

PINEMAP's DSS

- Target audience:
 - Professional foresters
 - Specialized practitioner / land manager

- For more details, contact:
Heather Dinon Aldridge
hadinon@ncsu.edu
919-513-0244

What are projections of extreme minimum temperature?

- Environment
- Establishment
- Management
- Temperature
- Precipitation
- Drought
- Other Weather Conditions
- Soils
- Water

Select a tool: **Extreme minimum temperature frequency**

Historical dataset (from 1986 to 2005):
 Observations
 Model baseline data

Future projections:
 Period: **2061 to 2080**

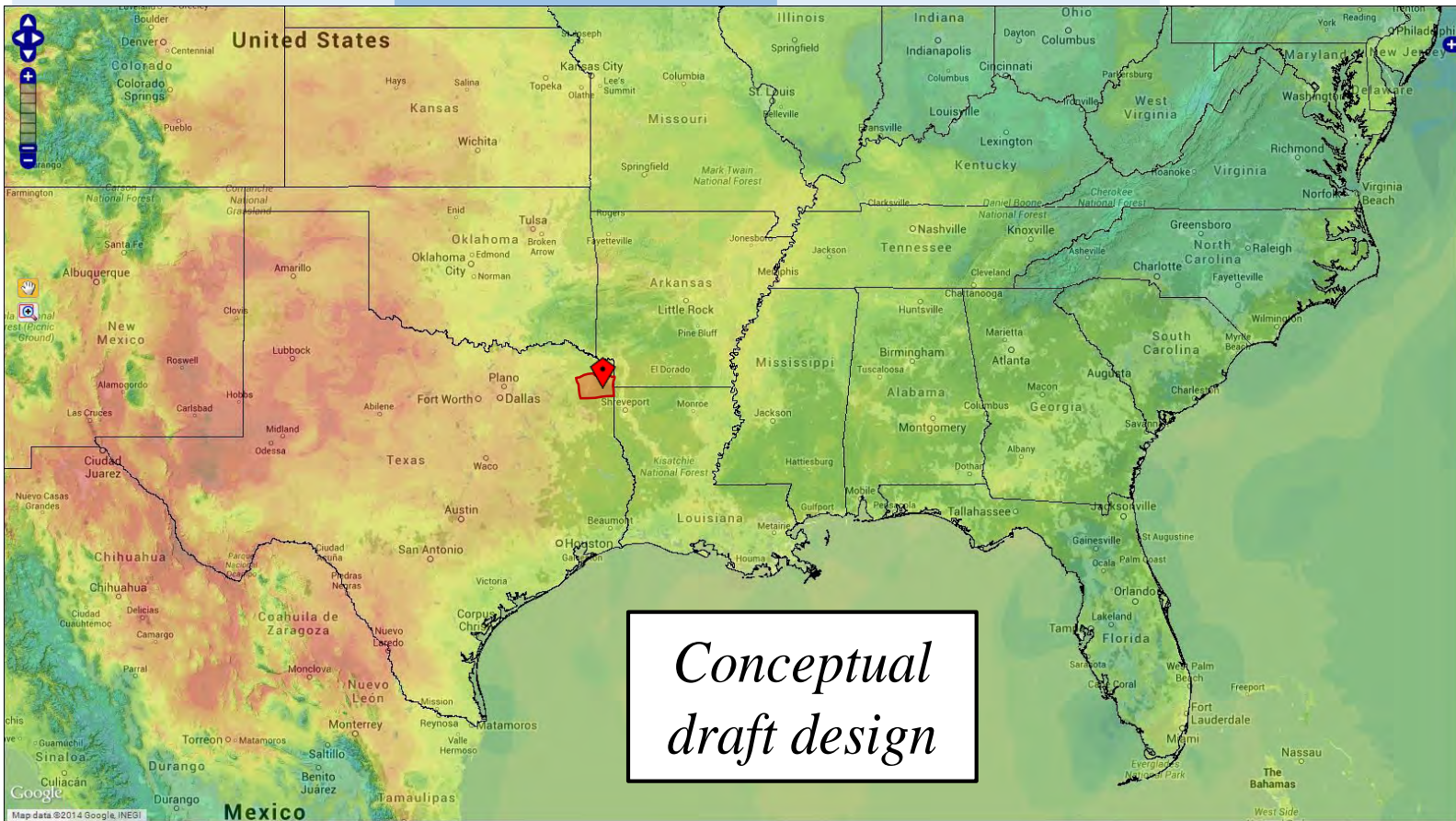
Temp. threshold: **20°F**
 Season: **Winter (DJF)**
 RCP scenario: **4.5**

Display

Minimum projected change

Mean projected change

Maximum projected change

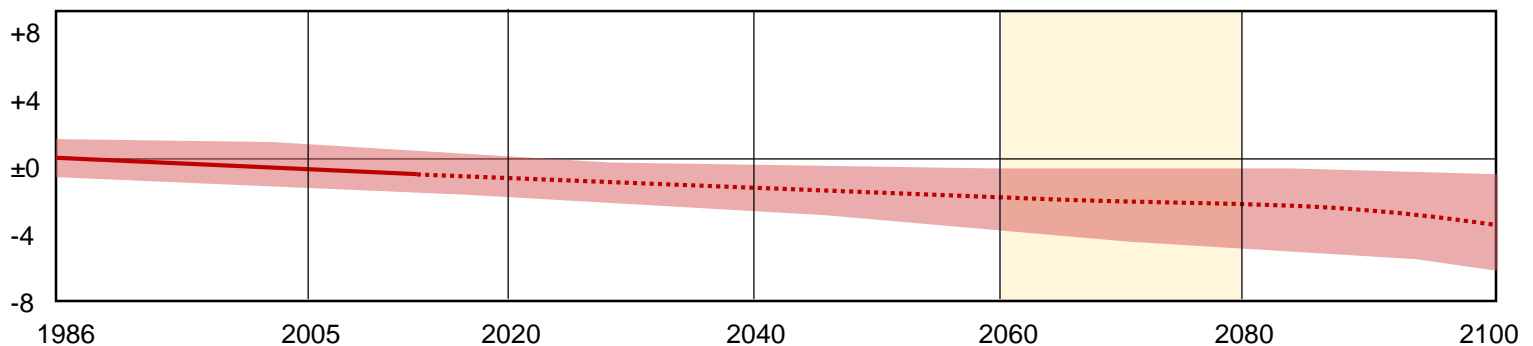


Mean projected change in days per year with minimum temperatures < 20°F for the period from 2061 to 2080 (reference period: 1986 to 2005)



At your location:

Region: Cass County, TX Baseline: 12 ± 3.2 days Projected Change: -2.8 ± 2.1 days



Other Resources:

- [Temperature Sensitivities Fact Sheet](#)
- [Background: MACA Statistical Downscaling](#)



PINEMAP

Mapping the future of southern pine management

What will future water supply and demand look like?

