Updated weekly from NPVU archive.
   Full Record

10. **Title:** River Forecsting Center Quantitative Precipitation Estimates - North Central River Forecasting Center
    Abstract: Radar indicated-rain gage verified and corrected precipitation estimate on the ~4km HRAP grid. 1 hour temporal resolution. Includes only the North Central River Forecasting Center's data.
    Full Record

11. **Title:** USGS Dynamical Downscaled Regional Climate - V1.0
Abstract: Note: Their are numerous unique datasets available from this research project. A full list of datasets is available here: http://cida.usgs.gov/climate/hostetlerprojections.jsp Clicking the links at that page will bring you to the Geo Data Portal with that dataset selected as a source for processing. Abstract: We have completed an array of high-resolution simulations of present and future climate over Western North America (WNA) and Eastern North America (ENA) by dynamically downscaling global cl ...
Full Record

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12. **Title:** STATSGO2 MUIDs
Abstract: MetaData from ArcGIS coverage and info tables. Note: This service is for MUIDs only. This digital data release consists of a 100 meter resolution grid of the Natural Resources Conservation Service's (NRCS) Soil Survey Geographic (STATSGO2) Database soil mapping unit identifiers (MUKEY) and associated INFO tables for the state of United States and Puerto Rico. The associated tables, LAYER and TEXT, are areal and depth weighted average values for several soil characteristics from the STATSGO2 dat ...
Full Record

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13. **Title:** Parameter-elevation Regressions on Independent Slopes Model Monthly Climate Data for the Continental United States.
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Full Record

---

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Full Record

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16. **Title:** Gridded Observed Meteorological Data, 1950-1999
Abstract: These daily gridded observations at 1/8 degree spatial resolution (about 12 km) are a baseline dataset to be compered to downscaled climate predictions. The grid used is the same as has been used by other 1/8th degree spatial resolution downscaling projects.
Full Record

Examples

USGS

LOTS OF DATA....LOTS OF MODELS

LOTS OF DATA….LOTS OF MODELS

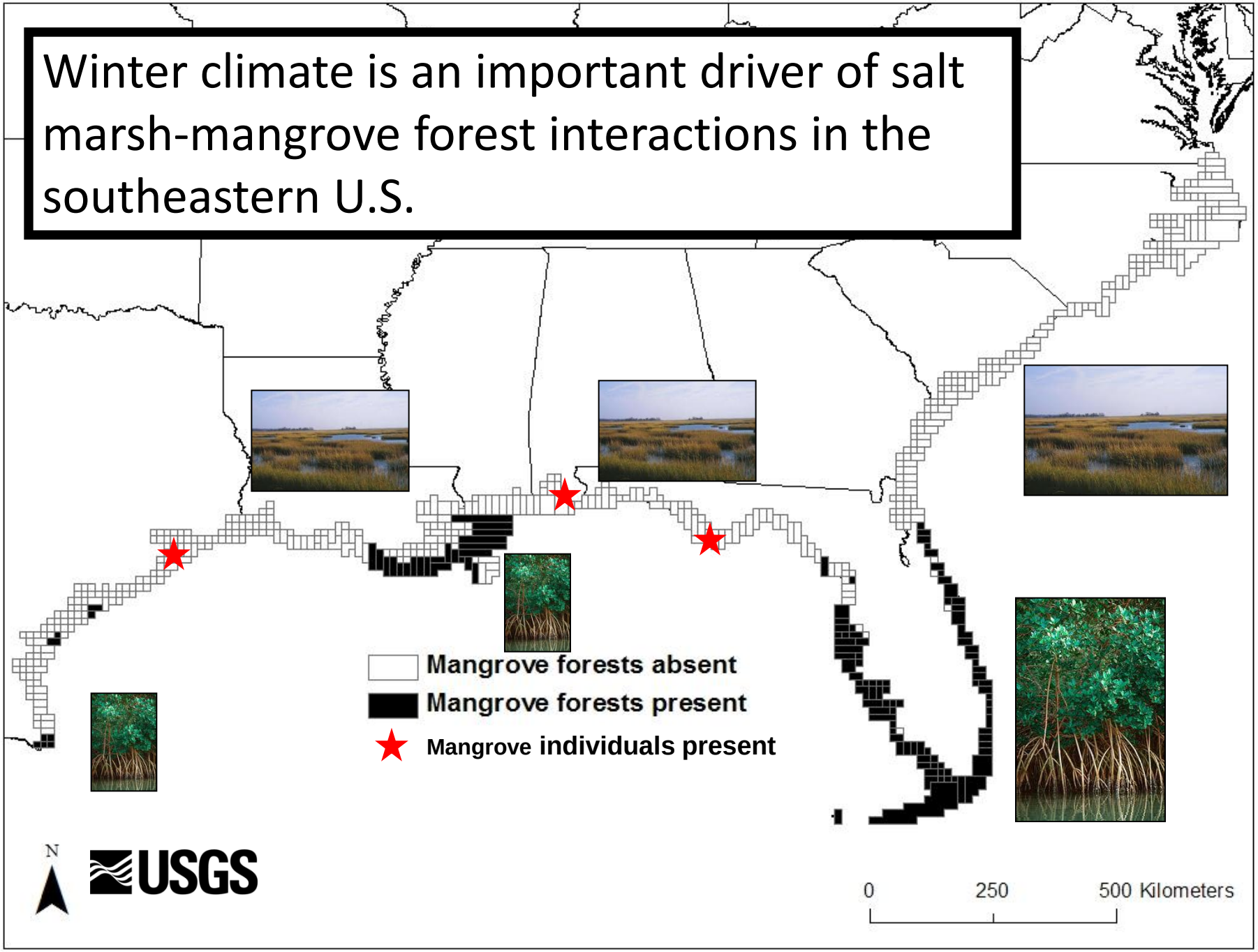
CAN WE USE GDP TO FACILITATE RESEARCH PROCESS?

Driving Marsh-Mangrove Interactions Model

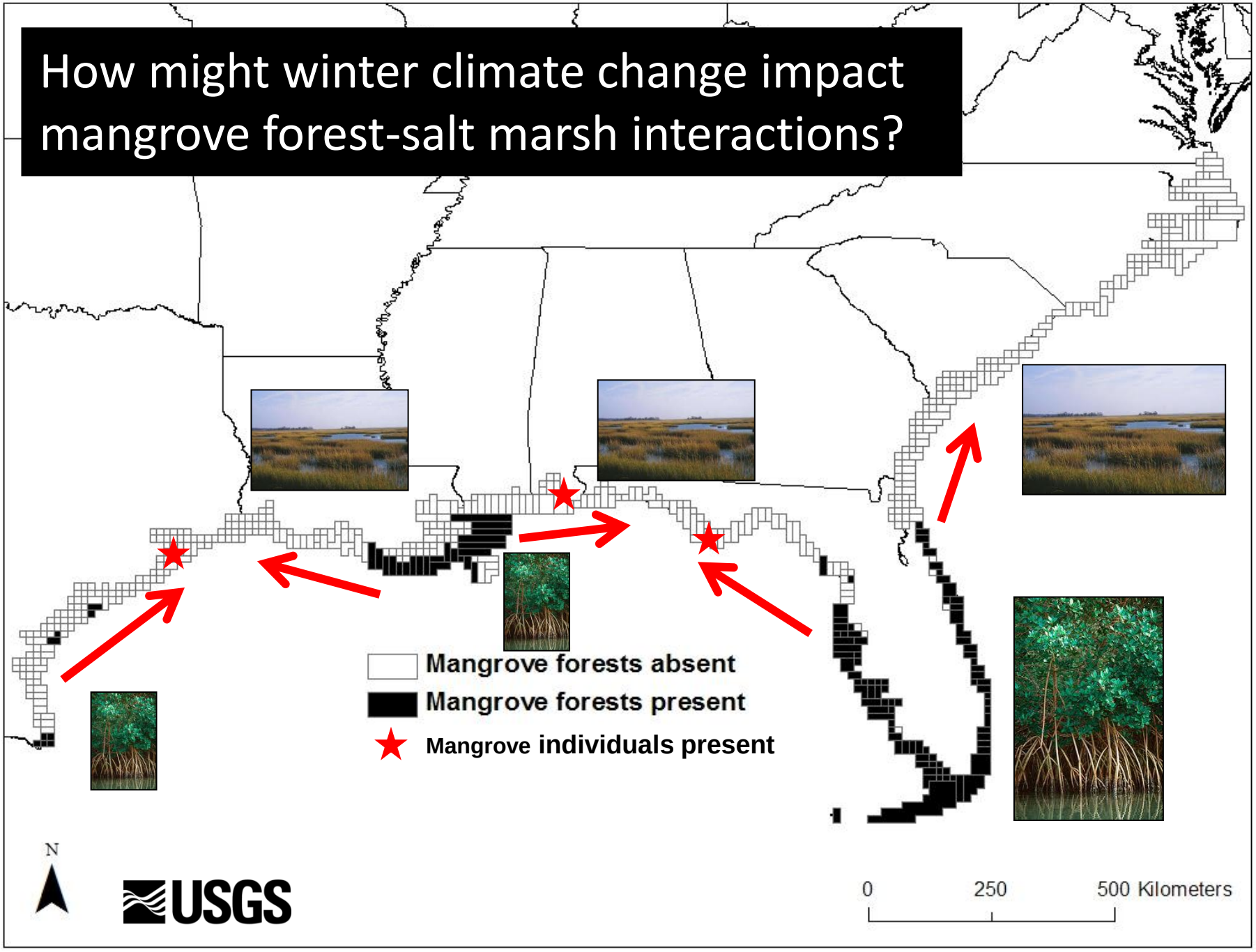
- Mike Oslund, USGS National Wetlands Research Center

USGS

Winter climate is an important driver of salt marsh-mangrove forest interactions in the southeastern U.S.



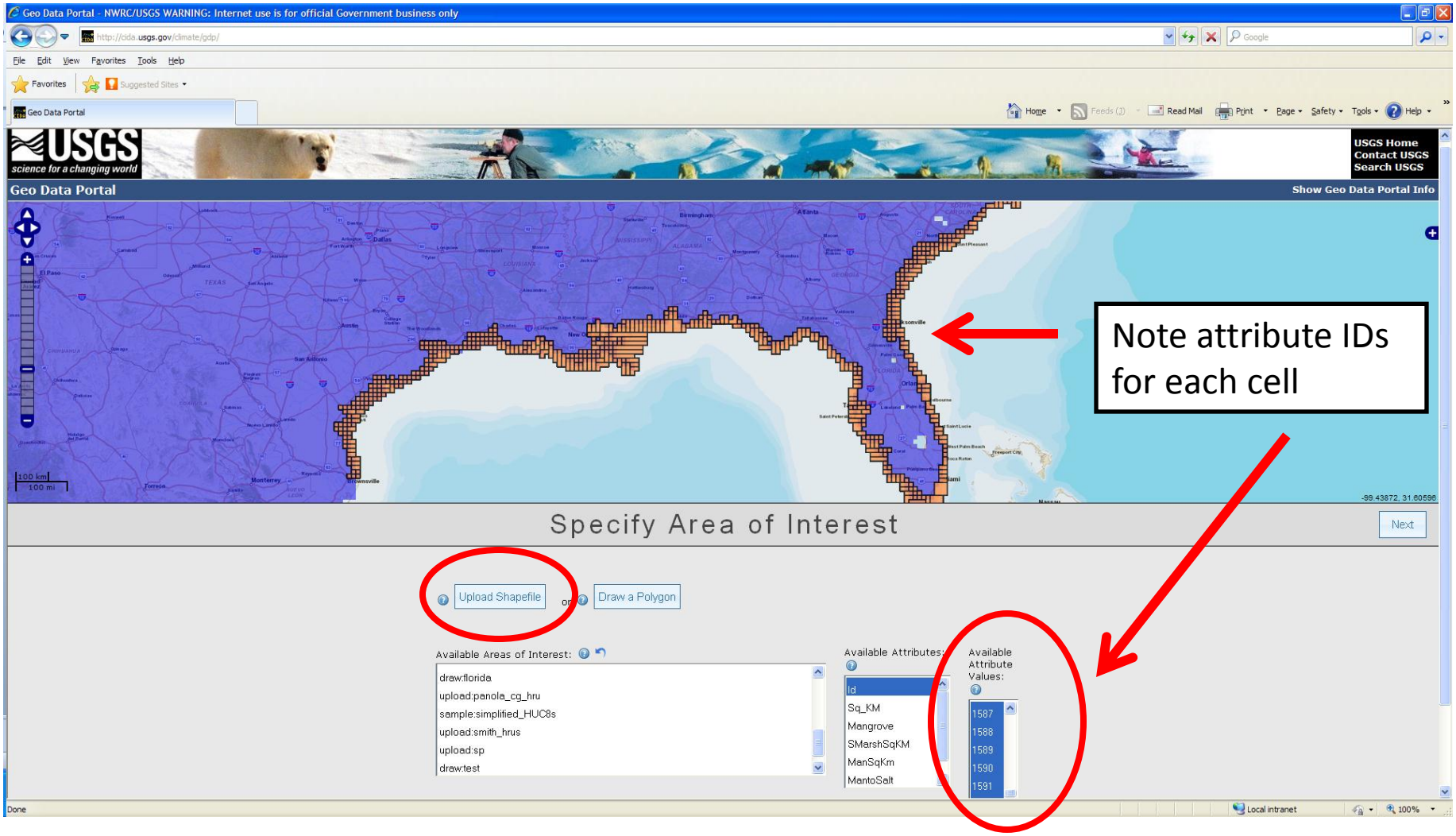
How might winter climate change impact mangrove forest-salt marsh interactions?



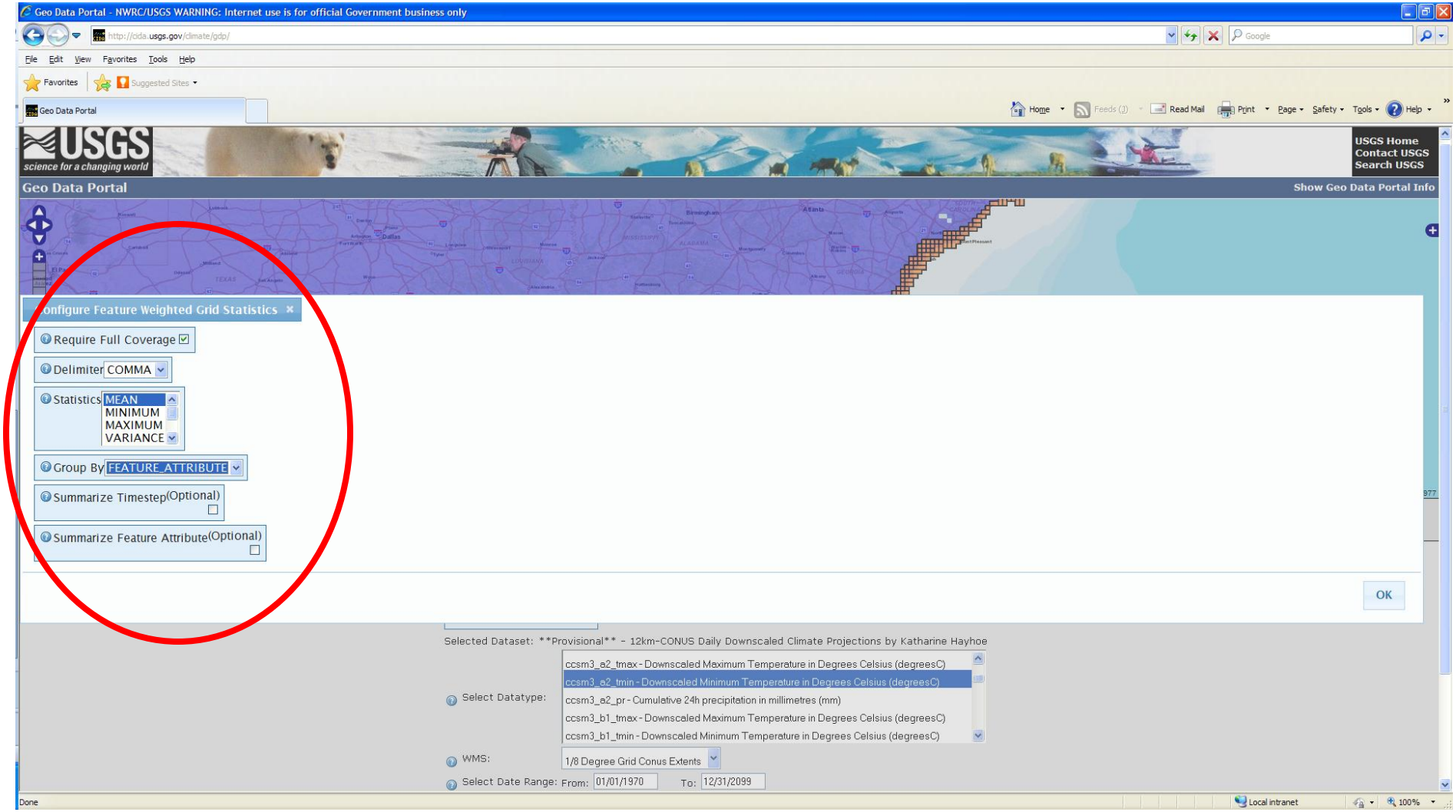
USGS Climate Geo Data Portal: Center for Integrated Data Analytics (CIDA)

