California Landscape Conservation Cooperative

Webinar Series

CaliforniaLCC.org

Today's guest presenter – Dr. Jason Kreitler, Western Geographic Science Center, USGS

"California Climate Change and Landscape Connectivity: Enhancing Climate Stability through Corridor Prioritization"

Webinar will begin shortly.

For audio call 1-866-737-4154 Passcode: 2872670

The call will be globally muted.

October 24, 2012

USGS
science for a changing world

California Climate Change and Landscape Connectivity

Enhancing Climate Stability Through Corridor Prioritization

Jason Kreitler
U.S. Geological Survey
Carrie Schloss
Univ. of Washington

Climate change in California

- Not all areas will be equally affected
- Rate of change varies considerably
- Loarie et al. (2009)

- What does that mean for protected areas?
- How to mitigate (-) effects of climate change?
- Increasing connectivity most oft cited rec for mgmt. Heller and Zavaleta (2009)

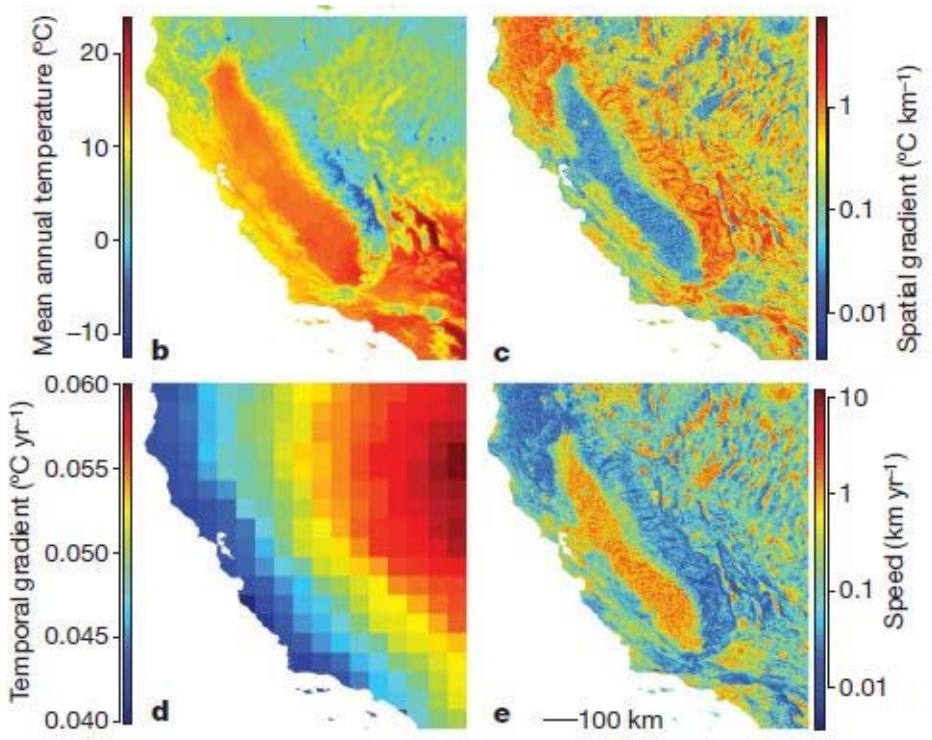

Figure 1 | Changing temperature in California. **a**, Current (1950–2000) mean annual temperature at 800 m resolution. The black rectangle indicates the Central California inset in **b**. **c**, The spatial gradient of temperature change using a 9 pixel kernel. **d**, The temporal gradient of climate change from 2000–2099 from 0.5 °C 16 general circulation model (GCM) ensemble projection with A1B emissions. **e**, The velocity of climate change determined from the quotient of **d** and **c**.

HABITAT CONSERVATION PLANNING

- Strategic Goals
- Publications
- Connectivity
- Endowments
- Environmental Review & Permitting
  - California Endangered Species Act Permitting
  - California Environmental Quality Act Review
  - Lake & Streambed Alteration Program
  - Timberland Conservation Program
- Conservation Planning
  - Natural Community Conservation Planning
  - Conservation & Mitigation Banking
- Invasive Species
- Native Plant Program

Habitat Conservation Planning Branch

Connectivity

- Statewide Analysis - California Essential Habitat Connectivity Project
- Ecoregional Analyses Within California
- Western States
- Grant Funded Connectivity Research

California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California

The California Department of Fish and Game and the California Department of Transportation (CalTrans) commissioned a team of consultants to produce a statewide assessment of essential habitat connectivity by February of 2010, using the best available science, data sets, spatial analyses and modeling techniques.

The goal was to identify large remaining blocks of intact habitat or natural landscape and model linkages between them that need to be maintained, particularly as corridors for wildlife.

Over sixty federal, state, local, tribal and non-governmental organizations collaborated in the creation of :

1. A statewide wildlife habitat connectivity map using a Geographic Information System (GIS) based modeling approach;
2. An assessment of the biological value of identified connectivity areas; and
3. A strategic plan that helps varied end users interpret and use the statewide map and outlines a methodology necessary for completing connectivity analyses at finer spatial scales.

TBC3

Terrestrial Biodiversity and Climate Change Collaborative – San Francisco Bay Area

People

- **David Ackerly**- UC Berkeley (dackerly@berkeley.edu)
- **Ryan Branciforte**- Bay Area Open Space Council (ryan@openspacecouncil.org)
- **Alan Flint**- USGS Sacramento (aflint@usgs.gov)
- **Lorraine Flint**- USGS Sacramento (lflint@usgs.gov)
- **Healy Hamilton**- UC Berkeley (hhamilton@berkeley.edu)
- **Mike Hamilton**- UCB Blue Oak Ranch Reserve (mphamilton@berkeley.edu)
- **Nicole Heller**- Duke University (nicole.heller@duke.edu)
- **Scott Loarie**- Carnegie Institute, iNaturalist (loarie@gmail.com)
- **Michelle Jensen**- Pepperwood Preserve (mjensen@pepperwoodpreserve.org)
- **Morgan Kennedy**- Pepperwood Preserve (mkennedy@pepperwoodpreserve.org)
- **Kirk Klausmeyer**- The Nature Conservancy (kklausmeyer@tnc.org)
- **Jason Kreitler**- USGS (jkreitler@usgs.gov)
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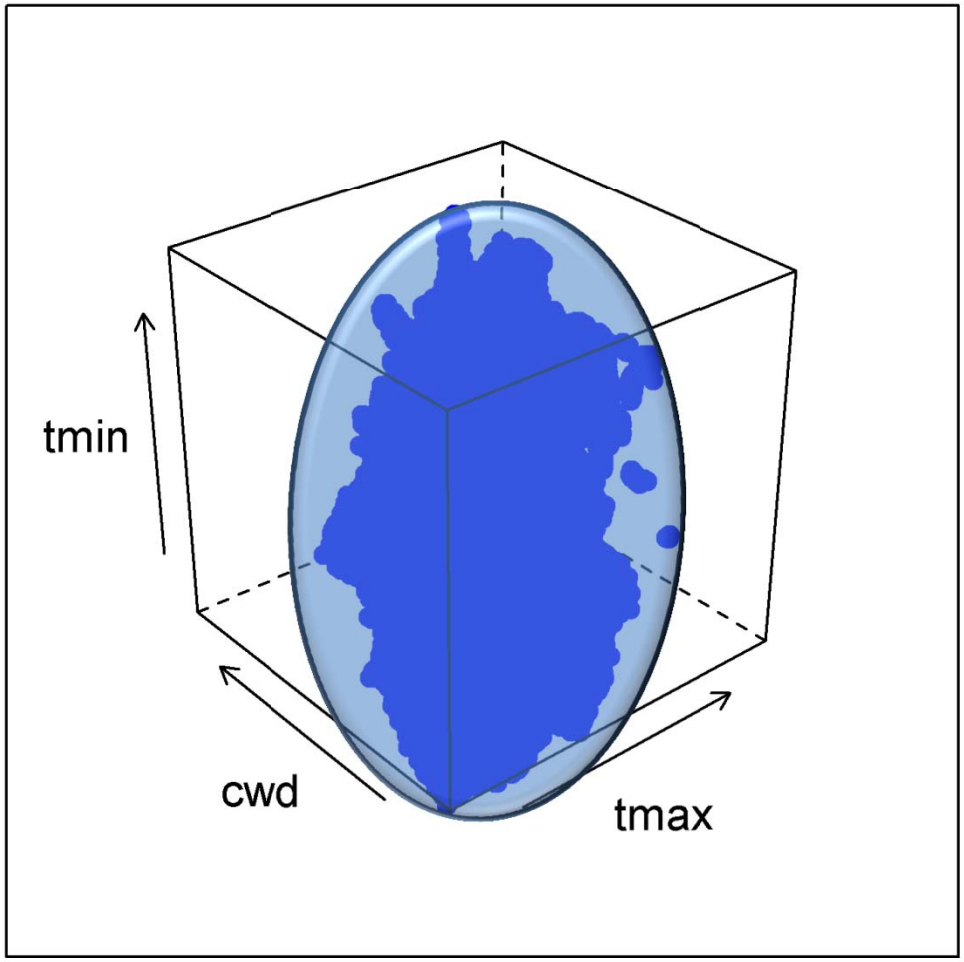
- **Claudia Tebaldi**-Climate Central (ctebaldi@climatecentral.org)
- **James Thorne-** UCD Information Center for the Environment (jhthorne@ucdavis.edu)
- **Bridget Thrasher**- Climate Central (bthrasher@climatecentral.org)
- **Alicia Torregrosa**- USGS Menlo Park (atorregrosa@usgs.gov)