Environment

Establishment

Management

Temperature

Precipitation

Drought

Other Weather Conditions

Soils

Water

Select a tool:

Historical dataset (1986 to 2005):

Future projections:

Output:

Display

Observations

Period:

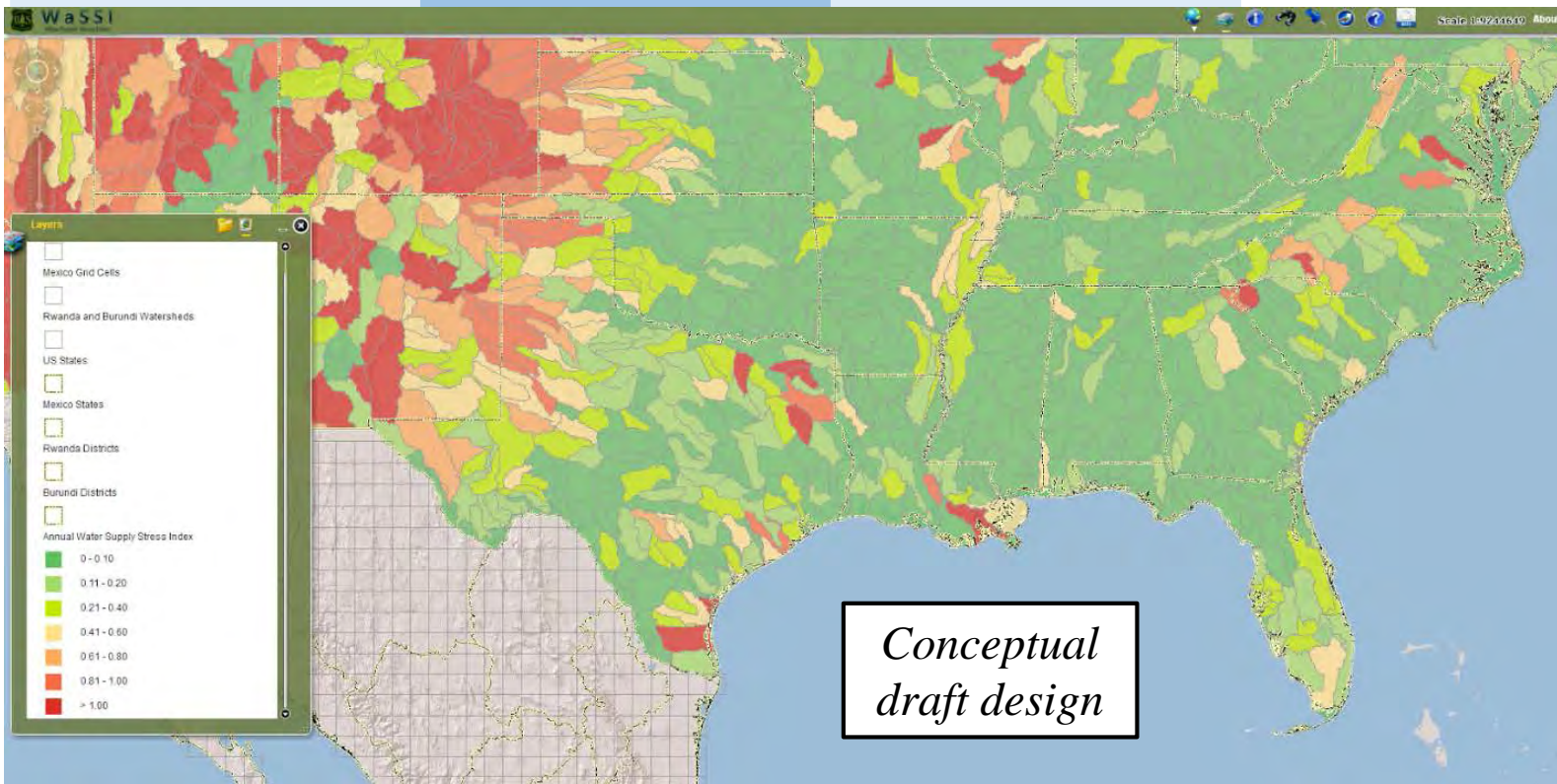
RCP scenario:

Model baseline data

Minimum projected change

Mean projected change

Maximum projected change



Other Resources:

[Water Supply Stress Index Fact Sheet](#)

[Background: WaSSI](#)

Where can I plant my seed in the future?

Environment

Establishment

Management

Seedling Selection

Planting

Site Preparation

Select a tool:

Historical dataset (from 1986 to 2005):

Observations

Model baseline data

Future projections:

Period:

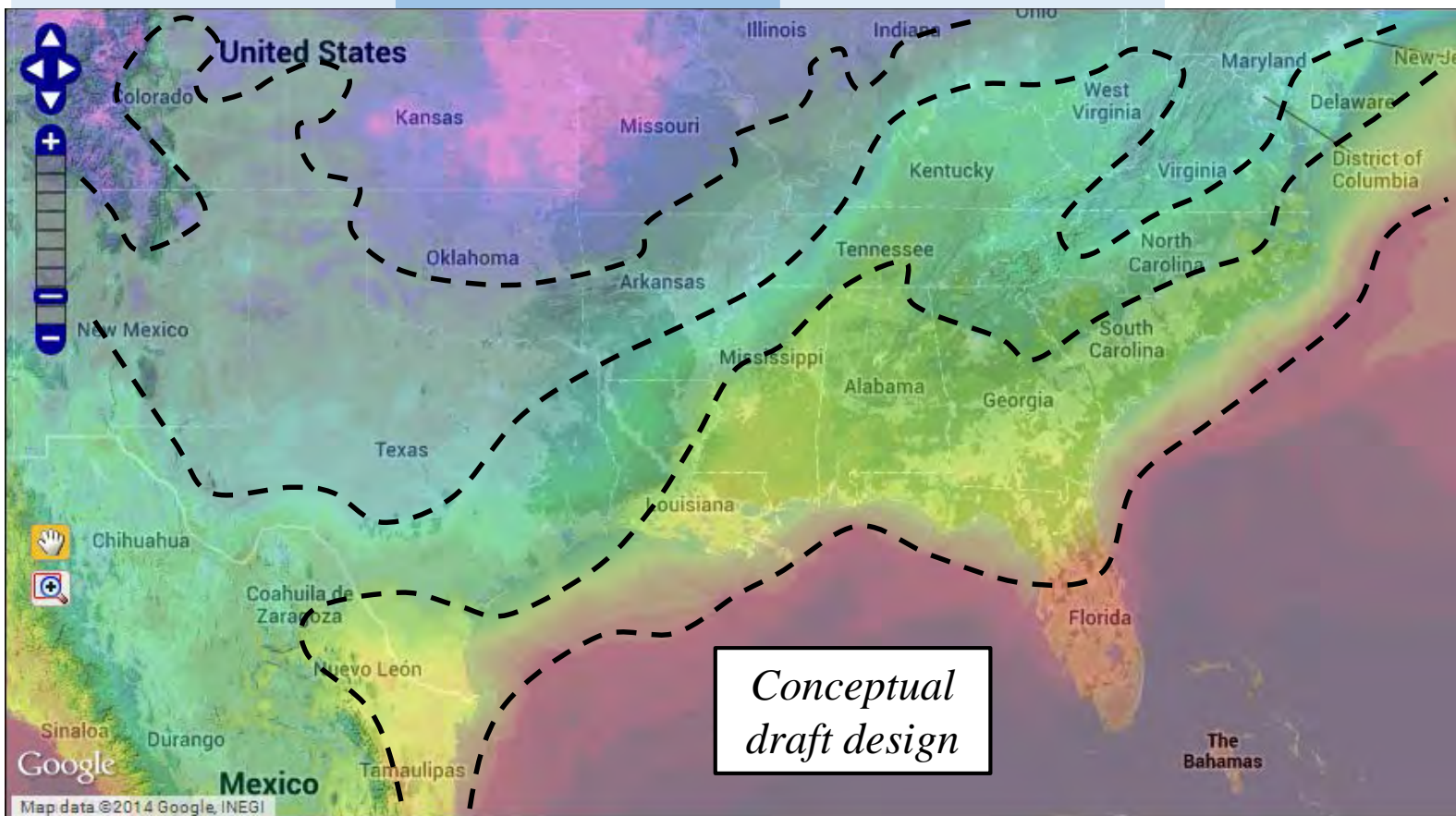
RCP scenario:

Display

Minimum projected values

Mean projected values

Maximum projected values



Projected mean annual extreme temperature for the period from 2021 to 2040

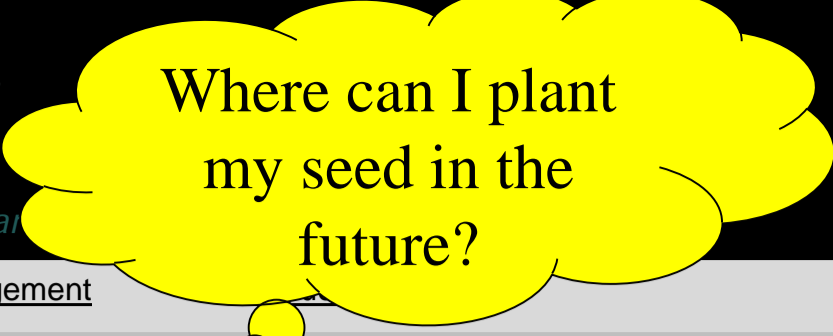


[Click to select your location](#)

Other Resources:

[Seed Deployment Fact Sheet](#)

[Background: MACA Statistical Downscaling](#)



Environment

Establishment

Management

Seedling Selection

Planting

Site Preparation

Select a tool: Seed Deployment Tool

Historical dataset (from 1986 to 2005):

Observations

Model baseline data

Future projections:

Period: 2021 to 2040

RCP scenario:

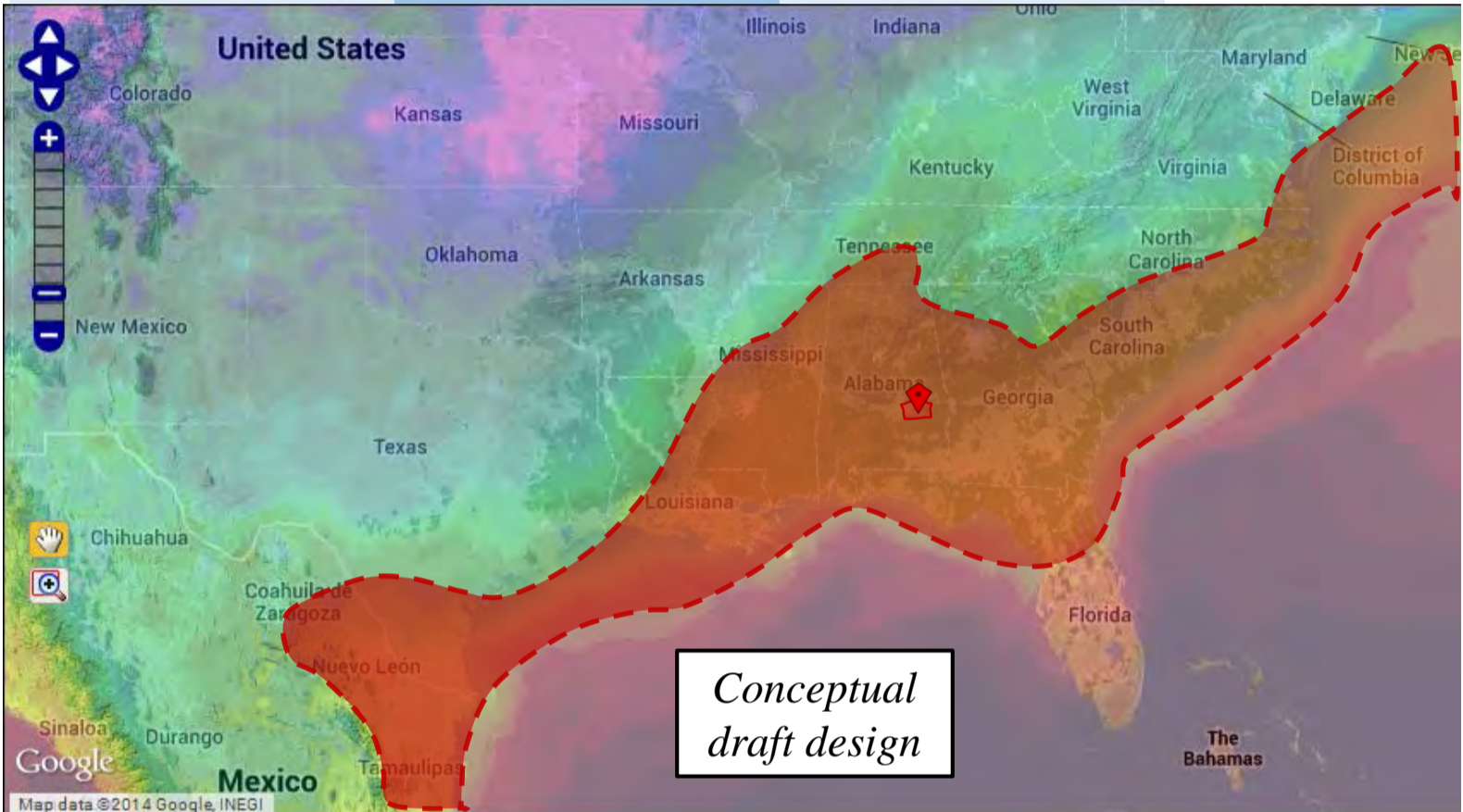
Low (4.5)

Display

Minimum projected values

Mean projected values

Maximum projected values



Projected mean annual extreme temperature for the period from 2021 to 2040



Potential seed selection range (locations with mean annual extreme temperatures within $\pm 2.5^\circ\text{F}$)