- Link: http://cida.usgs.gov/climate/gdp/

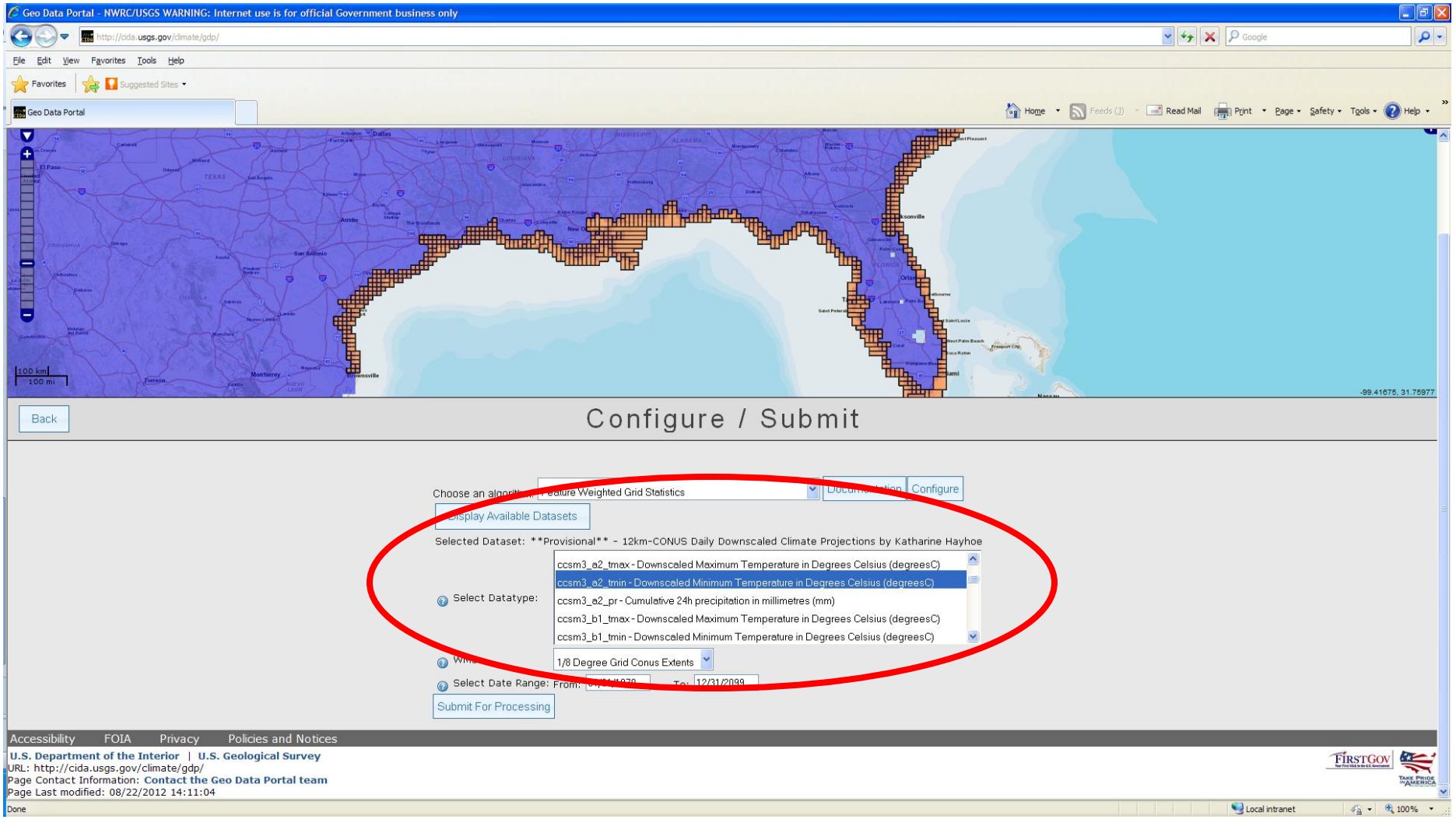
Uploading a shapefile to the portal



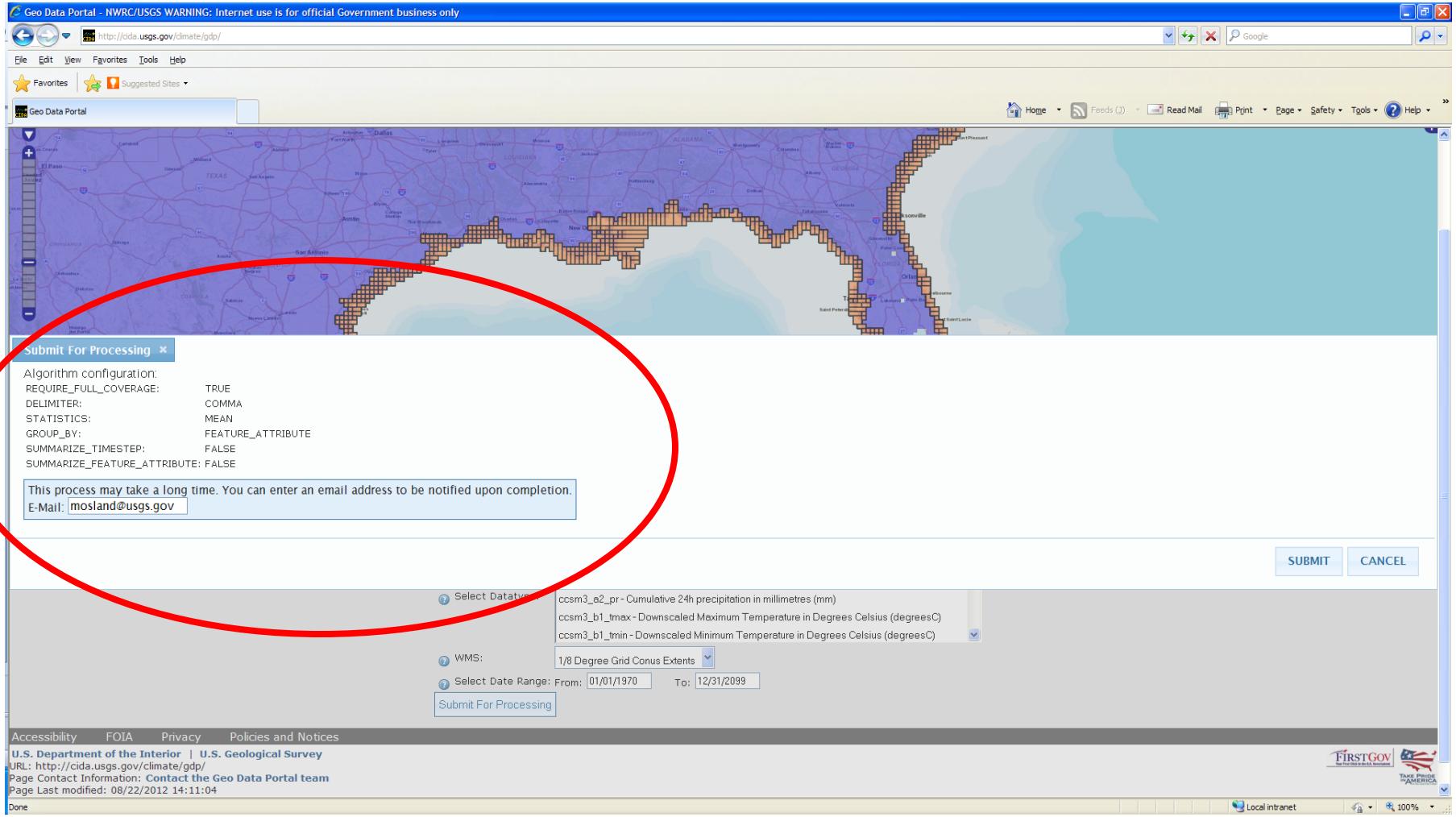
Configuring the grid statistics



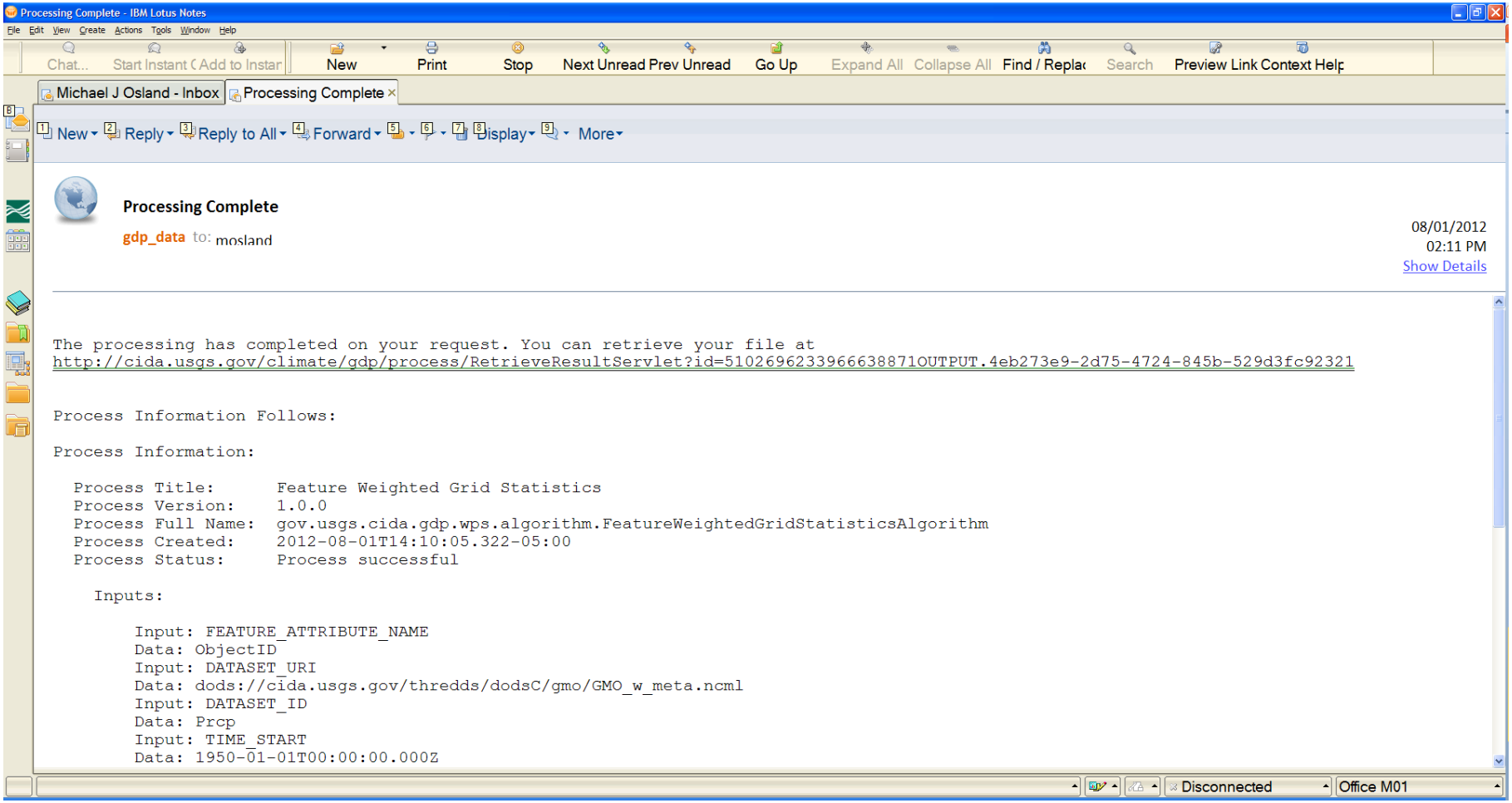
Selecting the dataset



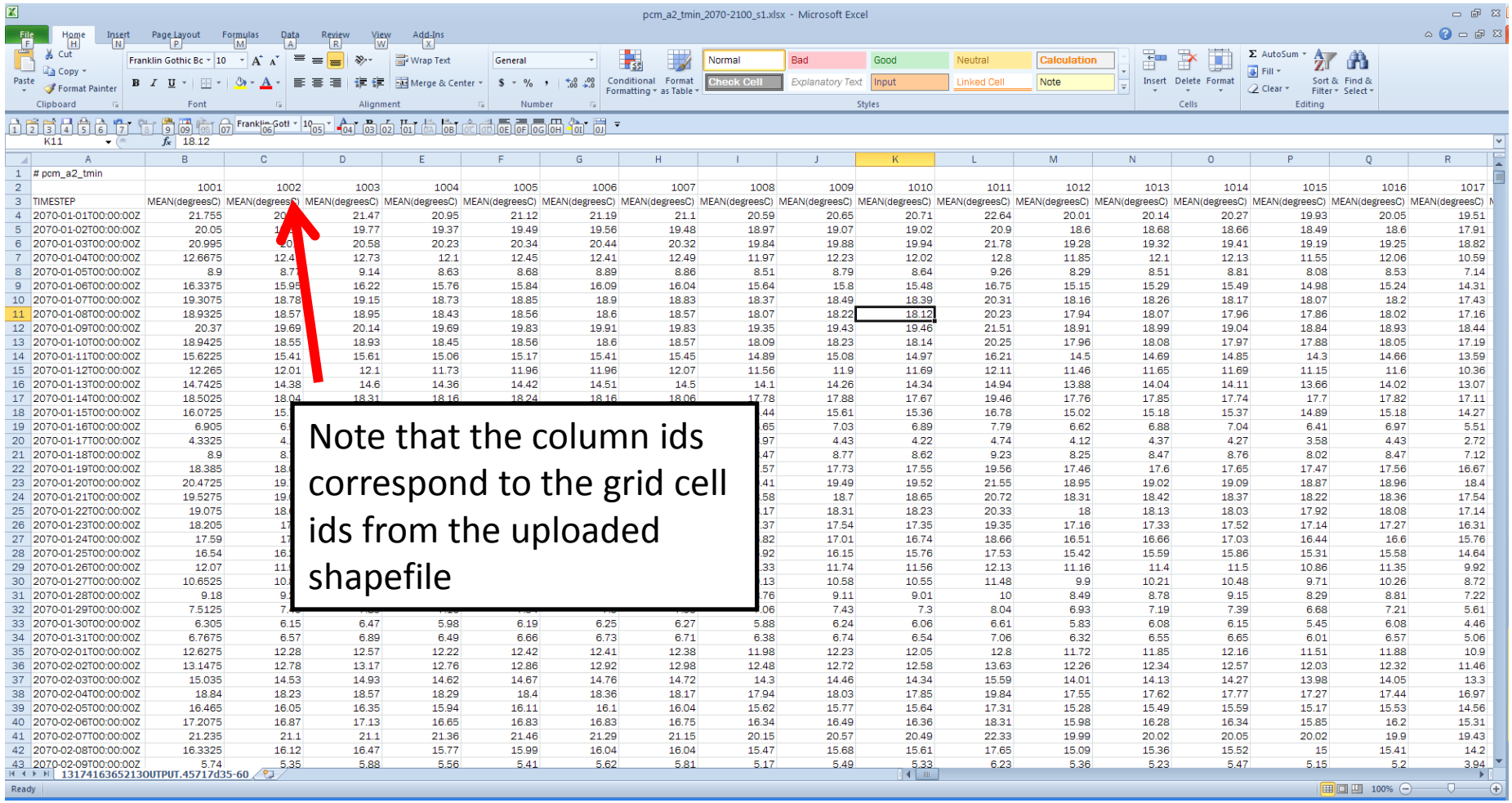
Submitting for processing



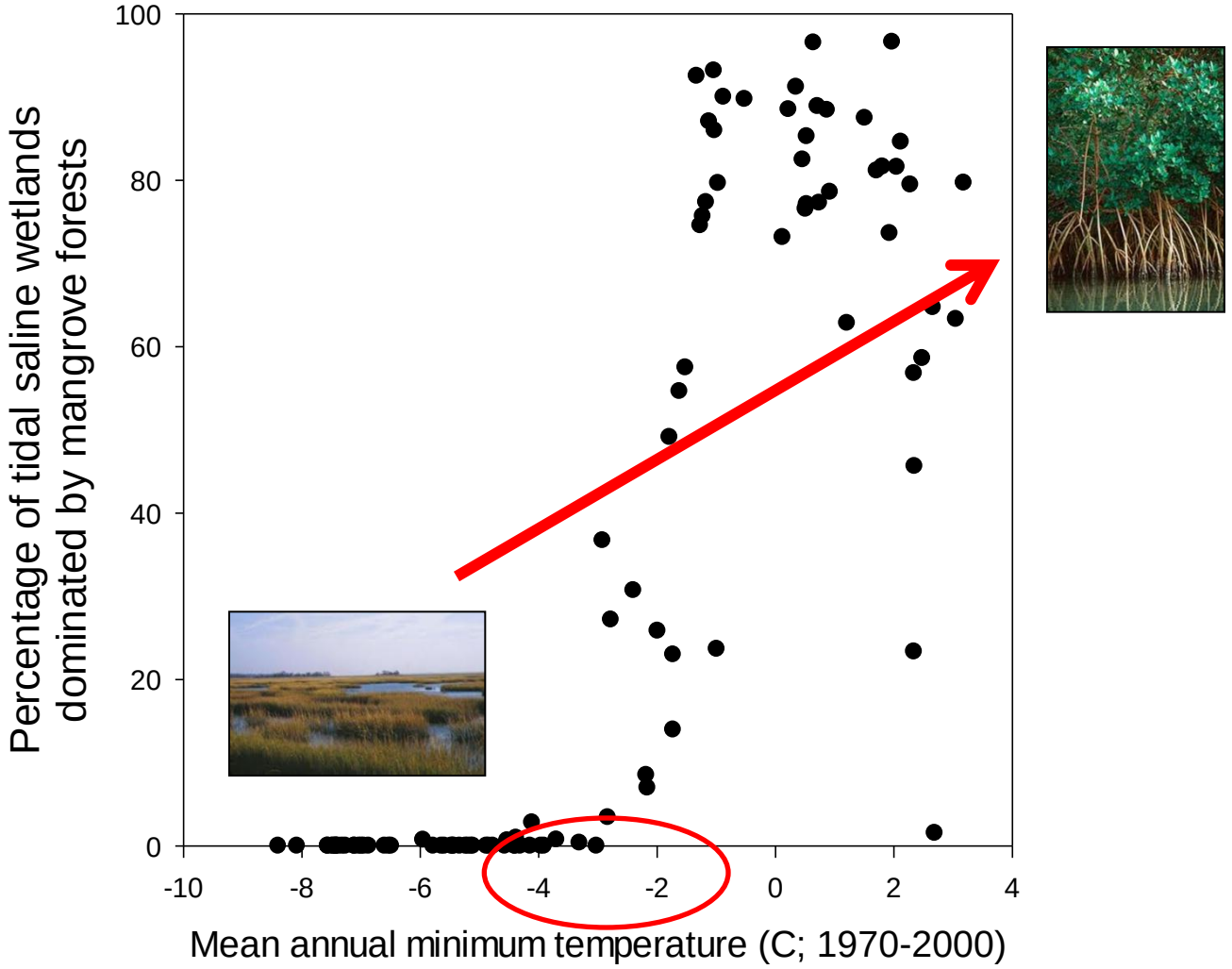
An email indicating that the data is ready



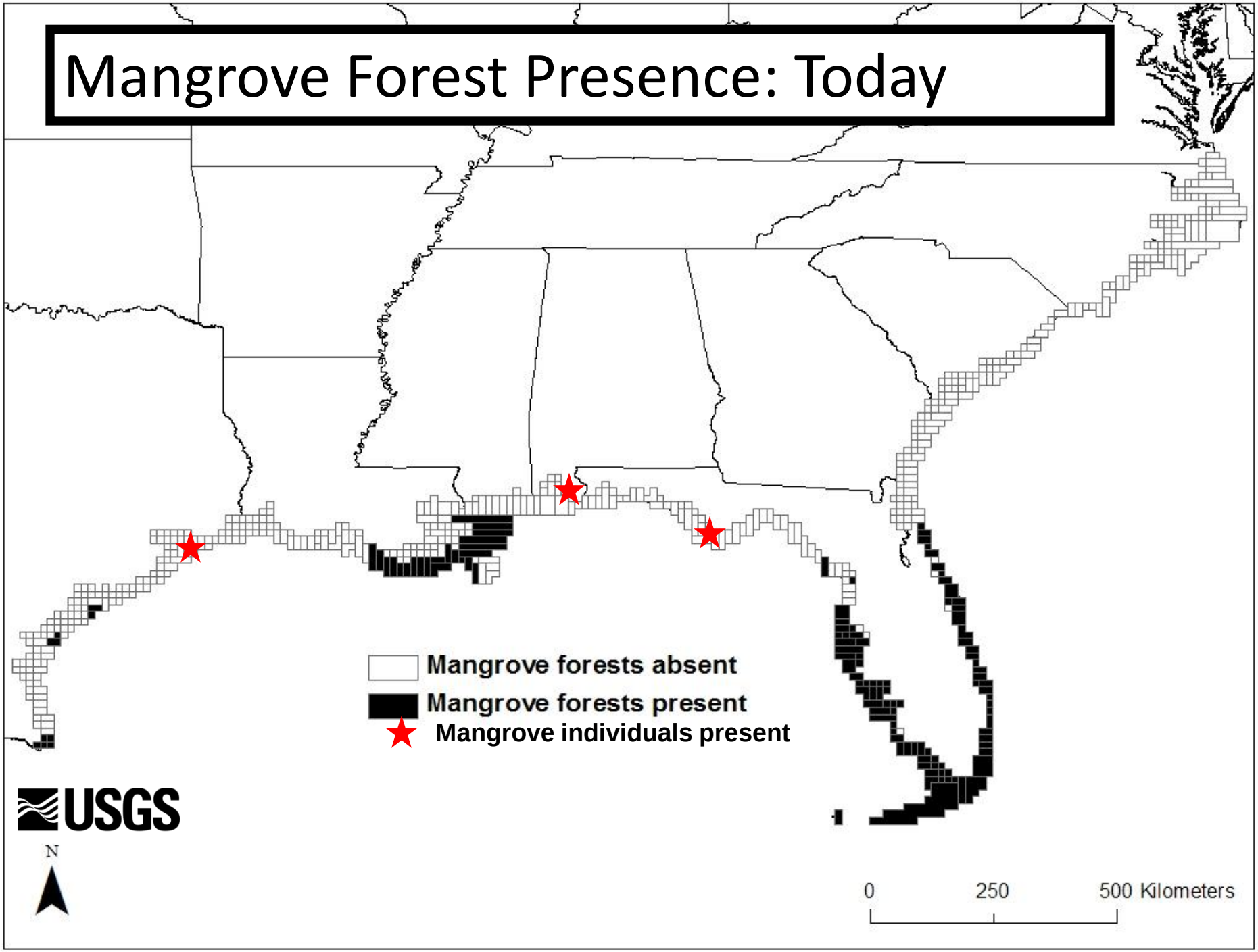
The downloaded data



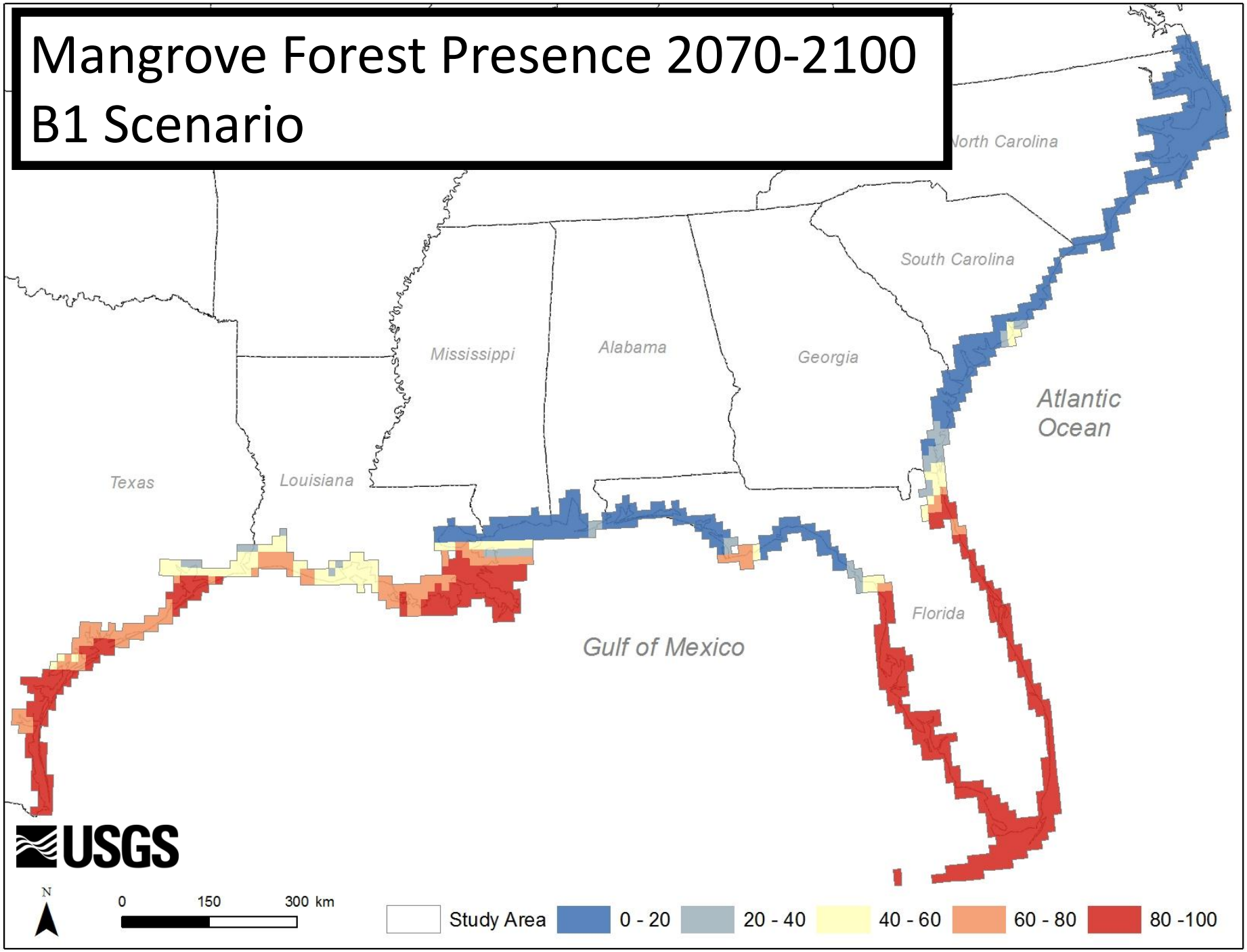
The relationship between winter severity and mangrove forest dominance



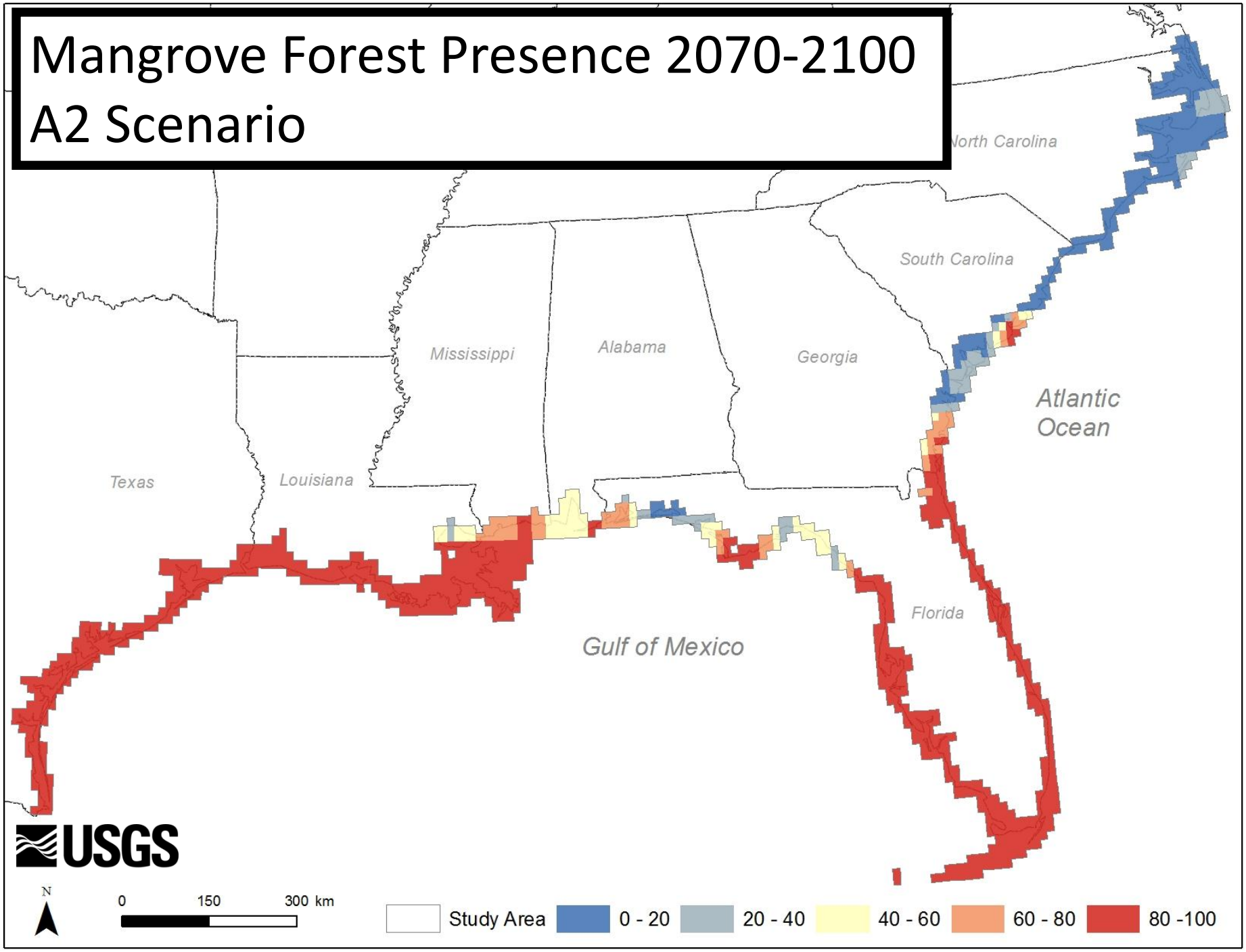
Mangrove Forest Presence: Today



Mangrove Forest Presence 2070-2100
B1 Scenario



Mangrove Forest Presence 2070-2100
A2 Scenario



Driving Tidal Flats Abundance Model

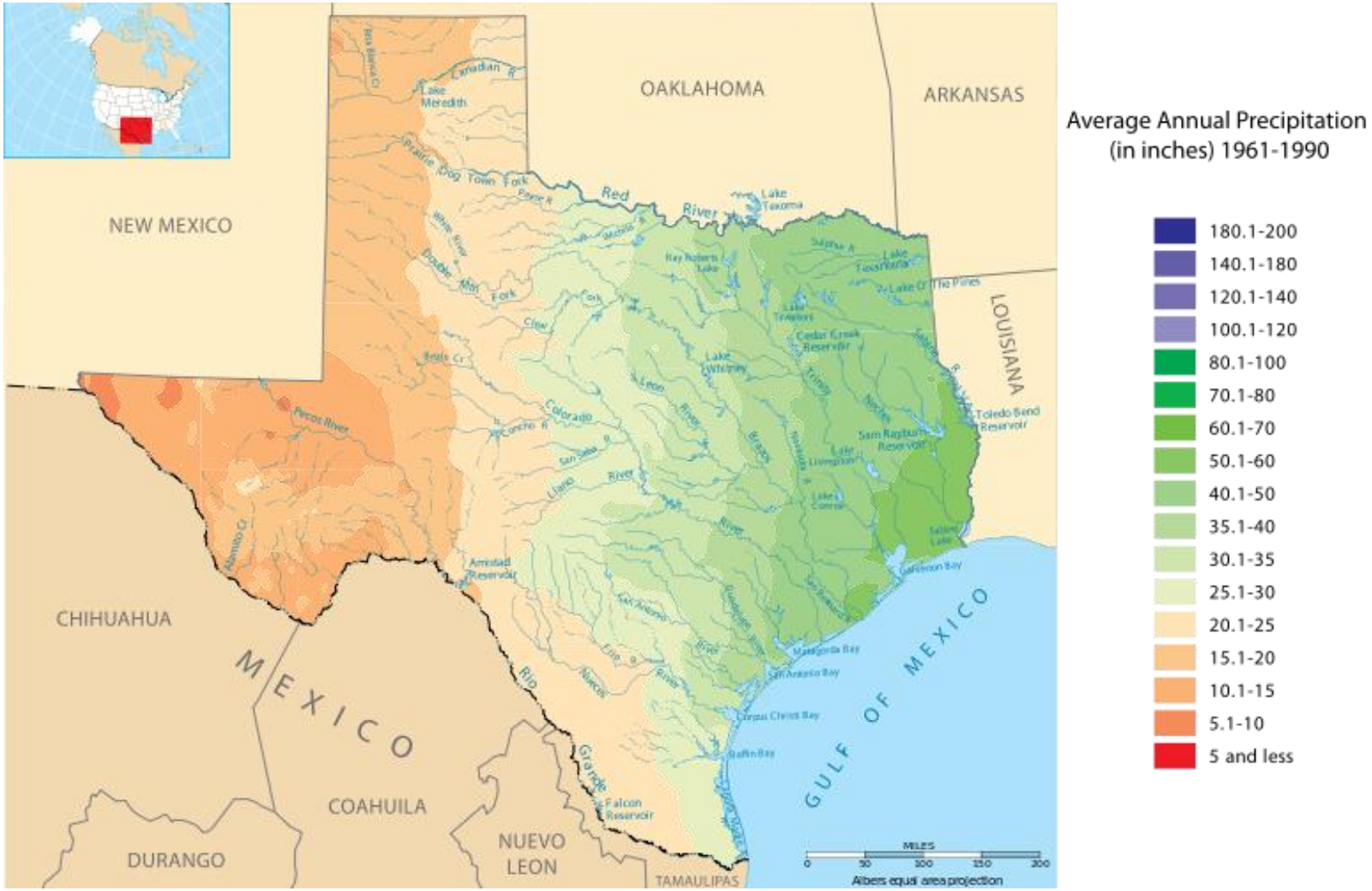
- Mike Osland, USGS National Wetlands Research Center