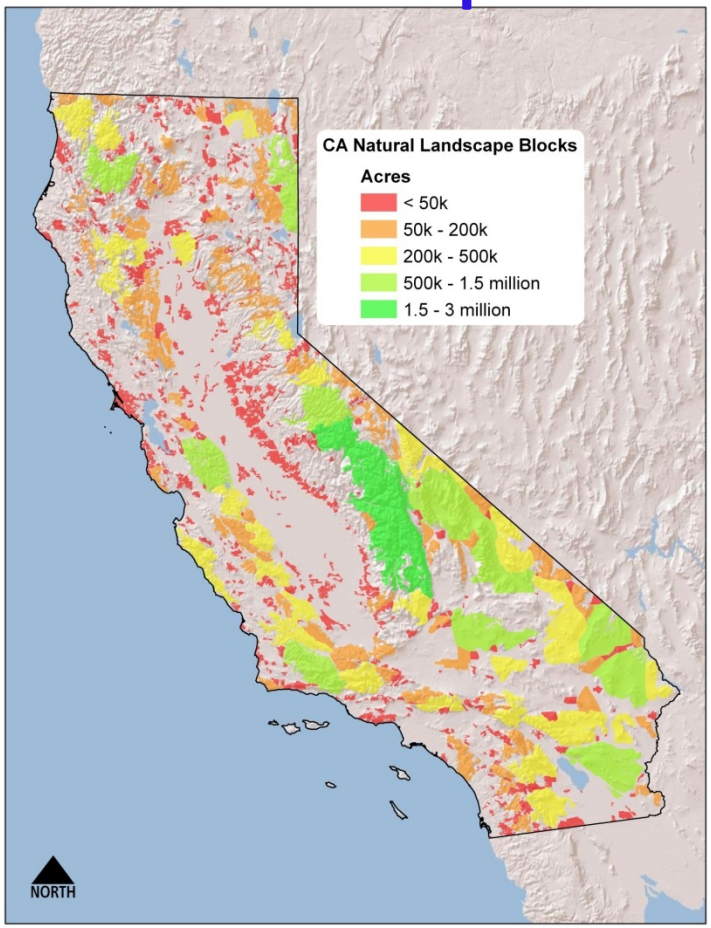
Climate space

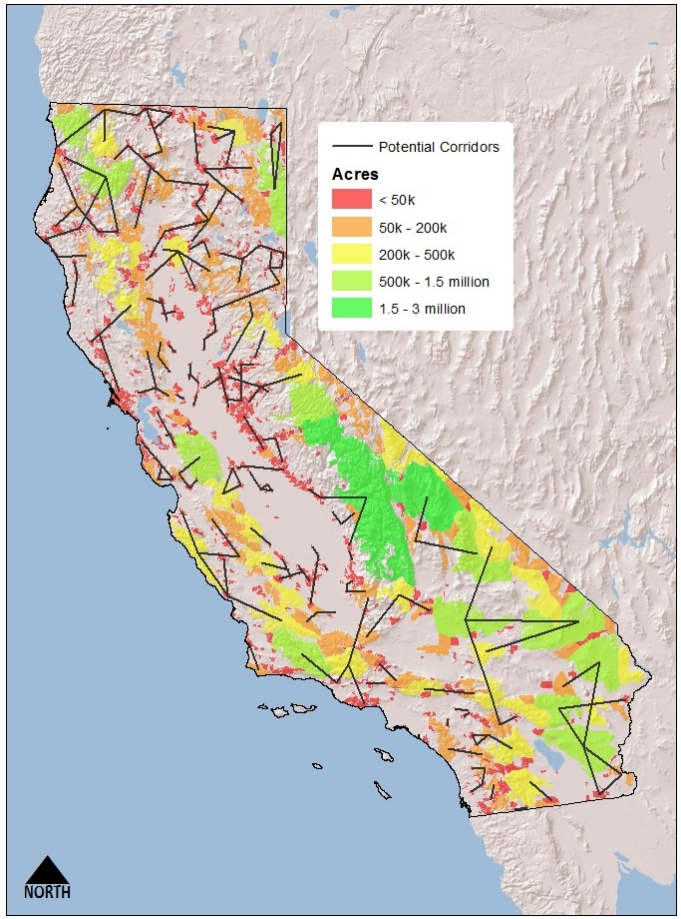


- Each data point represents one pixel on the landscape
- Variables important to explain the range in variation of climate: tmax(JJA), tmin(DJF), cwd
- Climate hull (Q-hull in R)

California Protected Areas and CEHC Corridors*

304 Natural Landscape Blocks 174 Corridors

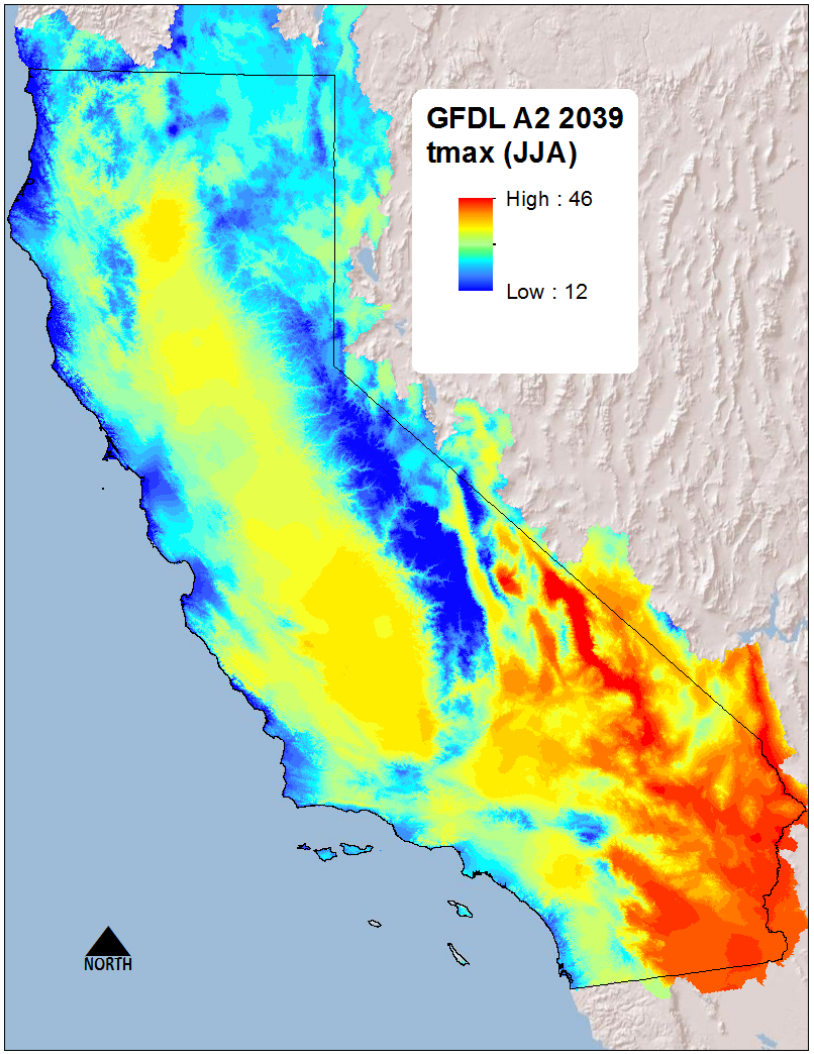


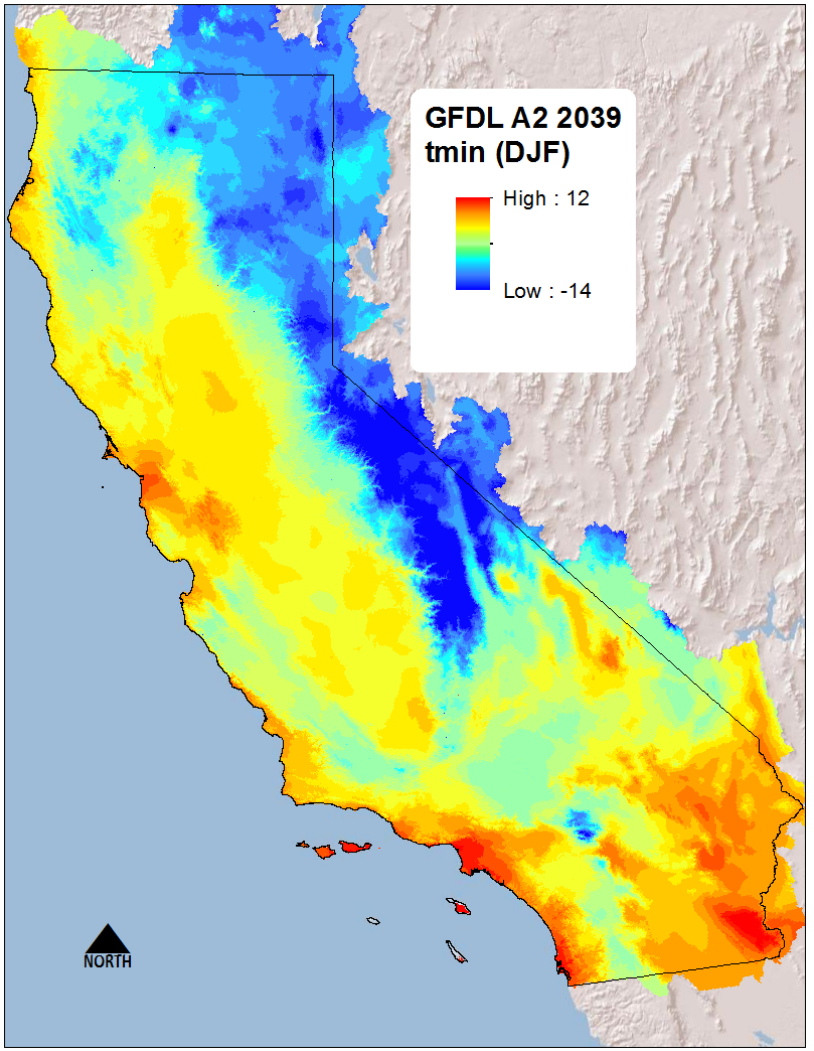


With limited Resources for implementation, how do we prioritize corridors?

