A NEW SPATIALLY-DENSE TREE-RING NETWORK: WHAT CAN IT TELL US?

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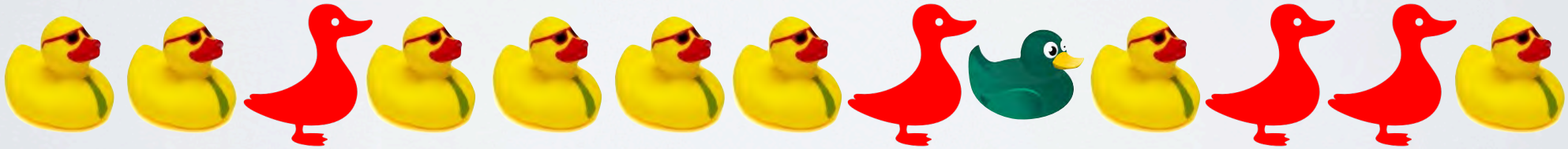
Utah State University

Utah Climate Center

EOF ~ Principal Component



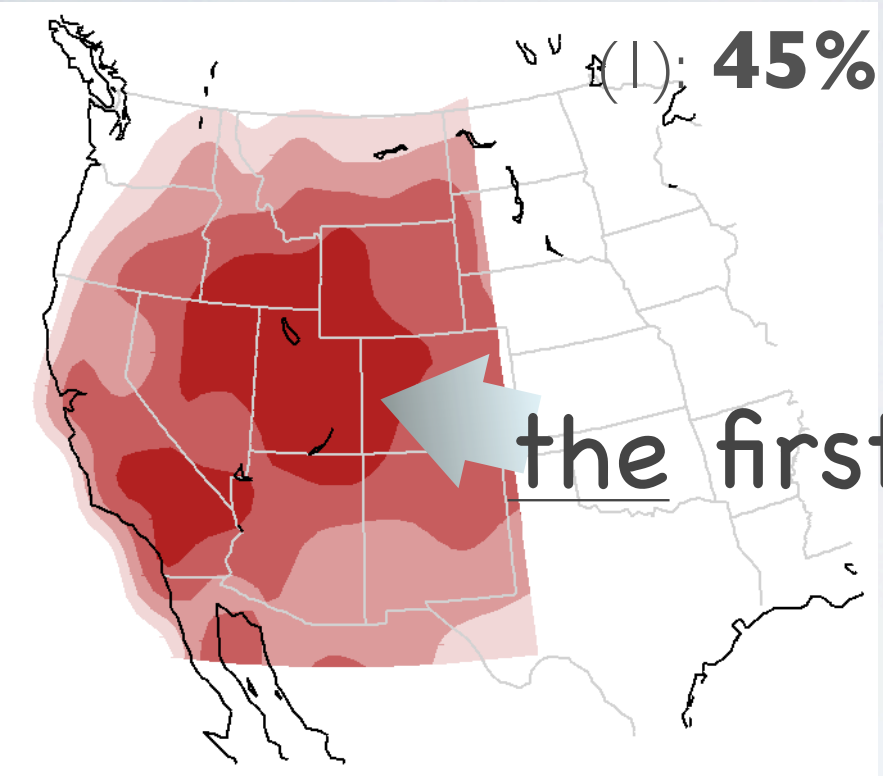
EOF ~ Principal Component

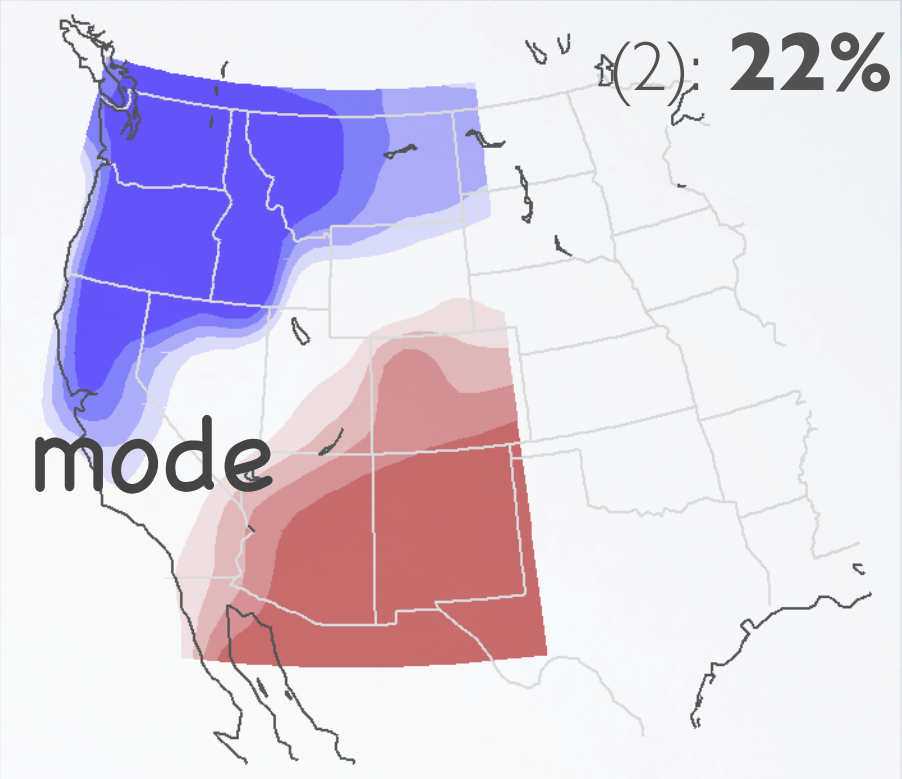
First leading mode
(60%)

Second leading mode
(30%)

(10%)

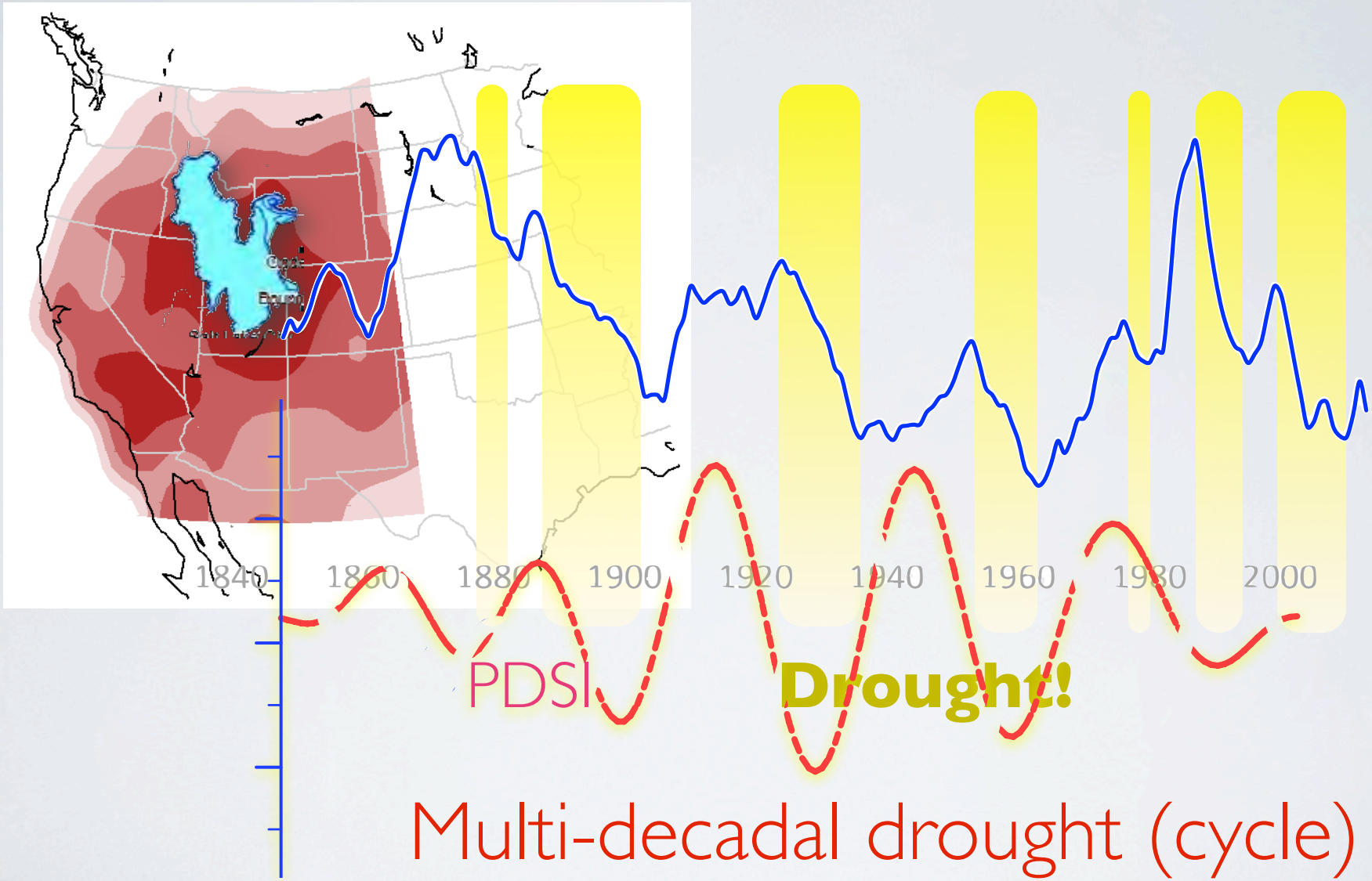
Predominant drought patterns: 1700-2005





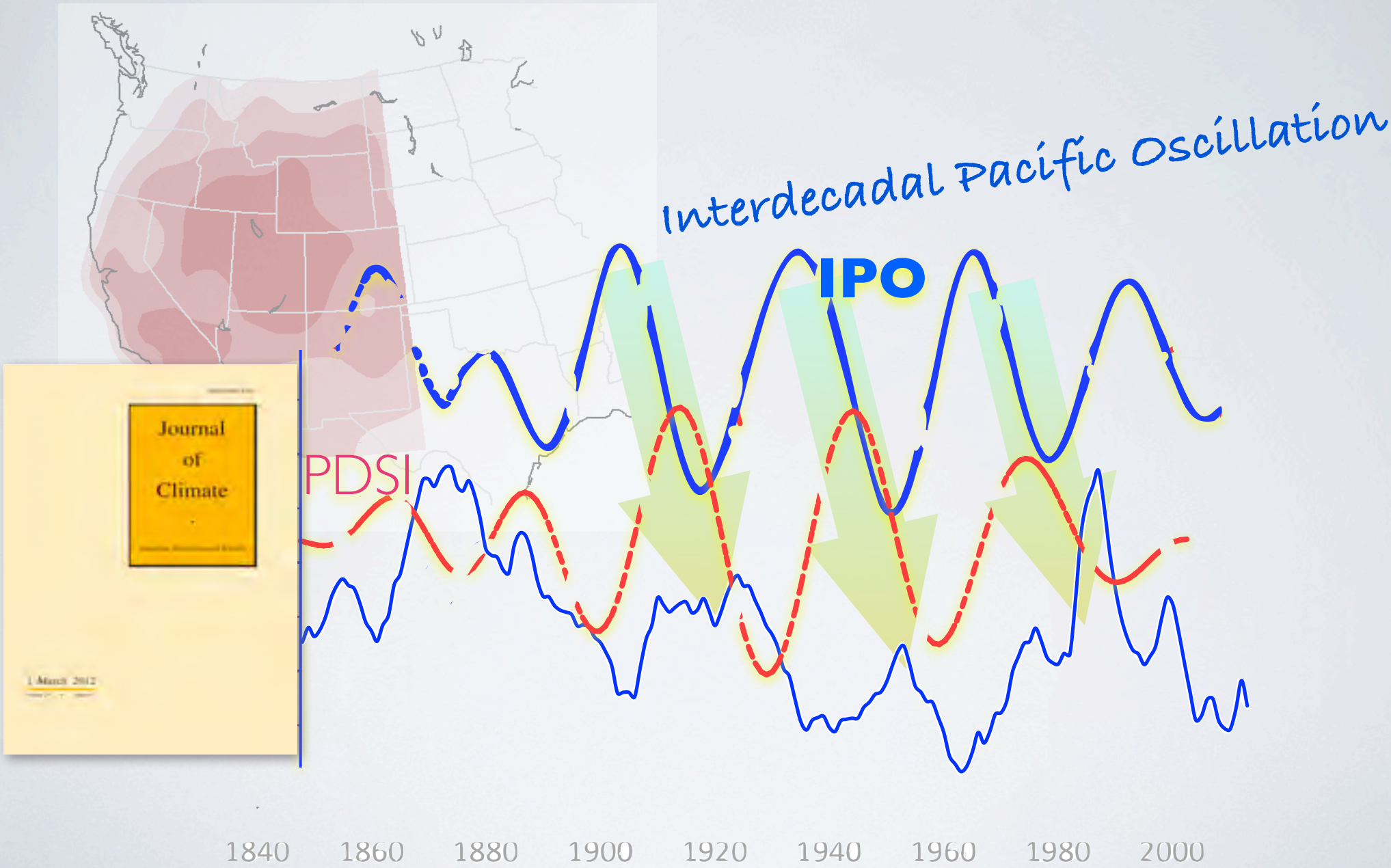
the first mode

EOF ~ Principal Component

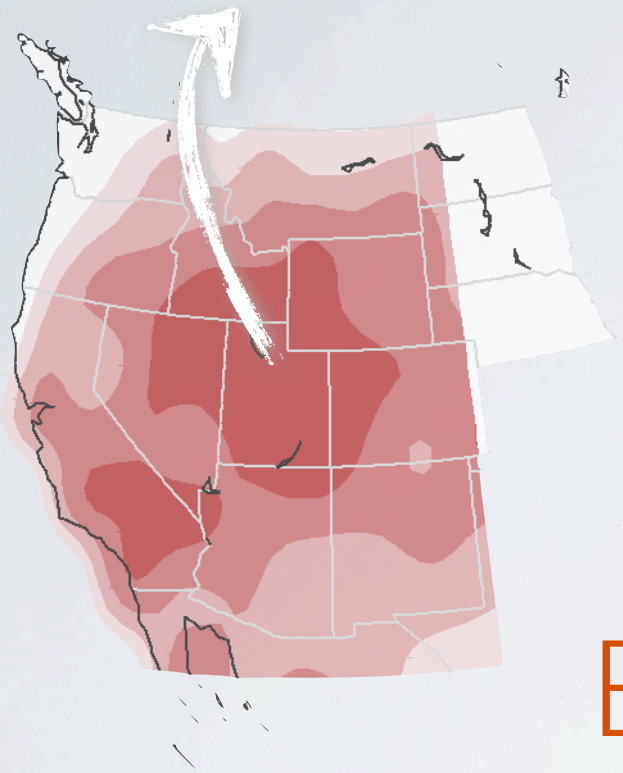


Multi-decadal drought (cycle)