USGS

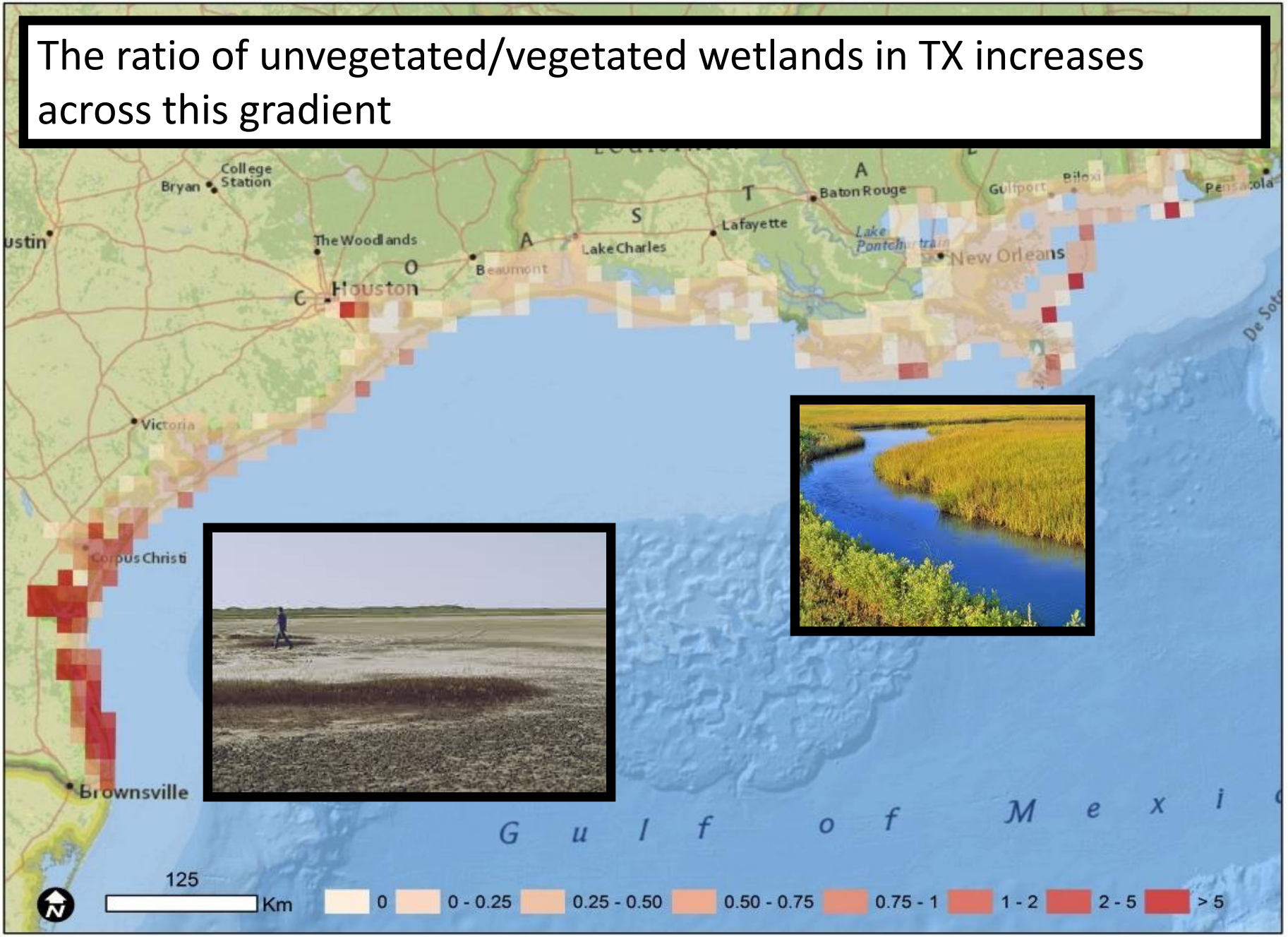
Scenario

- Objective: Use precipitation and coastal wetland occurrence data to develop a simple tidal flat relative abundance model for part of the Gulf of Mexico (LA and TX)

The Gulf of Mexico coast has a dramatic precipitation gradient from LA to TX



The ratio of unvegetated/vegetated wetlands in TX increases across this gradient



Question

- Objective: Use precipitation and coastal wetland occurrence data to develop a simple tidal flat relative abundance model for part of the Gulf of Mexico (LA and TX)

- You have the coastal wetland data, where to get the climate data (modern climate and future projected climate)?

Precipitation Data

# Prcp				
	9622	9777	9778	9779
TIMESTEP	MEAN(mm/d)	MEAN(mm/d)	MEAN(mm/d)	MEAN(mm/d)
1970-01-01T00:00:00Z	2.4700112	1.350038	1.5799996	1.2699907
1970-01-02T00:00:00Z	3.0501208	5.4999714	5.2800207	5.450081
1970-01-03T00:00:00Z	1.4800586	0.81996584	0.64996207	0.42995635
1970-01-04T00:00:00Z	14.800013	6.399866	5.649978	6.119959
1970-01-05T00:00:00Z	6.149936	7.530015	7.400038	7.049931
1970-01-06T00:00:00Z	0.16999207	0.37997645	0.24998344	0.16998486
1970-01-07T00:00:00Z	0	0	0	0
1970-01-08T00:00:00Z	0	0.119998366	0.07999796	0.07999439
1970-01-09T00:00:00Z	1.9999517	1.2300582	1.4799938	1.3299696
1970-01-10T00:00:00Z	1.4199675	5.349971	5.0300374	6.0300775
1970-01-11T00:00:00Z	0.11999075	0.69996184	0.5199704	0.3999848
1970-01-12T00:00:00Z	1.16E-04	0	0	0
1970-01-13T00:00:00Z	5.9499383	0.21998227	0.07999435	0.049993575
1970-01-14T00:00:00Z	2.5500069	0.049994394	2.38E-06	0.029996144
1970-01-15T00:00:00Z	10.519864	15.249549	13.179449	9.39932
1970-01-16T00:00:00Z	6.0299473	22.829617	20.300262	25.05066
1970-01-17T00:00:00Z	0.27999488	1.2299354	0.9299391	0.5999554
1970-01-18T00:00:00Z	0.5699991	0.37998757	0.27998427	0.19999358
1970-01-19T00:00:00Z	0.24999891	0.32000875	0.2999855	0.21998948
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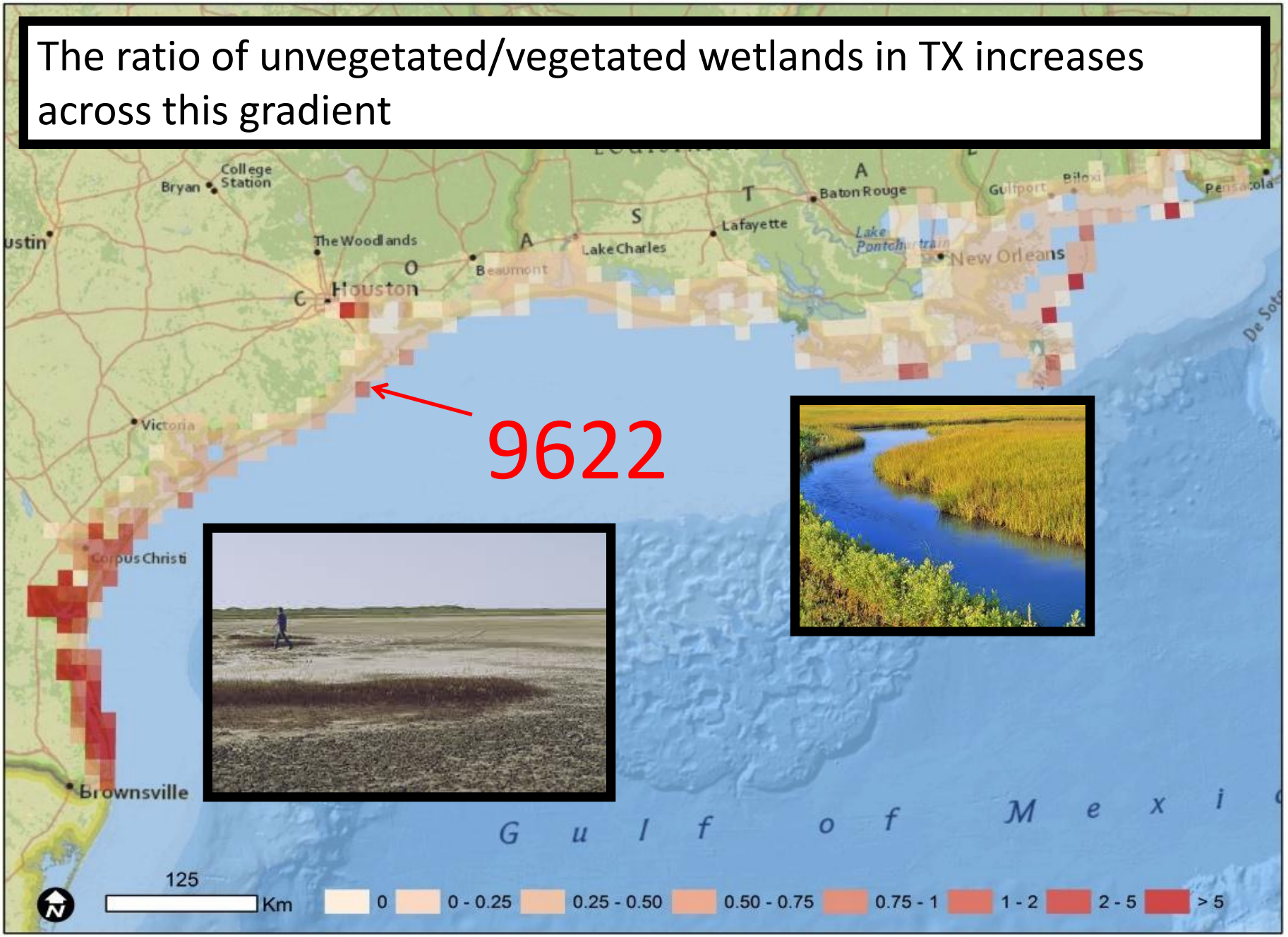
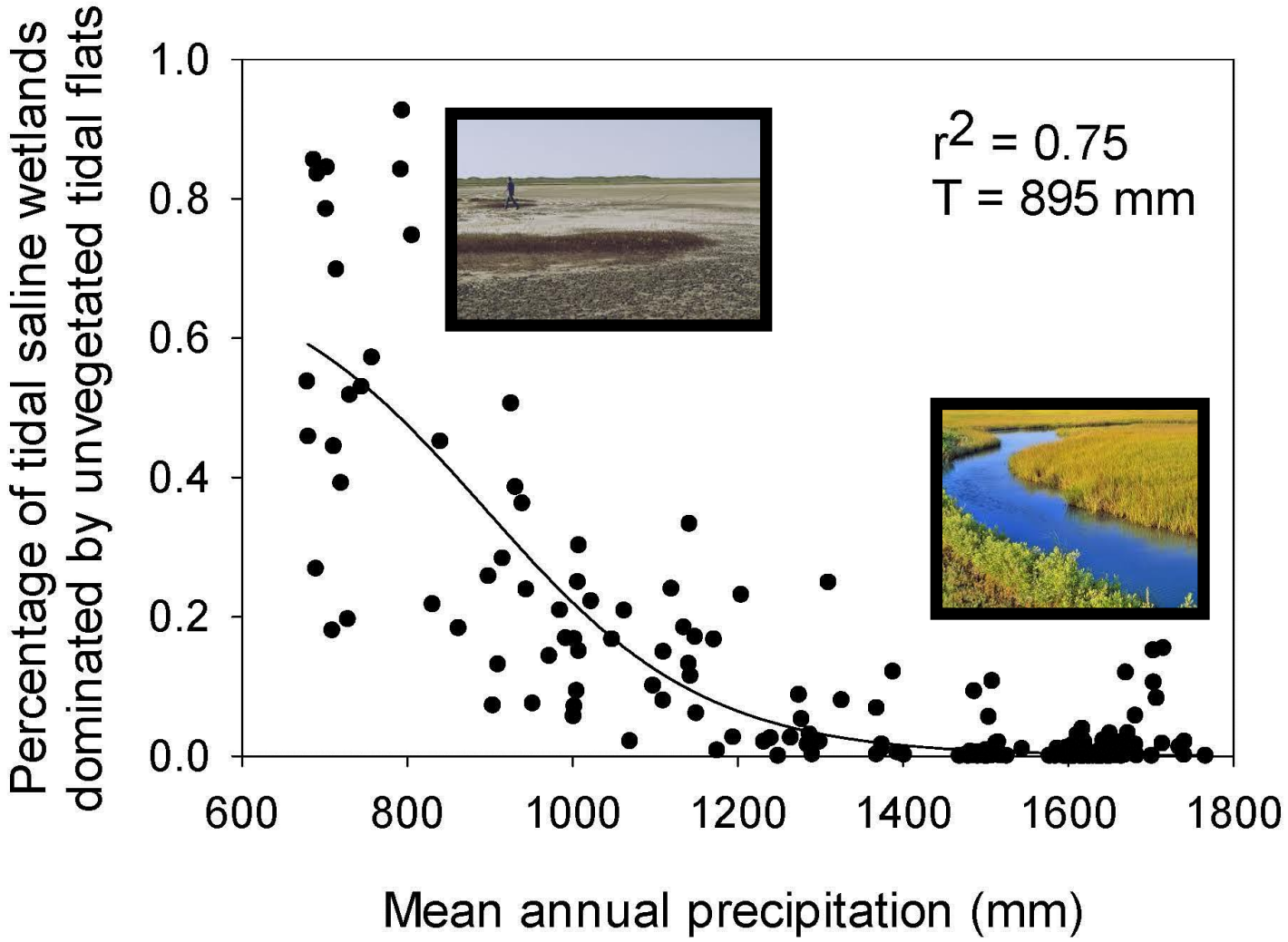
1970-01-21T00:00:00Z	1.9199672	0.40002447	0.60001	0.8800207
1970-01-22T00:00:00Z	0.69994754	0.25001335	0.38001442	0.5000105

The ratio of unvegetated/vegetated wetlands in TX increases across this gradient



The relationship between precipitation and tidal flat relative abundance



Develop climate indices

- Adam Terando, Jean Brennan, Rua Mordecai, Paul Conrads, Sean Finn, Galia Guentchev

USGS

Climatic Indices

- Climate change information can't exist in a vacuum
- Needs to link to biology or ecology of system
- GDP can help with this process
  - Quickly access climate variables from GCMs besides temperature and precip (e.g. evapotranspiration, relative humidity, wind speed)
  - Obtain time series of climate indices based on meaningful thresholds

USGS Derived Downscaled Climate Projection Portal

- Link: http://cida.usgs.gov/climate/derivative/

cida.usgs.gov/climate/derivative/

Raleigh Public Record | climate | ncsu | adam

USGS science for a changing world

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USGS Derived Downscaled Climate Projection Portal *** BETA ***

Dataset Configuration

Derivative
Days with Tmax Above

Threshold (degF):
90.0

Map

Emissions Scenario
A1FI

Climate Model
Ensemble

Time Period For Map:
2011 - 2040

Plot

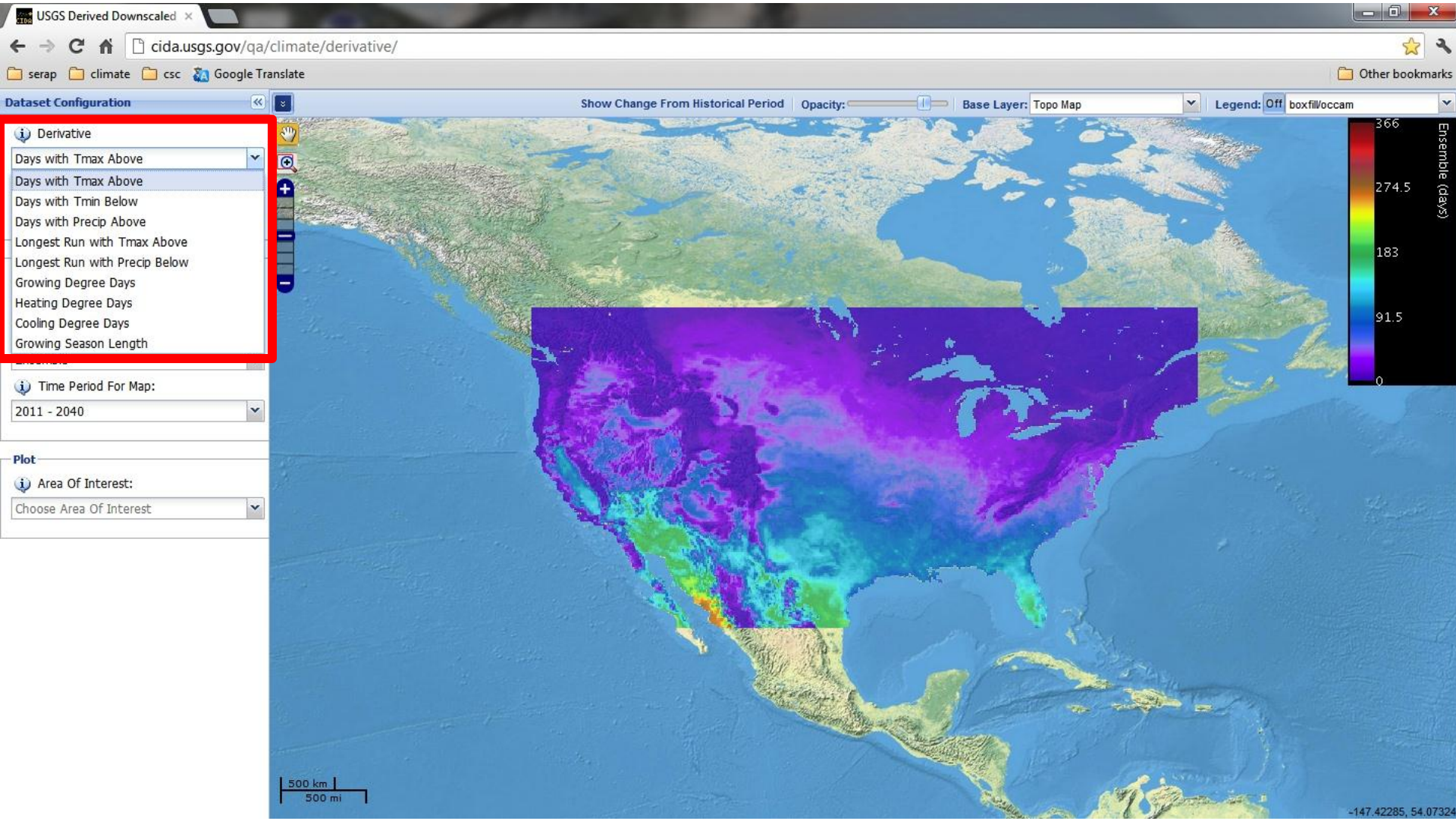
Area Of Interest:
Choose Area Of Interest

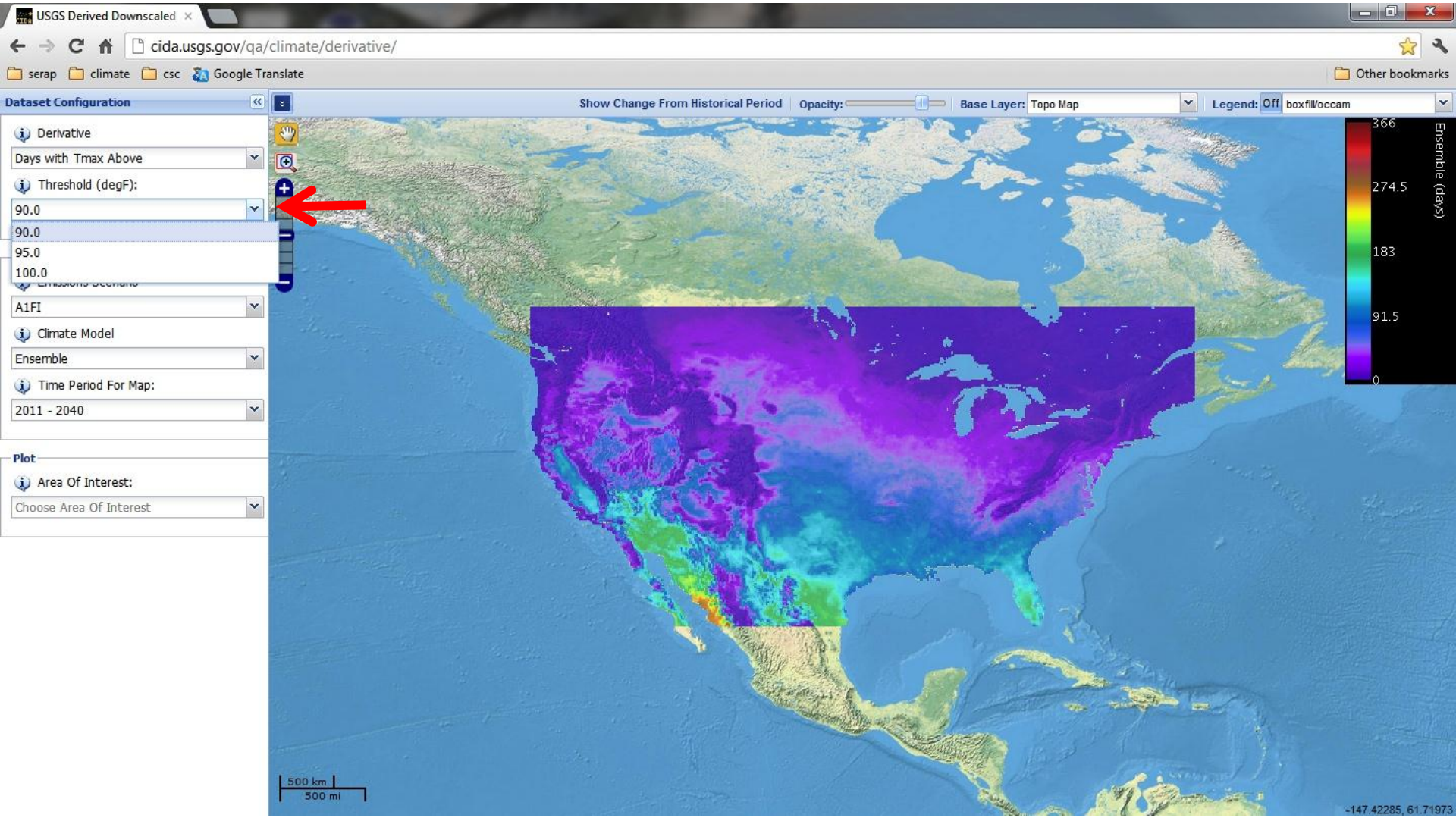
Show Change From Historical Period | Opacity: | Base Layer: Topo Map | Legend: Off boxfill/occam

These data are preliminary and are subject to revision. They are being provided to meet the need for timely "best science" information. The assessment is provided on the condition that neither the U.S. Geological Survey nor the United States Government may be held liable for any damages resulting from the authorized or unauthorized use of the assessment.

This web portal allows visualization and downloading of future climate projections from a group of "statistically downscaled" global climate models (GCMs). Temperature and precipitation projections from these models have been used to calculate derivative climate indicators that measure the number of days that exceed certain thresholds. You can control what is shown on the map and this plot window using the toolbar on the left.