*Spencer et al. (2010) http://www.dfg.ca.gov/habcon/connectivity/

Summer tmax & winter tmin
GFDL A2 2039

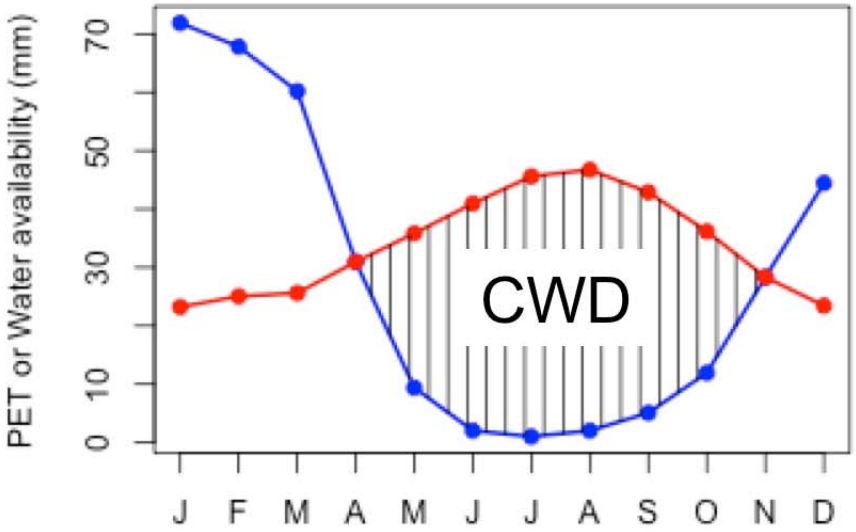


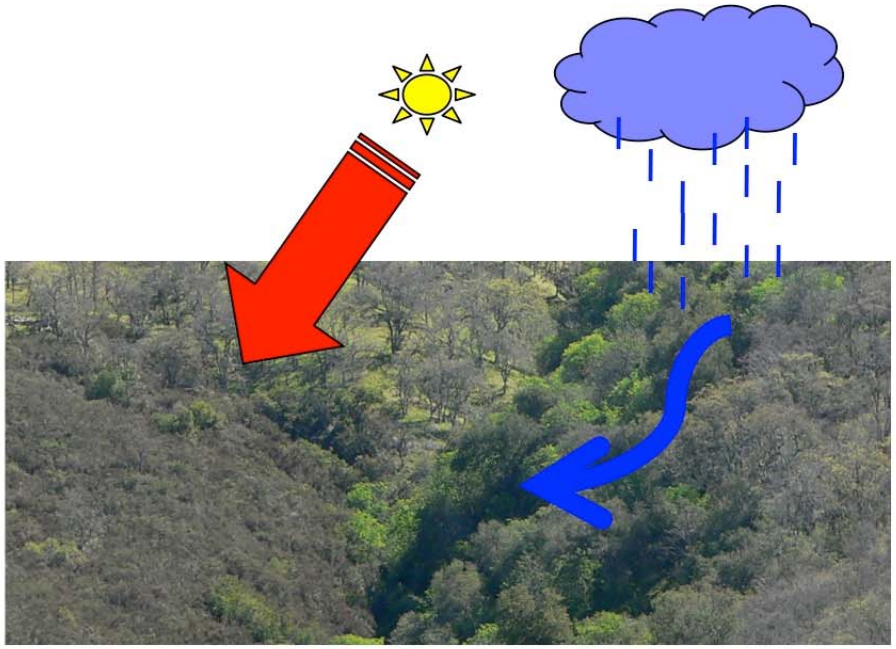


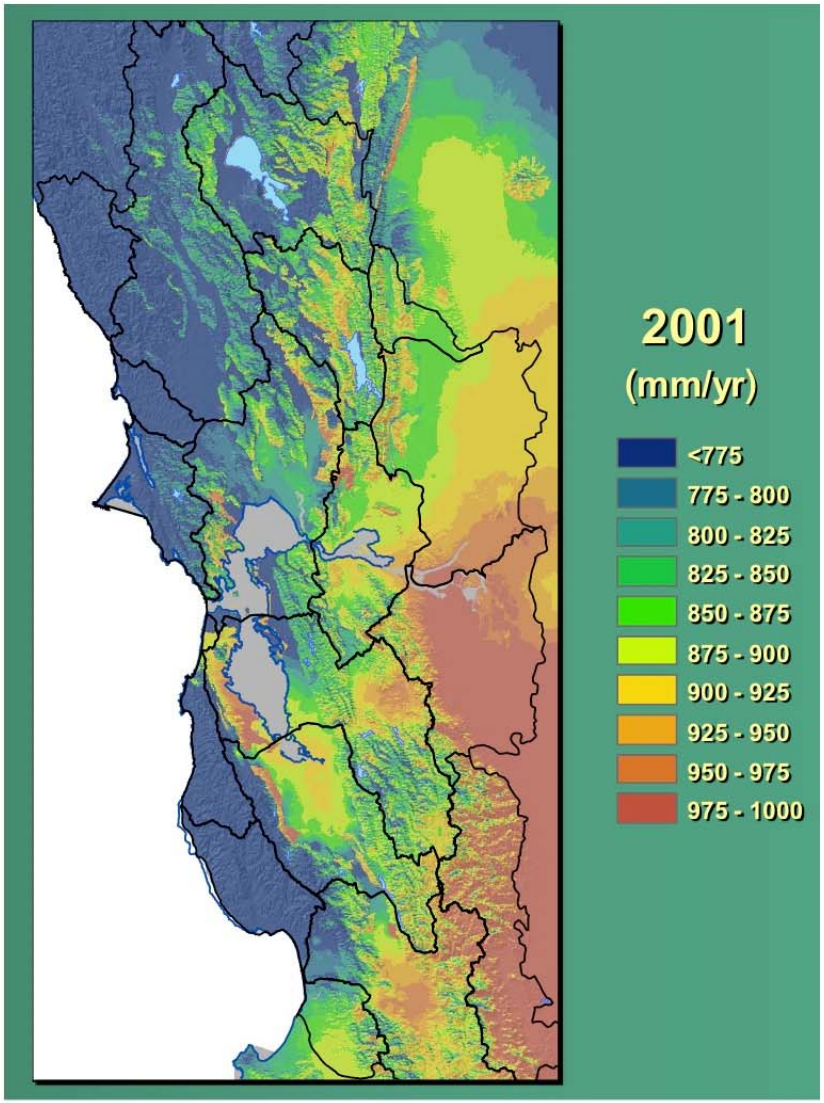
BCM 270m output, courtesy of Alan & Lorrie Flint – see climate.calcommons.org

Climatic Water Deficit:

excess evaporative demand relative to available water

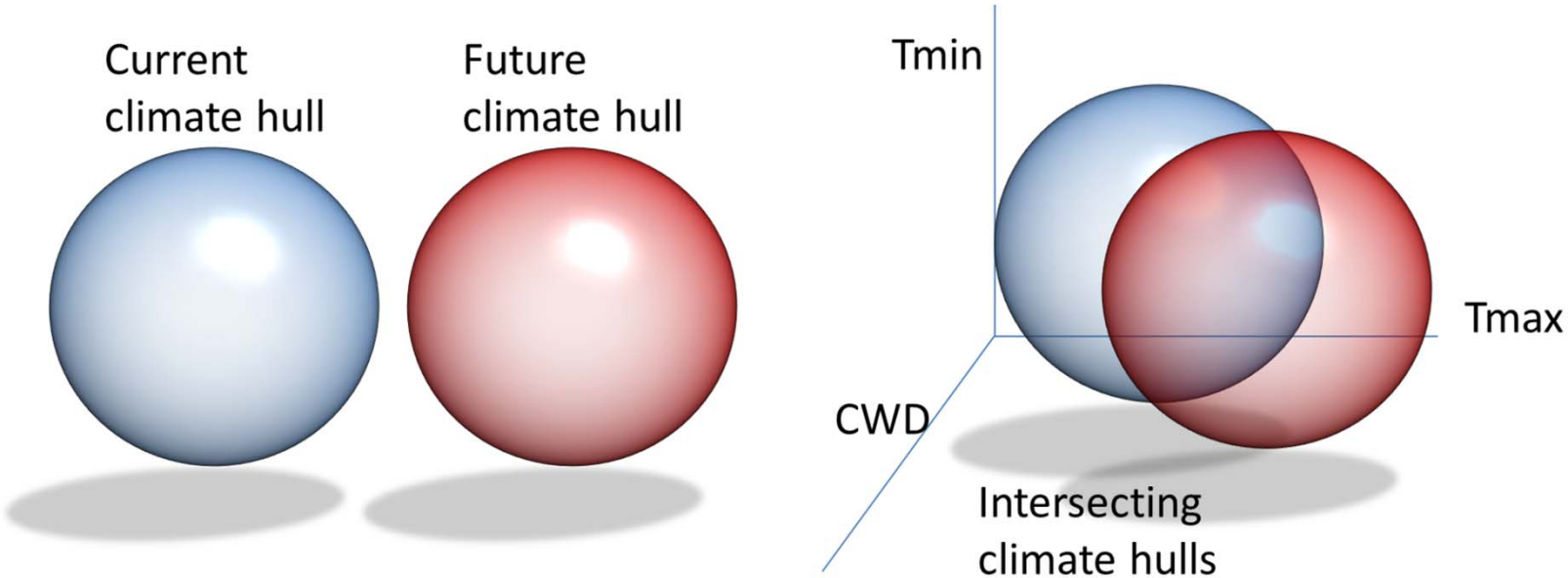






courtesy: Al and Lorrie Flint, USGS
see Stephenson 1998 J. Biogeog.