Multi-decade drought cycle: similar dynamics

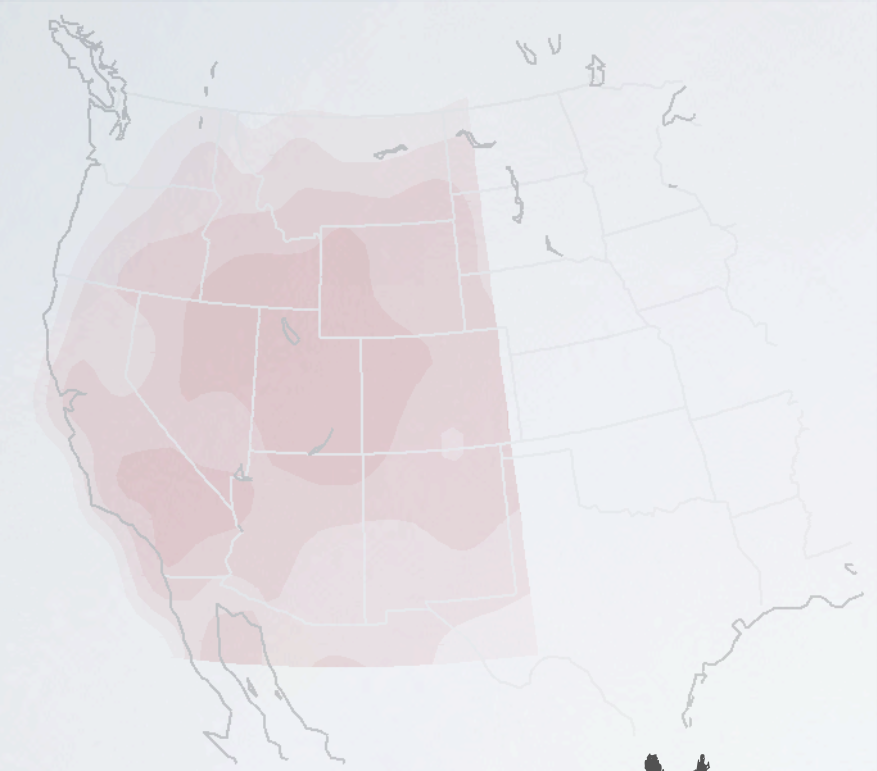


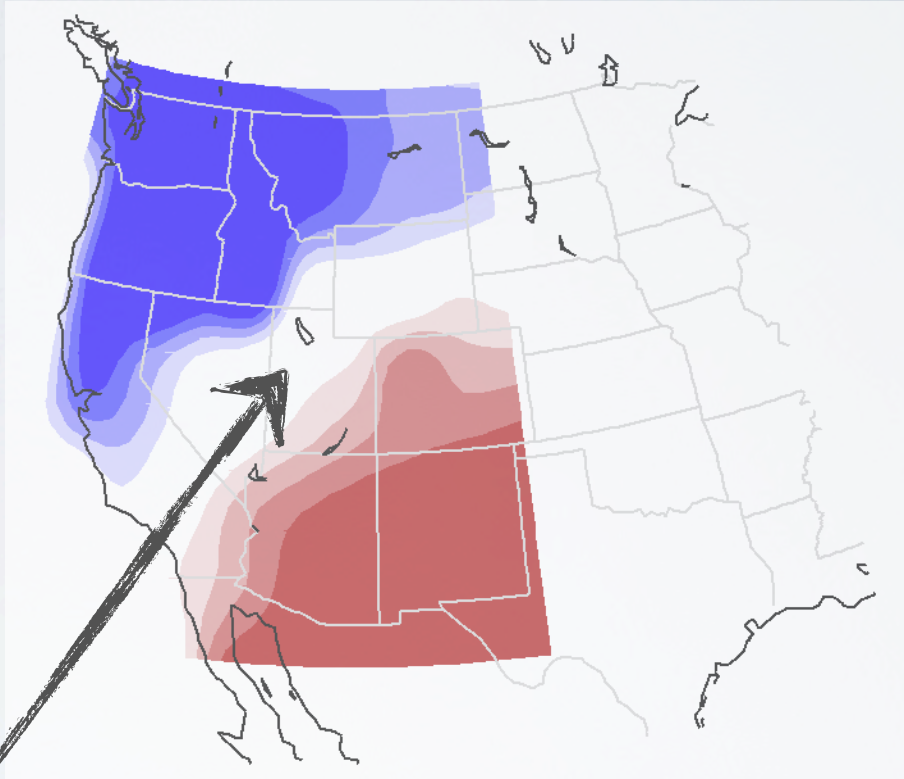
It's our OWN climate regime!



But few people know...

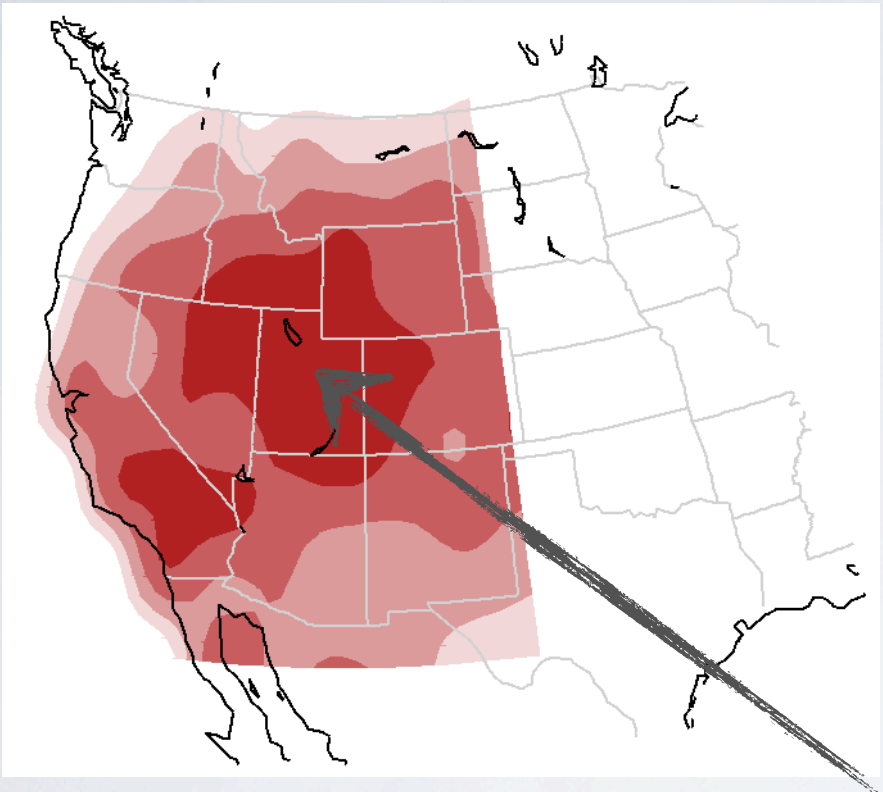
Hence the climate challenge:



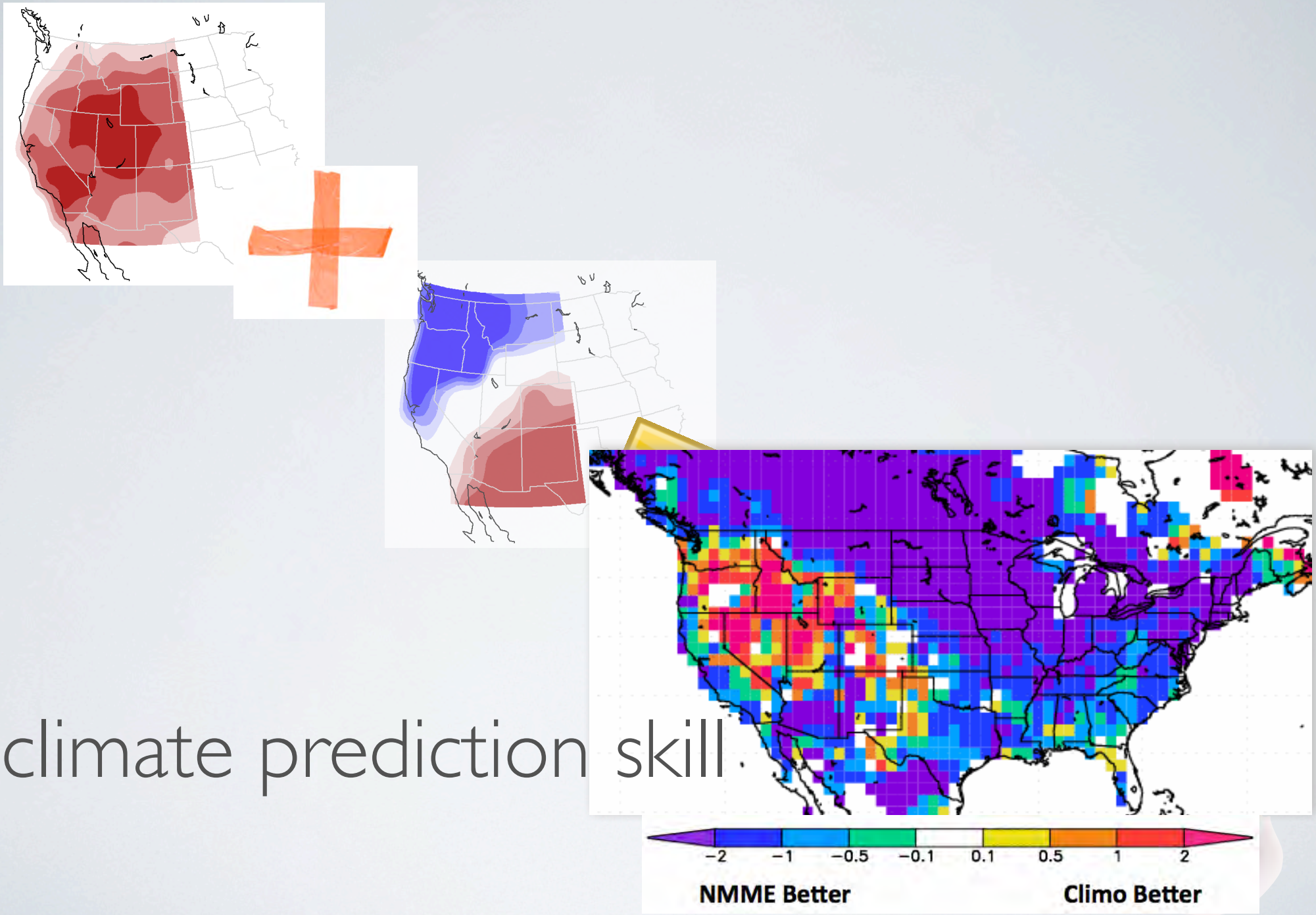


No man's land (EC)

Hence the climate challenge:

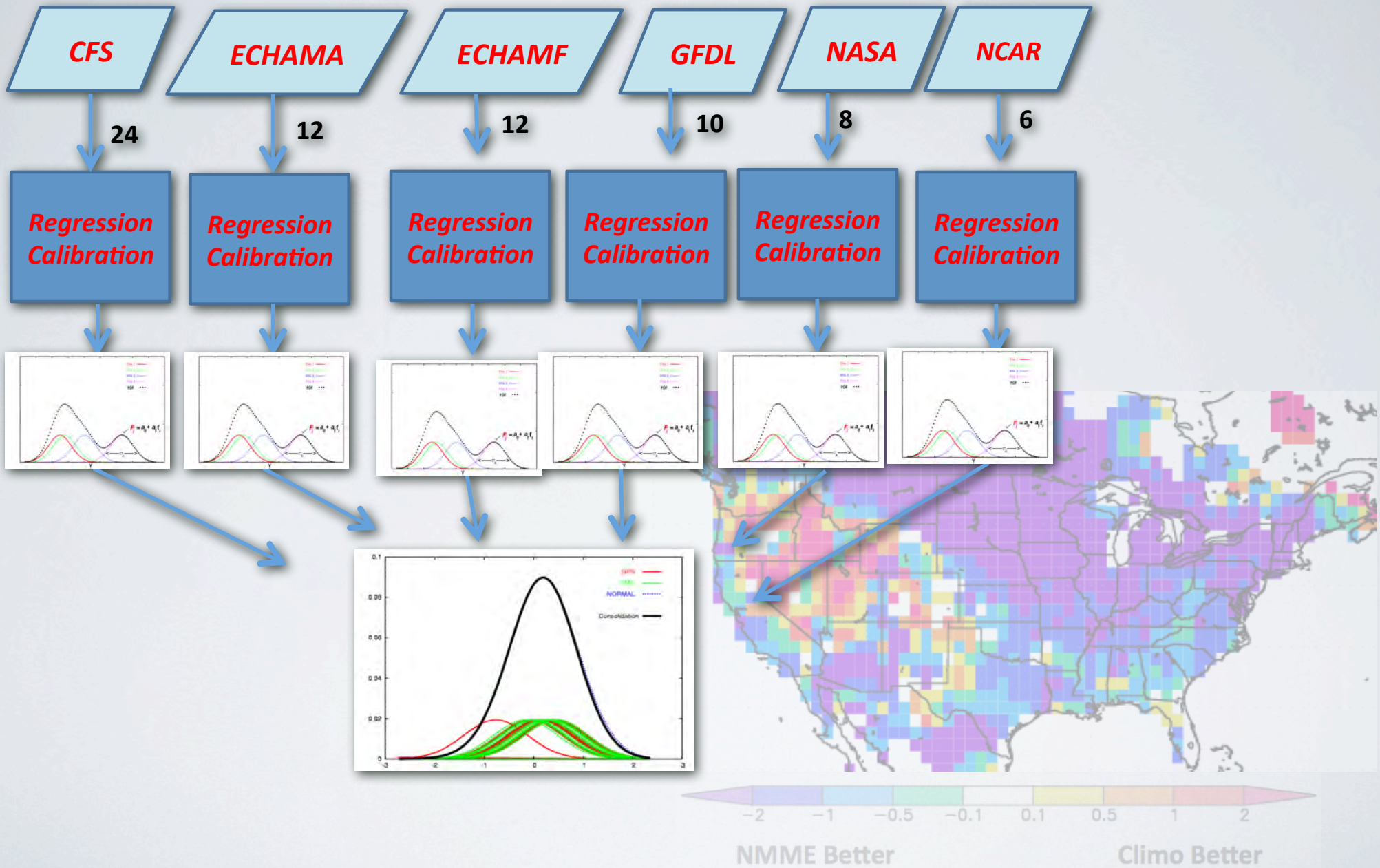


No one knows why!



climate prediction skill

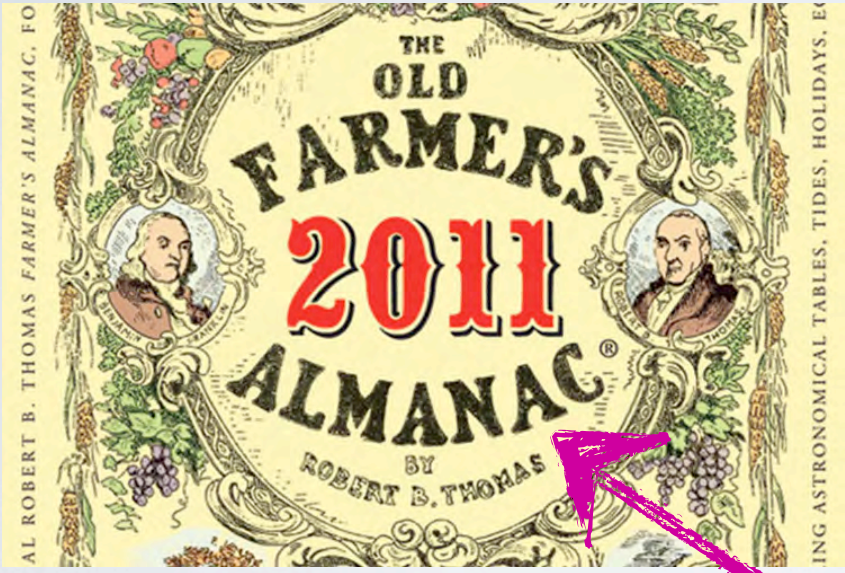
National Multi-Model Ensemble (or, A-team models)

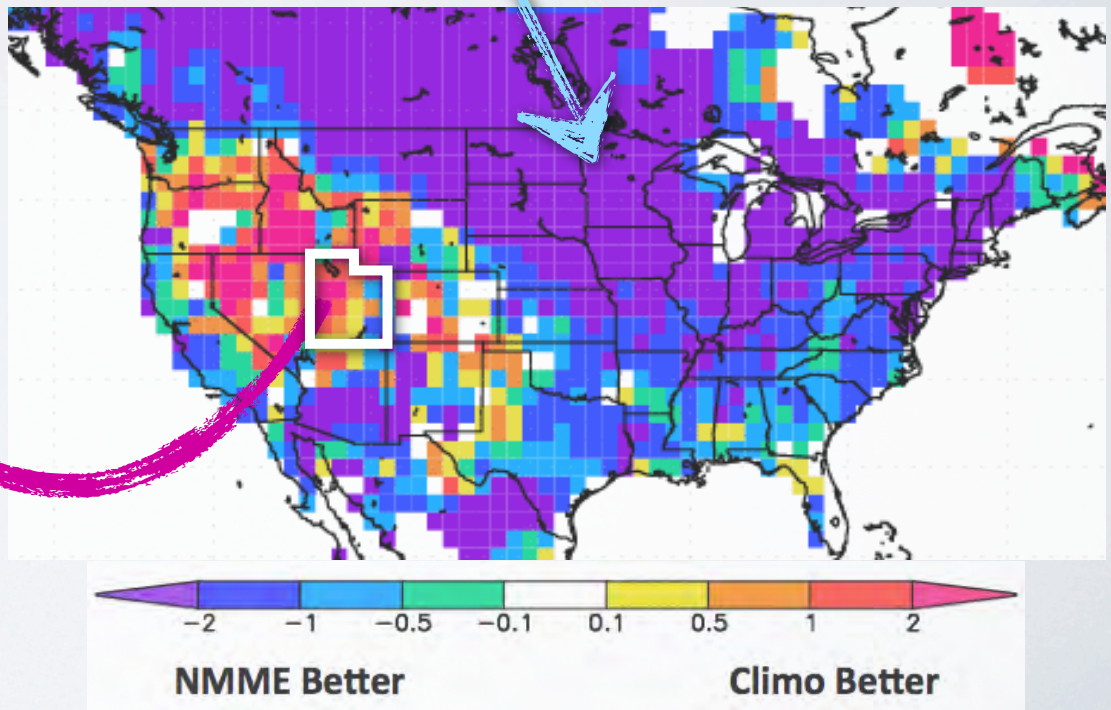


National Multi-Model Ensemble (or, A-team models)

CFS | ECHAMA | ECHAMF | GFDL | NASA | NCAR

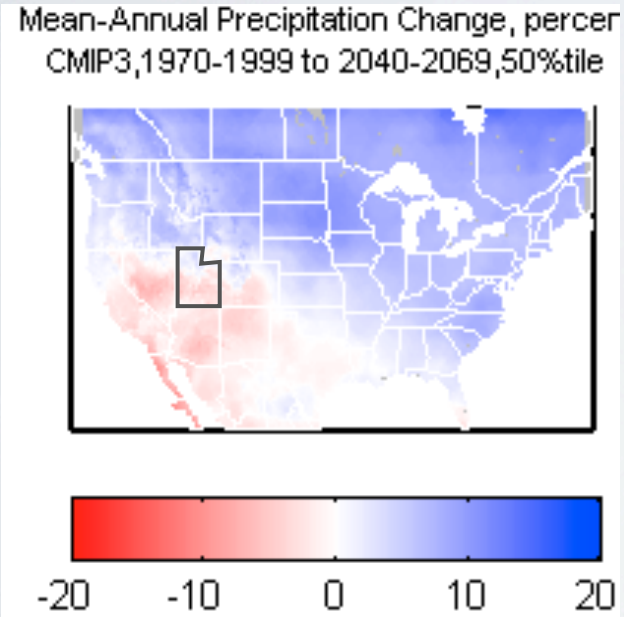
vs.



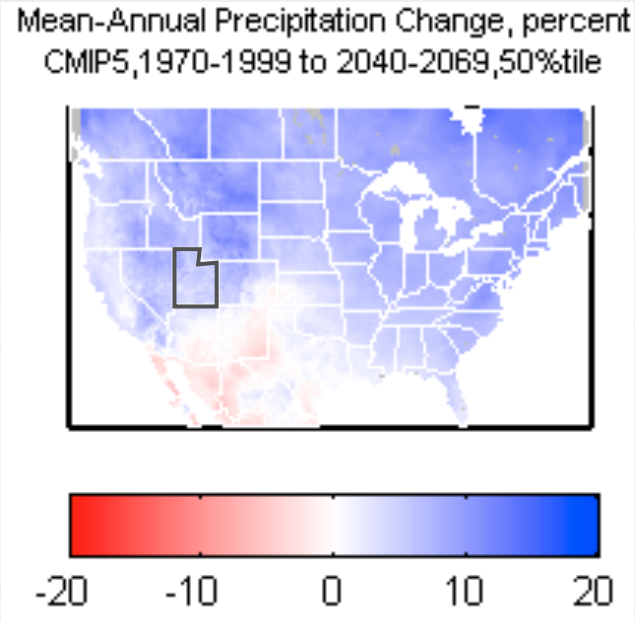


Future?

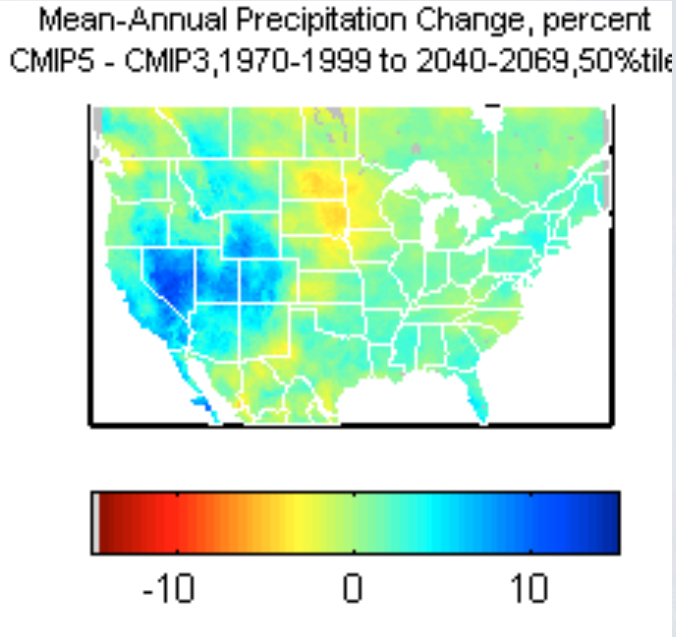
CMIP3
(older models)



CMIP5
(newer models)