All derivative climate indicators on this page have been derived from a suite of downscaled **World Climate Research Program Coupled Model Inter-comparison Project 3** atmospheric-oceanic general circulation model simulations using


USGS Derived Downscaled
cida.usgs.gov/qa/climate/derivative/
serap
climate
csc
Google Translate
Other bookmarks
Dataset Configuration
Derivative
Days with Tmax Above
Days with Tmax Above
Days with Tmin Below
Days with Precip Above
Longest Run with Tmax Above
Longest Run with Precip Below
Growing Degree Days
Heating Degree Days
Cooling Degree Days
Growing Season Length
Time Period For Map:
2011 - 2040
Plot
Area Of Interest:
Choose Area Of Interest
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
Off
boxfill/occam
366
274.5
183
91.5
0
Ensemble (days)
500 km
500 mi
-147.42285, 54.07324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cida.usgs.gov/qa/climate/derivative/
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climate
csc
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Other bookmarks
Dataset Configuration
Derivative
Days with Tmax Above
Threshold (degF):
90.0
90.0
95.0
100.0
A1FI
Climate Model
Ensemble
Time Period For Map:
2011 - 2040
Plot
Area Of Interest:
Choose Area Of Interest
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
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boxfill/occam
366
274.5
183
91.5
0
Ensemble (days)
500 km
500 mi
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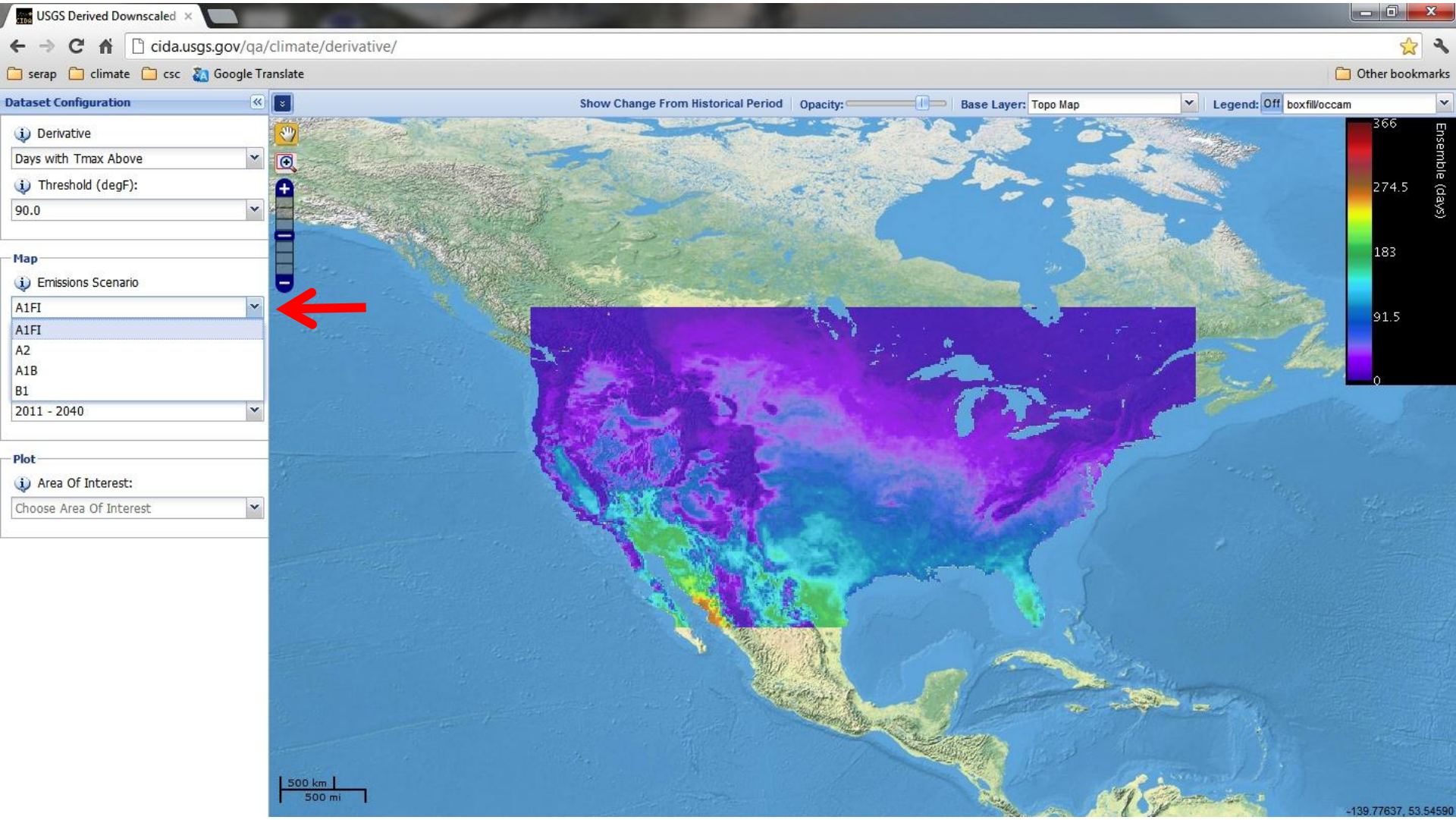
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cida.usgs.gov/qa/climate/derivative/
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csc
Google Translate
Other bookmarks
Dataset Configuration
Derivative
Days with Tmax Above
Threshold (degF):
90.0
Map
Emissions Scenario
A1FI
A1FI
A2
A1B
B1
2011 - 2040
Plot
Area Of Interest:
Choose Area Of Interest
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
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boxfill/occam
366
274.5
183
91.5
0
Ensemble (days)
500 km
500 mi
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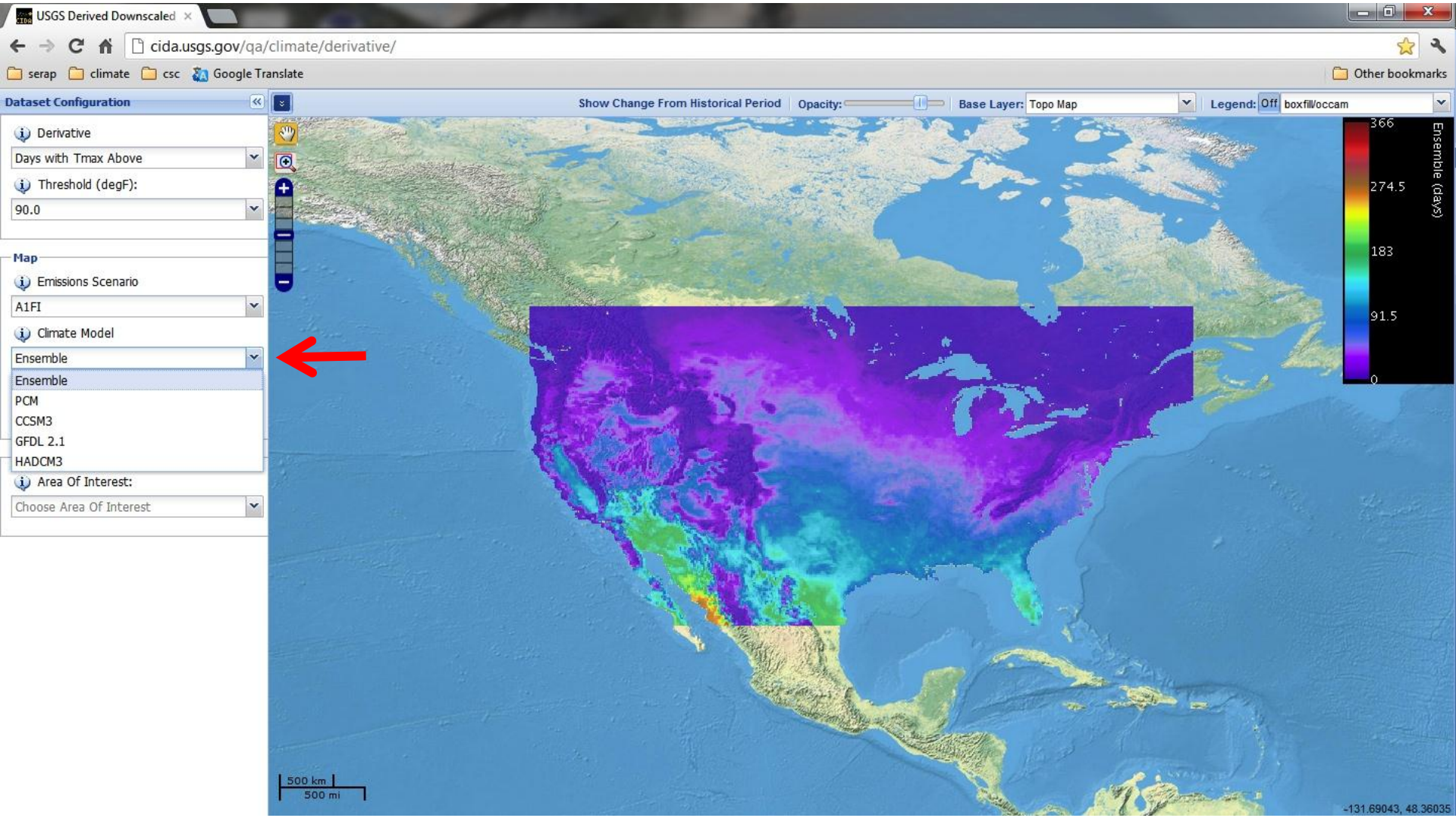
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serap
climate
csc
Google Translate
Other bookmarks
Dataset Configuration
Derivative
Days with Tmax Above
Threshold (degF):
90.0
Map
Emissions Scenario
A1FI
Climate Model
Ensemble
Ensemble
PCM
CCSM3
GFDL 2.1
HADCM3
Area Of Interest:
Choose Area Of Interest
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
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boxfill/occam
366
274.5
183
91.5
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Ensemble (days)
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500 mi
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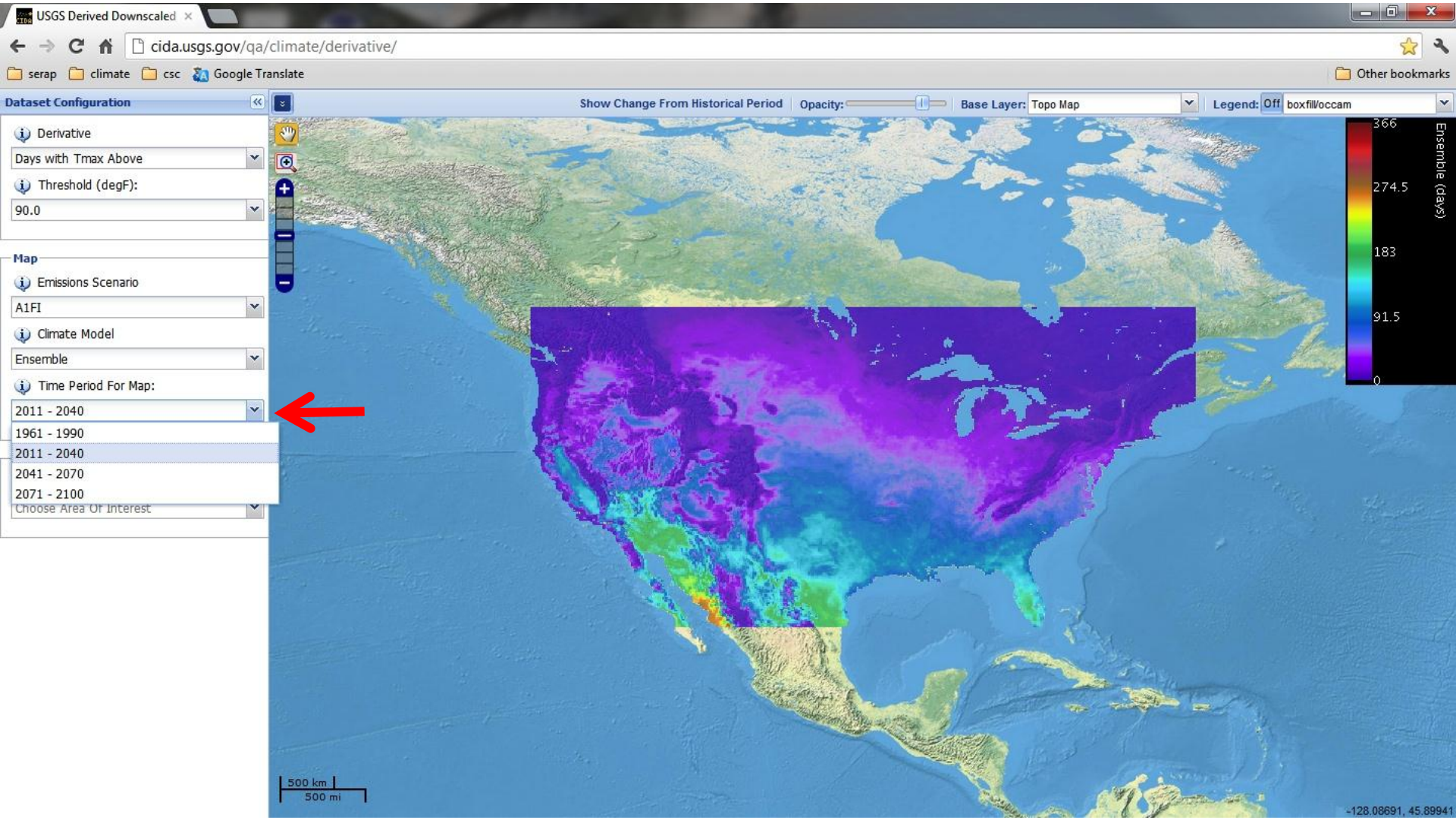
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Other bookmarks
Dataset Configuration
Derivative
Days with Tmax Above
Threshold (degF):
90.0
Map
Emissions Scenario
A1FI
Climate Model
Ensemble
Time Period For Map:
2011 - 2040
1961 - 1990
2011 - 2040
2041 - 2070
2071 - 2100
Choose Area Of Interest
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
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boxfill/occam
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274.5
183
91.5
0
Ensemble (days)
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500 mi
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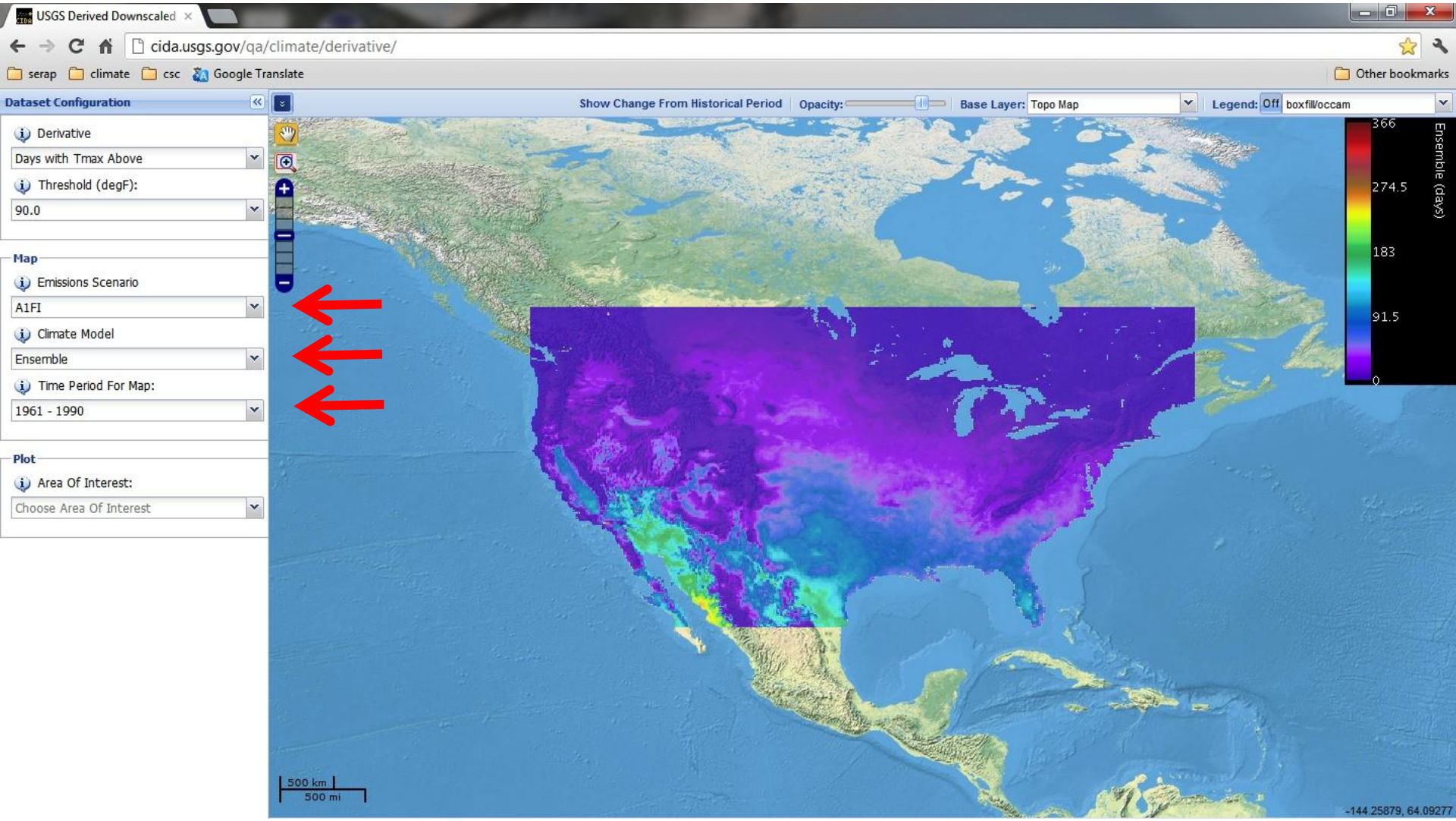
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Other bookmarks
Dataset Configuration
Derivative
Days with Tmax Above
Threshold (degF):
90.0
Map
Emissions Scenario
A1FI
Climate Model
Ensemble
Time Period For Map:
1961 - 1990
Plot
Area Of Interest:
Choose Area Of Interest
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
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boxfill/occam
366
274.5
183
91.5
0
Ensemble (days)
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500 mi
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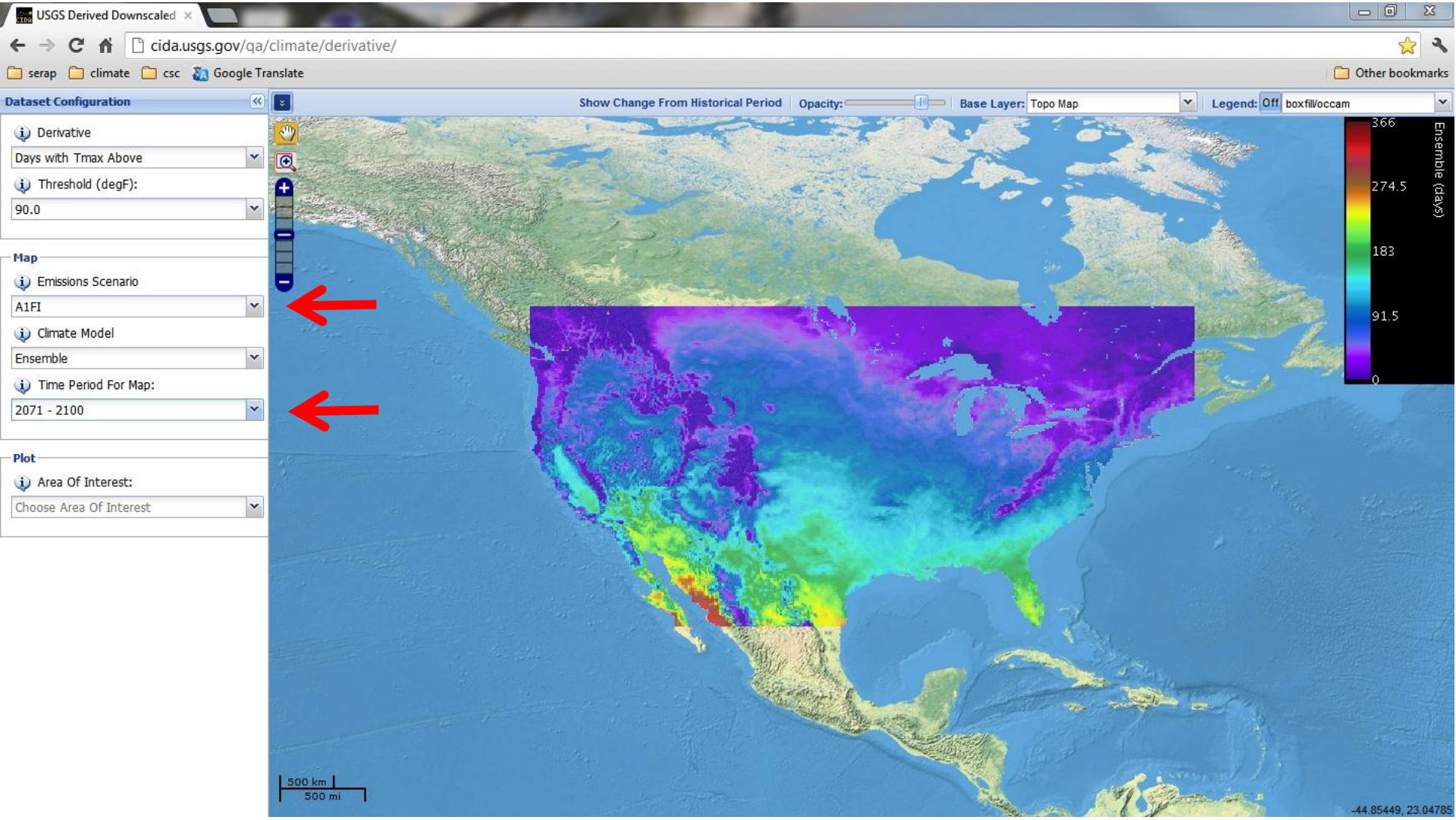
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climate
csc
Google Translate
Other bookmarks
Dataset Configuration
Derivative
Days with Tmax Above
Threshold (degF):
90.0
Map
Emissions Scenario
A1FI
Climate Model
Ensemble
Time Period For Map:
2071 - 2100
Plot
Area Of Interest:
Choose Area Of Interest
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
Off
boxfill/occam
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274.5
183
91.5
0
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500 mi
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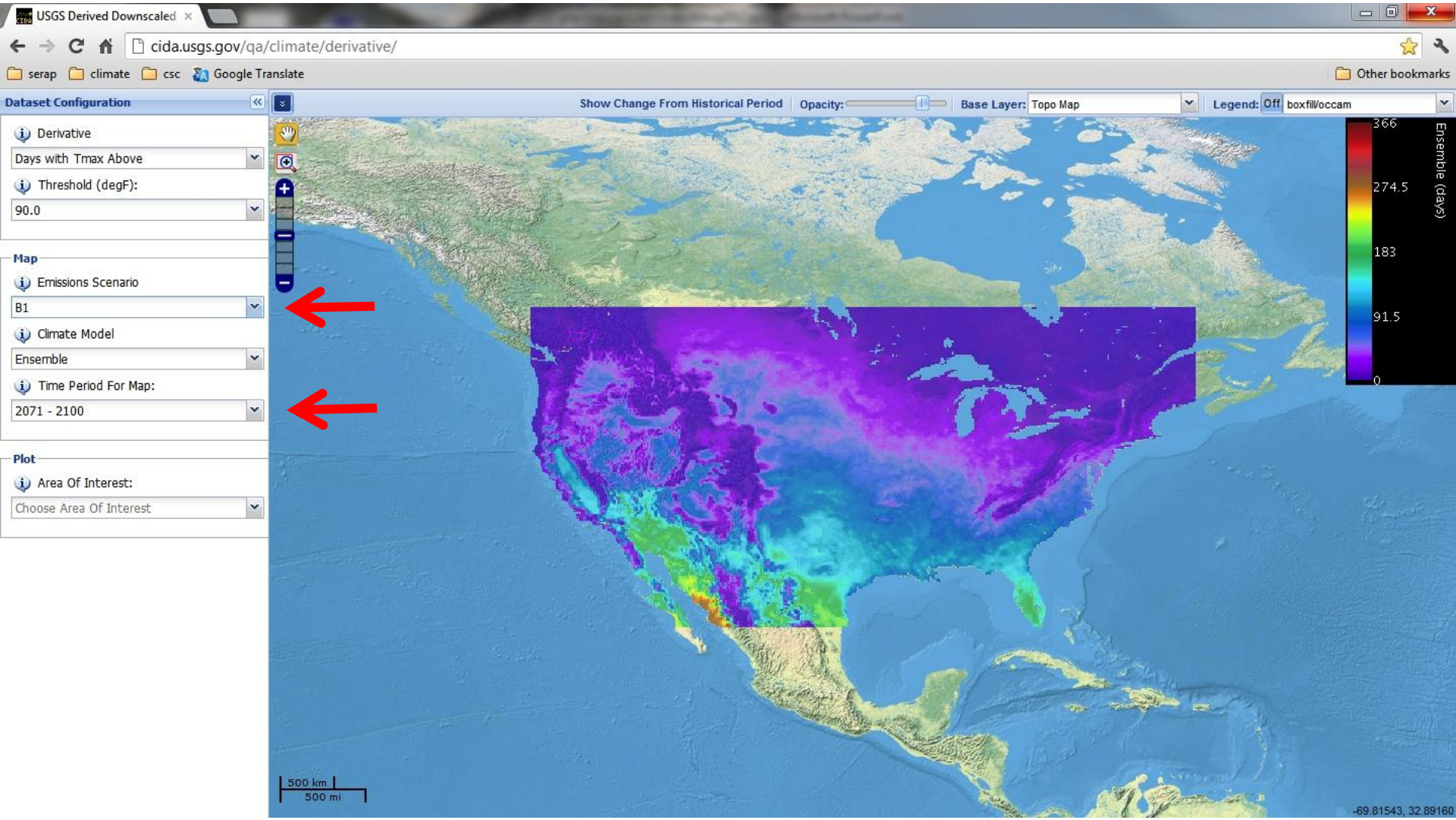
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cida.usgs.gov/qa/climate/derivative/
serap
climate
csc
Google Translate
Other bookmarks
Dataset Configuration
Derivative
Days with Tmax Above
Threshold (degF):
90.0
Map
Emissions Scenario
B1
Climate Model
Ensemble
Time Period For Map:
2071 - 2100
Plot
Area Of Interest:
Choose Area Of Interest
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
Off
boxfill/occam
366
274.5
183
91.5
0
Ensemble (days)
500 km
500 mi
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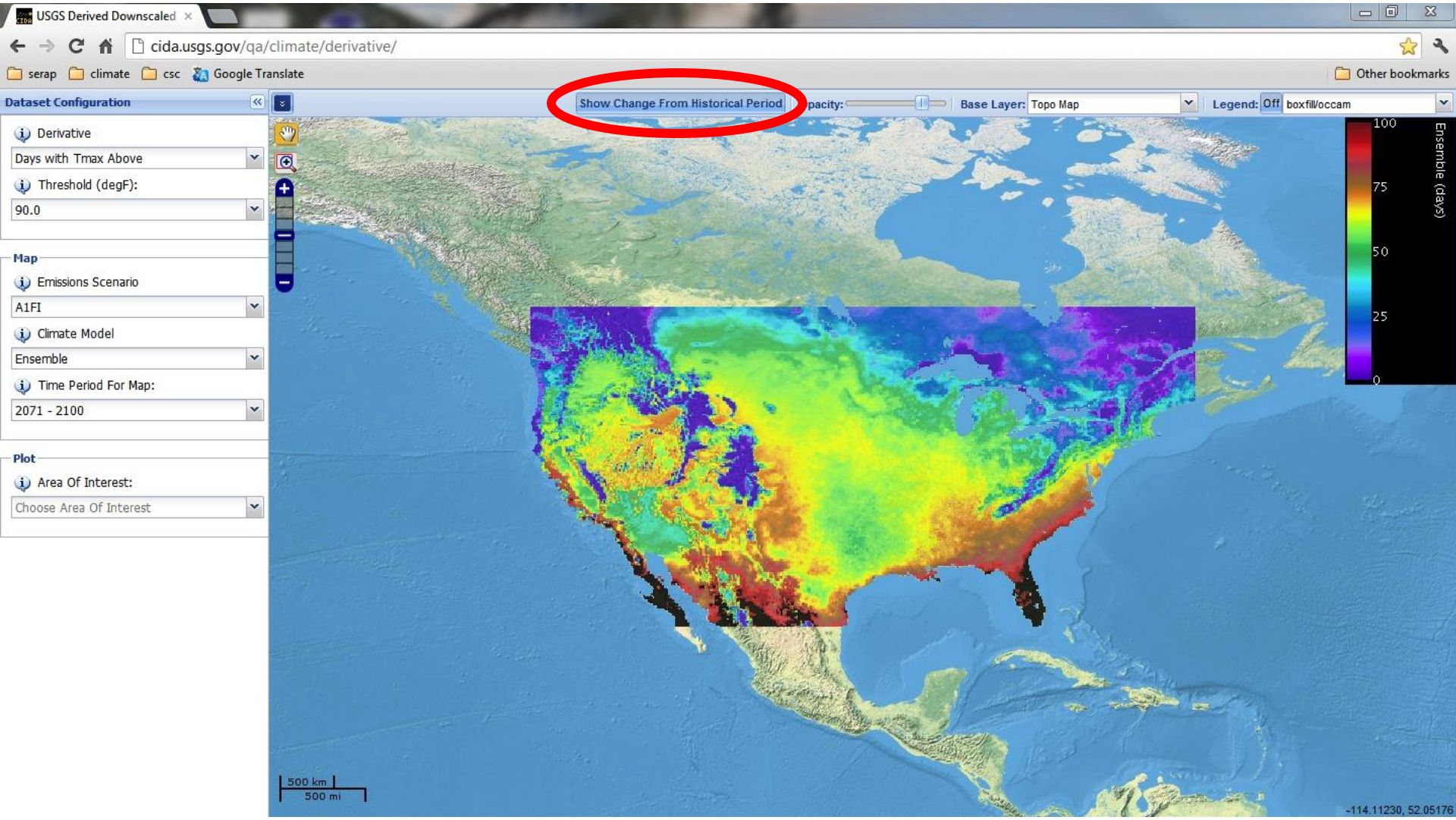
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cida.usgs.gov/qa/climate/derivative/
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climate
csc
Google Translate
Other bookmarks
Dataset Configuration
Derivative
Days with Tmax Above
Threshold (degF):
90.0
Map
Emissions Scenario
A1FI
Climate Model
Ensemble
Time Period For Map:
2071 - 2100
Plot
Area Of Interest:
Choose Area Of Interest
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
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boxfill/occam
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75
50
25
0
Ensemble (days)
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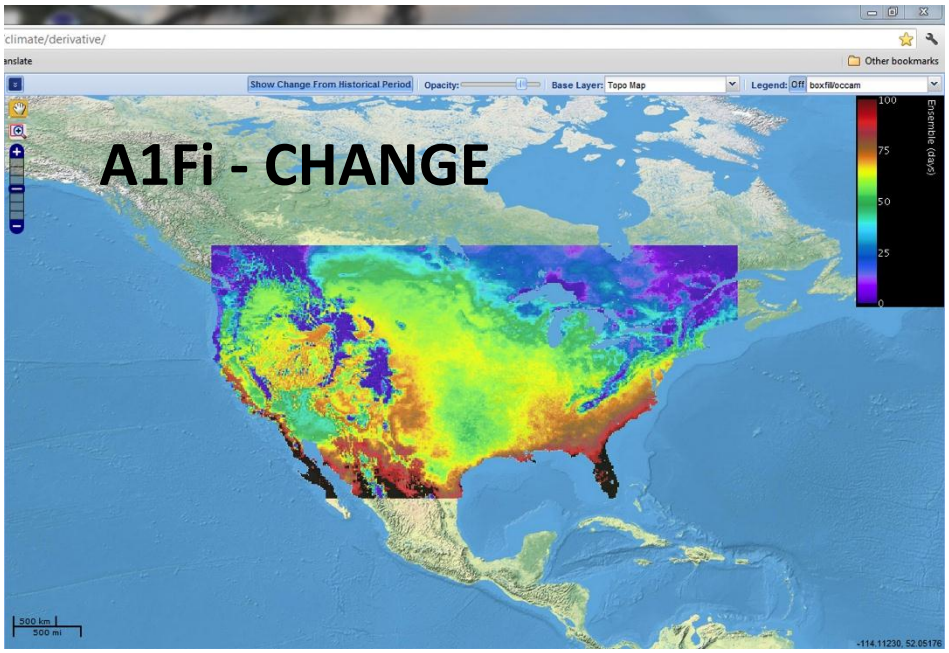
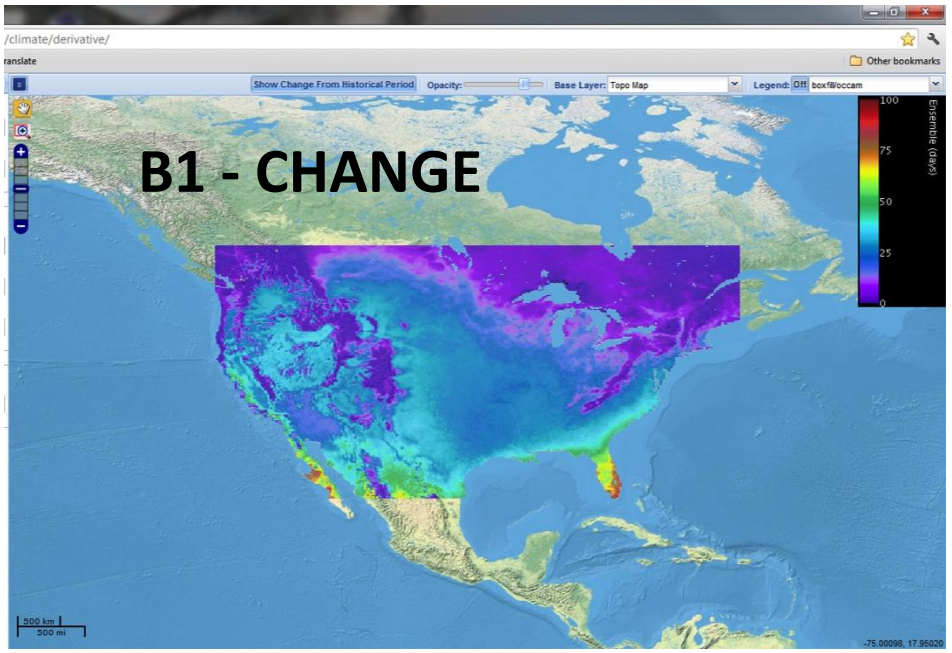
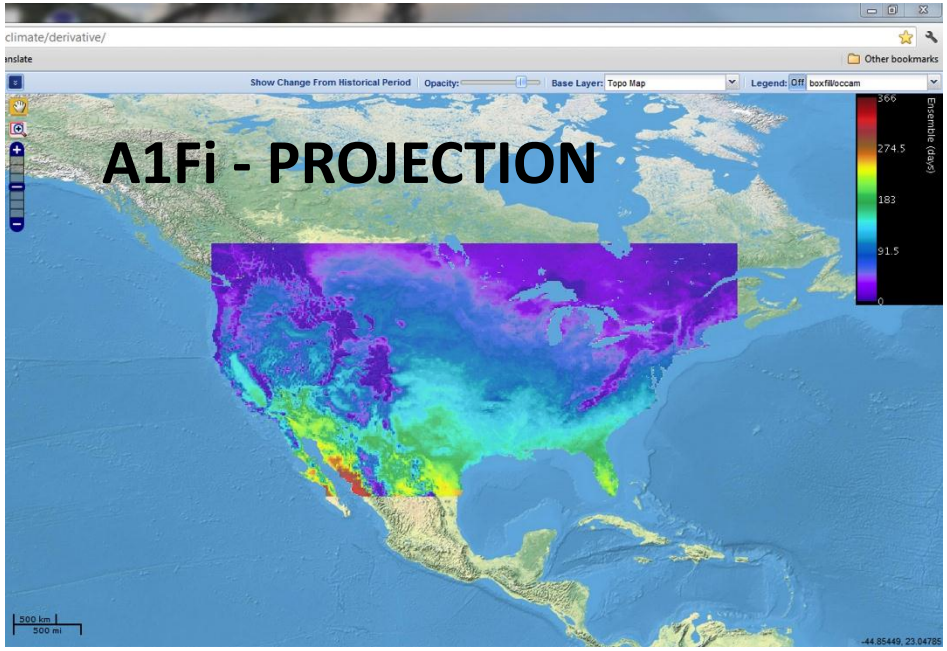
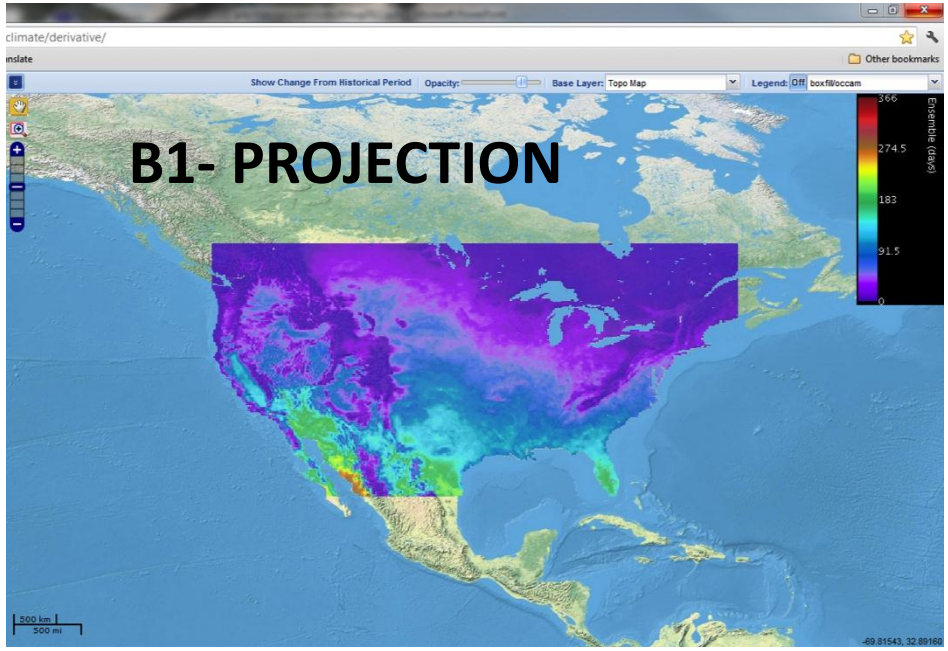