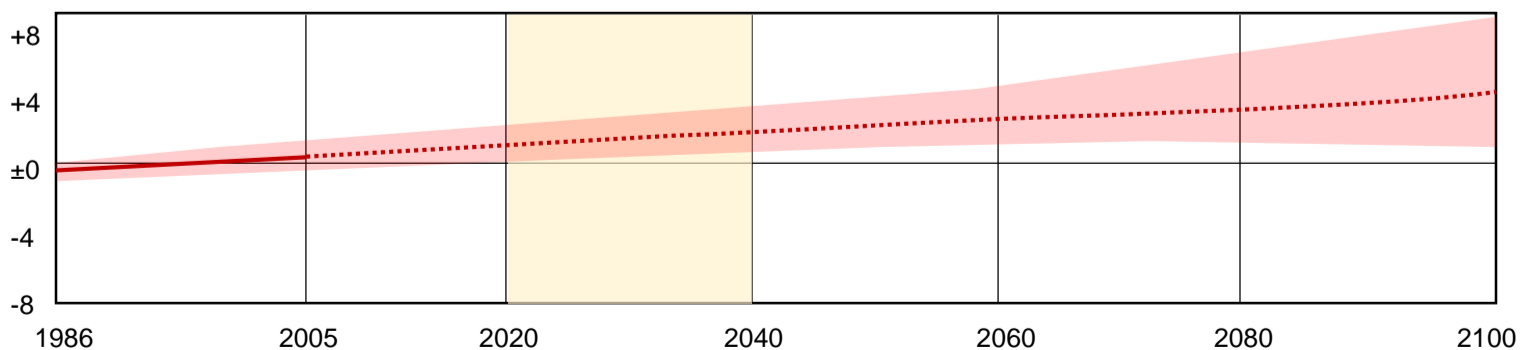
At your location:

Region: Macon County, AL

Historical mean annual extreme temp. for the period from 1986 to 2005: 7°F

Projected mean annual extreme temp. for the period from 2021 to 2040: 8°F (+1°F)

Projected future changes in mean annual extreme temperatures:



Other Resources:

[Seed Deployment Fact Sheet](#)

[Background: MACA Statistical Downscaling](#)



PINEMAP

Mapping the future of southern pine management

What is the risk of SPB outbreaks in the future?

Environment

Establishment

Management

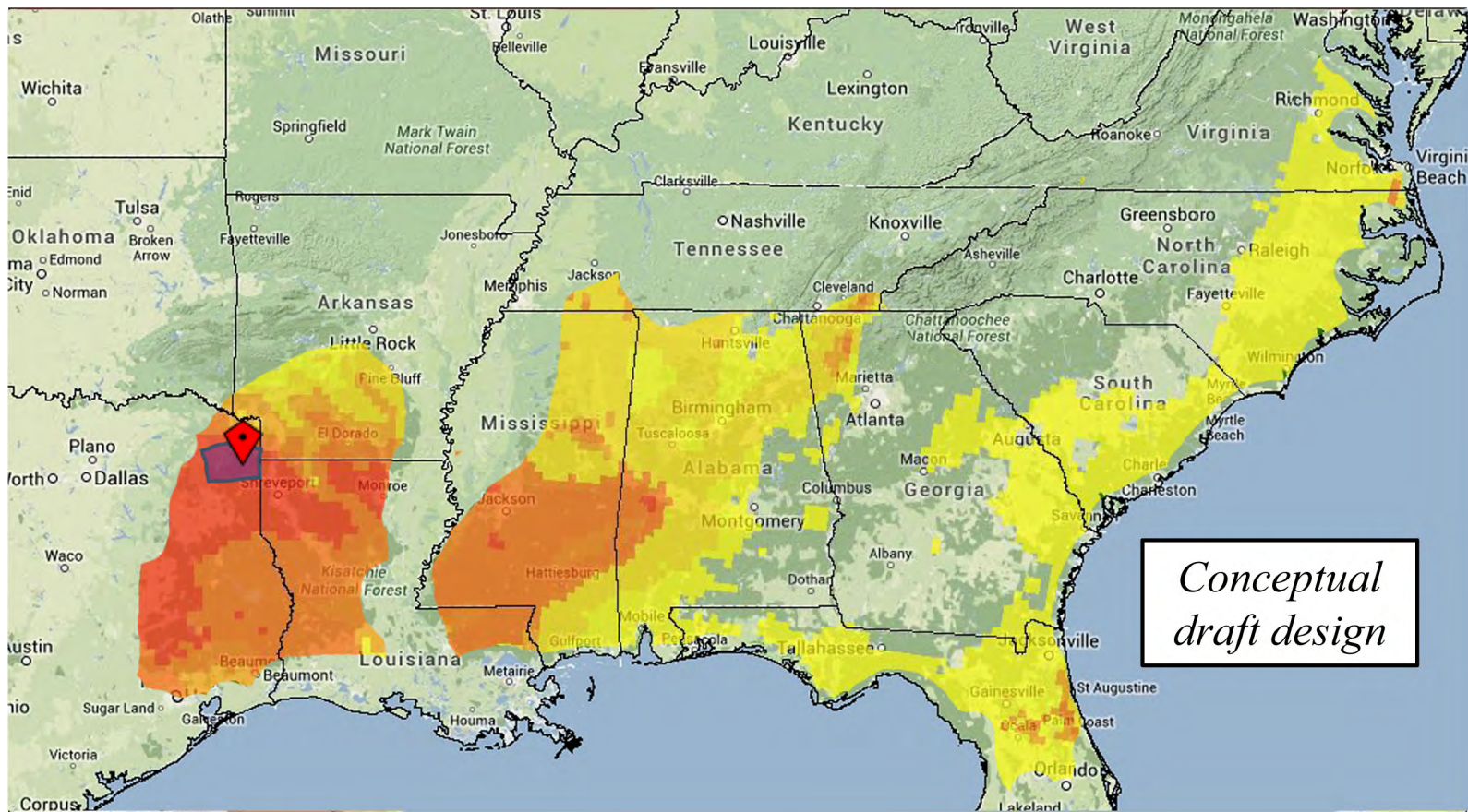
Thinning

Pests

Diseases & Vegetation

Nutrient Guidance

Select a tool:



High risk

Moderate risk

Low risk

◆ At your location:

Region: Cass County, TX

Risk Level: Moderate

Other Resources:

 [SPB Outbreak Fact Sheet](#)

 [Pest and Disease Impacts on Loblolly Pine Stands](#)

How does future climate influence pine productivity?