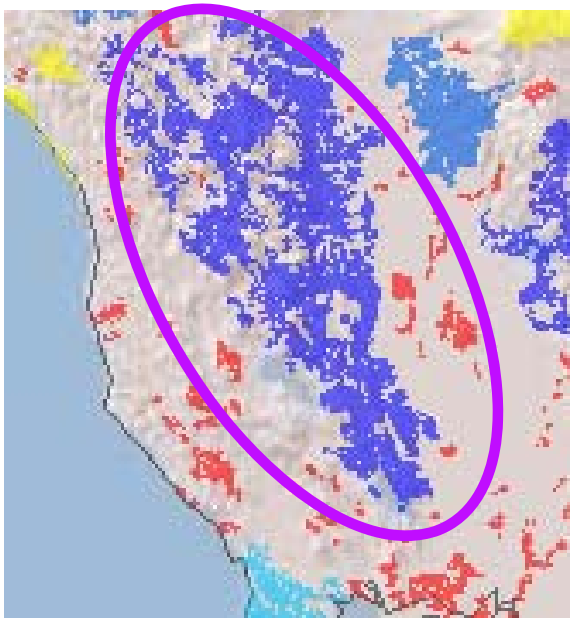
Climate stability method: convex hulls in climate space derived from protected area boundaries