A1Fi - CHANGE
Show Change From Historical Period
Opacity:
Base Layer: Topo Map
Legend: Off boxfill/occam
100
75
50
25
0
Ensemble (days)
500 km
500 mi


B1 - CHANGE
Show Change From Historical Period
Opacity:
Base Layer: Topo Map
Legend: Off boxfill/occam
100
75
50
25
0
Ensemble (days)
500 km
500 mi


A1Fi - PROJECTION
Show Change From Historical Period
Opacity:
Base Layer: Topo Map
Legend: Off boxfill/occam
366
274.5
183
91.5
0
Ensemble (days)
500 km
500 mi


B1- PROJECTION
Show Change From Historical Period
Opacity:
Base Layer: Topo Map
Legend: Off boxfill/occam
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91.5
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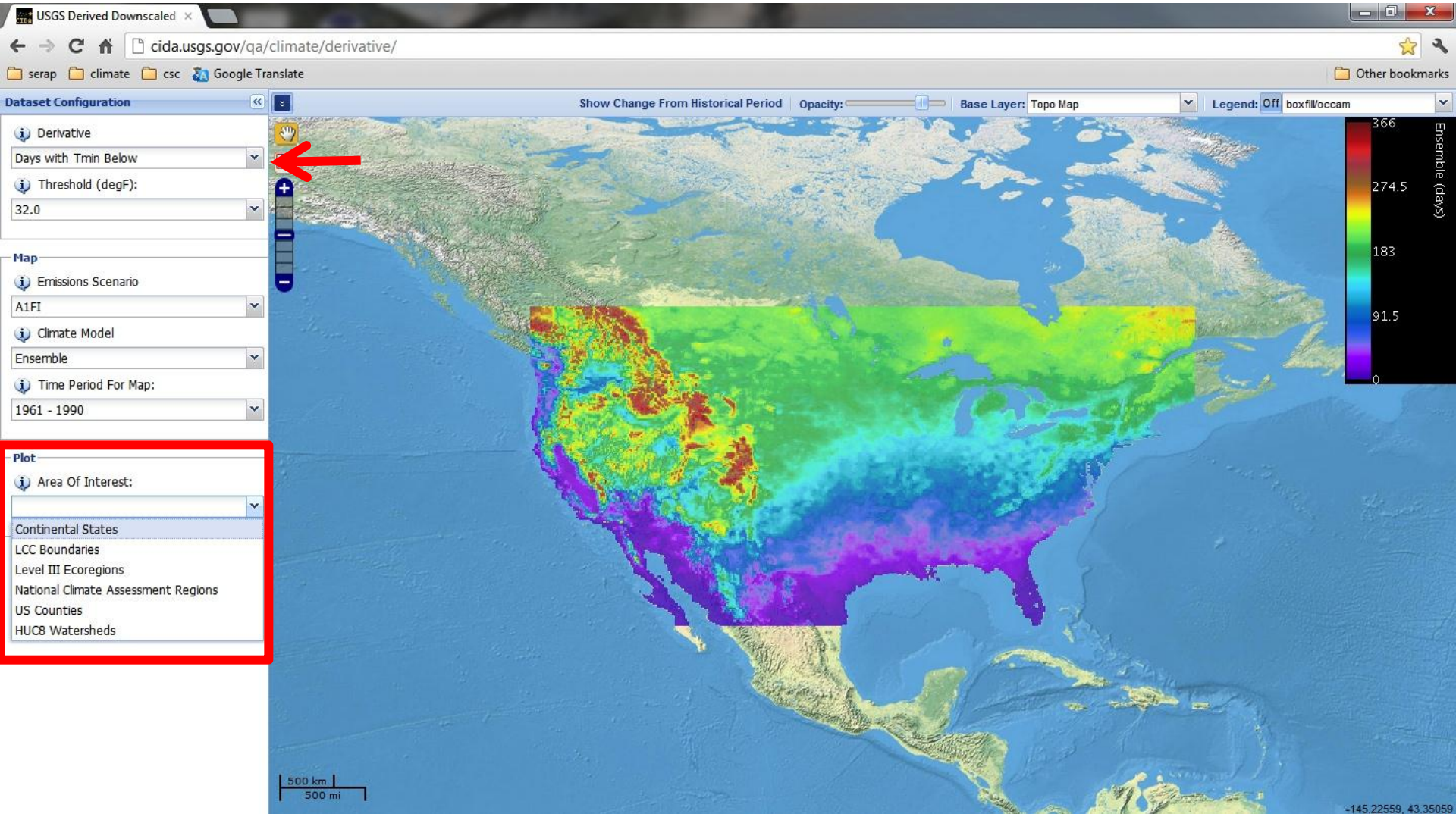
Ensemble (days)
500 km
500 mi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serap
climate
csc
Google Translate
Other bookmarks
Dataset Configuration
Derivative
Days with Tmin Below
Threshold (degF):
32.0
Map
Emissions Scenario
A1FI
Climate Model
Ensemble
Time Period For Map:
1961 - 1990
Plot
Area Of Interest:
Continental States
LCC Boundaries
Level III Ecoregions
National Climate Assessment Regions
US Counties
HUC8 Watersheds
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
Off
boxfill/occam
366
274.5
183
91.5
0
Ensemble (days)
500 km
500 mi
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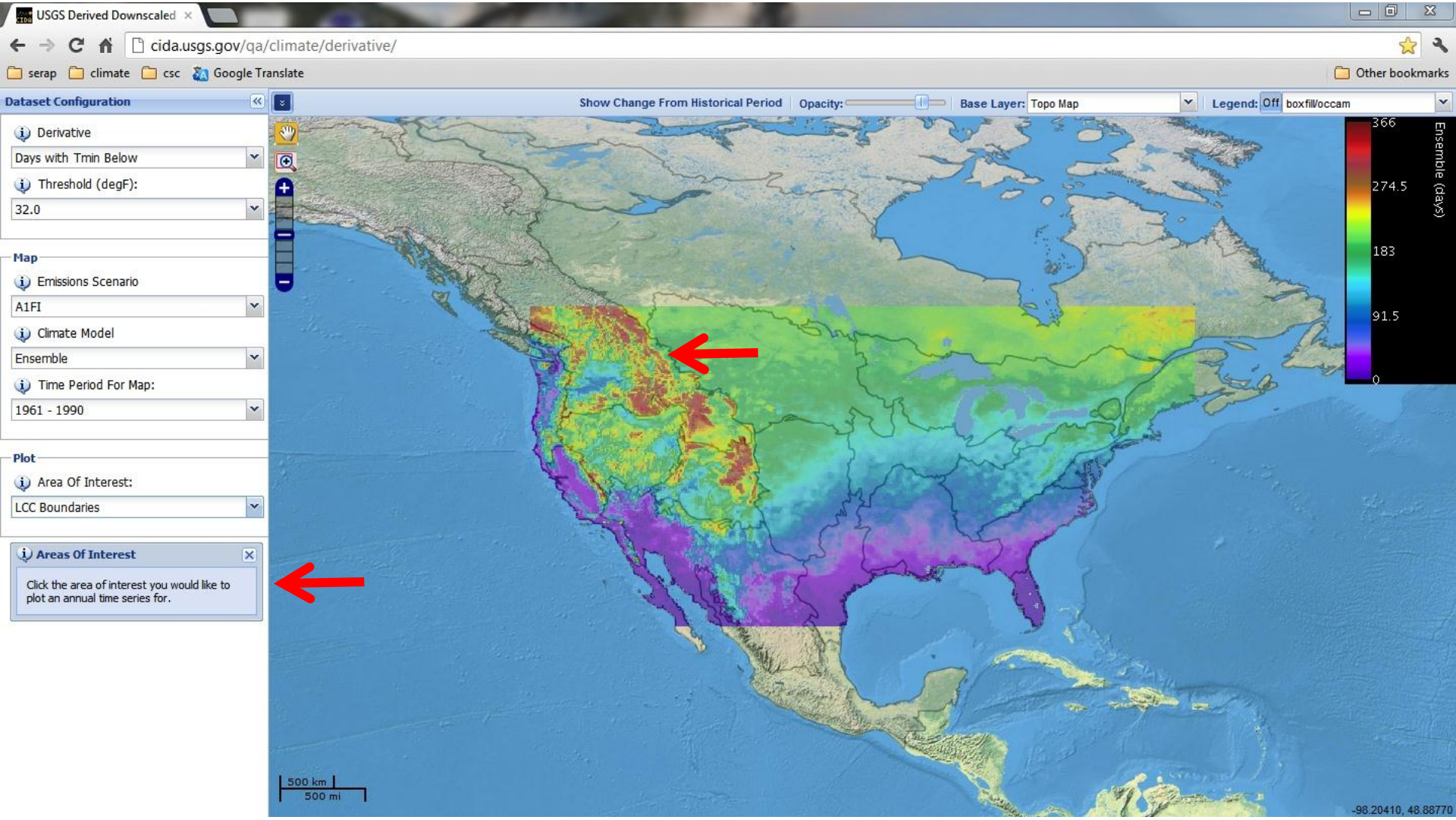
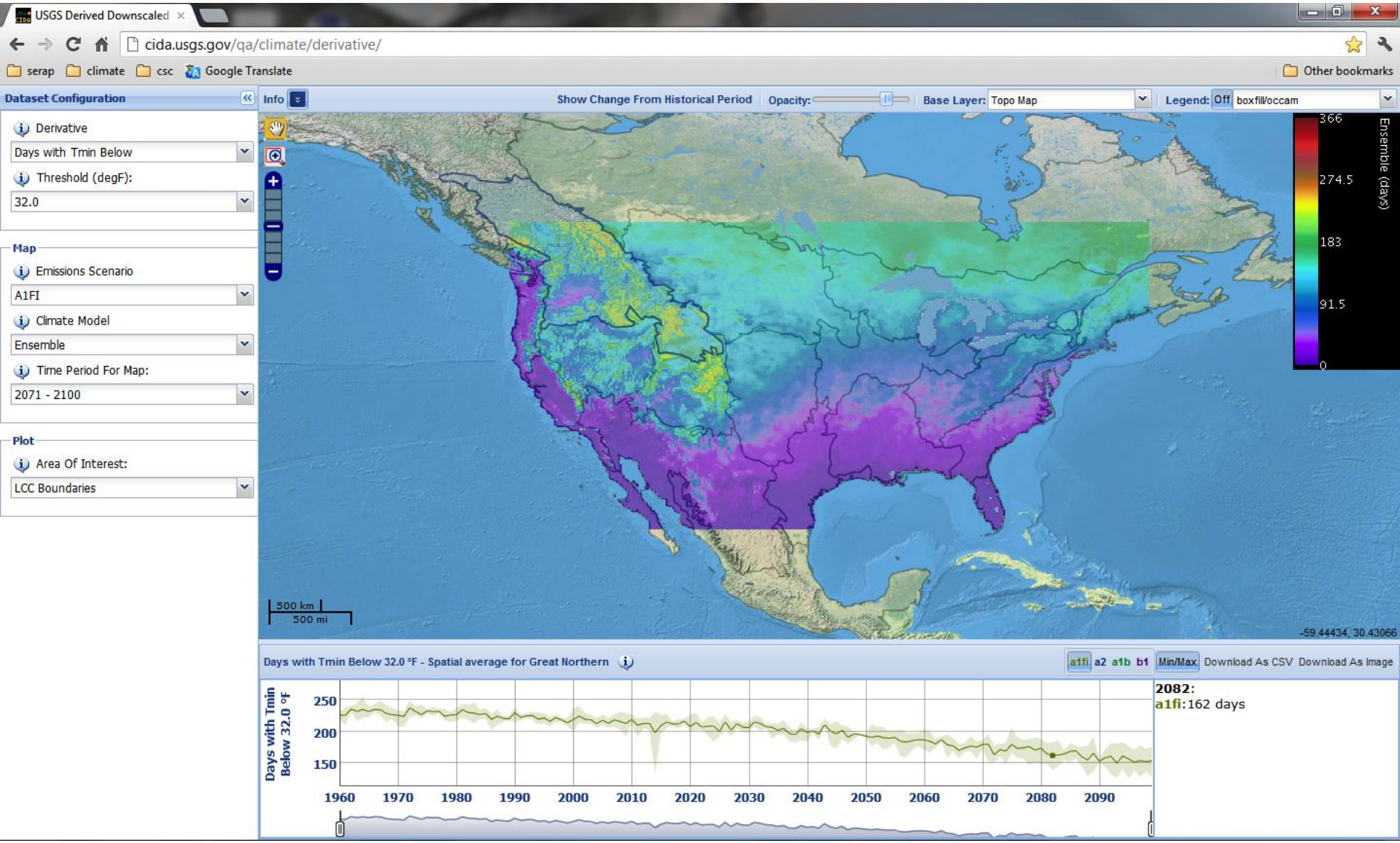
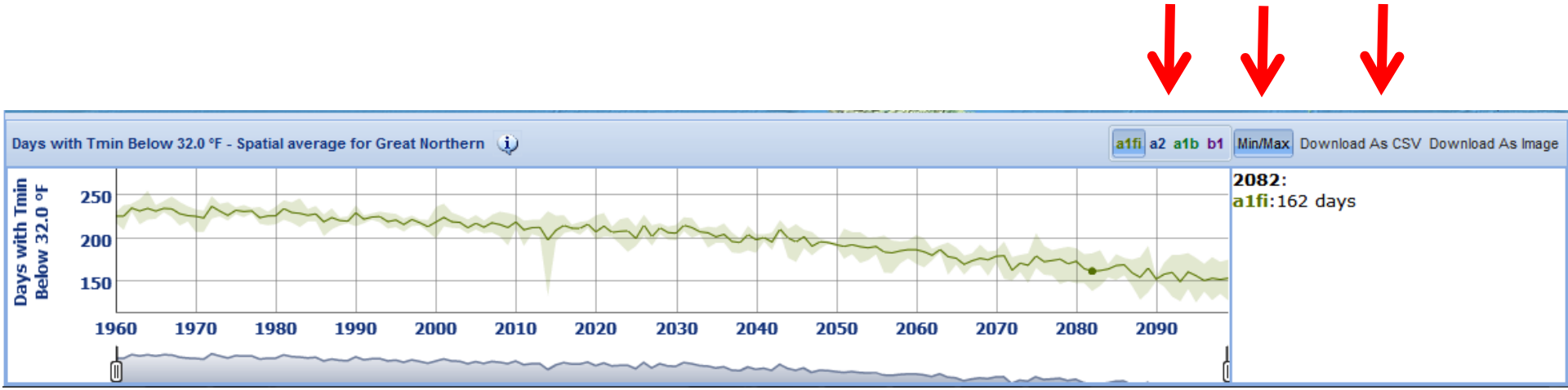
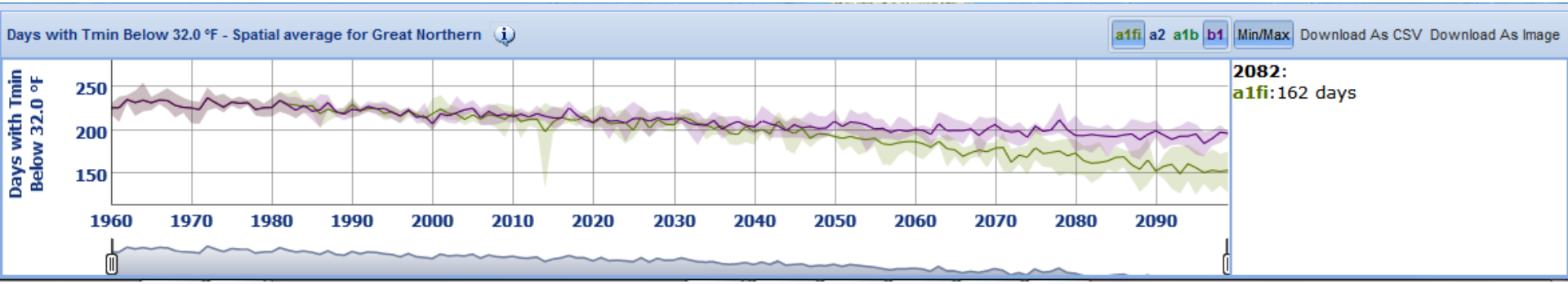
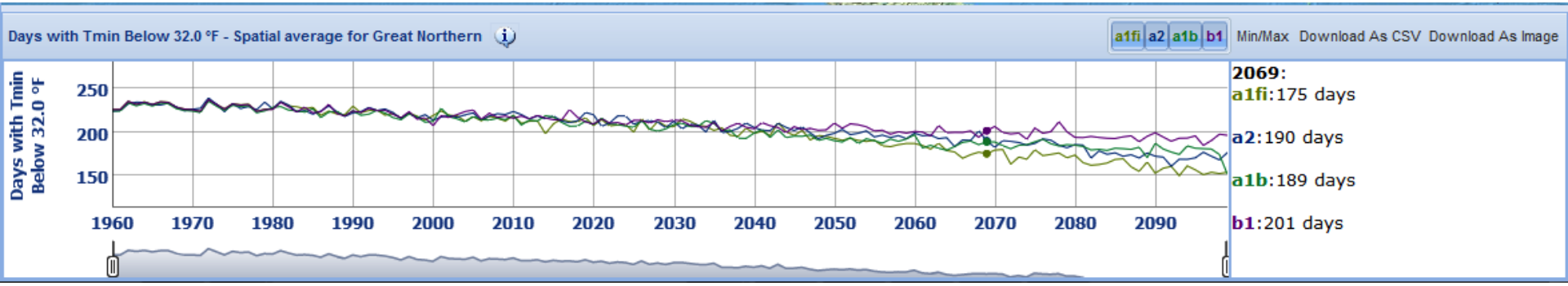
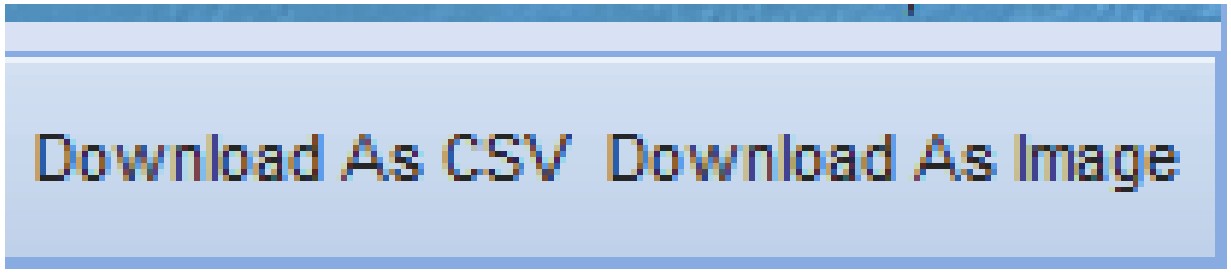