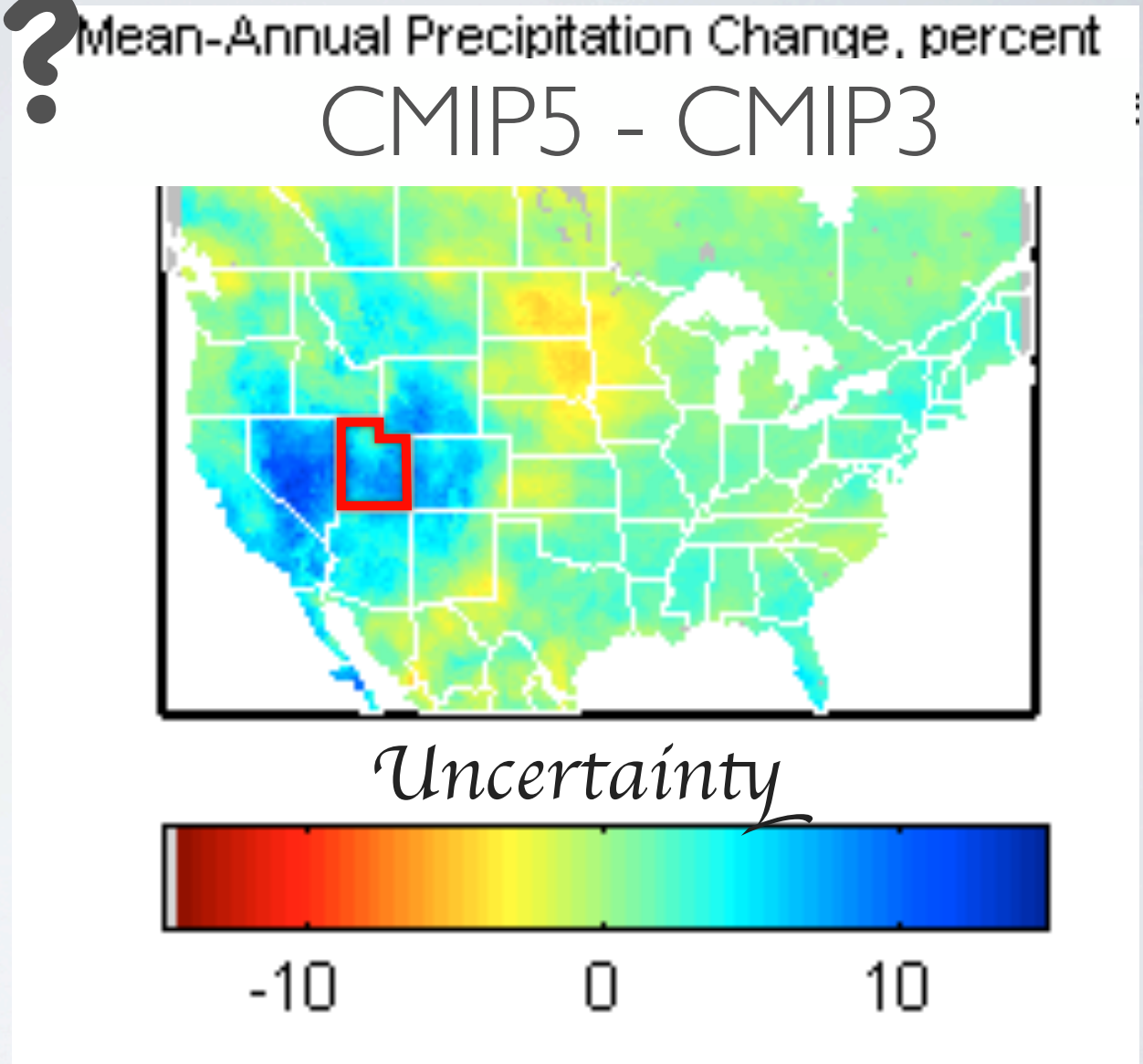


CMIP5 - CMIP3



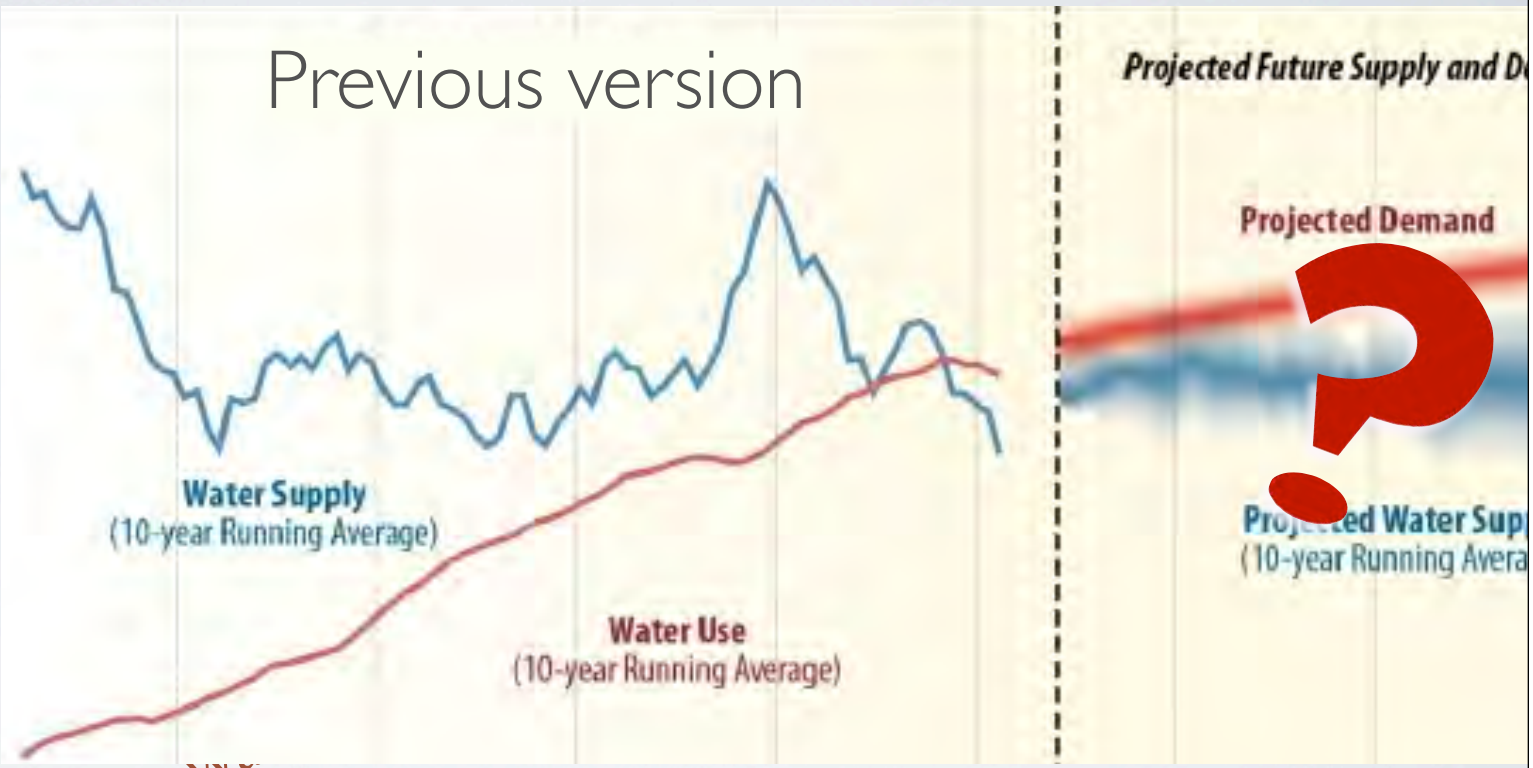
Levi Brekke (BoR; 2013)

Future?


Mean-Annual Precipitation Change, percent
CMIP5 - CMIP3
Uncertainty
-10
0
10

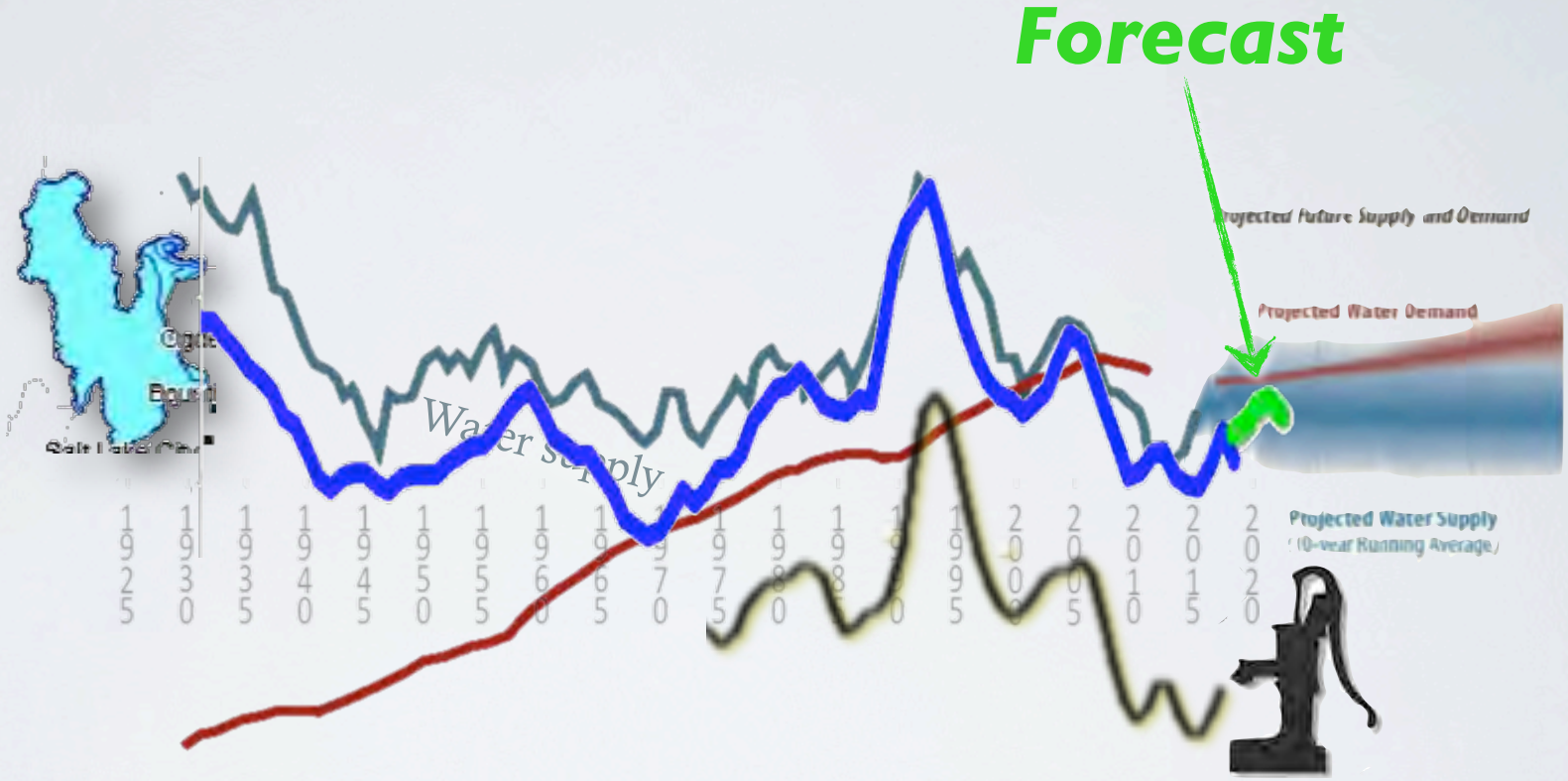
Water supply

colorado river:



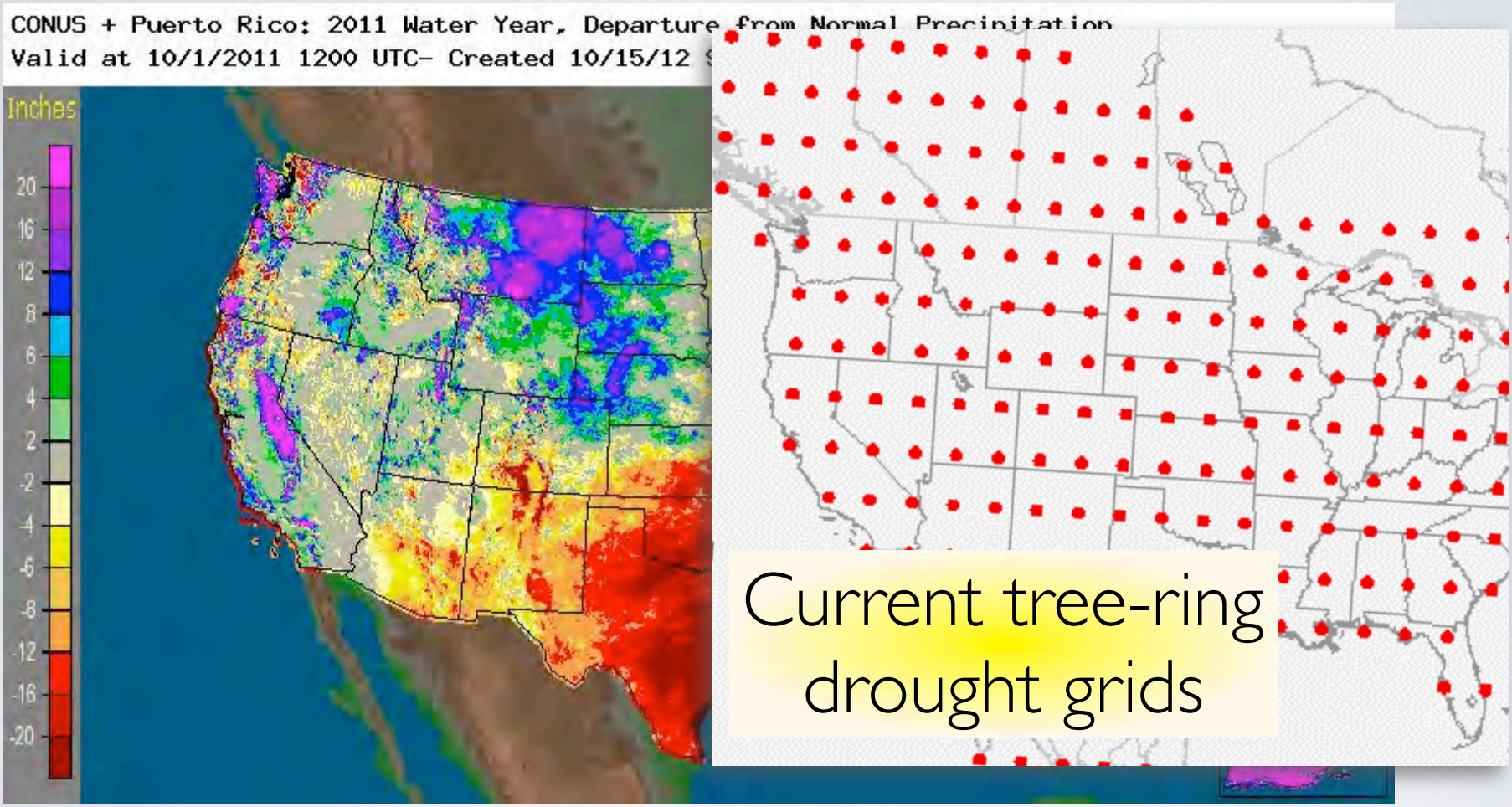
Water supply

colorado river:



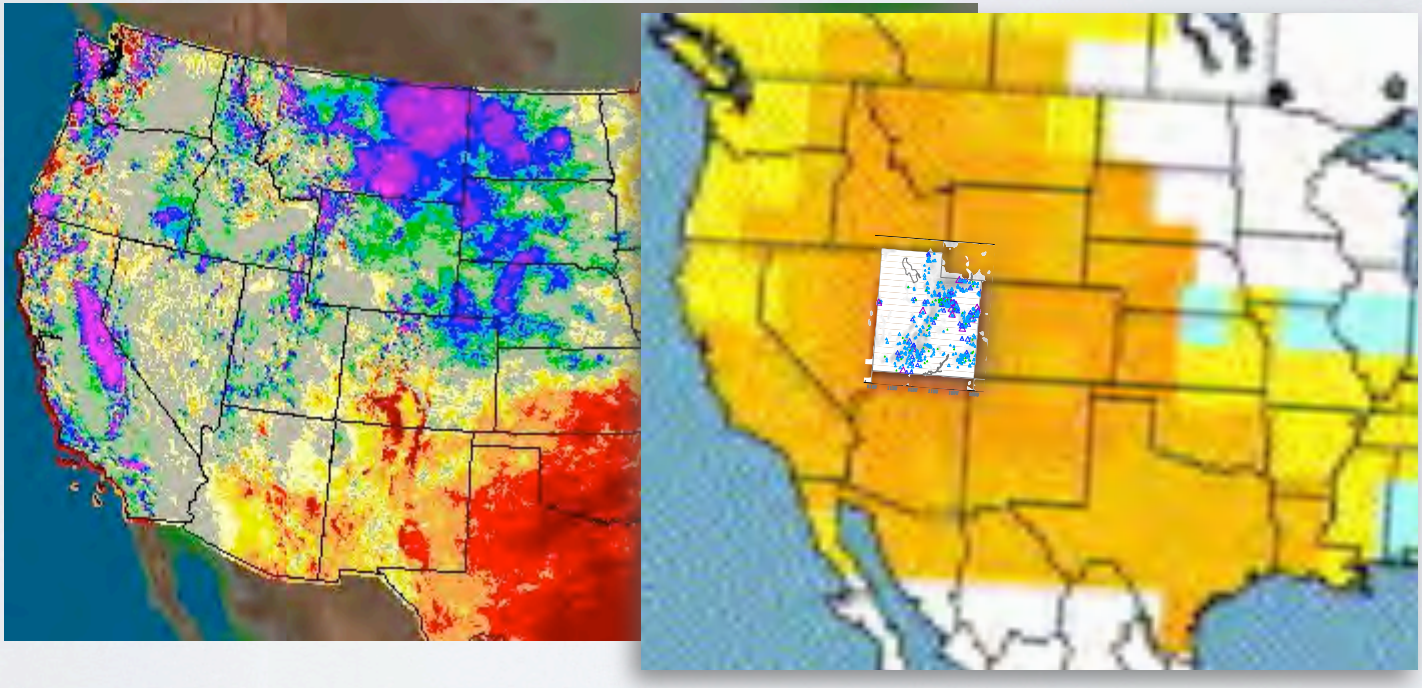
N.Utah groundwater
(400 wells)

Solution: *more research, better data*



Can we get finer details?

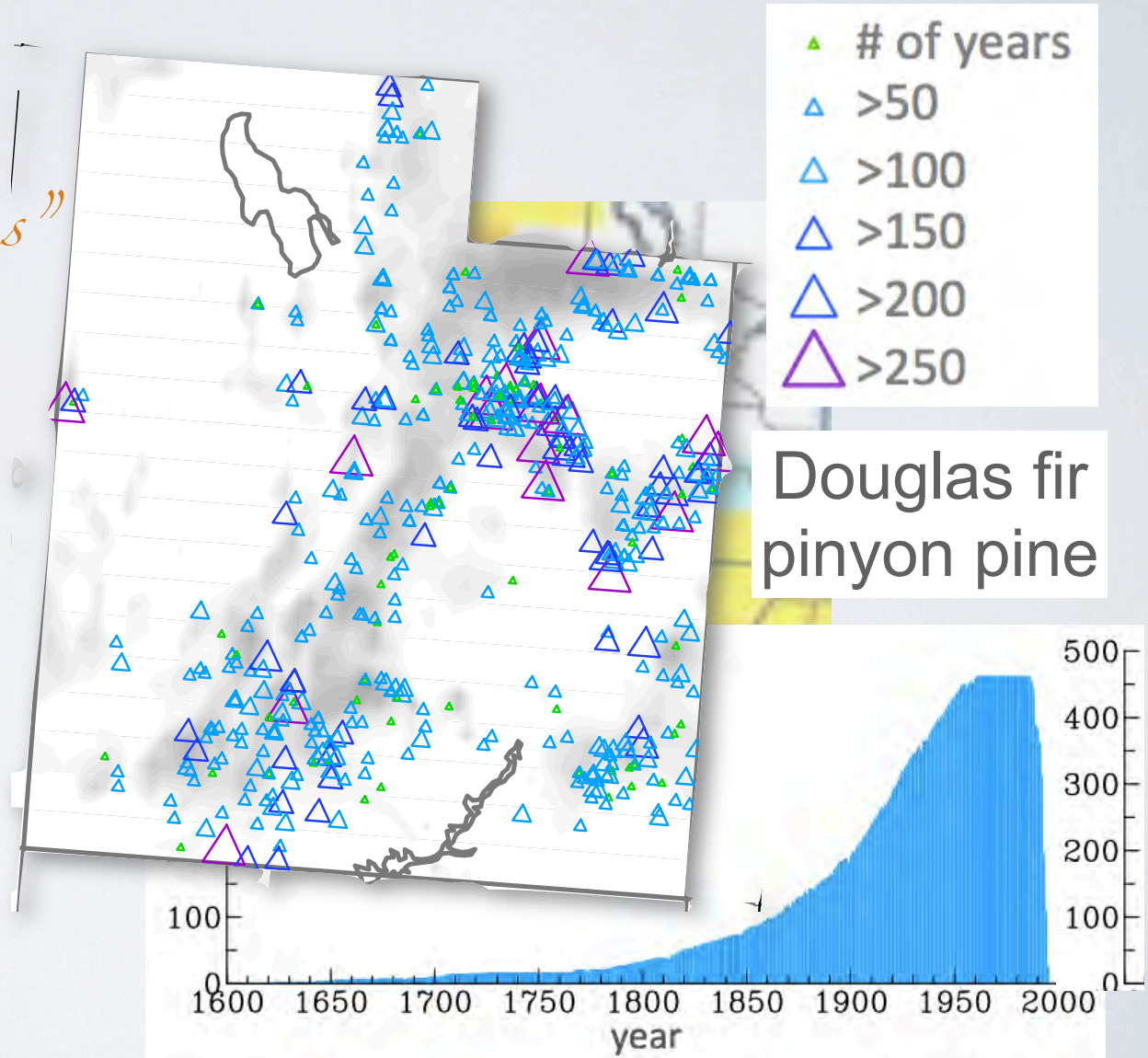
Have tried that!

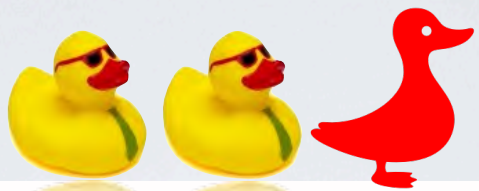


FIA: Forest Inventory Analysis (USFS)

"Nation's Forest Census"

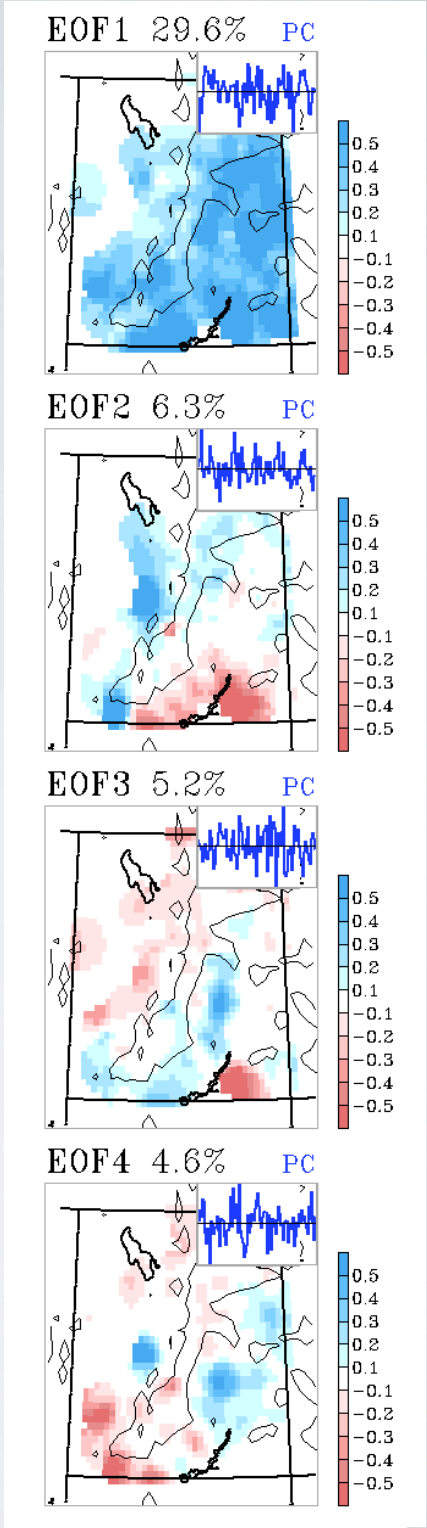
http://www.fia.fs.fed.us/



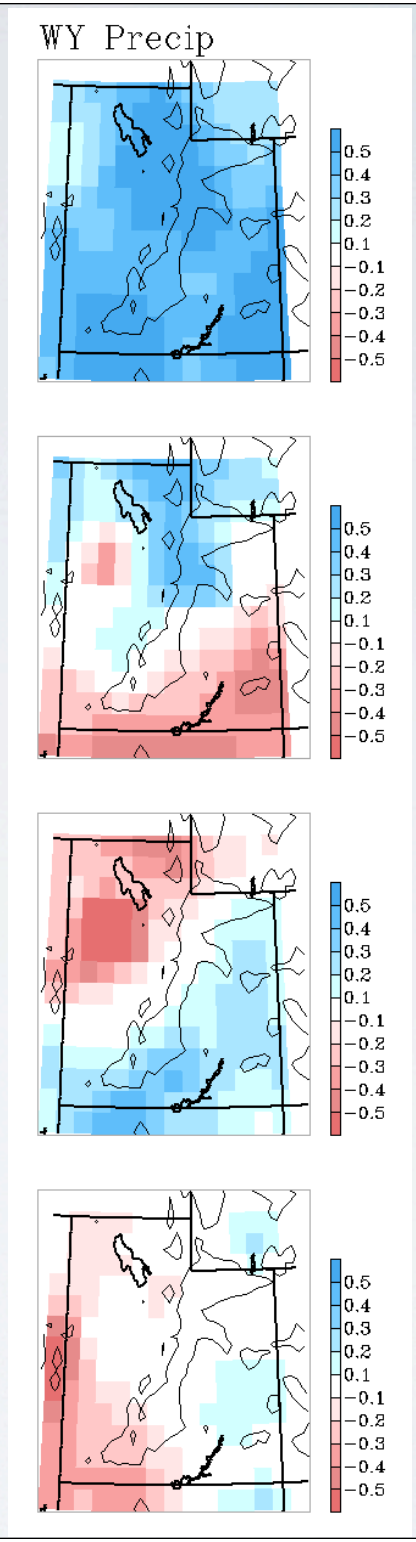


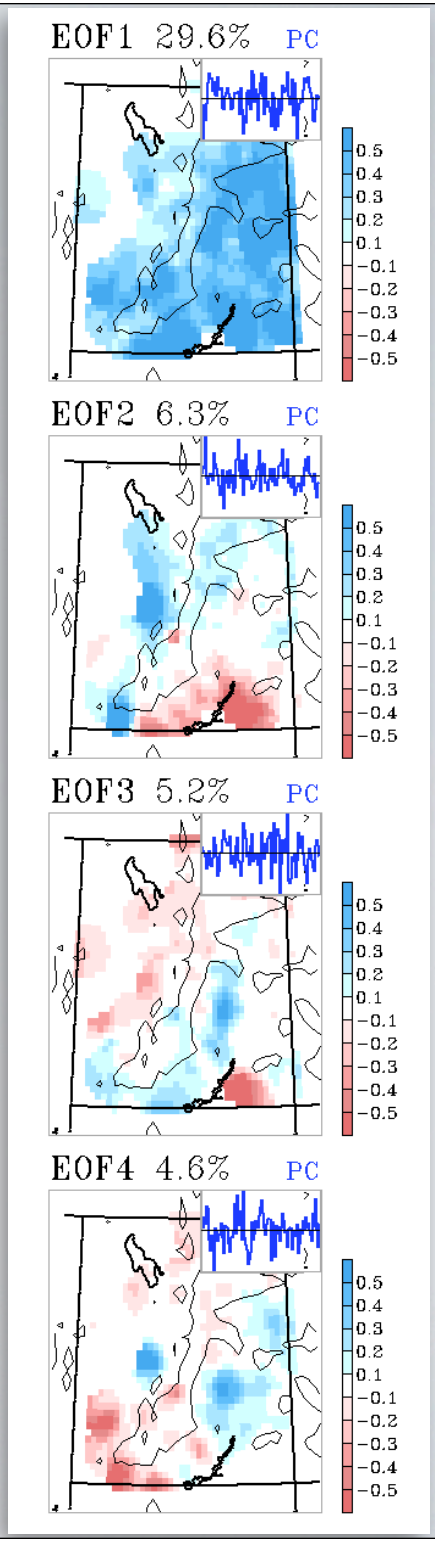
Important climate patterns:

Now these are <u>1/8-deg resolution</u>!