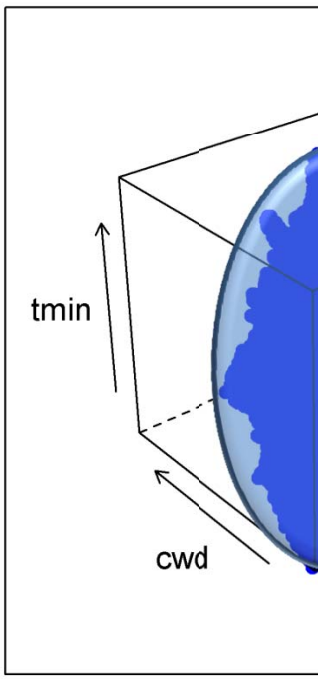
Increasing distance (-) (+) overlap

← Departure Stability →

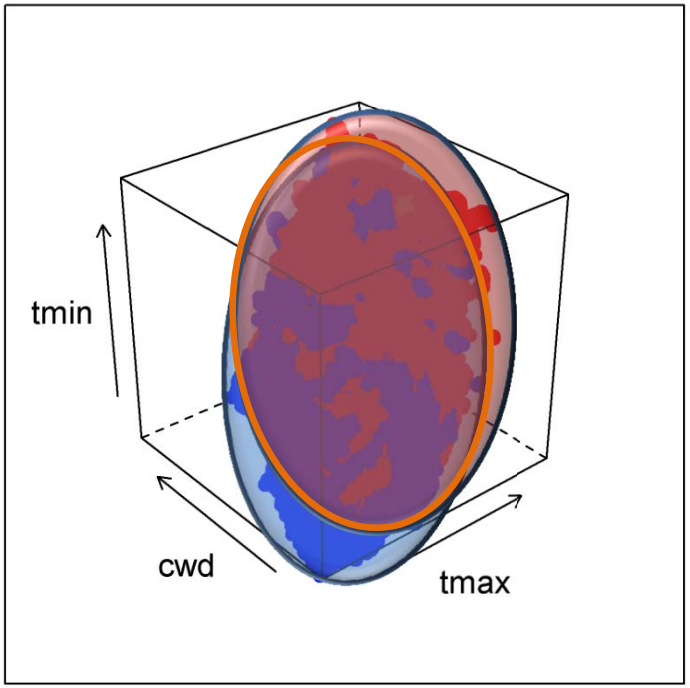
Protected Area A



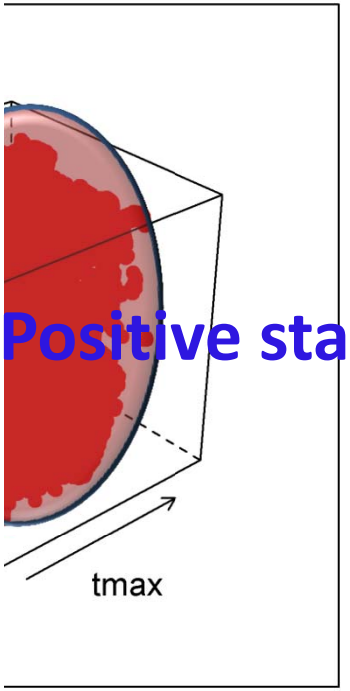
Current Clir



67% overlap

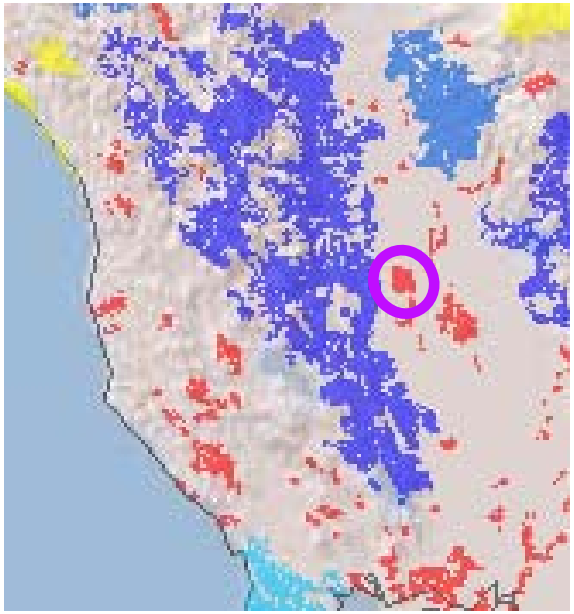


e Hull



Positive stability

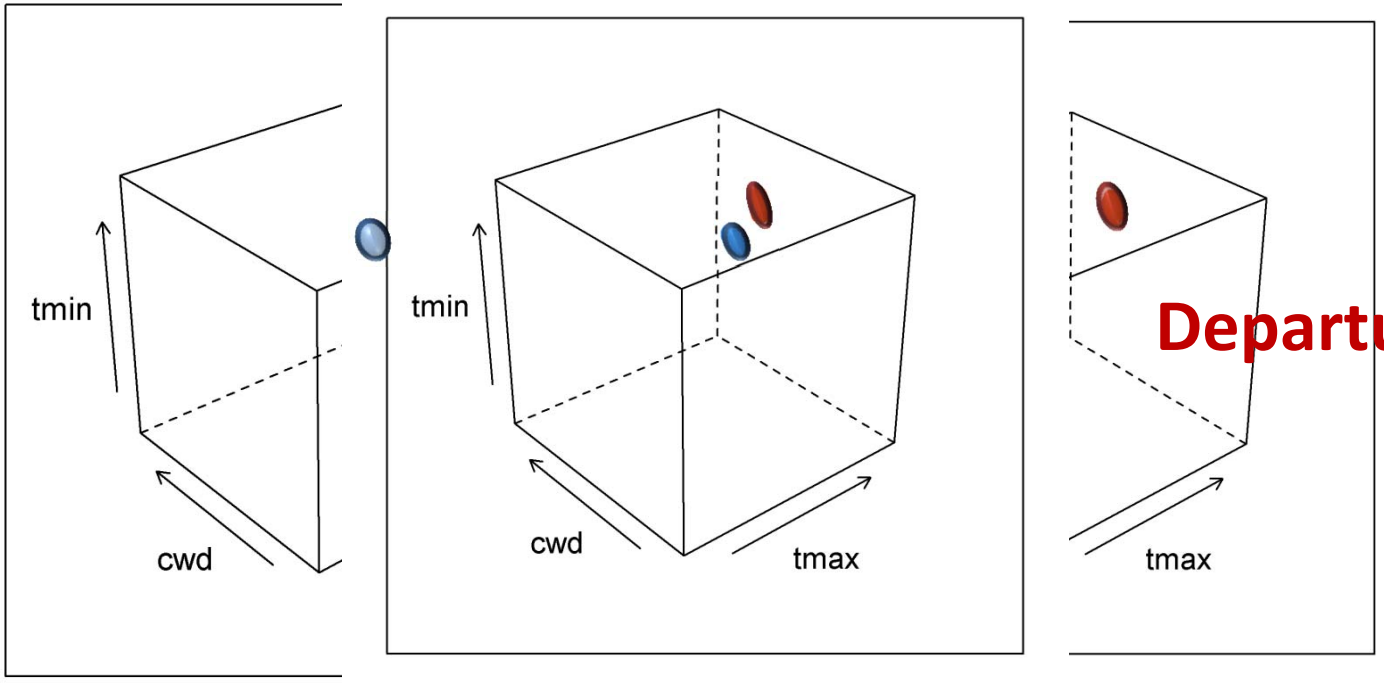
Protected Area B



Current Climate Hull

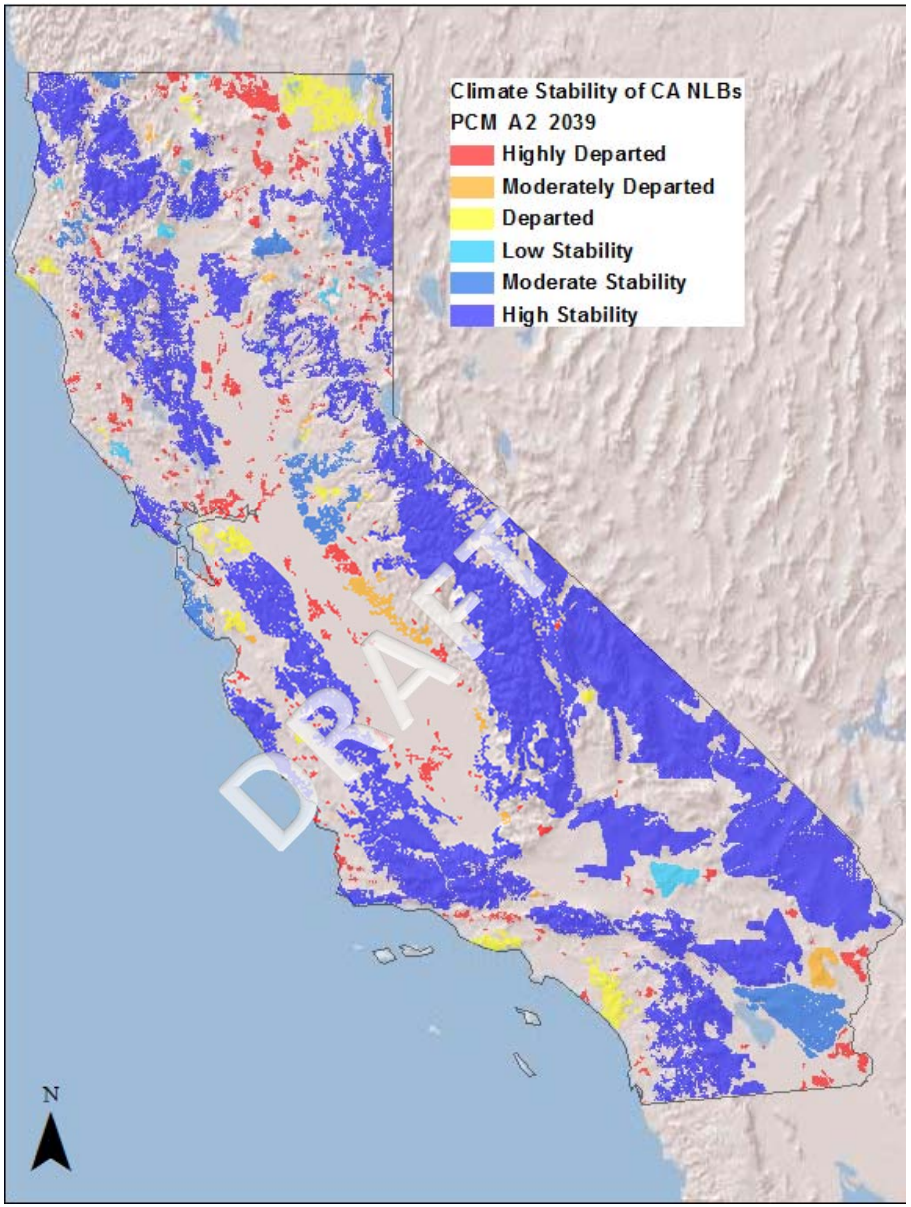
0% overlap

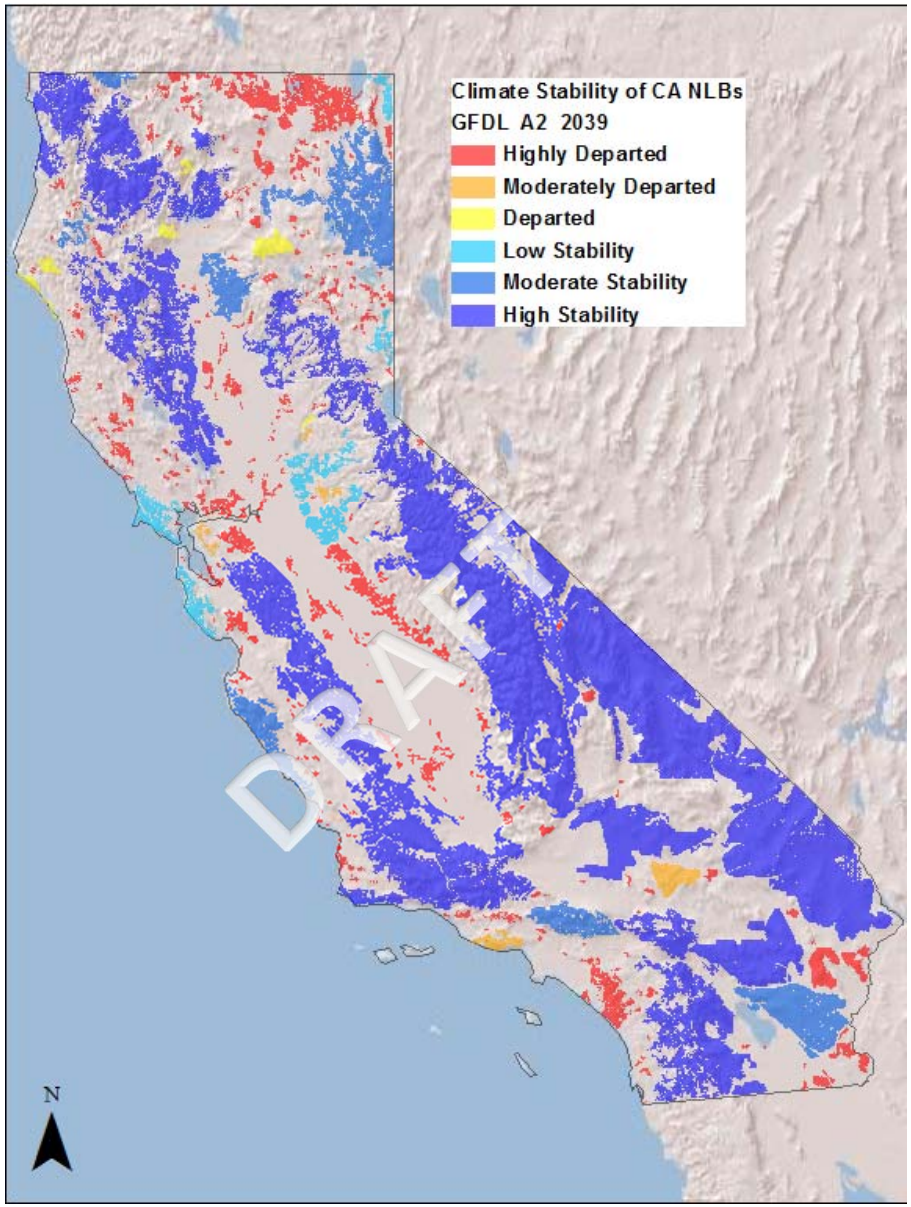
Future Climate Hull



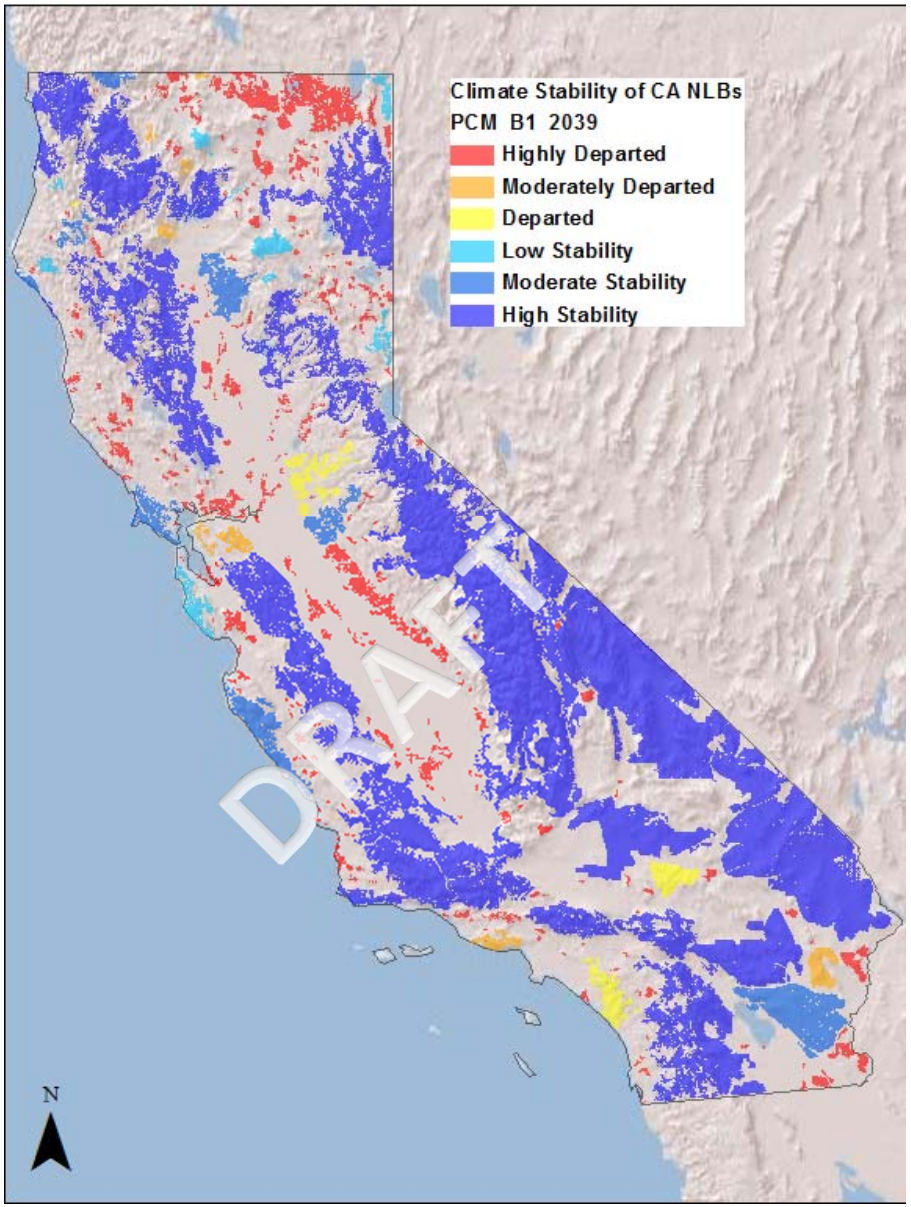
Departure

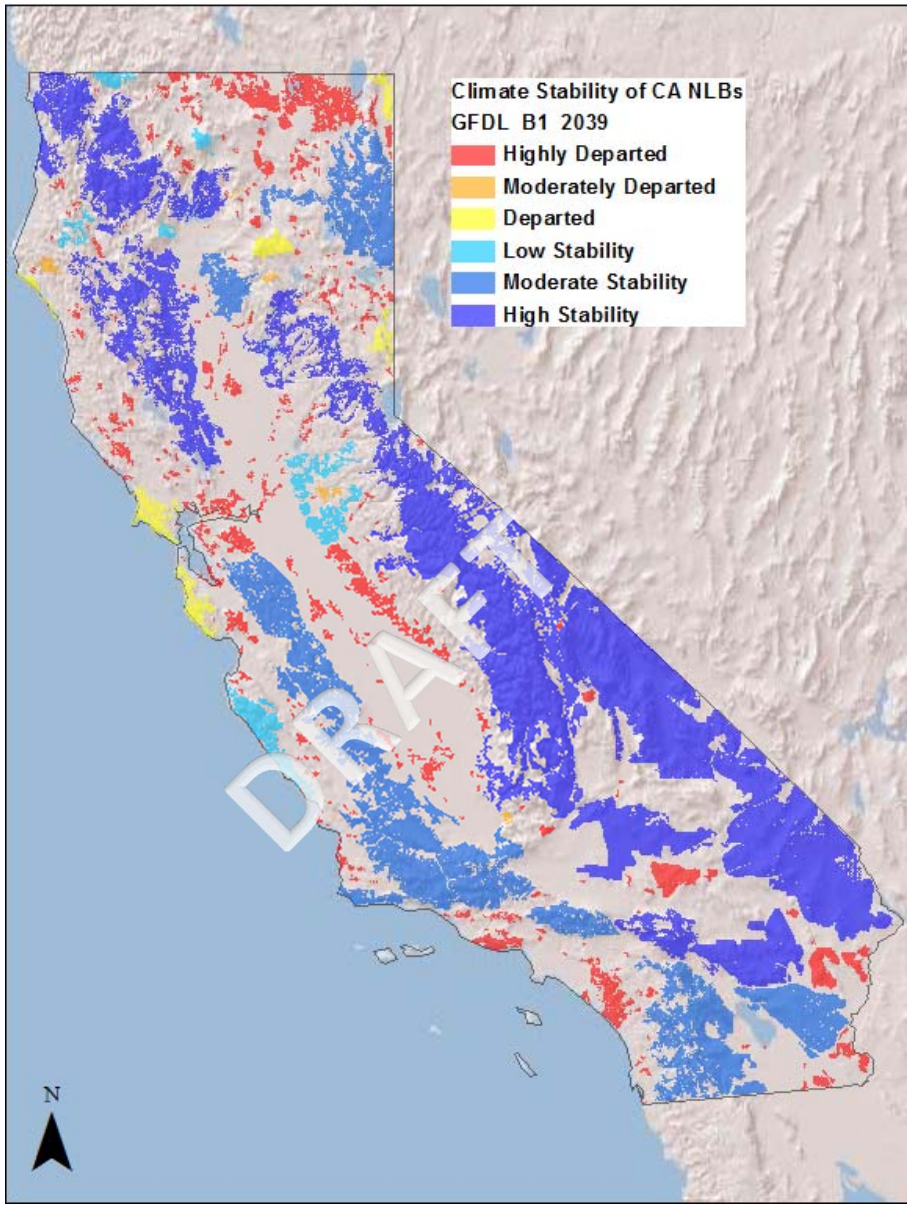