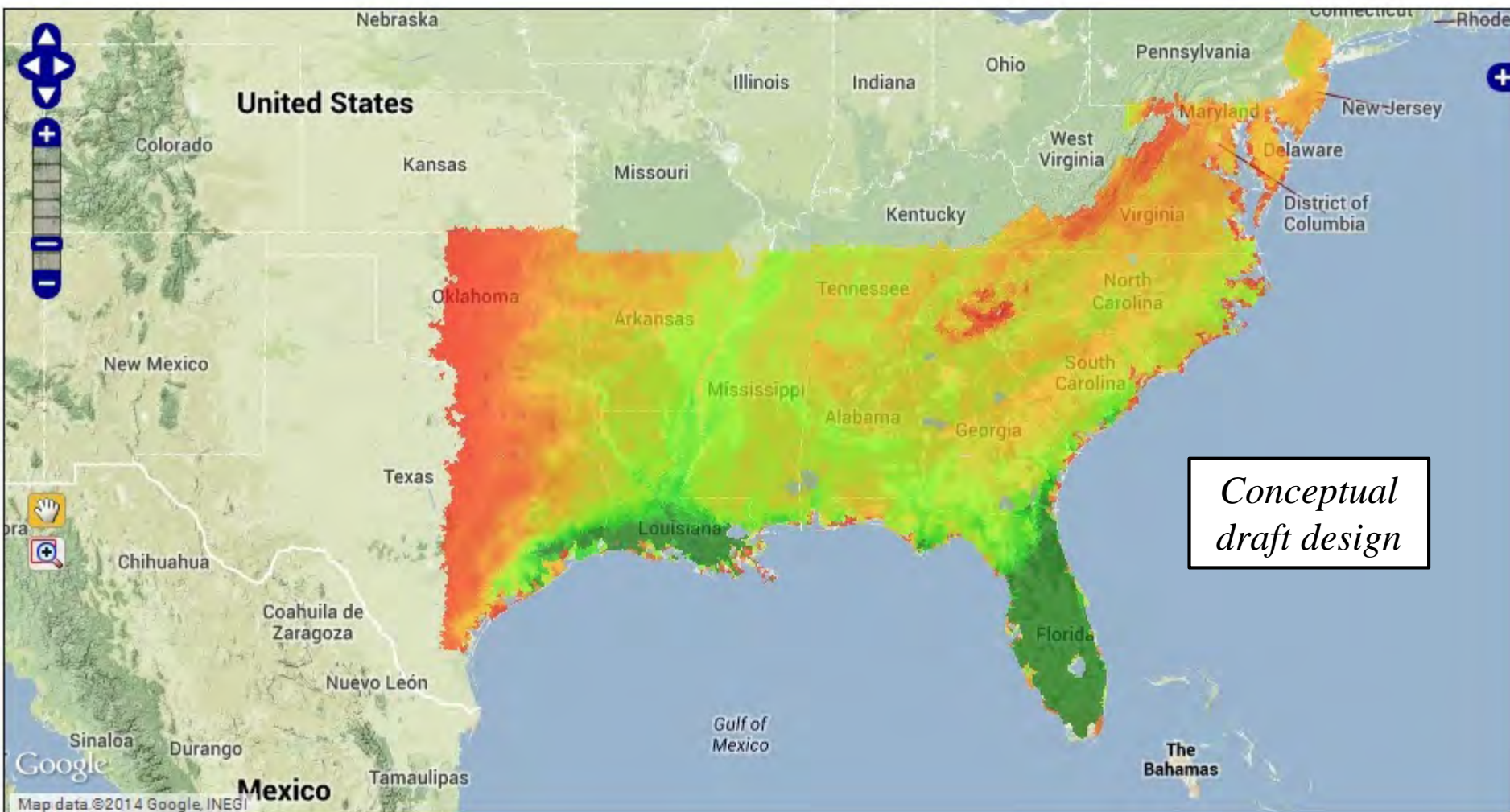
Select a tool: Growth & Yield Model: Green Weight

Year: 2014

Display

RCP scenario: Intense (8.5)

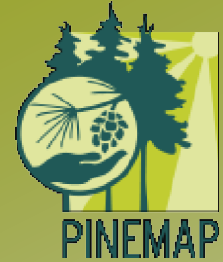
Management scenario: Baseline (control)



Other Resources

[Virginia Tech's Forest Modeling Research Cooperative](#)

For more information on this data, contact [Dr. Harold Burkhart](#) at Virginia Tech University.



PINEMAP Gridded Data: THREDDS Data Server & Climate Model Data

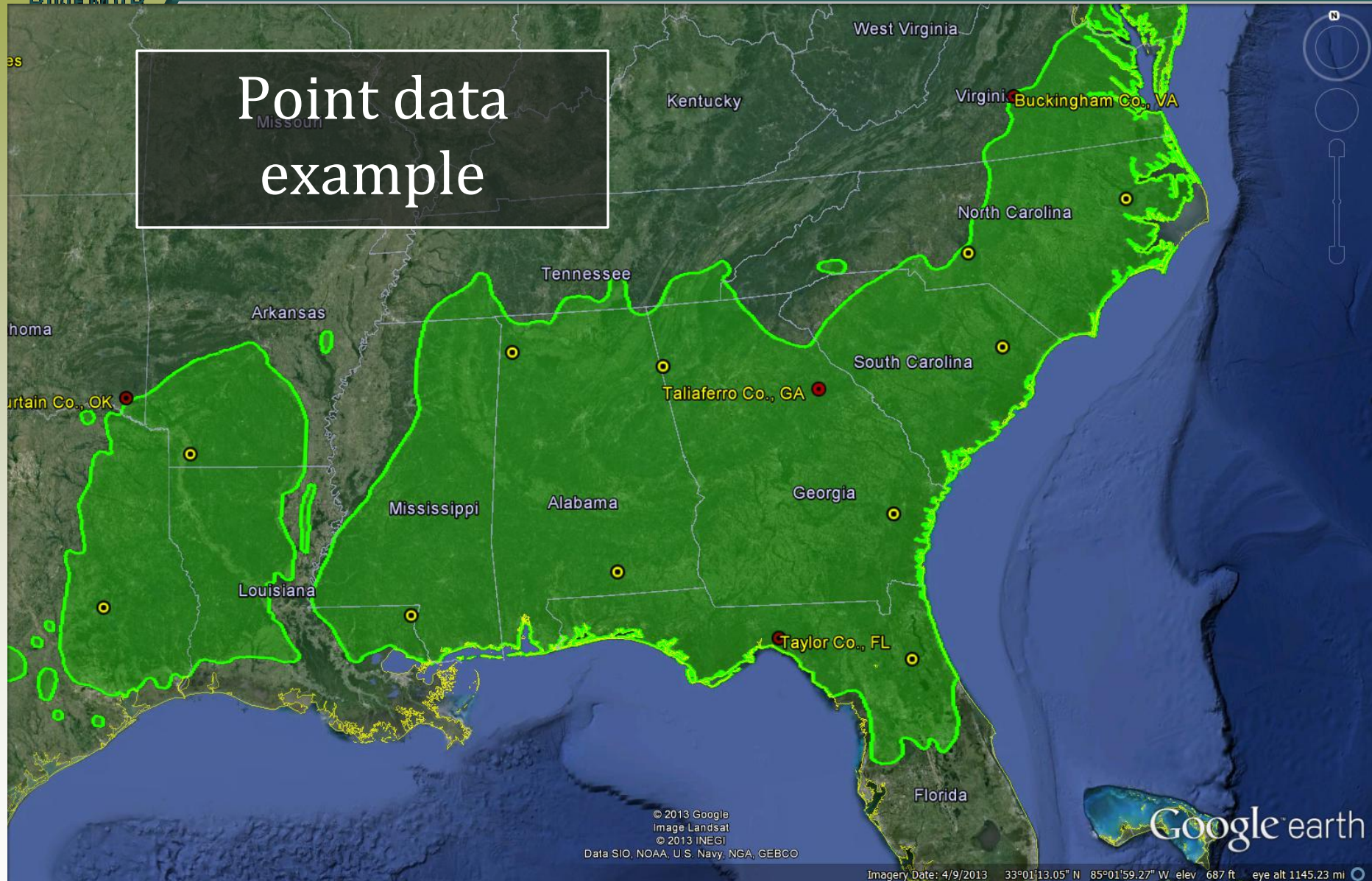
Heather Dinon Aldridge, Ryan Boyles
ATP Meeting
February 7, 2014