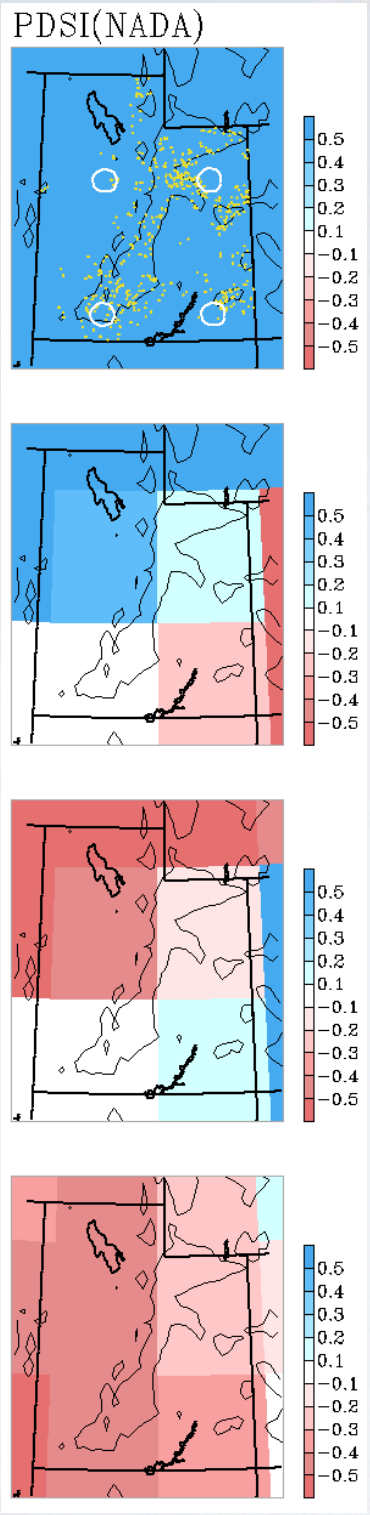


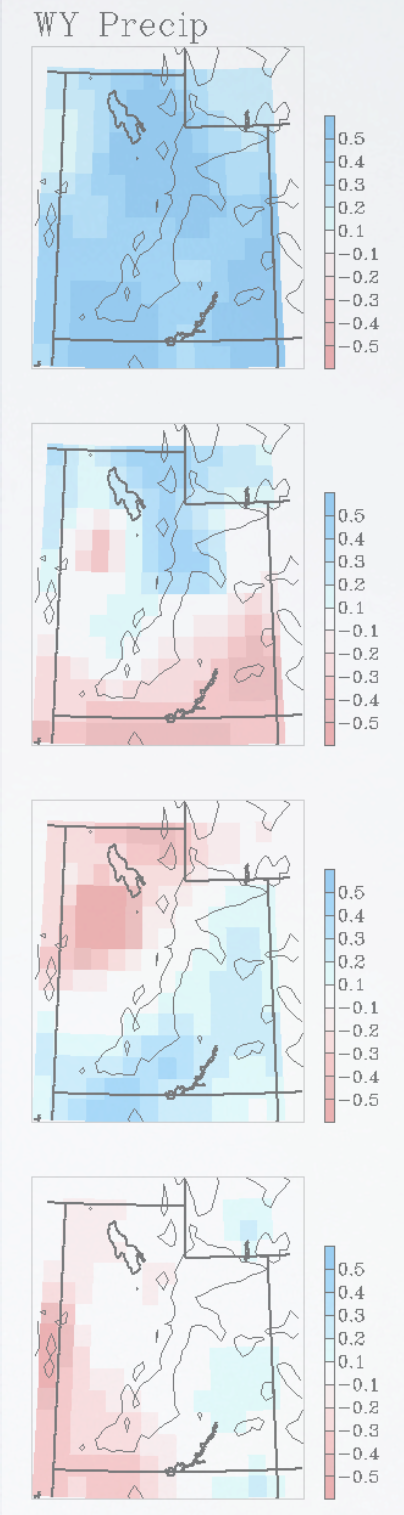
Comparing gridded precipitation:

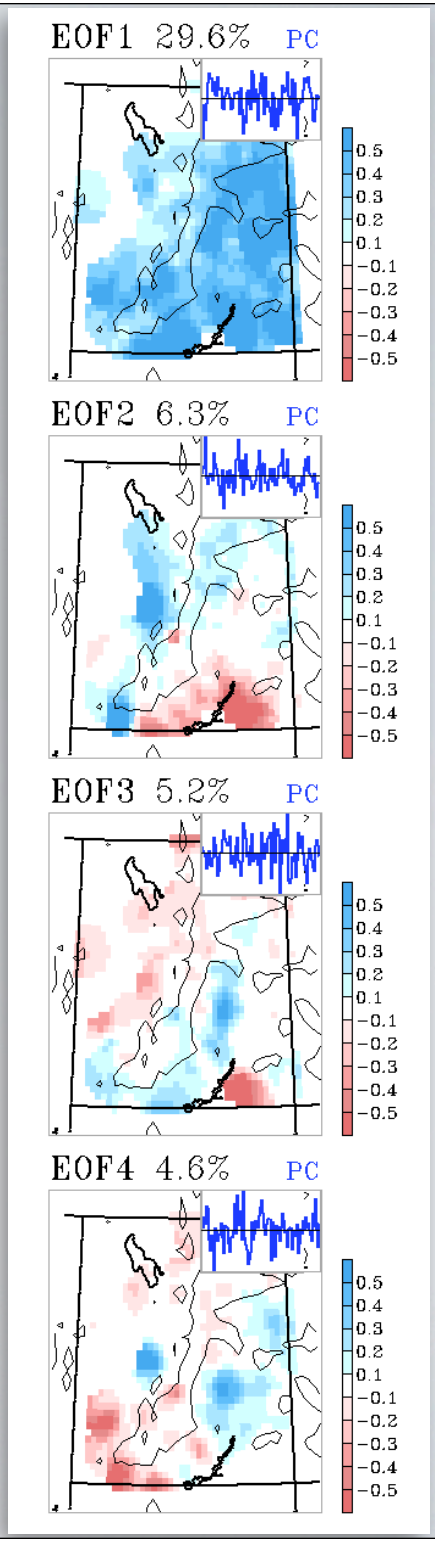




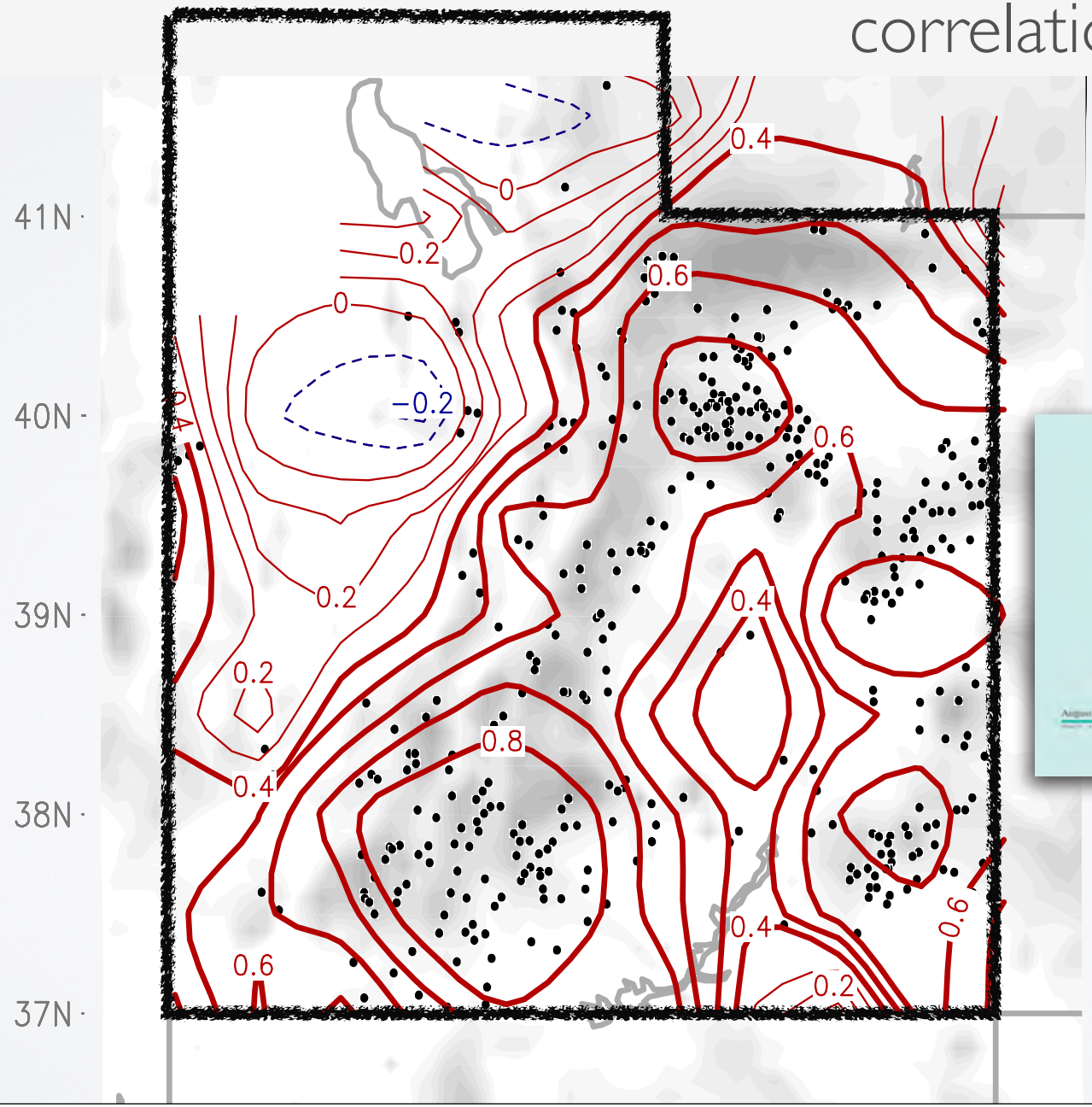
Comparing existing PDSI:



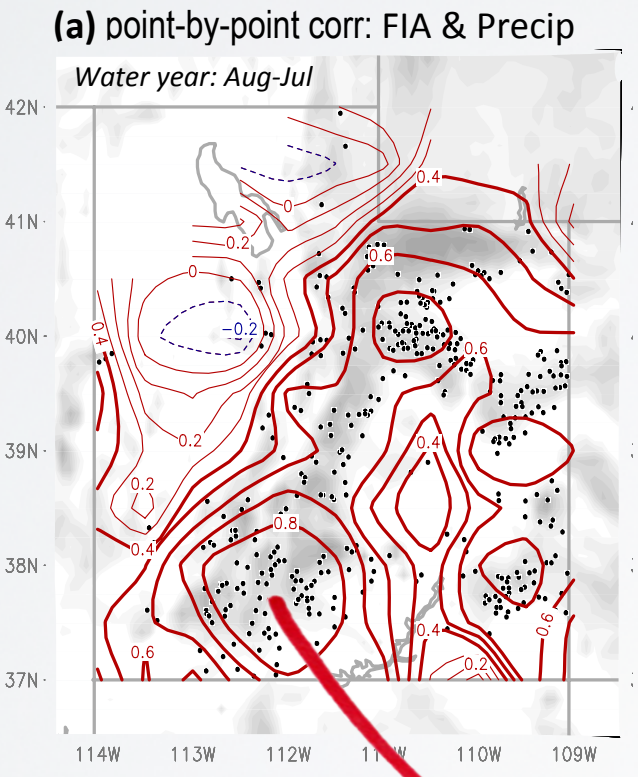




FIA tree rings vs. water-year precipitation : point-to-point correlation

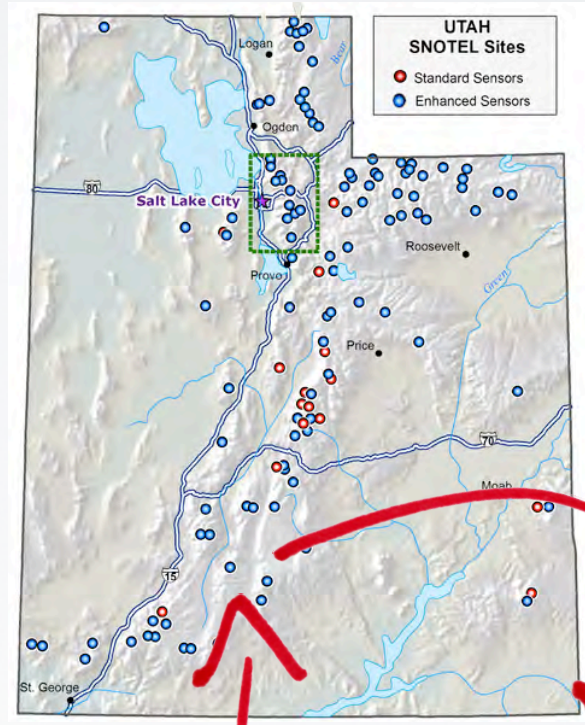


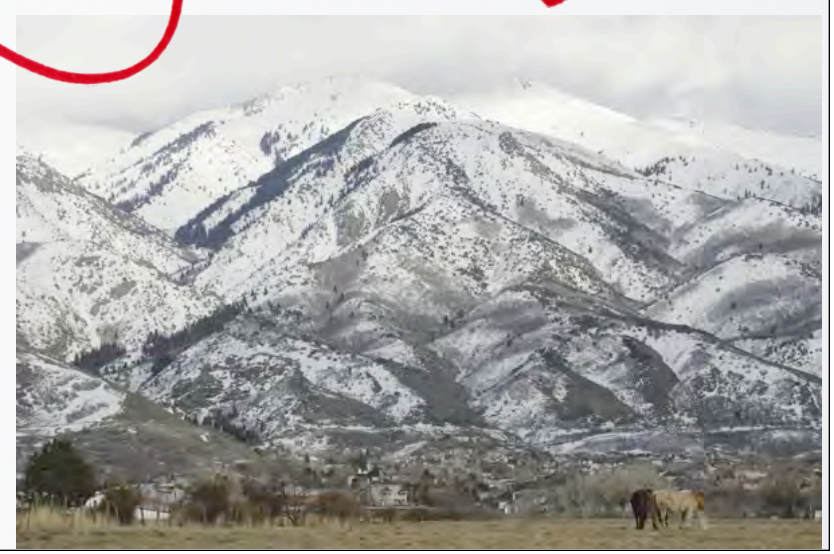
Next task...