Climate Stability using A2 emissions





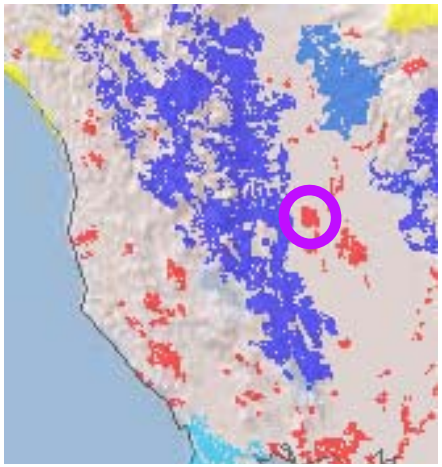
Climate Stability using B1 emissions

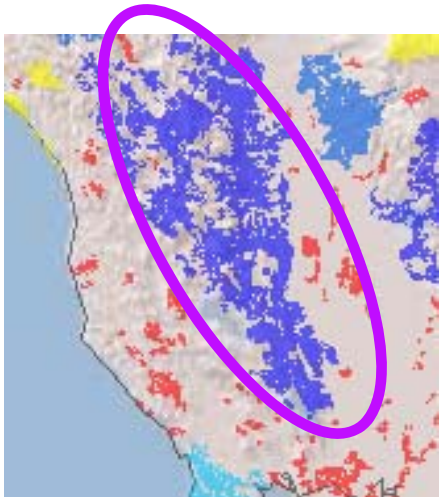


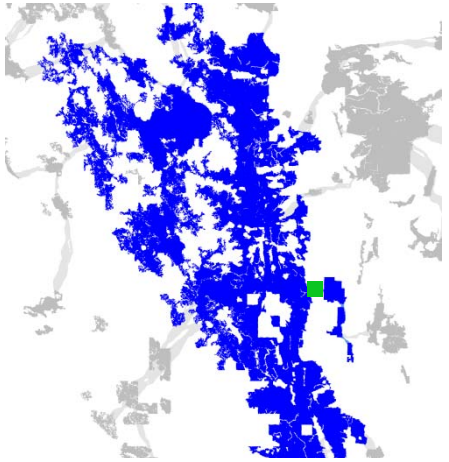


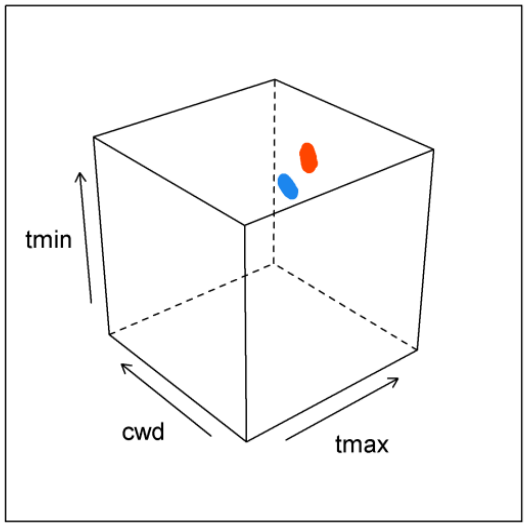
Increase Protected Area Resilience to Climate Change

Increase climate stability through corridor implementation









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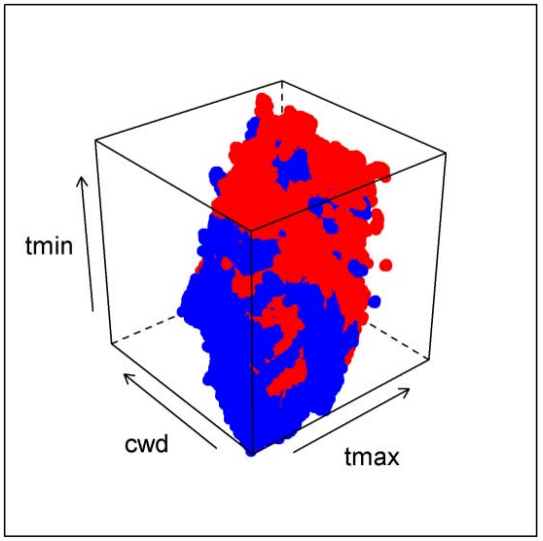

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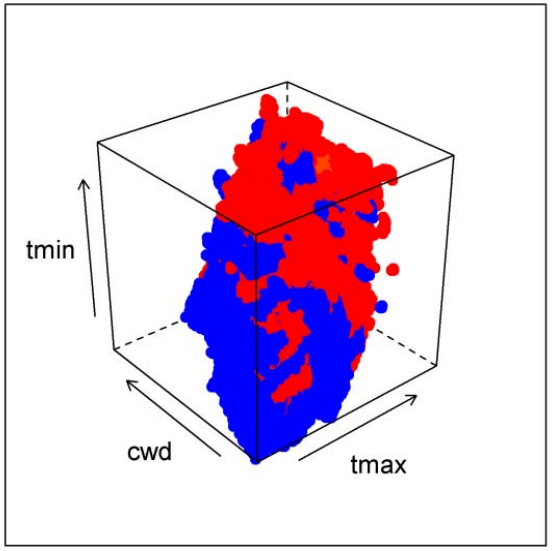


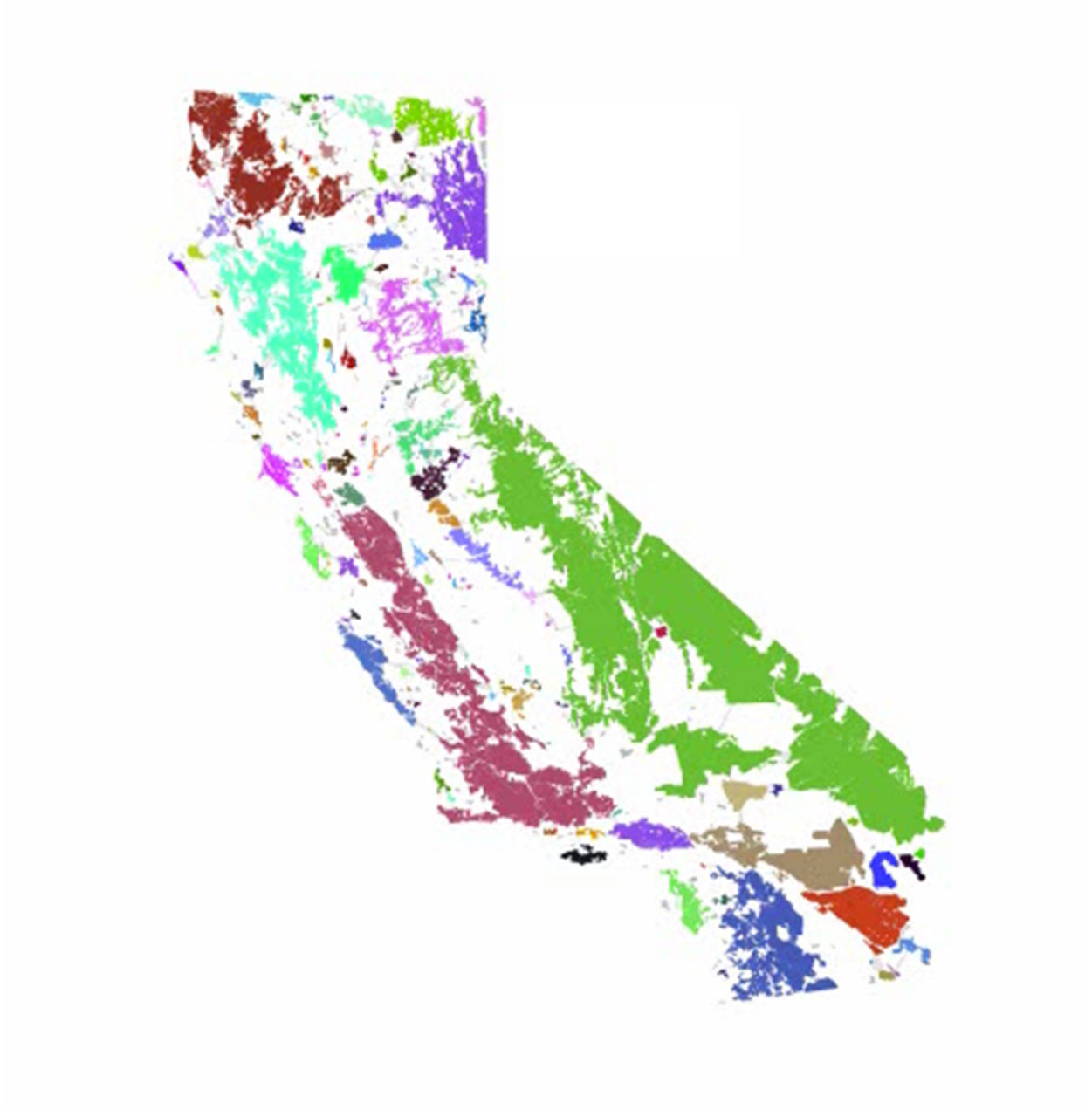
How to prioritize corridors?