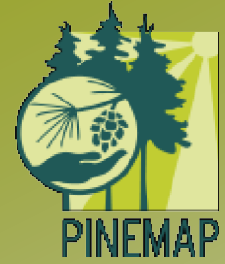
A recording of this presentation is located at:
<http://www.pinemap.org/intranet/pinemap-meetings/atp-meetings>



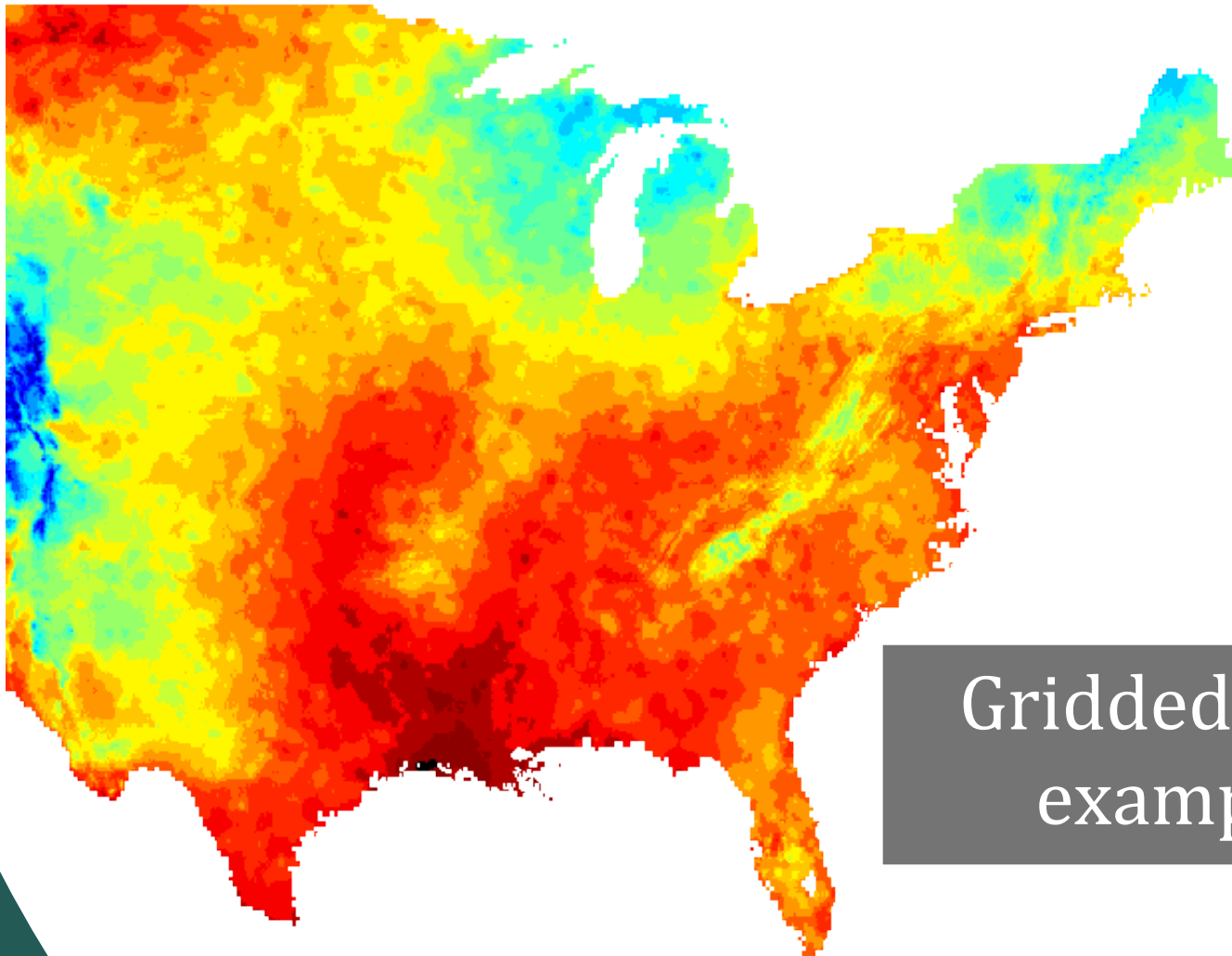
Gridded vs. Point Data

Point data
example

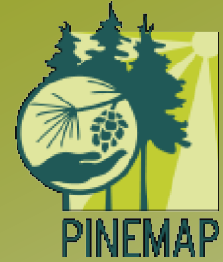




Gridded vs. Point Data

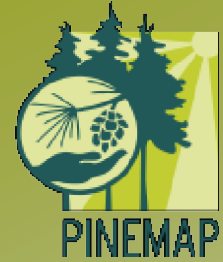


Gridded data
example



What is THREDDS Data Server?

- Provides metadata and data access for scientific datasets using remote data access protocols commonly used across the web, such as:
 - OPeNDAP
 - OGC WMS and WCS
 - HTTP
- These protocols are already supported by software you probably use

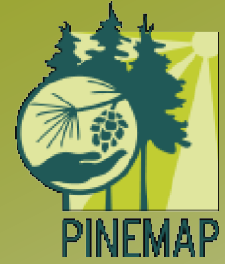


Which datasets are available?

3 PINEMAP datasets:

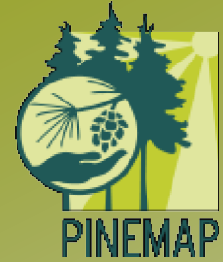
1. Historical Climate Data (U. of Idaho)
2. NARCCAP (NOAA/NCAR)
3. MACA (U. of Idaho)

- Available for full download elsewhere, why do we need THREDDS?
 - Allows for automated requests and machine to machine data manipulation of your data of interest



Ways to access the data

- Download entire PINEMAP domain at a particular time slice or multiple times
 - netCDF subset service
- Pull out time series for individual points/locations
 - New web interface



Example: netCDF subset service

- June to Aug 1986 min temperature across PINEMAP region

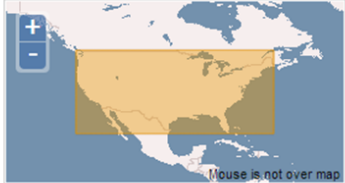
NCSS for Grids ([Grid as Point Dataset](#))

Dataset: [/thredds/ncss/grid/pinemap/idaho/tmmn_1986.nc](#) ([Gridded Dataset Description](#))
Base Time: 1986-01-01T00:00:00Z

Select Variable(s):
Variables with Time coordinate day

air_temperature = Daily Minimum Temperature

Choose Spatial Subset:



Lat/lon subset Coordinate subset
Bounding Box (decimal degrees):
north 40
west -100 -76 east
25
south
[reset to full extension](#)

Horizontal Stride: 1

Choose Time Subset:
Time range Single time
Starting: 1986-06-01T00:00:00Z
Ending: 1986-08-31T00:00:00Z
Stride: 1

Add 2D Lat/Lon to file (if needed for CF compliance)
 Add Lat/Lon variables

Choose Output Format:
Format: netcdf

Submit Reset

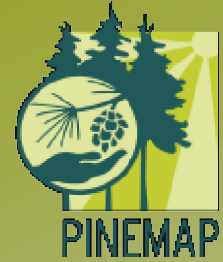
Step 2

Step 3

Step 4


Step 5

Step 6



Example: new web interface

- Precipitation from 1950-2100 for 30.206,-83.870 (FL Tier III)

 **PINEMAP**

This website allows PINEMAP researchers to download MACA downscaled climate projections at individual locations.