USGS Derived Downscaled
cida.usgs.gov/qa/climate/derivative/
serap
climate
csc
Google Translate
Other bookmarks
Dataset Configuration
Derivative
Days with Tmin Below
Threshold (degF):
32.0
Map
Emissions Scenario
A1FI
Climate Model
Ensemble
Time Period For Map:
1961 - 1990
Plot
Area Of Interest:
LCC Boundaries
Areas Of Interest
Click the area of interest you would like to plot an annual time series for.
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
Off
boxfill/occam
366
274.5
183
91.5
0
Ensemble (days)
500 km
500 mi
-98.20410, 48.88770


USGS Derived Downscaled
cida.usgs.gov/qa/climate/derivative/
serap
climate
csc
Google Translate
Other bookmarks
Dataset Configuration
Derivative
Days with Tmin Below
Threshold (degF):
32.0
Map
Emissions Scenario
A1FI
Climate Model
Ensemble
Time Period For Map:
2071 - 2100
Plot
Area Of Interest:
LCC Boundaries
Info
Show Change From Historical Period
Opacity:
Base Layer:
Topo Map
Legend:
Off
boxfill/occam
366
274.5
183
91.5
0
Ensemble (days)
500 km
500 mi
-59.44434, 30.43066
Days with Tmin Below 32.0 °F - Spatial average for Great Northern
a1fi
a2
a1b
b1
Min/Max
Download As CSV
Download As Image
Days with Tmin Below 32.0 °F
250
200
150
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2082:
a1fi:162 days

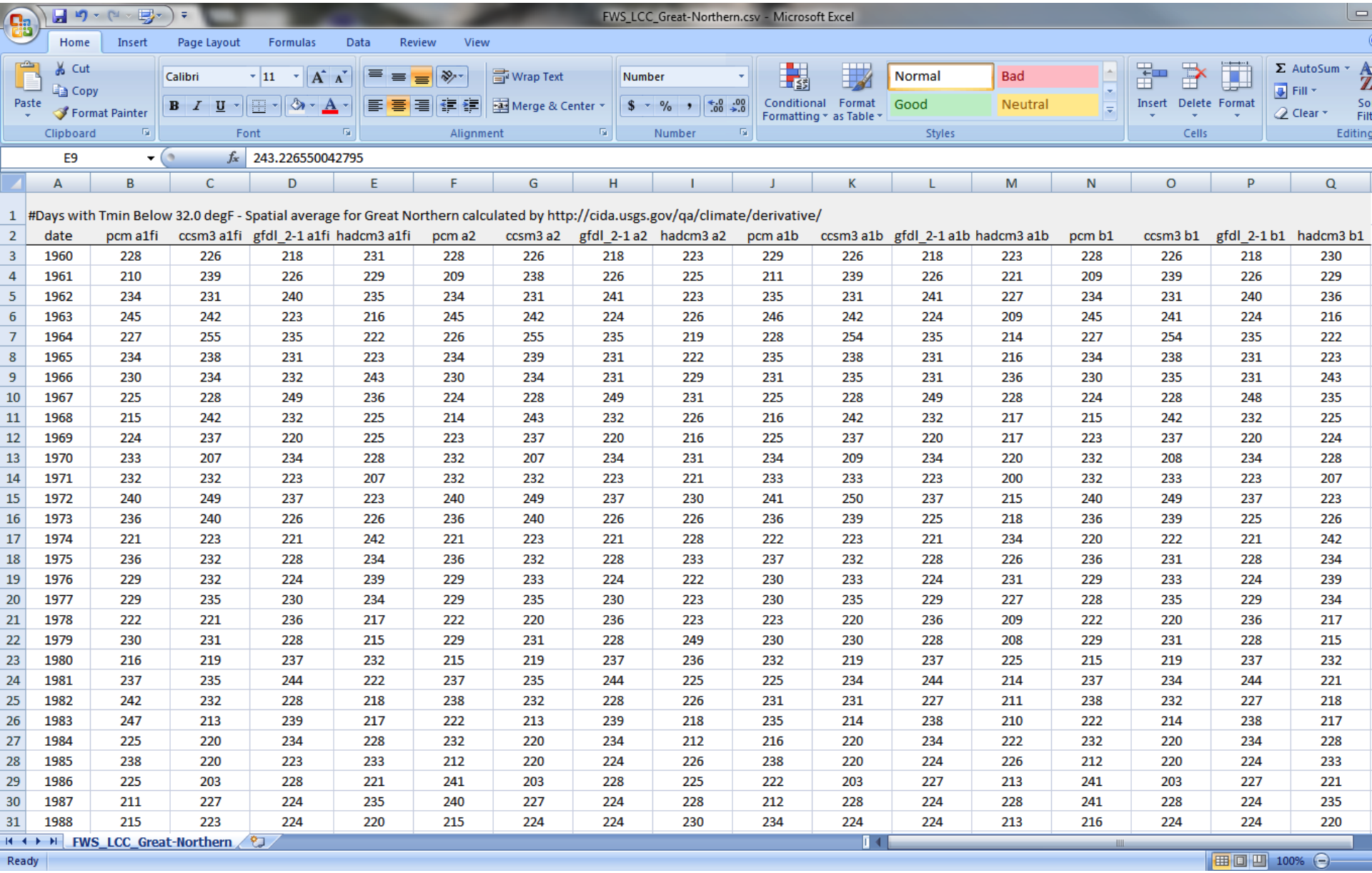

Days with Tmin Below 32.0 °F - Spatial average for Great Northern
a1fi a2 a1b b1
Min/Max
Download As CSV
Download As Image
Days with Tmin Below 32.0 °F
250
200
150
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2082:
a1fi:162 days


Days with Tmin Below 32.0 °F - Spatial average for Great Northern
a1fi a2 a1b b1
Min/Max
Download As CSV
Download As Image
Days with Tmin Below 32.0 °F
250
200
150
1960 1970 1980 1990 2000 2010 2020 2030 2040 2050 2060 2070 2080 2090
2082:
a1fi:162 days


Days with Tmin Below 32.0 °F - Spatial average for Great Northern
a1fi a2 a1b b1
Min/Max
Download As CSV
Download As Image
Days with Tmin Below 32.0 °F
250
200
150
1960 1970 1980 1990 2000 2010 2020 2030 2040 2050 2060 2070 2080 2090
2069:
a1fi:175 days
a2:190 days
a1b:189 days
b1:201 days


Download As CSV
Download As Image

READY FOR ANALYSIS



FWS_LCC_Great-Northern.csv - Microsoft Excel

Home | Insert | Page Layout | Formulas | Data | Review | View

Cut | Copy | Format Painter | Paste | Clipboard

Calibri | 11 | Font

Wrap Text | Merge & Center | Alignment

Number | Number

Conditional Formatting | Format as Table | Normal | Bad | Good | Neutral | Styles

Insert | Delete | Format | Cells

AutoSum | Fill | Clear | Editing

E9 | 243.226550042795

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	#Days with Tmin Below 32.0 degF - Spatial average for Great Northern calculated by http://cida.usgs.gov/qa/climate/derivative/																
2	date	pcm a1fi	ccsm3 a1fi	gfdl_2-1 a1fi	hadcm3 a1fi	pcm a2	ccsm3 a2	gfdl_2-1 a2	hadcm3 a2	pcm a1b	ccsm3 a1b	gfdl_2-1 a1b	hadcm3 a1b	pcm b1	ccsm3 b1	gfdl_2-1 b1	hadcm3 b1
3	1960	228	226	218	231	228	226	218	223	229	226	218	223	228	226	218	230
4	1961	210	239	226	229	209	238	226	225	211	239	226	221	209	239	226	229
5	1962	234	231	240	235	234	231	241	223	235	231	241	227	234	231	240	236
6	1963	245	242	223	216	245	242	224	226	246	242	224	209	245	241	224	216
7	1964	227	255	235	222	226	255	235	219	228	254	235	214	227	254	235	222
8	1965	234	238	231	223	234	239	231	222	235	238	231	216	234	238	231	223
9	1966	230	234	232	243	230	234	231	229	231	235	231	236	230	235	231	243
10	1967	225	228	249	236	224	228	249	231	225	228	249	228	224	228	248	235
11	1968	215	242	232	225	214	243	232	226	216	242	232	217	215	242	232	225
12	1969	224	237	220	225	223	237	220	216	225	237	220	217	223	237	220	224
13	1970	233	207	234	228	232	207	234	231	234	209	234	220	232	208	234	228
14	1971	232	232	223	207	232	232	223	221	233	233	223	200	232	233	223	207
15	1972	240	249	237	223	240	249	237	230	241	250	237	215	240	249	237	223
16	1973	236	240	226	226	236	240	226	226	236	239	225	218	236	239	225	226
17	1974	221	223	221	242	221	223	221	228	222	223	221	234	220	222	221	242
18	1975	236	232	228	234	236	232	228	233	237	232	228	226	236	231	228	234
19	1976	229	232	224	239	229	233	224	222	230	233	224	231	229	233	224	239
20	1977	229	235	230	234	229	235	230	223	230	235	229	227	228	235	229	234
21	1978	222	221	236	217	222	220	236	223	223	220	236	209	222	220	236	217
22	1979	230	231	228	215	229	231	228	249	230	230	228	208	229	231	228	215
23	1980	216	219	237	232	215	219	237	236	232	219	237	225	215	219	237	232
24	1981	237	235	244	222	237	235	244	225	225	234	244	214	237	234	244	221
25	1982	242	232	228	218	238	232	228	226	231	231	227	211	238	232	227	218
26	1983	247	213	239	217	222	213	239	218	235	214	238	210	222	214	238	217
27	1984	225	220	234	228	232	220	234	212	216	220	234	222	232	220	234	228
28	1985	238	220	223	233	212	220	224	226	238	220	224	226	212	220	224	233
29	1986	225	203	228	221	241	203	228	225	222	203	227	213	241	203	227	221
30	1987	211	227	224	235	240	227	224	228	212	228	224	228	241	228	224	235
31	1988	215	223	224	220	215	224	224	230	234	224	224	213	216	224	224	220

FWS_LCC_Great-Northern

Ready | 100%

READY FOR ANALYSIS

RGui (64-bit)

File History Resize Windows

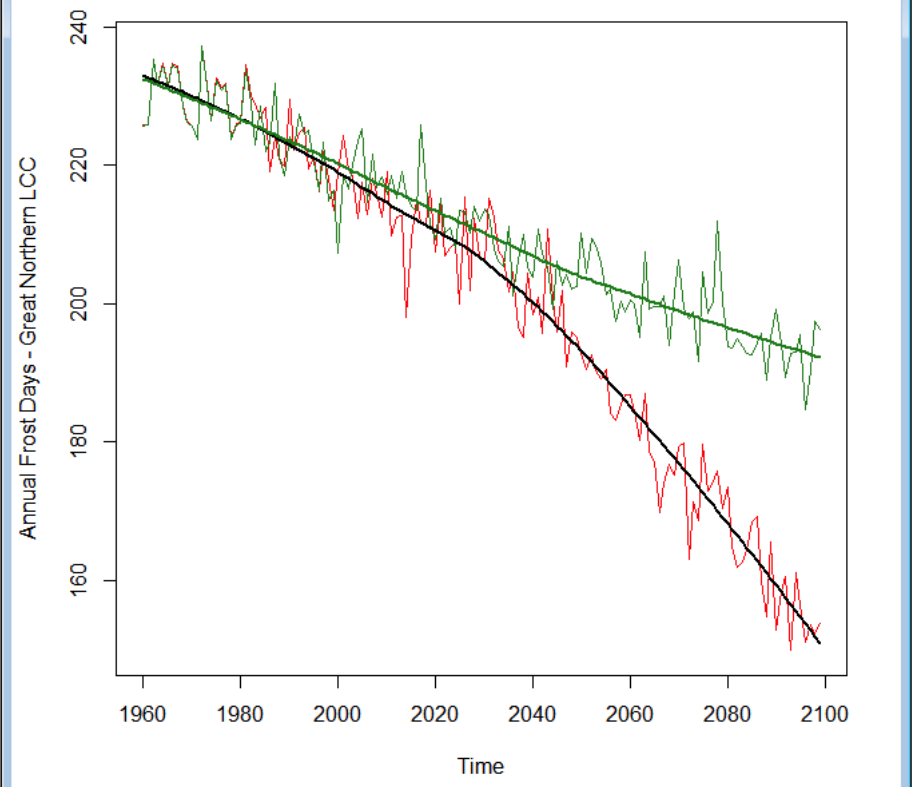
R Console

```
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> frost = read.table("f:\\temp\\FWS_LCC_Great-Northern.csv",skip=1,header=TRUE,$
> frost.ts = ts(as.matrix(frost[,2:17]), start=1960)
>
>
> mean.a1fi = apply(frost.ts[,1:4],1,mean,na.rm=TRUE); mean.a1fi = ts(mean.a1fi$
> mean.b1 = apply(frost.ts[,13:16],1,mean,na.rm=TRUE); mean.b1 = ts(mean.b1,sta$
> plot(mean.a1fi,col='red',ylab="Annual Frost Days - Great Northern LCC"); line$
>
>
> time = c(1960:2099)
> loess.a1fi <- loess(mean.a1fi ~ time)
> loess.b1 <- loess(mean.b1 ~ time)
>
>
> lines(ts(fitted(loess.a1fi),start=1960),lwd=2)
> lines(ts(fitted(loess.b1),start=1960),col="forestgreen",lwd=2)
>
>
>
```

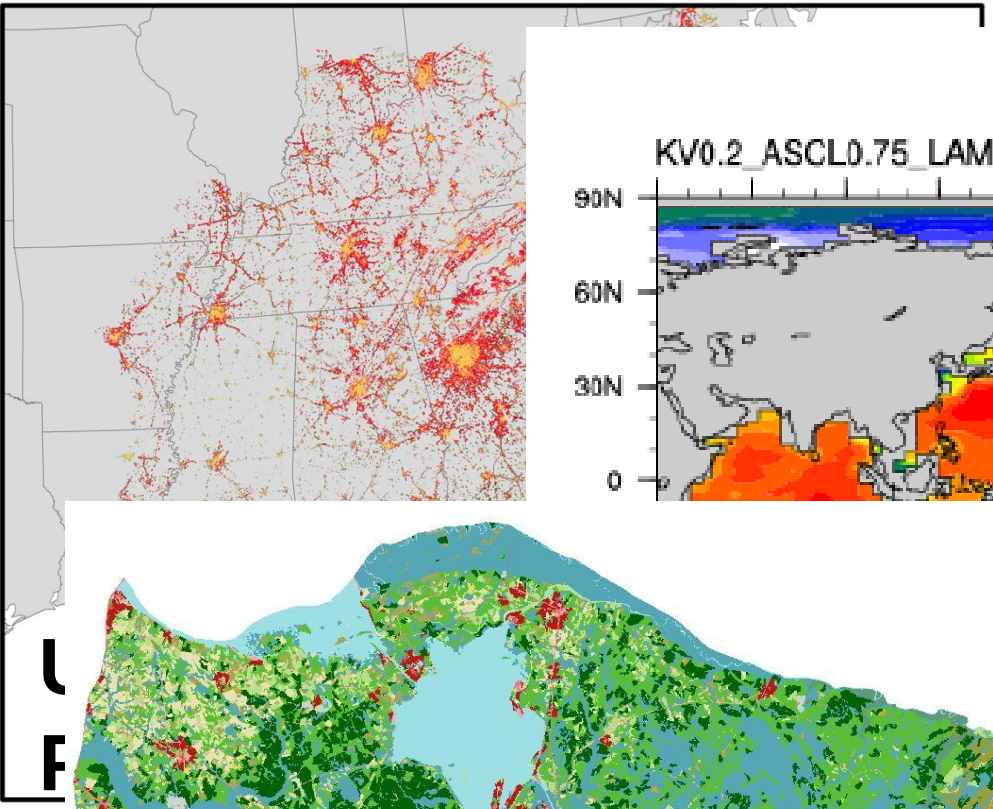
R Graphics: Device 2 (ACTIVE)

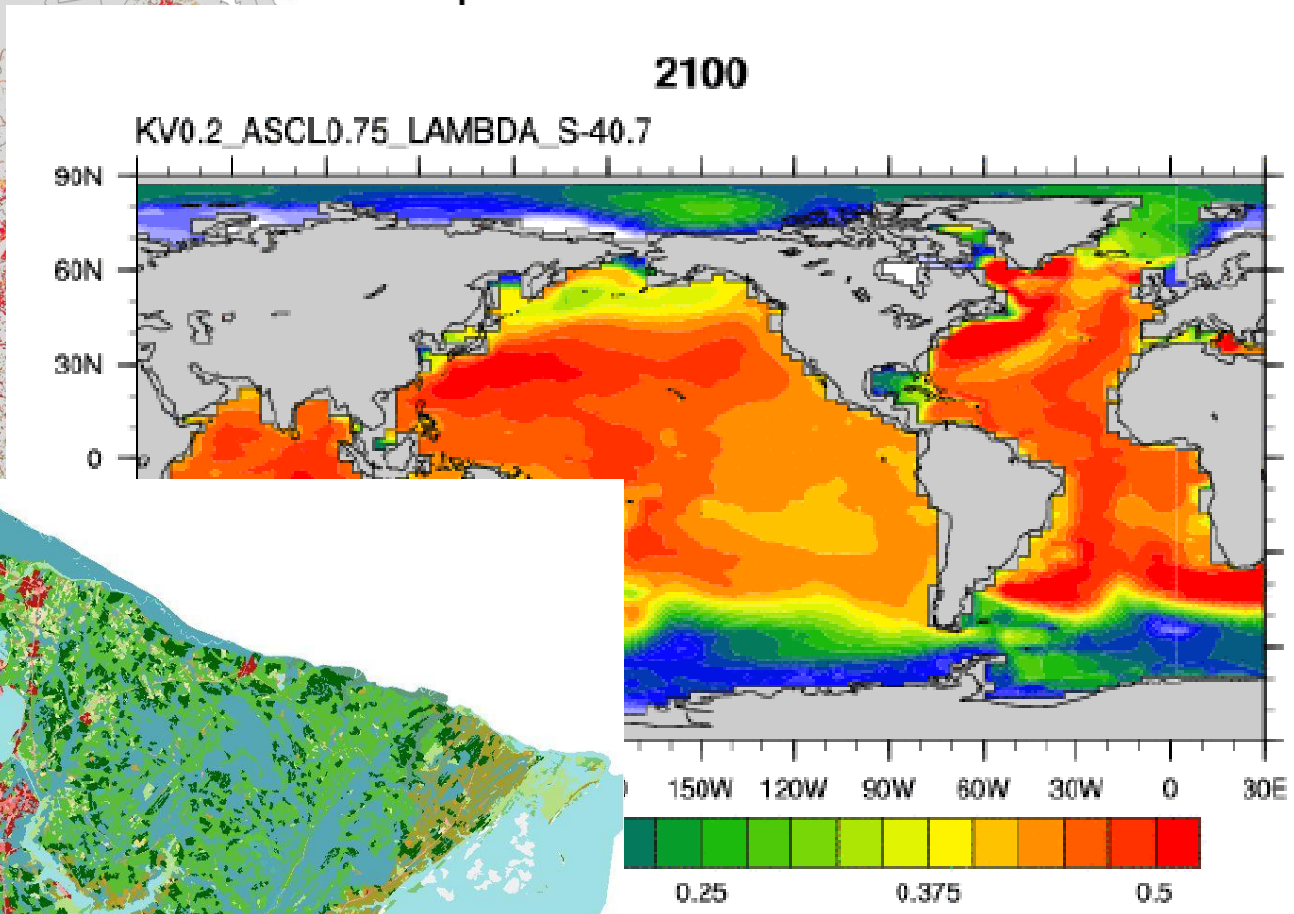


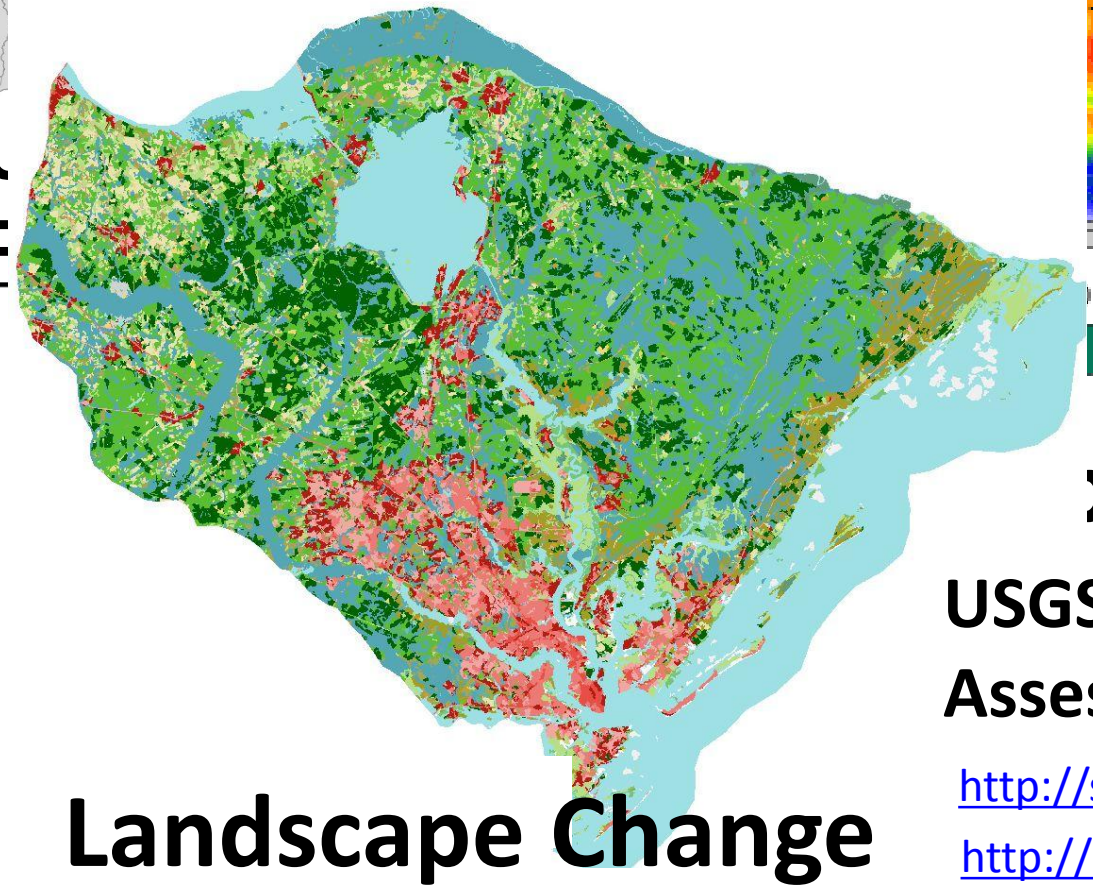
Other global change datasets.