- Objective – maximize climate stability of entire protected area network through corridor conservation/implementation

- Prioritization –
  - heuristic adds corridors that result in the *largest* increase in climate stability per acre of corridor

- Constraints – 250k acres of corridors – 10% of the 'refined' CEHC corridor area

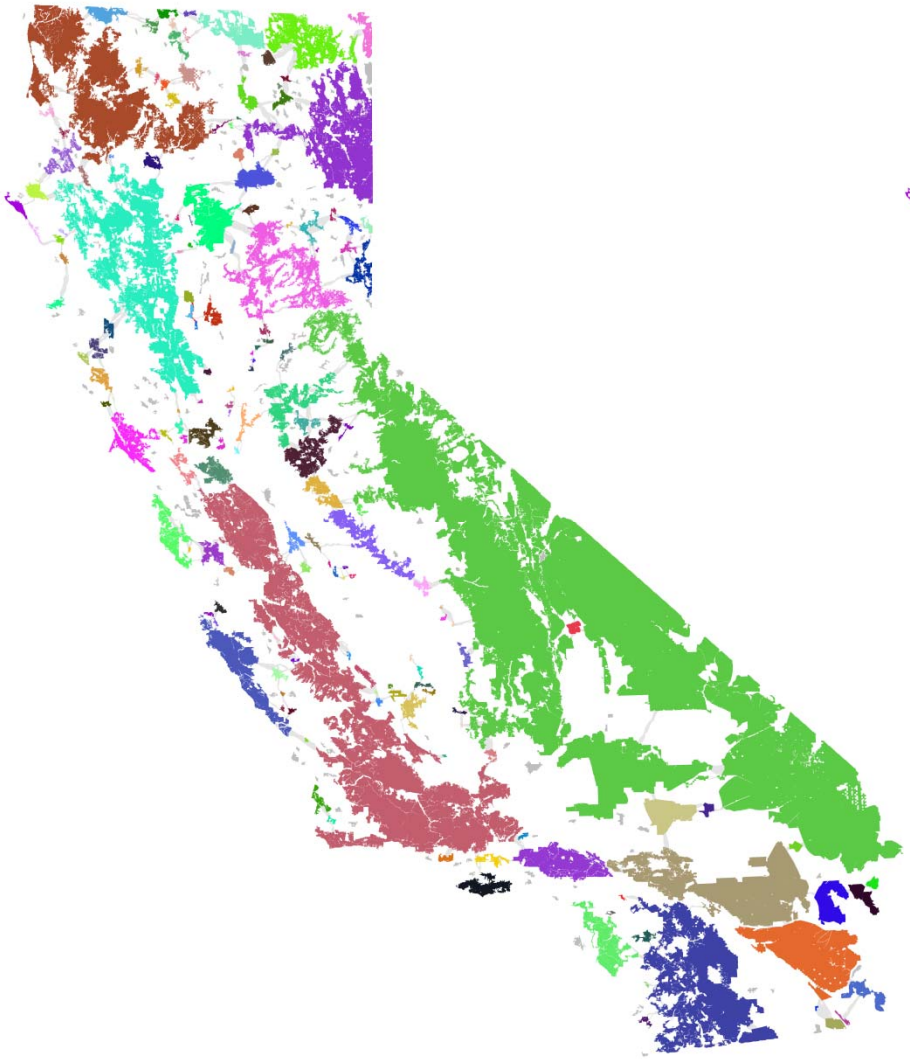
Corridor Selection



GFDL A2

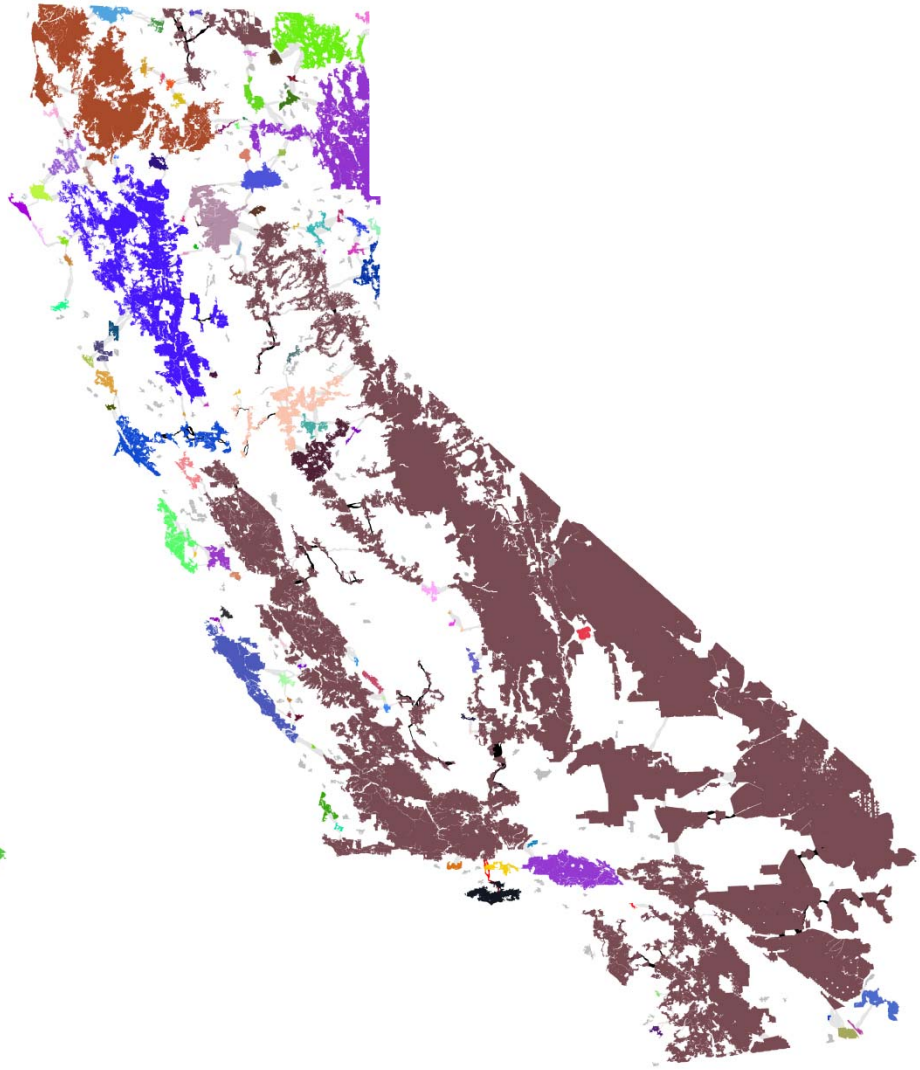
No Corridors Implemented

25 million stable acres,
57% of total area



250,000 acres of corridors implemented

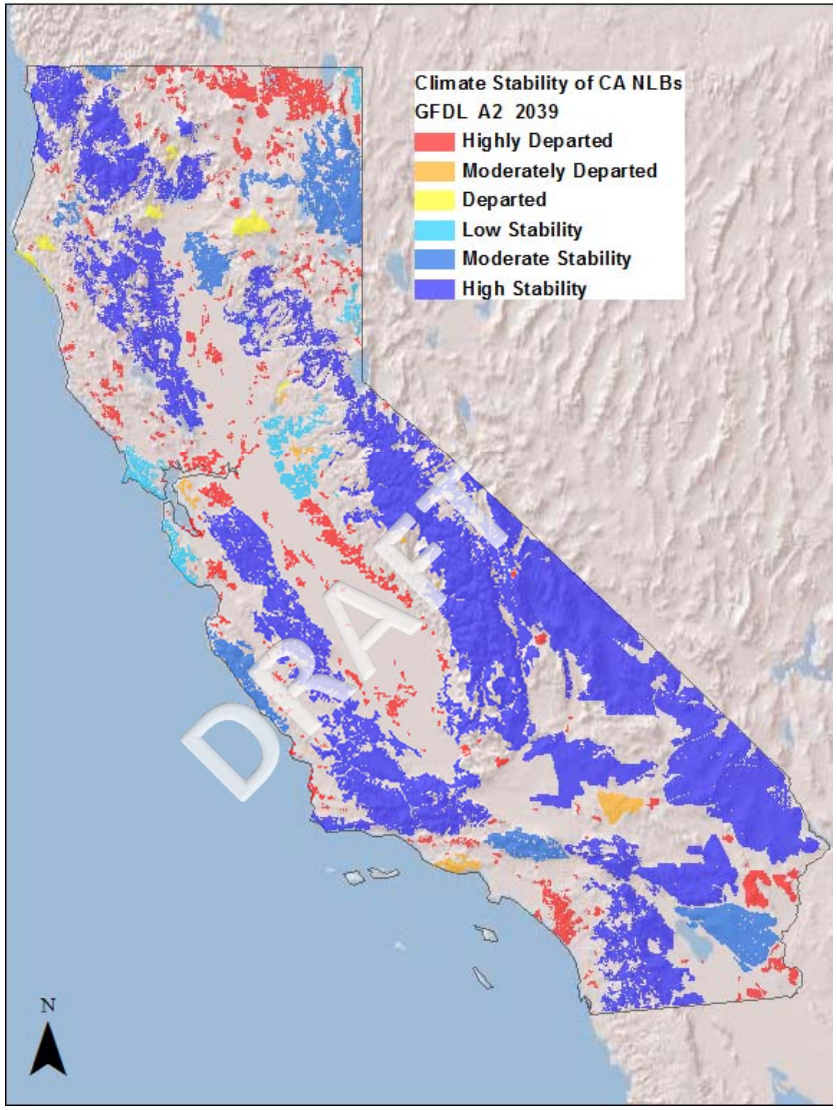
30.7 million stable acres,
70% of total area