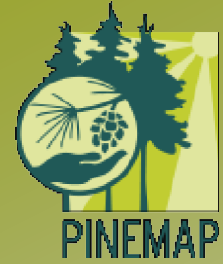
Enter your latitude and longitude values here:

Latitude: and Longitude: NOTE: Use negative values for west longitudes.

Select your parameter of interest:

Select your time period of interest:

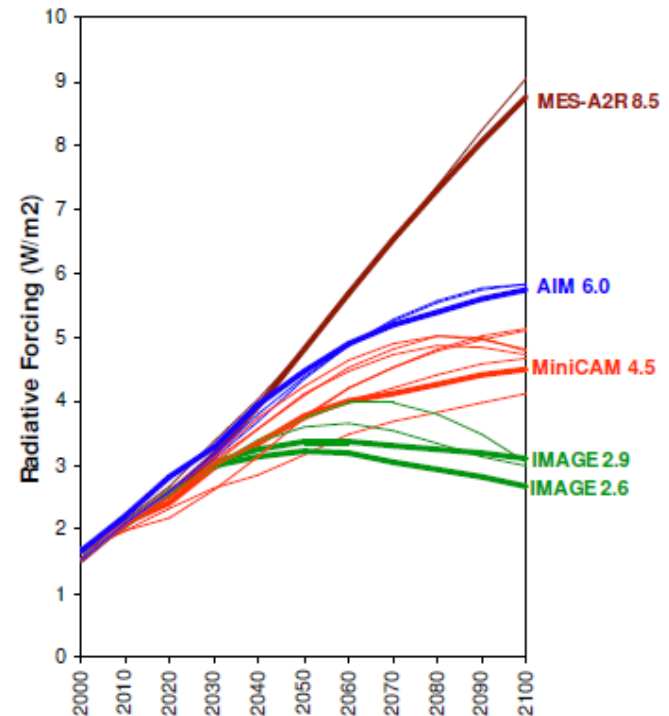
Select your model of interest:

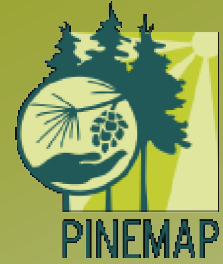


Climate Model Projections

- Climate models are *not* trying to predict the weather on any given day.
- Instead – we want to understand how weather *on average* will change given some changes in external forcing.
 - What happens if CO₂ doubles?

Climate Models are projections and dependent on the assumptions made about external forcing, such as changes in CO₂.



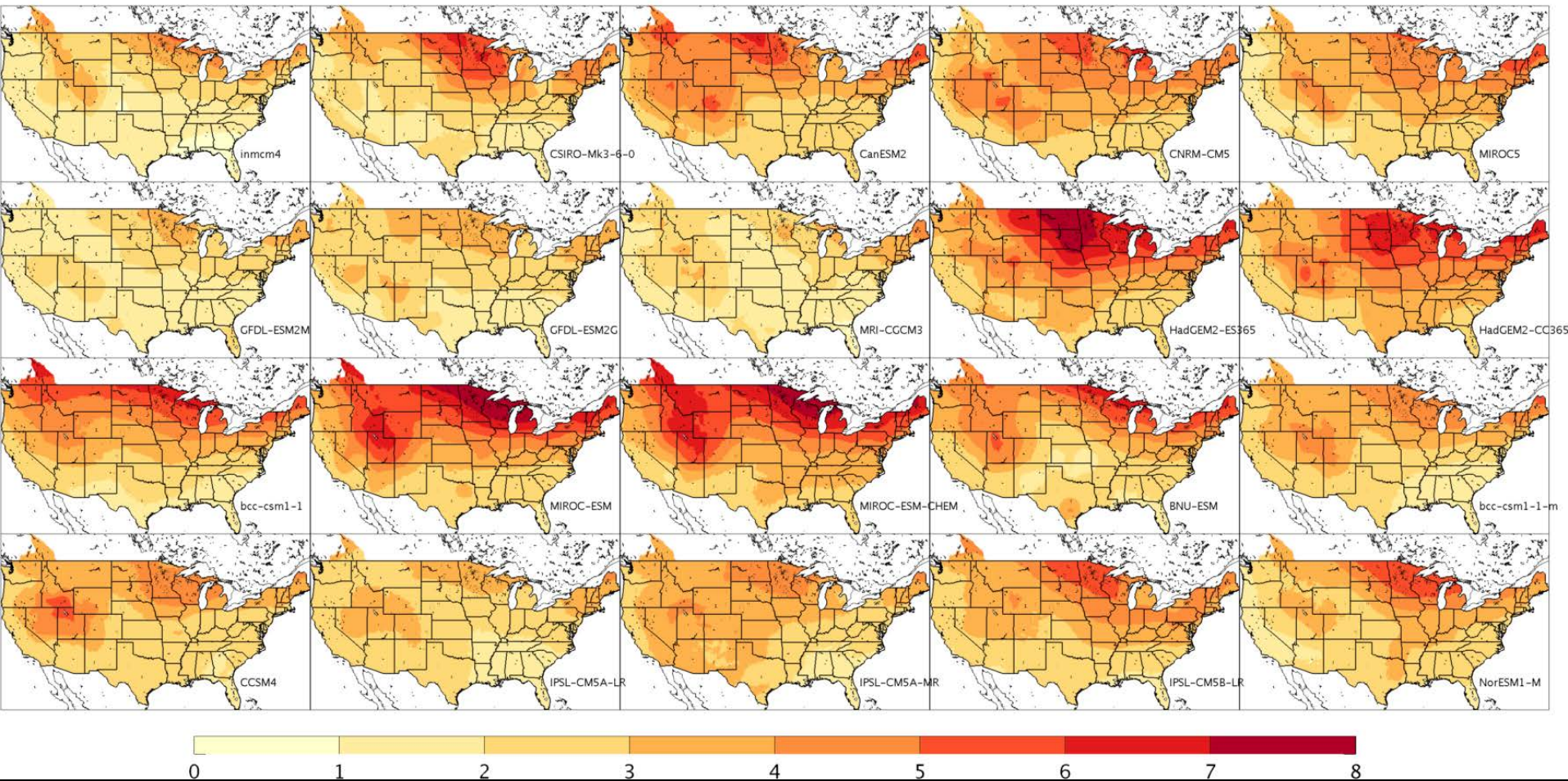


Model Ensembles

- There is no best climate model – each has strengths and weaknesses
- Multiple climate models are often used together as an ensemble
- Using ensembles provides the best estimate of the climate
 - Reduce model internal variability because GCMs can have different response with slight changes in initial conditions.
 - Multi-model ensembles reduce error statistics because no single GCM represents all physical processes best.
- For example...