- Adam Terando, NCSU

USGS







Landscape Change

projections

USGS Southeast Regional Assessment Project

http://serap.er.usgs.gov/

http://www.theglobalchangeforum.org/

Coupling climate to hydrology: investigating variability across climate models, scenarios and downscaling techniques

- Lauren Hay, Andy Bock, USGS CO

USGS

Differences in down-scaled climate data

Share Add Tools

37 Added by Andy Bock, last edited by Andy Bock on Aug 27, 2012 (view change)

Data sets utilized

PRMS

PRISM

This dataset was created using the PRISM (Parameter-elevation Regressions on Independent Slopes Model) climate mapping system, developed by Dr. Christopher Daly, PRISM Climate Group director. PRISM is a unique knowledge-based system that uses point measurements of precipitation, temperature, and other climatic factors to produce continuous, digital grid estimates of monthly, yearly, and event-based climatic parameters. Continuously updated, this unique analytical tool incorporates point data, a digital elevation model, and expert knowledge of complex climatic extremes, including rain shadows, coastal effects, and temperature inversions. PRISM data sets are recognized world-wide as the highest-quality spatial climate data sets currently available. PRISM is the USDA's official climatological data.

Project Website:http://prism.oregonstate.edu/

Spatial Resolution: 4 KM

Temporal Resolution: Monthly

Period of Record: 1895 to 2010

DAYMET

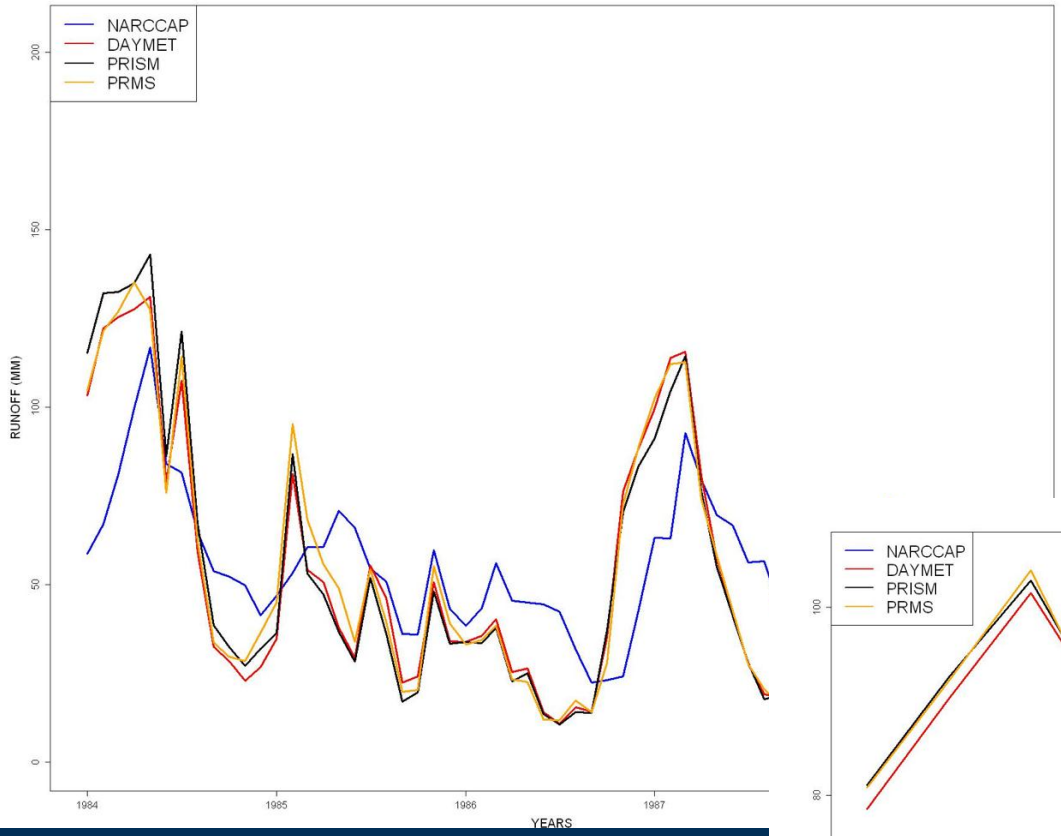
Developed by Dr. Peter E Thornton to fulfill the need for daily climatological data necessary for plant growth model inputs, Daymet generates daily, gridded surfaces of temperature, precipitation, humidity, and radiation over large regions and takes into account areas of complex terrain.

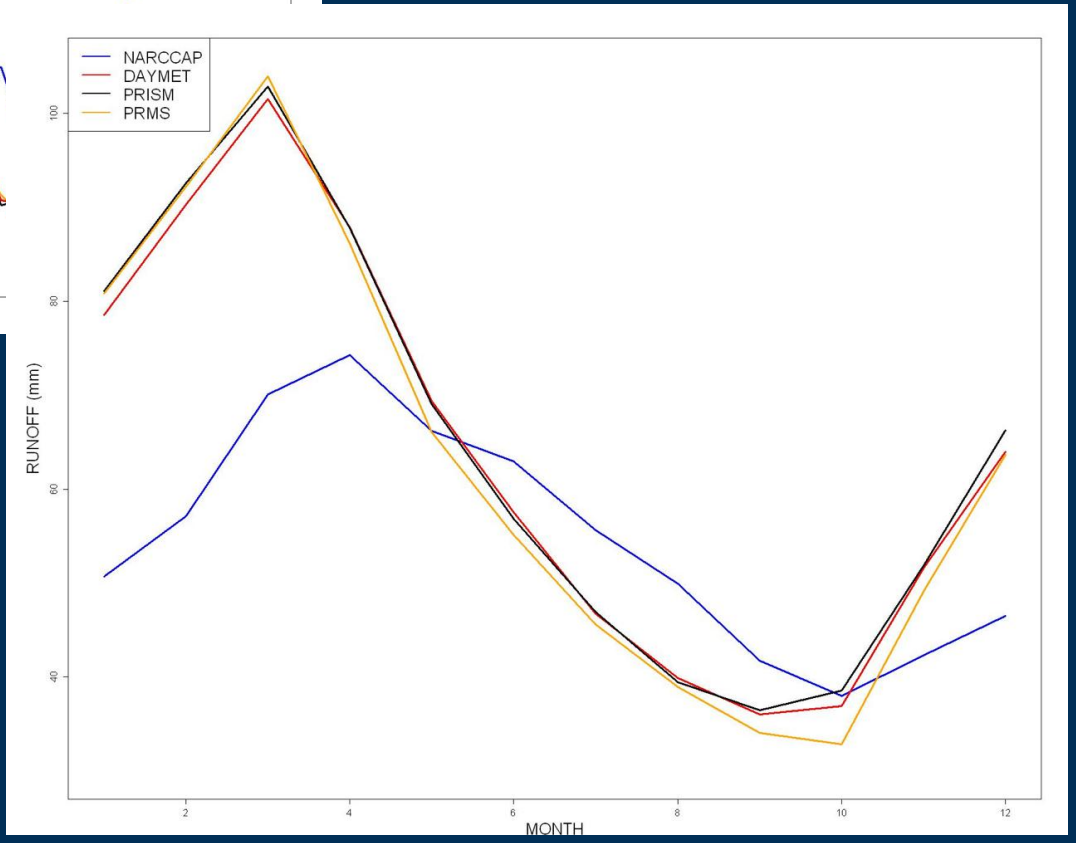
Daymet data has been updated for 1980-2009 and expanded to include the United States, Mexico, and Canada (south of 52 degrees North) as station density allows. Data can be downloaded for a single 1-km x 1-km pixel as a text file of daily data for all Daymet variables, or as a gridded tile of daily data for each Daymet variable. Annual climatological summaries are also available for some Daymet variables.

Project Website: http://daymet.ornl.gov/

Documentation: http://daymet.ornl.gov/sites/default/files/UserGuides/readme_dailygriddedsurfacedata_07102012.pdf

Spatial Resolution: 1 KM


NARCCAP
DAYMET
PRISM
PRMS
RUNOFF (MM)
0
50
100
150
200
1984
1985
1986
1987
YEARS


NARCCAP
DAYMET
PRISM
PRMS
RUNOFF (mm)
40
60
80
100
2
4
6
8
10
12
MONTH

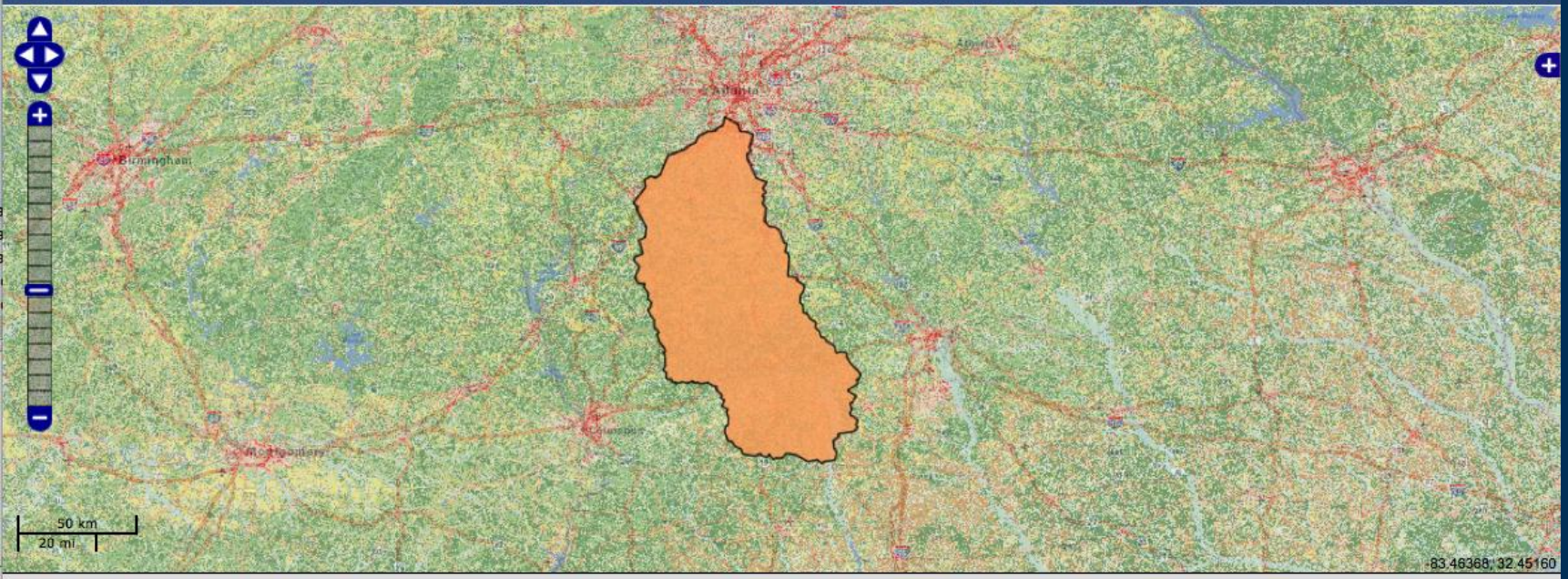
USGS

Watershed characterization and climate forcings

- SERAP project team, Upper Flint Watershed.

USGS

Geo Data Portal — Show Geo Data Portal Info



Back

Configure / Submit

Choose an algorithm: Feature Categorical Grid Coverage | Documentation | Configure

Display Available Datasets

Dataset URL: http://raster.nationalmap.gov/ArcGIS/services/LandCover/USGS_EDC_LandCover | Select

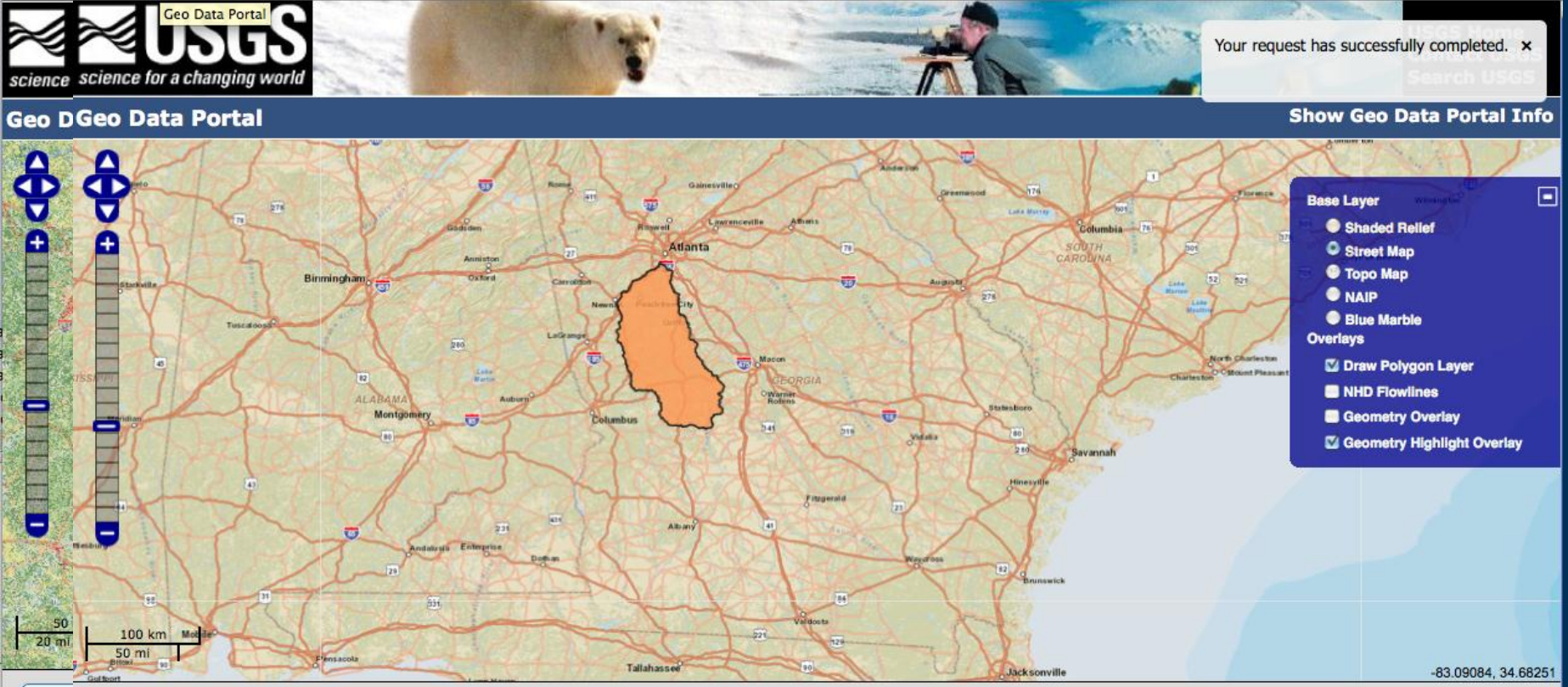
Selected Dataset: Experimental NLCD WCS

Select Datatype:
- Land_Cover_2006_1
- Impervious_Surface_2006_2
- Land_Cover_2001_AK_3
- Land_Cover_2001_HI_4
- Land_Cover_2001_PR_5

WMS: Land_Cover_2006

Submit For Processing

NLCD



Back

Configure / Submit

Choose an algorithm: Feature Weighted Grid Statistics | Documentation | Configure

Display Available Datasets

Dataset URL: http://cida.usgs.gov/qa/thredds/dodsC/prism | Select

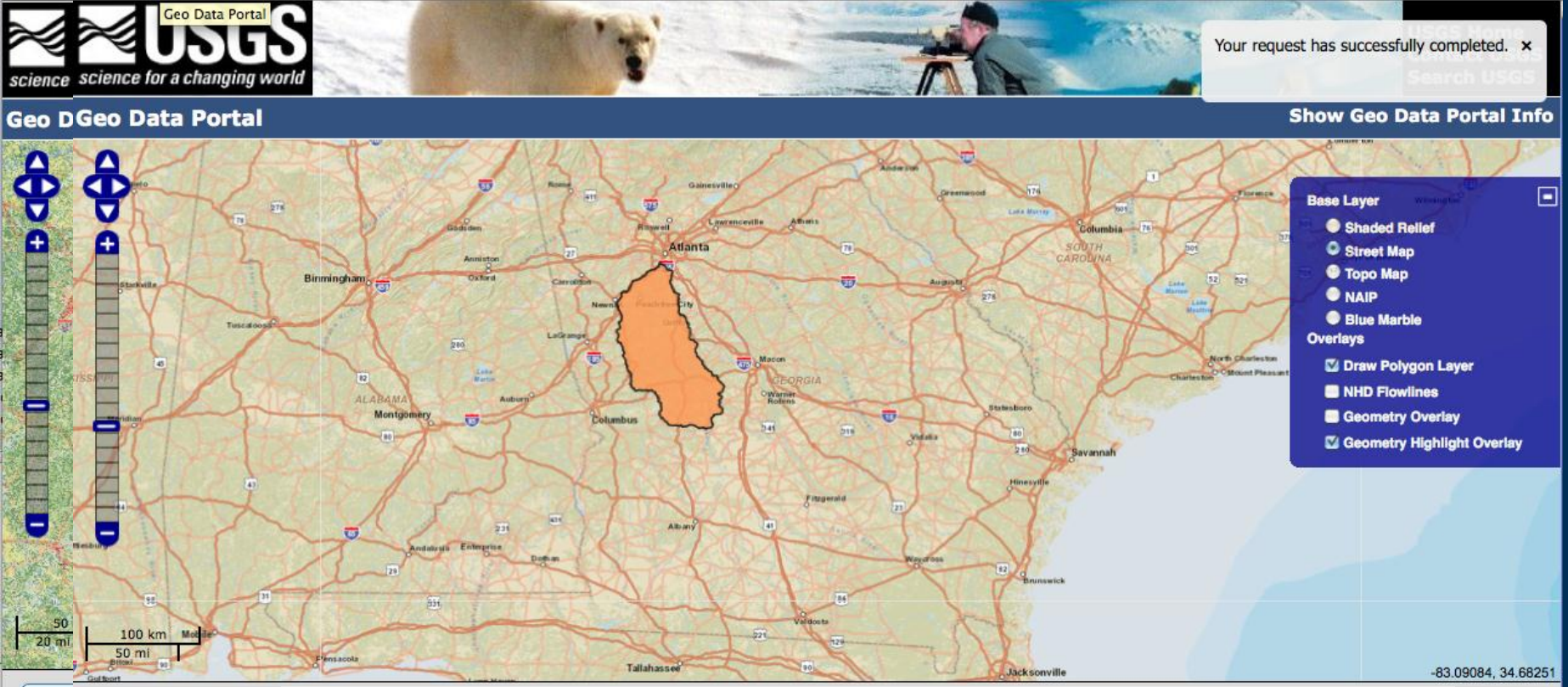
Selected Dataset: Parameter-elevation Regressions on Independent Slopes Model Monthly Climate Data for the Continental United States.

Select Datatype:
- ppt – mean monthly precipitation (mm/month)
- tmx – maximum monthly temperature (degC)
- tmn – minimum monthly temperature (degC)

PRISM

Select Date Range: From: 01/01/1895 To: 11/01/2011

Submit For Processing | Retrieve Output | Retreive Process Input



Back

Choose an algorithm: Feature Weighted Grid Statistics | Documentation | Configure

Display Available Datasets

Dataset URL: http://cida.usgs.gov/qa/thredds/dodsC/sleuth Select

Select Datatype: prj_urban – Projected Probability of Urbanization (percent)

SLEUTH

Select Date Range: From: 06/01/2010 To: 06/01/2101

Submit For Processing

upper_flint_land_cover.xlsx

Search in Sheet

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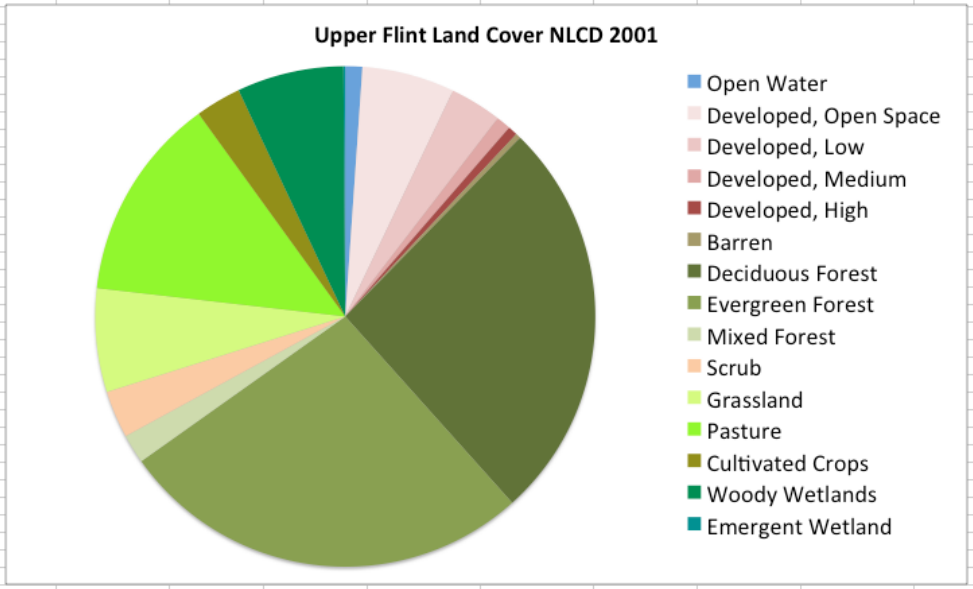
Security Warning Data connections have been disabled. Enable Content

K17

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	# 1	Susquahana Land Cover Classes														
2		Category	Category	Category	Category	Category	Category	Category	Category	Category	Category	Category	Category	Category	Category	Category
3	Attribute	11	21	22	23	24	31	41	42	43	52	71	81	82	90	
4	Susquehanr	0.011013039	0.05993929	0.033539813	0.00936292	0.006159185	0.003309796	0.2603265	0.26816934	0.018800419	0.030576494	0.06690574	0.13218834	0.029539313	0.0690022	0.0011676
5		Open Water	Developed, Op	Developed, Low	Developed, Me	Developed, High	Barren	Deciduous Fo	Evergreen Fore	Mixed Forest	Scrub	Grassland	Pasture	Cultivated Crops	Woody Wetla	Emergent We



NLCD_2001 | SLEUTH

Normal View | Ready | Sum=0

upper_flint_land_cover.xlsx

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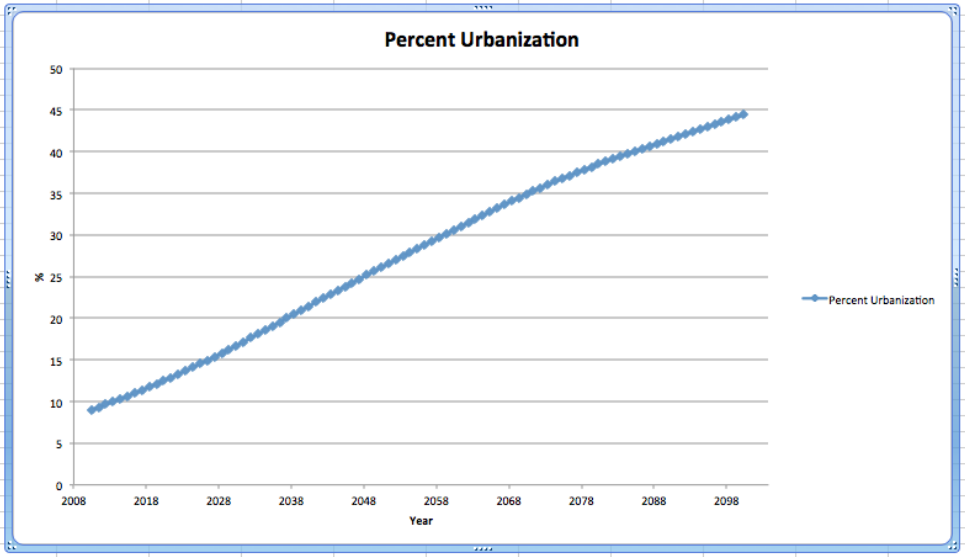
UPPER FLINT HUC8