r > 0.8

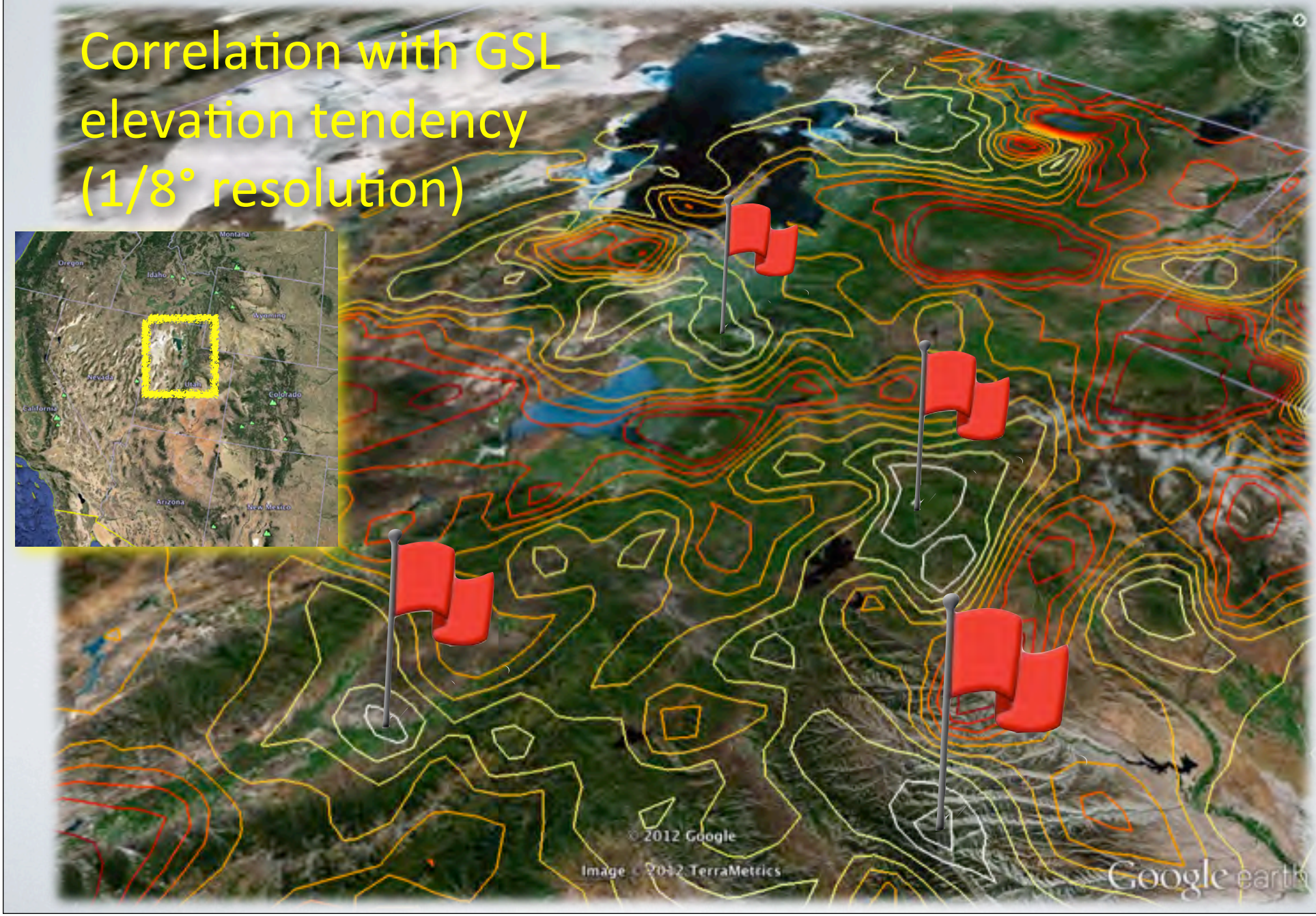
wow!

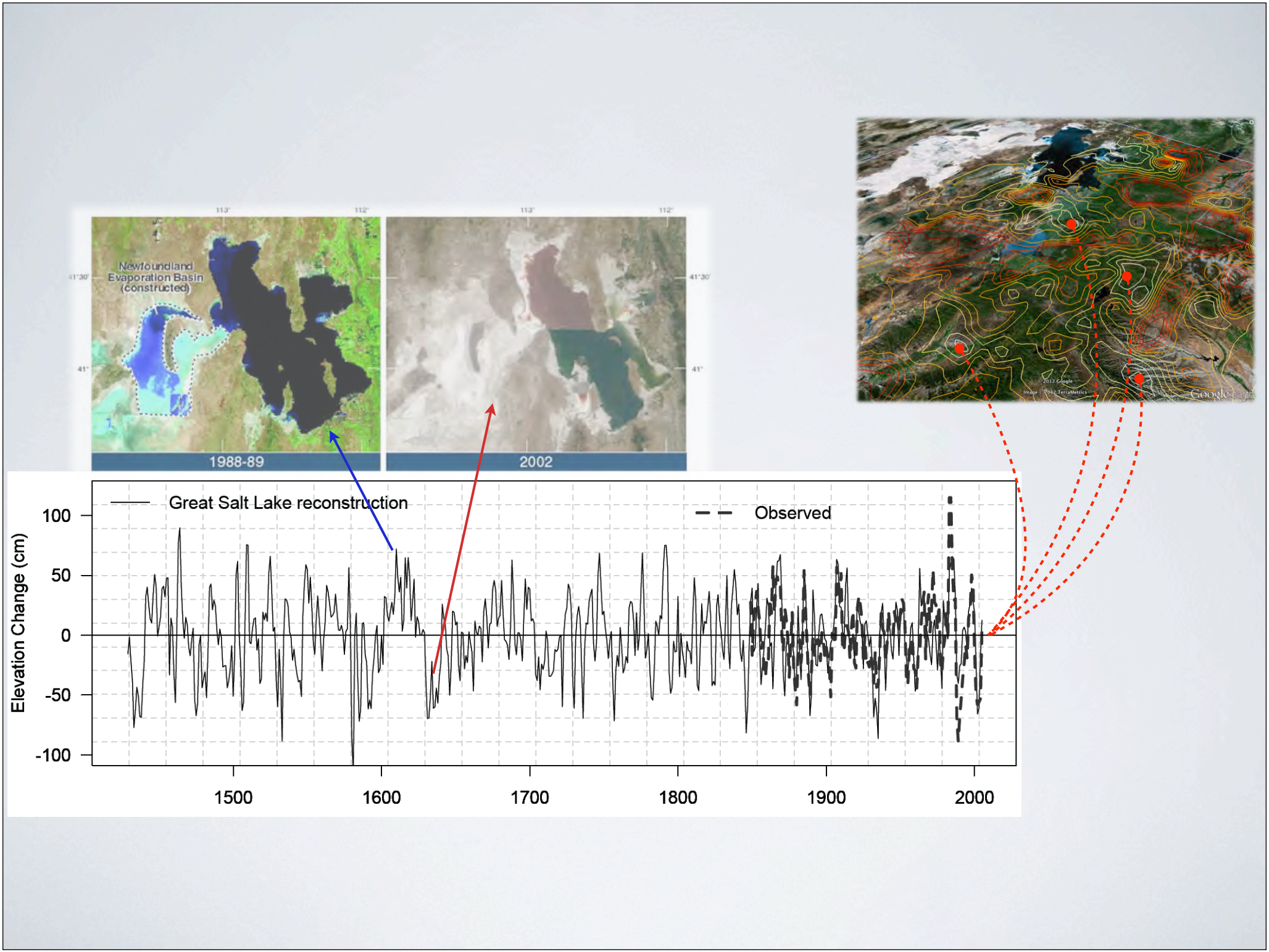




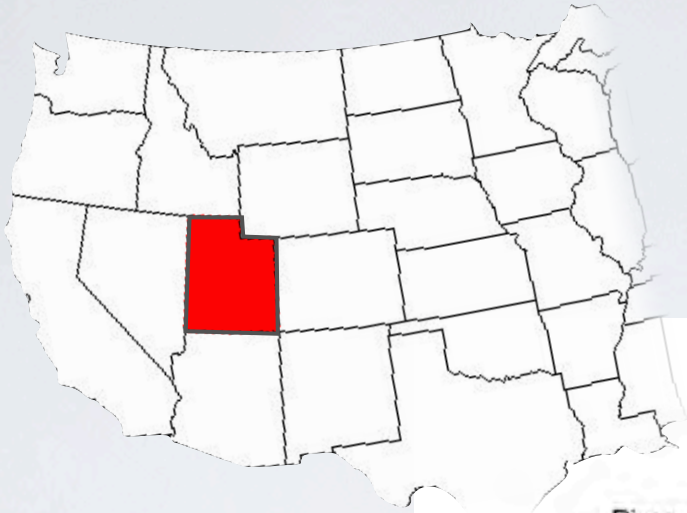
reconstruct snowpack

Other fun things to do: Great Salt Lake

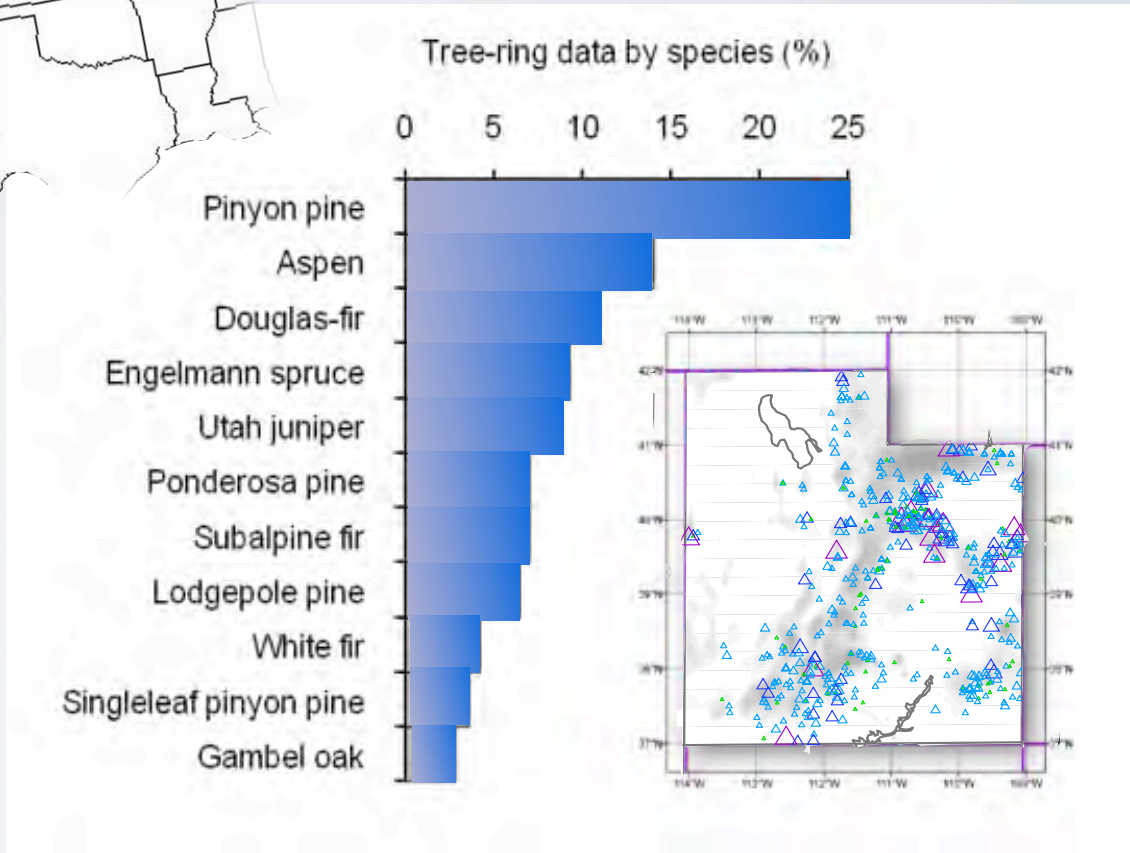


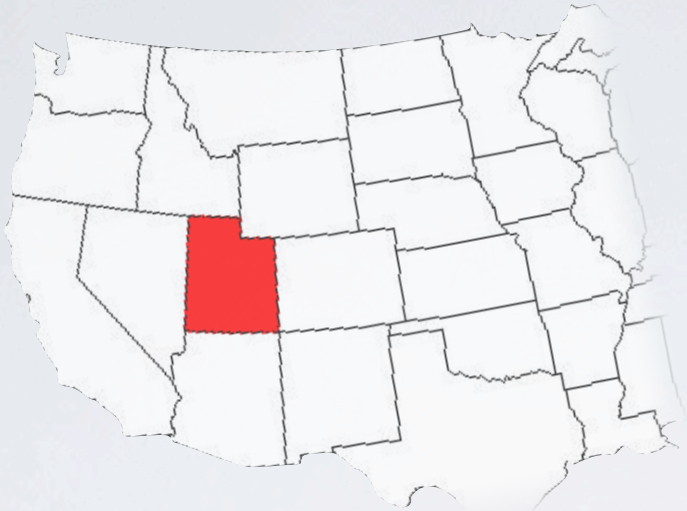

Newfoundland
Evaporation Basin
(constructed)
1988-89
2002
Great Salt Lake reconstruction
Observed
Elevation Change (cm)
100
50
0
-50
-100
1500
1600
1700
1800
1900
2000