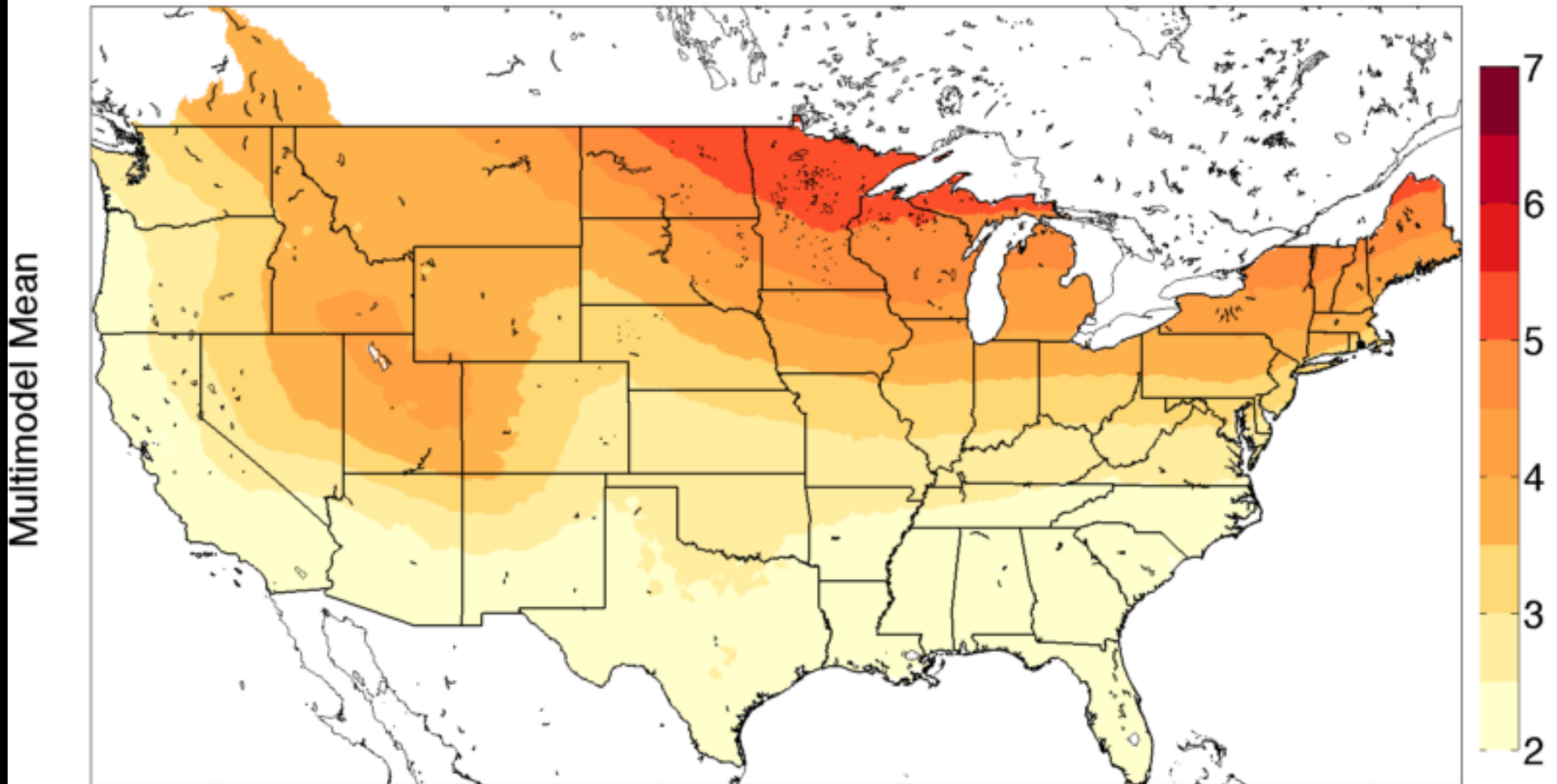
Range of model projections

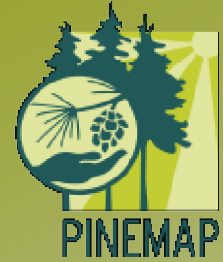
Δ Minimum Temperature Dec-Feb 2040-2069 vs. 1950-2005, RCP8.5: Units= $^{\circ}\text{C}$



Multi-model mean

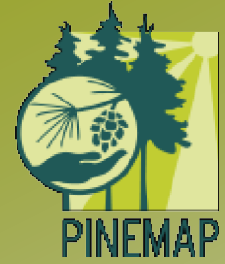
Δ Minimum Temperature Dec-Feb
2040-2069 vs. 1950-2005, RCP8.5: Units= $^{\circ}\text{C}$





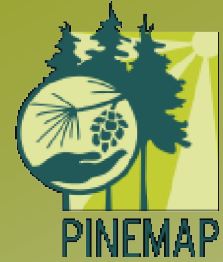
Best practices with climate models

1. Use more than one downscaled projection
 - When possible, use all available to capture full range of uncertainty
 - The ensemble mean is better than any single climate model (almost always)
 - Ensemble mean doesn't by itself capture the range of solutions, range of uncertainty



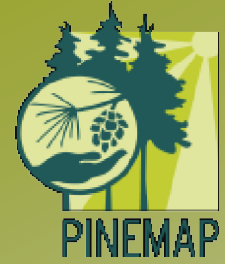
Best practices with climate models

2. The model change (Delta) is what is critical
 - Compare model history with *observations* to gauge *confidence* in model
 - Compare model projection with model historical simulation to see relative impact of change
 - DO NOT compare model projection with observations to see change



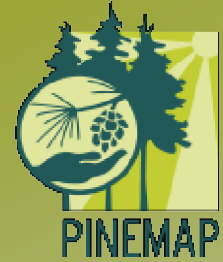
Best practices with climate models

3. Consult with your PINEMAP climatologist
 - We're here to help you with your research
 - Including design, interpretation of your simulations
 - Guidance on best data to use
 - Generate climate variables or analysis of interest
 - Early conversations are better than last second ones



Example Application with MACA

- http://nimbus.cos.uidaho.edu/MACA/images/MACA_sampleanalysis_freezefreeperiod.pdf



Ryan Boyles
ryan_boyles@ncsu.edu
919-513-2816

Heather Dinon Aldridge
hadinon@ncsu.edu
919-513-0244

<http://www.nc-climate.ncsu.edu>
<http://www.pinemap.org/extension/gridded-data/>