8	2014-05-31T23:15:03Z	5/31/14	10.305207
9	2015-06-01T05:03:49Z	6/1/15	10.650553
10	2016-05-31T10:52:35Z	5/31/16	11.005486
11	2017-05-31T16:41:21Z	5/31/17	11.368027
12	2018-05-31T22:30:07Z	5/31/18	11.73811
13	2019-06-01T04:18:53Z	6/1/19	12.114359
14	2020-05-31T10:07:39Z	5/31/20	12.497598
15	2021-05-31T15:56:25Z	5/31/21	12.887728
16	2022-05-31T21:45:11Z	5/31/22	13.284172
17	2023-06-01T03:33:57Z	6/1/23	13.688745
18	2024-05-31T09:22:43Z	5/31/24	14.101021
19	2025-05-31T15:11:29Z	5/31/25	14.52017
20	2026-05-31T21:00:15Z	5/31/26	14.943992
21	2027-06-01T02:49:01Z	6/1/27	15.375458
22	2028-05-31T08:37:47Z	5/31/28	15.811769
23	2029-05-31T14:26:33Z	5/31/29	16.255835
24	2030-05-31T20:15:19Z	5/31/30	16.705679
25	2031-06-01T02:04:05Z	6/1/31	17.162518
26	2032-05-31T07:52:51Z	5/31/32	17.623894
27	2033-05-31T13:41:37Z	5/31/33	18.092234
28	2034-05-31T19:30:23Z	5/31/34	18.56567
29	2035-06-01T01:19:09Z	6/1/35	19.046698
30	2036-05-31T07:07:55Z	5/31/36	19.532145
31	2037-05-31T12:56:41Z	5/31/37	20.013489
32	2038-05-31T18:45:27Z	5/31/38	20.491707
33	2039-06-01T00:34:13Z	6/1/39	20.96735
34	2040-05-31T06:22:59Z	5/31/40	21.442781
35	2041-05-31T12:11:45Z	5/31/41	21.915096
36	2042-05-31T18:00:31Z	5/31/42	22.38646
37	2043-05-31T23:49:17Z	5/31/43	22.854778
38	2044-05-31T05:38:03Z	5/31/44	23.322678
39	2045-05-31T11:26:49Z	5/31/45	23.788427
40	2046-05-31T17:15:35Z	5/31/46	24.25316
41	2047-05-31T23:04:21Z	5/31/47	24.71487
42	2048-05-31T04:53:07Z	5/31/48	25.176033
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45	2051-05-31T22:19:24Z	5/31/51	26.547915
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47	2053-05-31T09:56:56Z	5/31/53	27.45595
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49	2055-05-31T21:34:28Z	5/31/55	28.357037
50	2056-05-31T03:23:14Z	5/31/56	28.804825
51	2057-05-31T09:12:00Z	5/31/57	29.251875
52	2058-05-31T15:00:46Z	5/31/58	29.69578
53	2059-05-31T20:49:32Z	5/31/59	30.139406
54	2060-05-31T02:38:18Z	5/31/60	30.579168
55	2061-05-31T08:27:04Z	5/31/61	31.02094
56	2062-05-31T14:15:50Z	5/31/62	31.459175
57	2063-05-31T20:04:36Z	5/31/63	31.897104
58	2064-05-31T01:53:22Z	5/31/64	32.333794
59	2065-05-31T07:42:08Z	5/31/65	32.770103
60	2066-05-31T13:30:54Z	5/31/66	33.206284
61	2067-05-31T19:19:40Z	5/31/67	33.640278
62	2068-05-31T01:08:26Z	5/31/68	34.061623
63	2069-05-31T06:57:12Z	5/31/69	34.47472
64	2070-05-31T12:45:58Z	5/31/70	34.878696
65	2071-05-31T18:34:44Z	5/31/71	35.275246
66	2072-05-31T00:23:30Z	5/31/72	35.66206
67	2073-05-31T06:12:16Z	5/31/73	36.04143

NLCD_2001 SLEUTH

Normal View Ready Sum=30.579168

NLCD_2001 SLEUTH

Normal View Ready Sum=0

upper_flint_land_cover.xlsx

upper_flint_land_cover.xlsx

prism_upper_flint.xlsx

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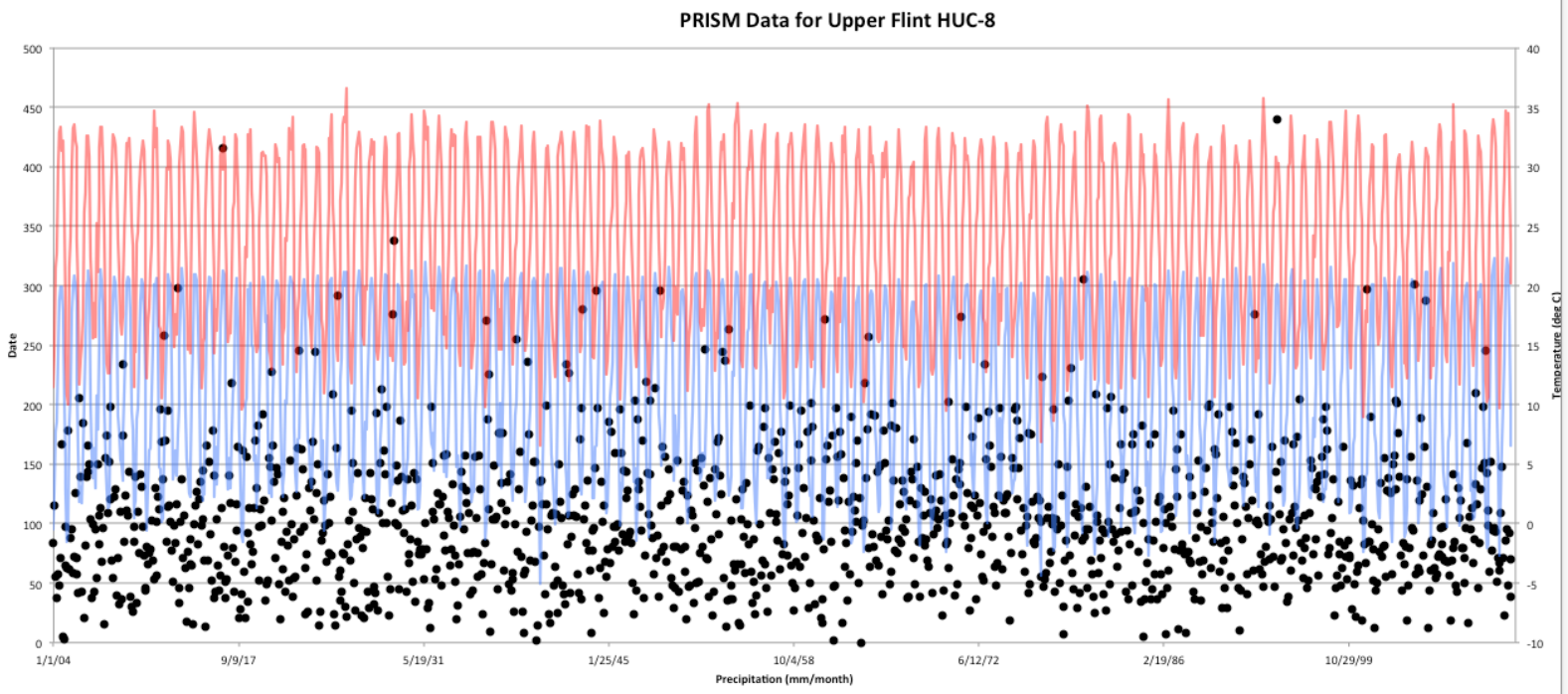
Security Warning Data connections have been disabled. Enable Content

M63

	A	B	C	D	E	F	G	H	I
2		Upper Flint			Upper Flint			Upper Flint	
3	TIMESTEP	MEAN(mm/month)		TIMESTEP	MEAN(degC)		TIMESTEP	MEAN(degC)	
4	1904-01-01T00:00:00Z	83.410515		1904-01-01T0	11.487021		1904-01-01T0	-0.5142484	1/1/04
5	1904-02-01T00:00:00Z	114.9141		1904-02-01T0	14.575719		1904-02-01T0	2.7112355	2/1/04
6	1904-03-01T00:00:00Z	55.682457		1904-03-01T0	21.509785		1904-03-01T0	7.6836176	3/1/04
7	1904-04-01T00:00:00Z								
8	1904-05-01T00:00:00Z								
9	1904-06-01T00:00:00Z								
10	1904-07-01T00:00:00Z								
11	1904-08-01T00:00:00Z								
12	1904-09-01T00:00:00Z								
13	1904-10-01T00:00:00Z								
14	1904-11-01T00:00:00Z								
15	1904-12-01T00:00:00Z								
16	1905-01-01T00:00:00Z								
17	1905-02-01T00:00:00Z								
18	1905-03-01T00:00:00Z								
19	1905-04-01T00:00:00Z								
20	1905-05-01T00:00:00Z								
21	1905-06-01T00:00:00Z								
22	1905-07-01T00:00:00Z								
23	1905-08-01T00:00:00Z								
24	1905-09-01T00:00:00Z								
25	1905-10-01T00:00:00Z								
26	1905-11-01T00:00:00Z								
27	1905-12-01T00:00:00Z								
28	1906-01-01T00:00:00Z								
29	1906-02-01T00:00:00Z								
30	1906-03-01T00:00:00Z								
31	1906-04-01T00:00:00Z								
32	1906-05-01T00:00:00Z								
33	1906-06-01T00:00:00Z								
34	1906-07-01T00:00:00Z								
35	1906-08-01T00:00:00Z								
36	1906-09-01T00:00:00Z								
37	1906-10-01T00:00:00Z								
38	1906-11-01T00:00:00Z								
39	1906-12-01T00:00:00Z								
40	1907-01-01T00:00:00Z								
41	1907-02-01T00:00:00Z								
42	1907-03-01T00:00:00Z								
43	1907-04-01T00:00:00Z								
44	1907-05-01T00:00:00Z								
45	1907-06-01T00:00:00Z								
46	1907-07-01T00:00:00Z								
47	1907-08-01T00:00:00Z								
48	1907-09-01T00:00:00Z								
49	1907-10-01T00:00:00Z								
50	1907-11-01T00:00:00Z								
51	1907-12-01T00:00:00Z	173.7375		1907-12-01T0	13.5428505		1907-12-01T0	2.8581011	12/1/07
52	1908-01-01T00:00:00Z	108.50106		1908-01-01T0	12.6660795		1908-01-01T0	1.343151	1/1/08
53	1908-02-01T00:00:00Z	152.3062		1908-02-01T0	12.60545		1908-02-01T0	1.4110295	2/1/08
54	1908-03-01T00:00:00Z	120.90784		1908-03-01T0	24.3131		1908-03-01T0	10.682844	3/1/08
55	1908-04-01T00:00:00Z	198.01686		1908-04-01T0	26.295586		1908-04-01T0	13.008608	4/1/08
56	1908-05-01T00:00:00Z	68.982475		1908-05-01T0	29.647814		1908-05-01T0	15.502369	5/1/08



Sheet1

Normal View | Ready | Sum=0

How much rain was there during the dustbowl? Analysis through Python.

- Rich Signell, USGS Woods Hole

USGS

In [5]:
```
from IPython.core.display import HTML
from IPython.core.display import Image
Image('http://www-tc.pbs.org/kenburns/dustbowl/media/photos/s257l-lg.jpg')
```

Out[5]:

In [2]:
```
#Above: Dust storm hits Hooker, OK, June 4, 1937. So how much precip really was there during the dust bowl years?
```

USGS

In [2]:
```
import pyGDP
# if we have our shapefile as a zip, base 64 encode it and upload it to geoserver
filePath = 'OKCNTYD.zip'
fileHandle = pyGDP.encodeZipFolder(filePath)
#OKshapeFile = pyGDP.uploadService(fileHandle)
```

In [3]:
```
# Above: We have sucessfully uploaded our shapefile onto geoserver.
```

In [3]:
```
# Now, if we used GDP on the browser, we would navigate through something liks this:
HTML('<iframe src=http://screencast.com/t/K7KTcaFrSUc width=800 height=600>')
```

Out[3]:

In [9]:
```
dataSetURI = 'dods://cida.usgs.gov/qa/thredds/dodsC/prism'
#Get the available dataTypes
dataTypes = pyGDP.getDataType(dataSetURI)
for d in dataTypes:
    print d
```

```
ppt
tmx
tmn
```

In [10]:
```
user_dataType = 'ppt'
#get the time range for the dataSet
timeRange = pyGDP.getTimeRange(dataSetURI, user_dataType)
for t in timeRange:
    print t
```

```
1895-01-01T00:00:00Z
2011-11-01T00:00:00Z
```

In [11]:
```
timeBegin = '1900-01-01T00:00:00Z'
timeEnd = '2011-11-01T00:00:00Z'
```

In [12]:
```
# Once we have our shapefile, attribute, value, dataset, datatype, and timerange as inputs, we can go ahead
# and submit our request.

out1, out2, out3, out4 = pyGDP.submitRequest(OKshapeFile, dataSetURI, user_dataType, user_attribute, user_value, timeBegin, timeEnd)
```

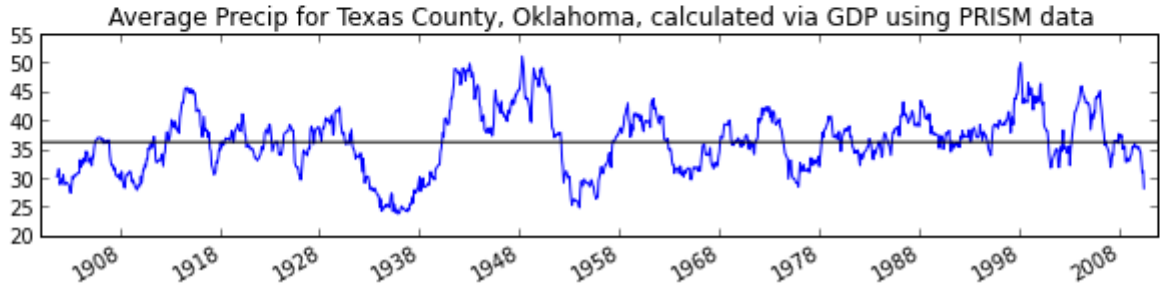
```
Executing Request...
Output URL=http://cida.usgs.gov/climate/gdp/process/RetrieveResultServlet?id=5220291858966525635OUTPUT.e956d6e9-6b2c-4395-90f2-
cb5330df2fb7
Output written to file: 5220291858966525635OUTPUT.e956d6e9-6b2c-4395-90f2-cb5330df2fb7
```

USGS

In [3]:
```
# PRISM data is monthly:  filter over 36 months
plp=boxfilt(precip,36)

fig=plt.figure(figsize=(10,2), dpi=80)
ax1 = fig.add_subplot(111)
g1=ax1.plot_date(jd,plp,fmt='b-')
g2=ax1.plot_date(jd,0*jd+np.mean(precip),fmt='k-')
fig.autofmt_xdate()
plt.title('Average Precip for Texas County, Oklahoma, calculated via GDP using PRISM data ')
```

Out[3]: <matplotlib.text.Text at 0x7648b38>



USGS

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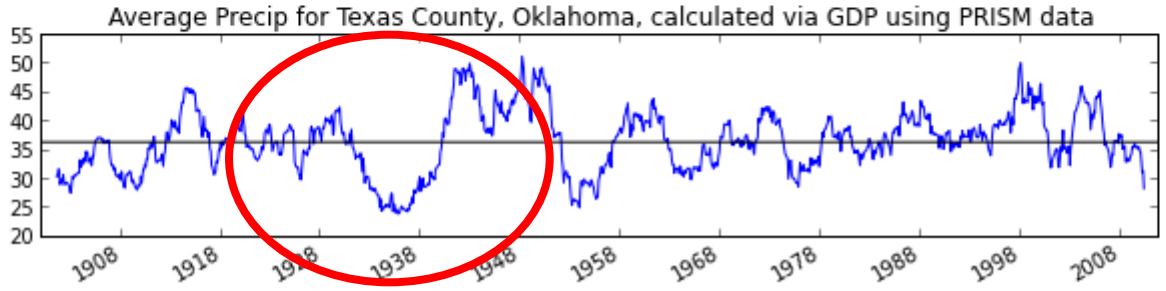


USGS

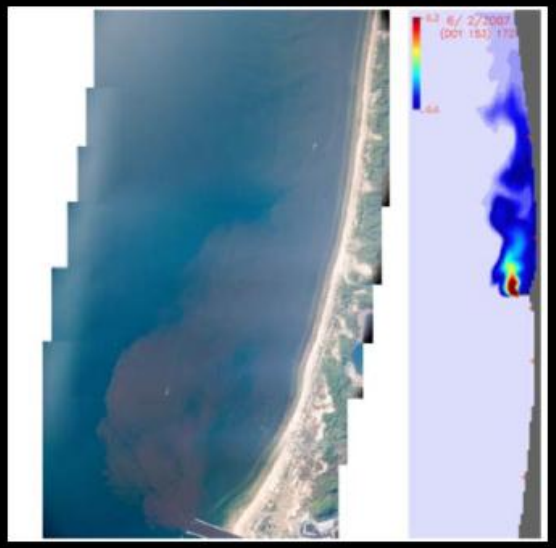
Supporting operational models for nearshore water-quality

- Steve Corsi, USGS WI Water Science Center

USGS

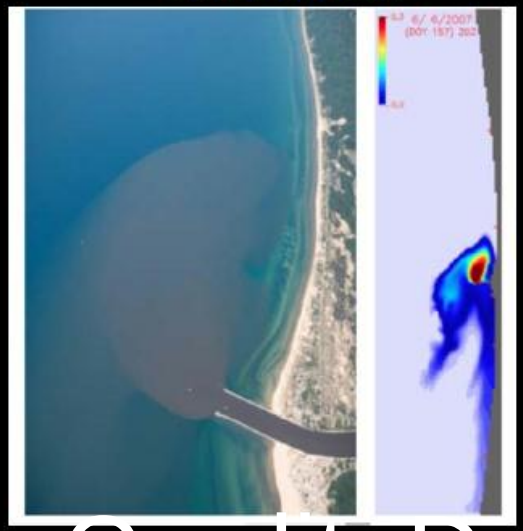
Grand River Plume Aerial Photography and Model Simulations

June 2, 2007



June 10, 2007

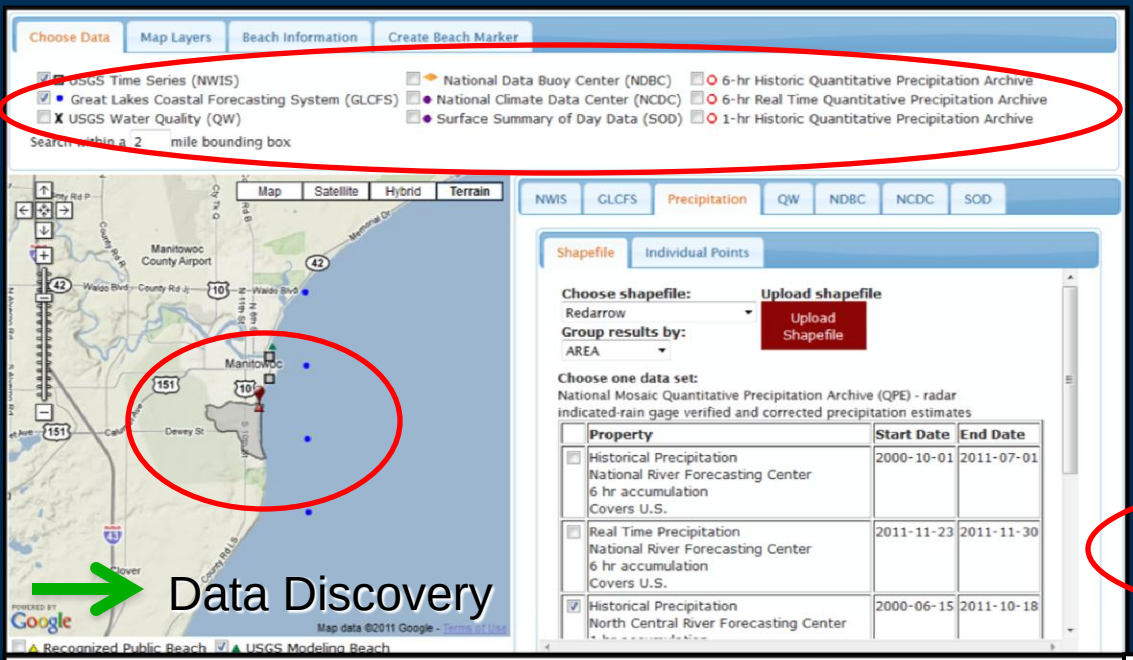
June 6, 2007

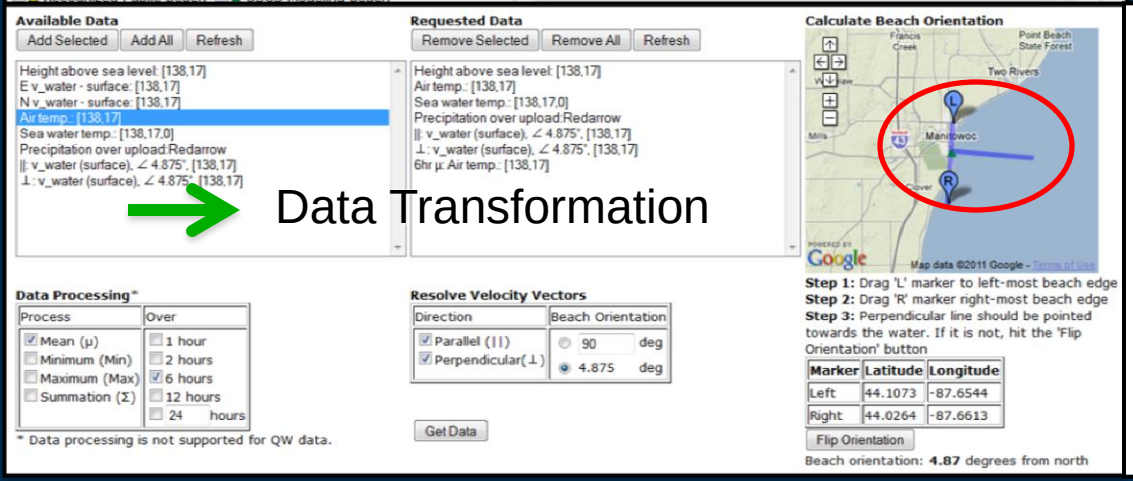


June 20, 2007

Credit: David J. Schwab

Environmental Data Discovery and Transformation (EnDDaT)





Data Discovery

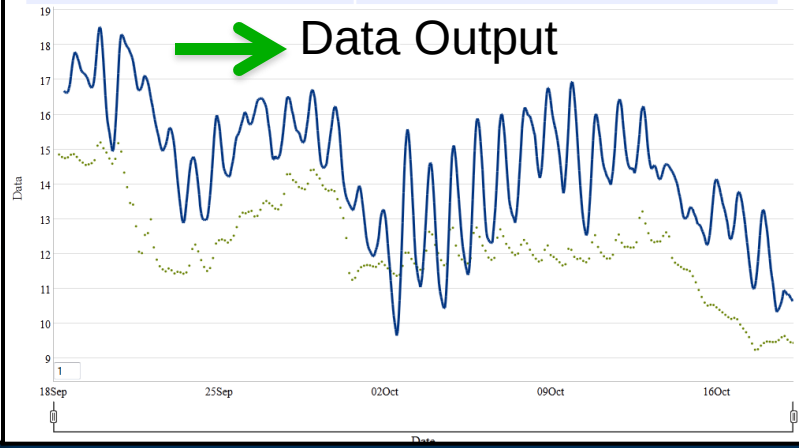
NWIS
Water Quality
GLCFS
Weather

Transformations

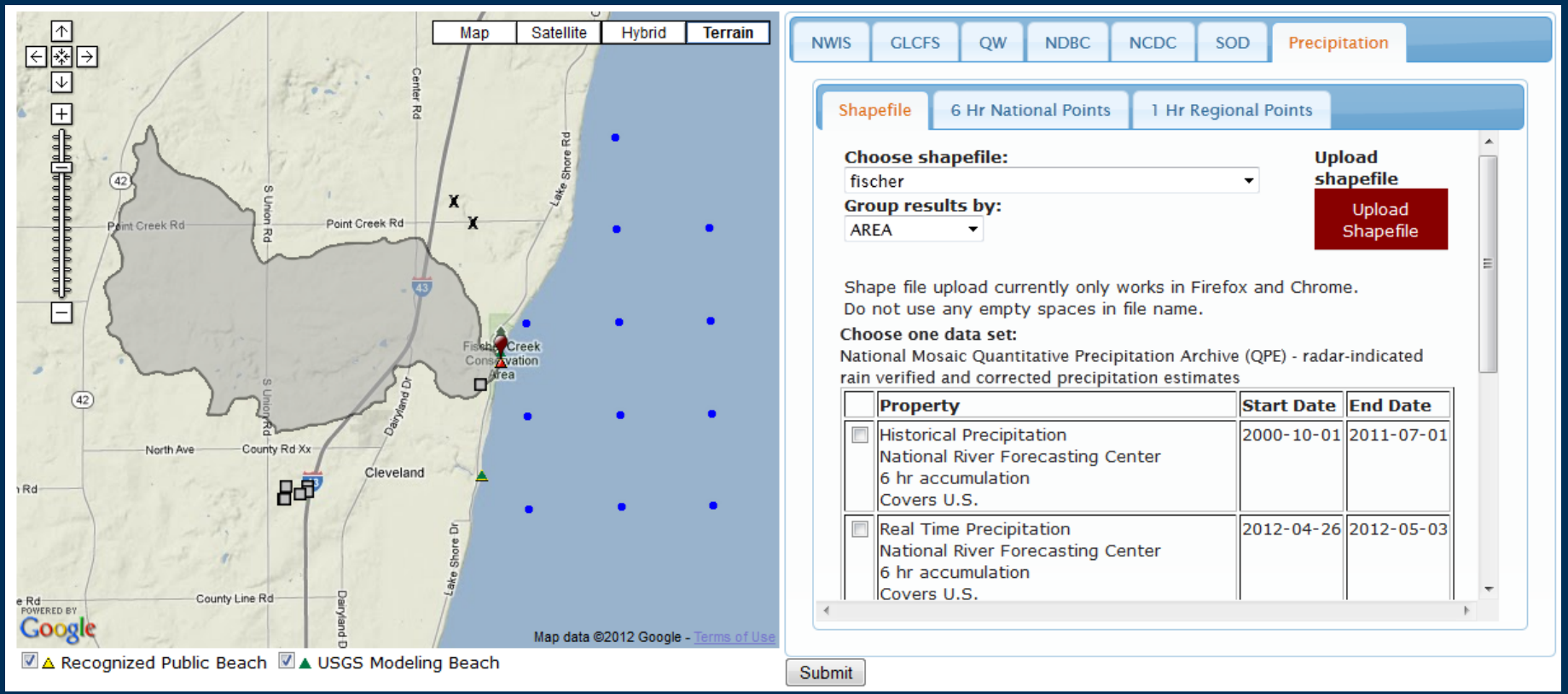
Temporal
Spatial
Statistical

Output Options

Tab delimited	Web report
Web Services	Interactive plot



Precipitation by watershed



USGS

Summary

Geo Data Portal is a convenient and powerful tool to access and process climate and landscape data.

Work continues to provide access to additional datasets.

Please try it out and provide feedback.

http://cida.usgs.gov/gdp

Use contact form on website.

USGS