Beyond Utah, beyond 2 species



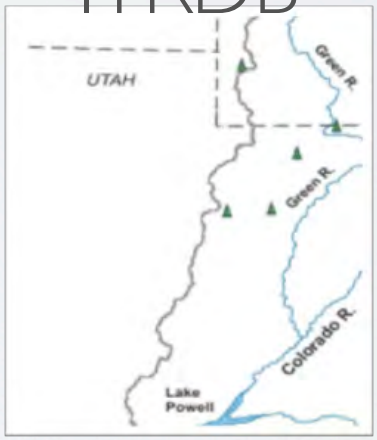
used in DeRose et al. (2013)



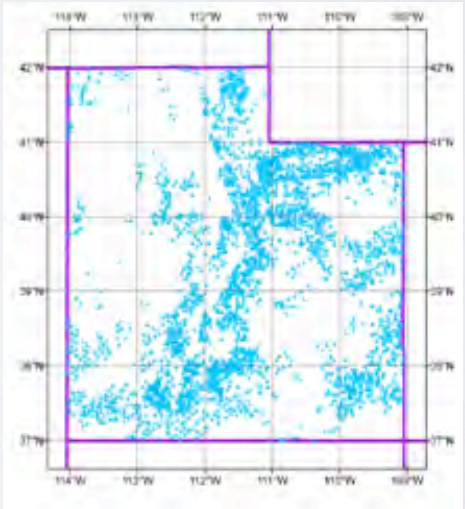


HCN

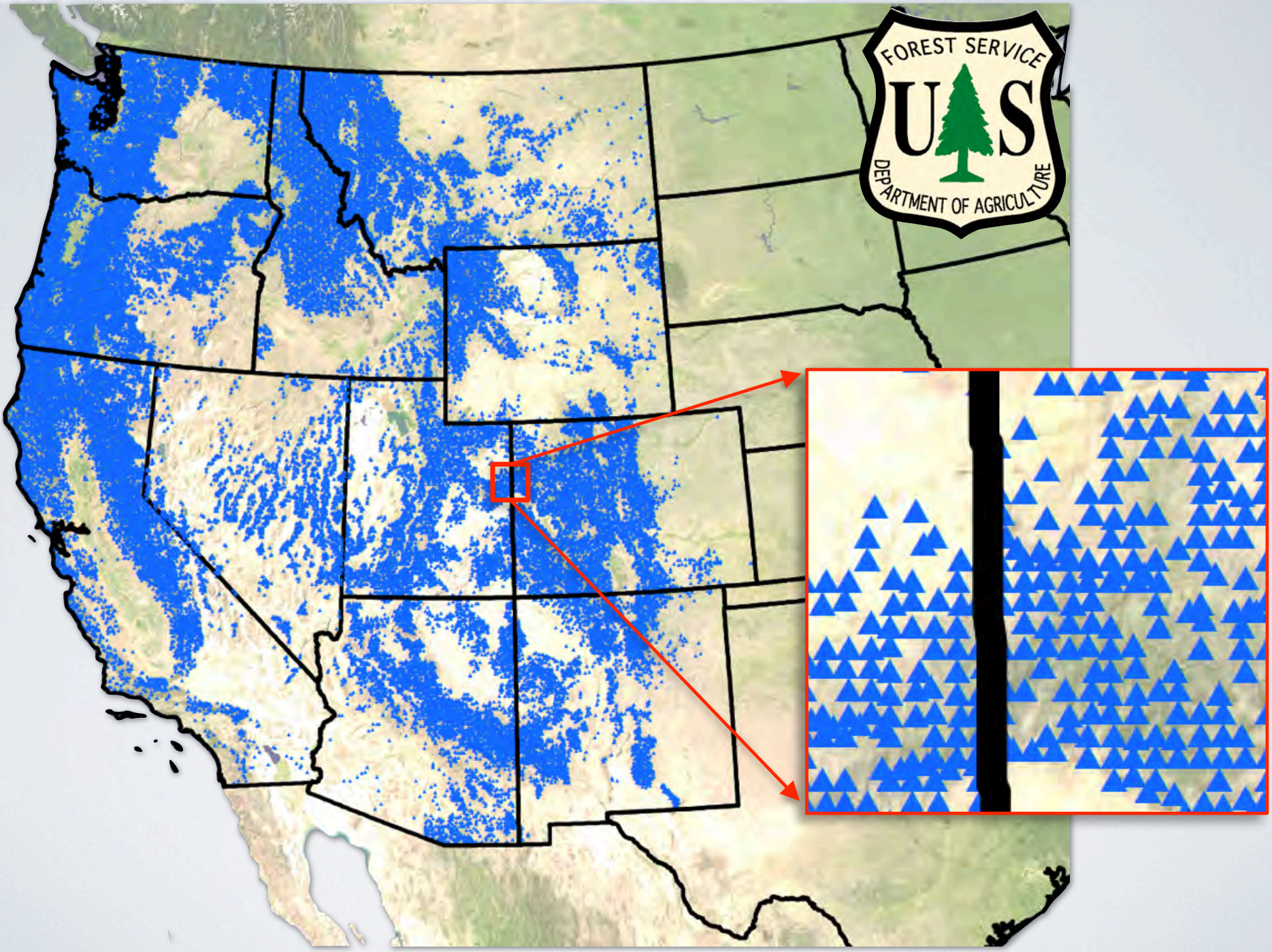
ITRDB

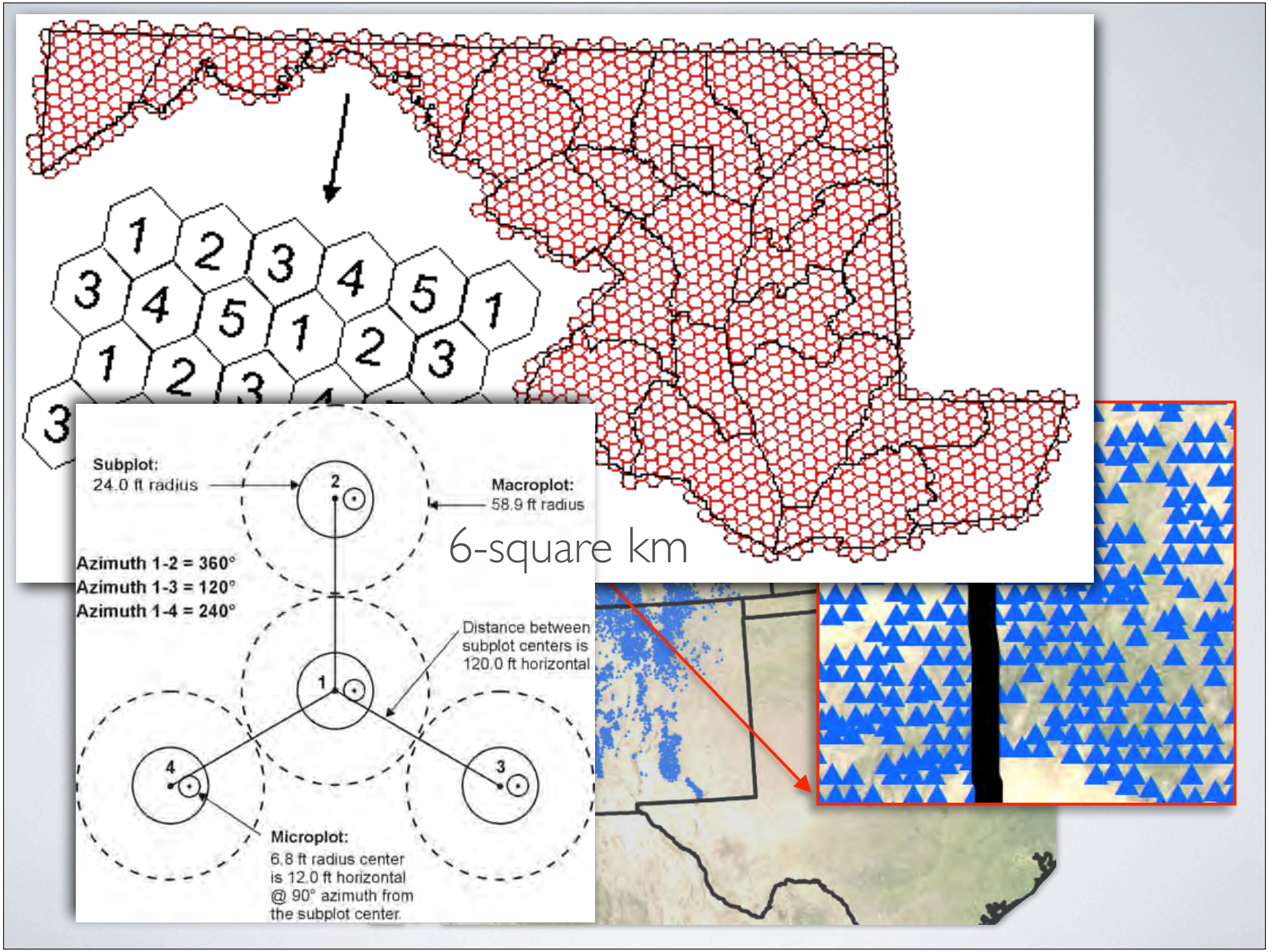


FIA



Full FIA data: the future




Subplot:
24.0 ft radius
Macroplot:
58.9 ft radius
6-square km
Azimuth 1-2 = 360°
Azimuth 1-3 = 120°
Azimuth 1-4 = 240°
Distance between subplot centers is 120.0 ft horizontal
Microplot:
6.8 ft radius center is 12.0 ft horizontal @ 90° azimuth from the subplot center.

WASTE

FIA vs. Conventional dendroclimatology:

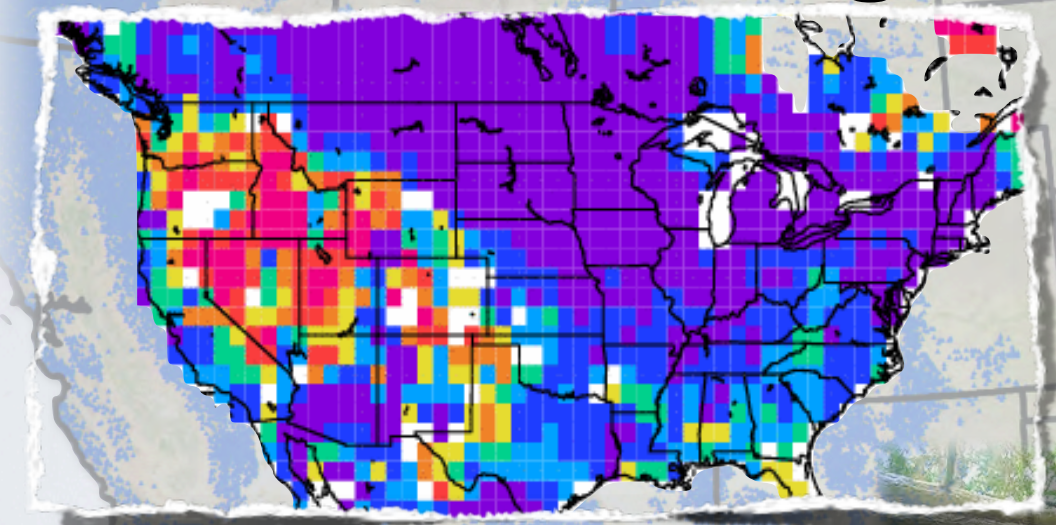
data period: *short* vs. long

plot sample: *one*+ vs. 20

species: *many* vs. one+

location: *unspecified* vs. chosen

concept: *Objective (validating)* vs. Subjective (conventional)

Our goal:

help solve the forecast challenge