PRE PEER REVIEW DRAFT RESULTS

No Corridors Implemented

25 million stable acres,
57% of total area



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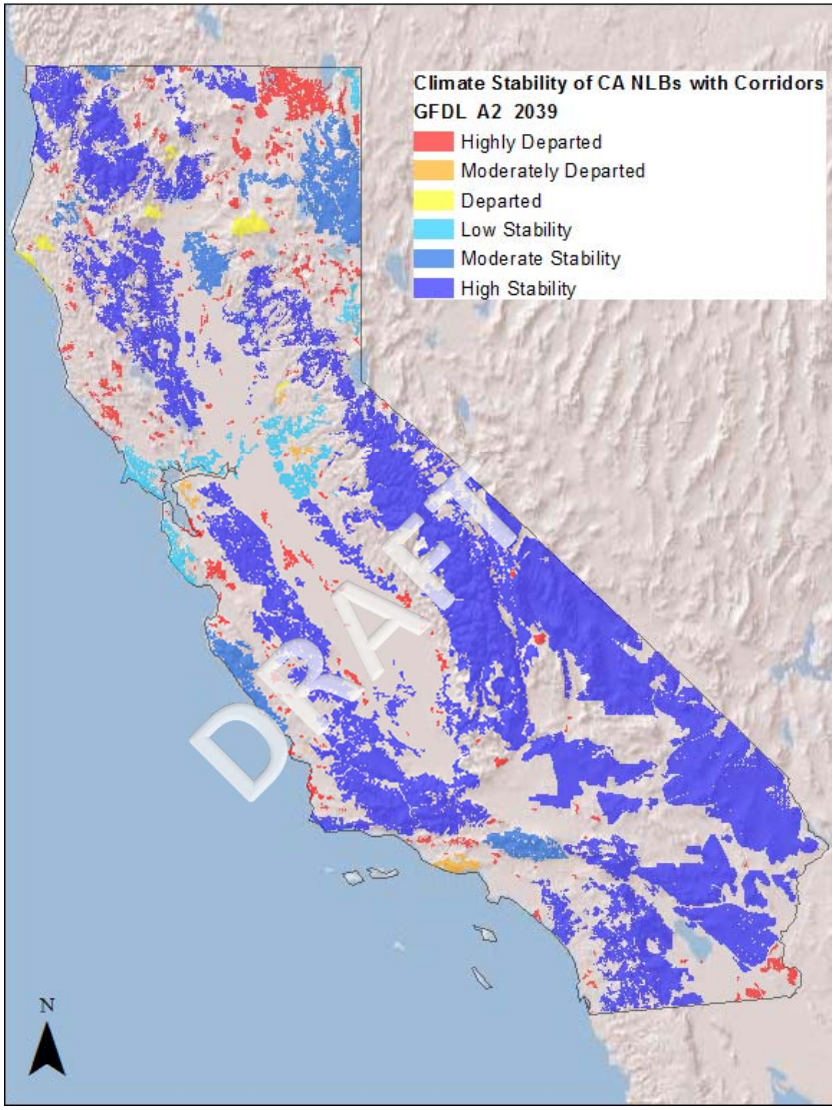
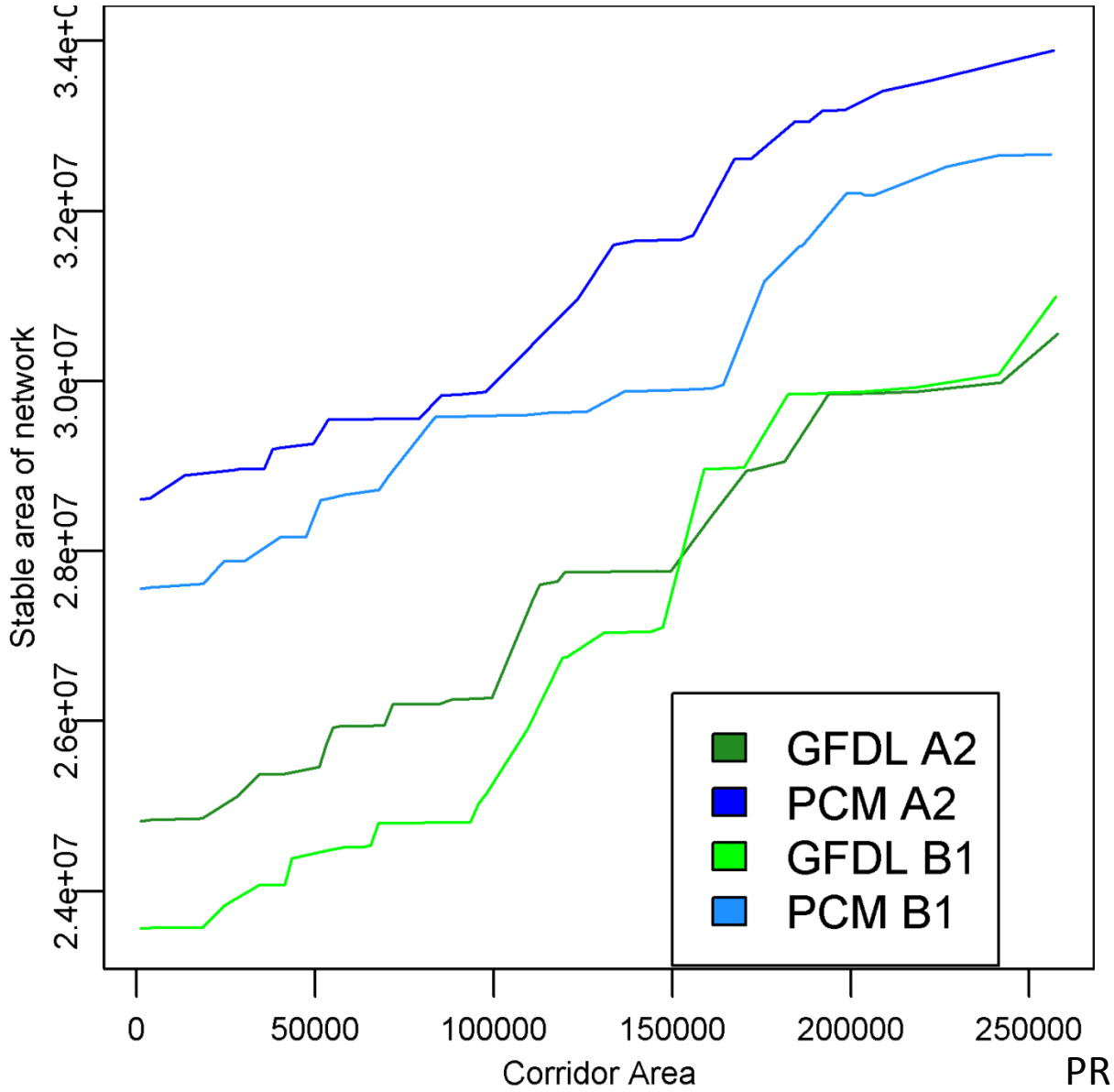


Differences across Climate Models



Approx overlap

78%

74%

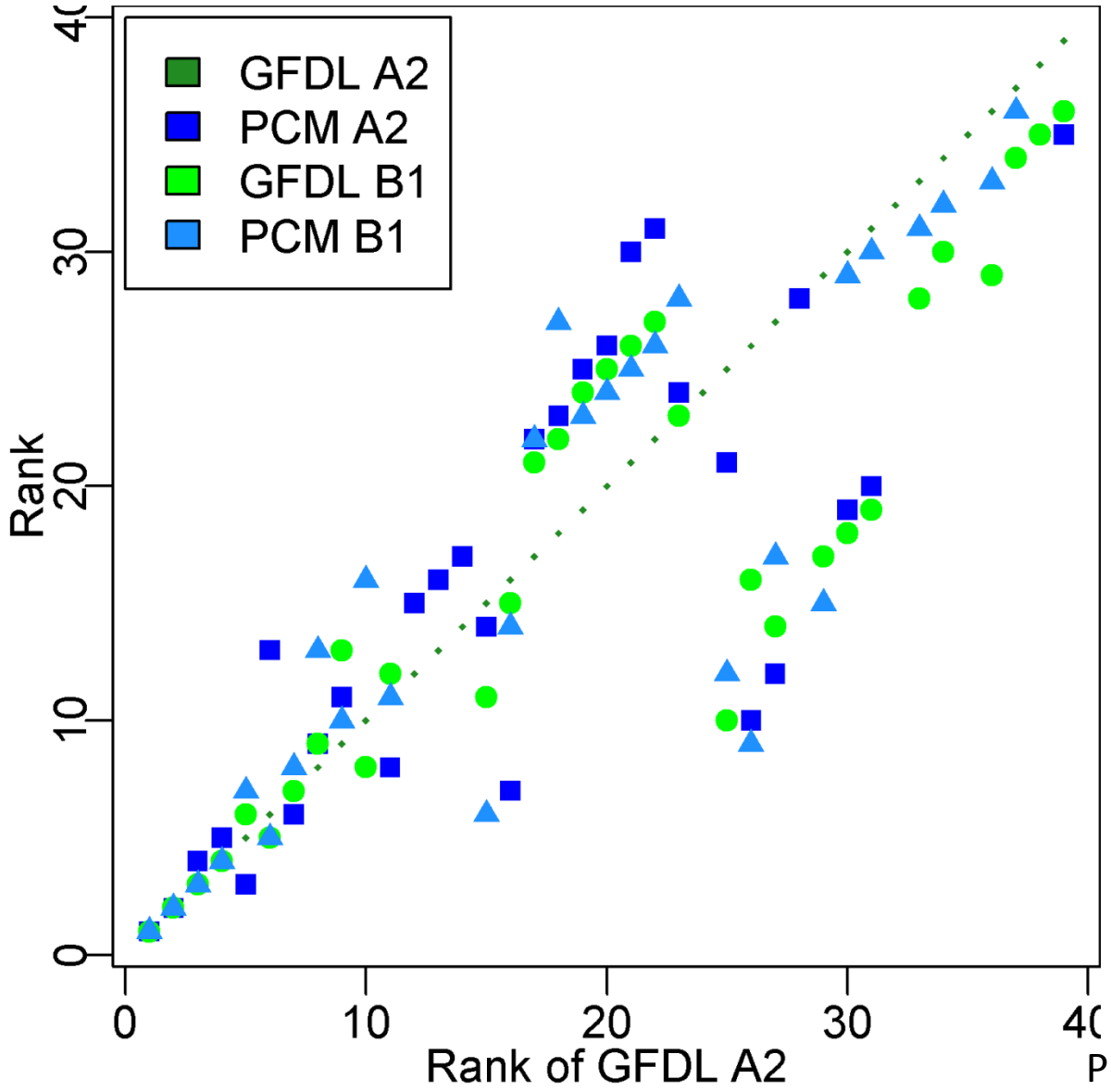
71%

70%

57% -- no action alt.

PRE PEER REVIEW DRAFT RESULTS

Corridor Ranking across Climate Models



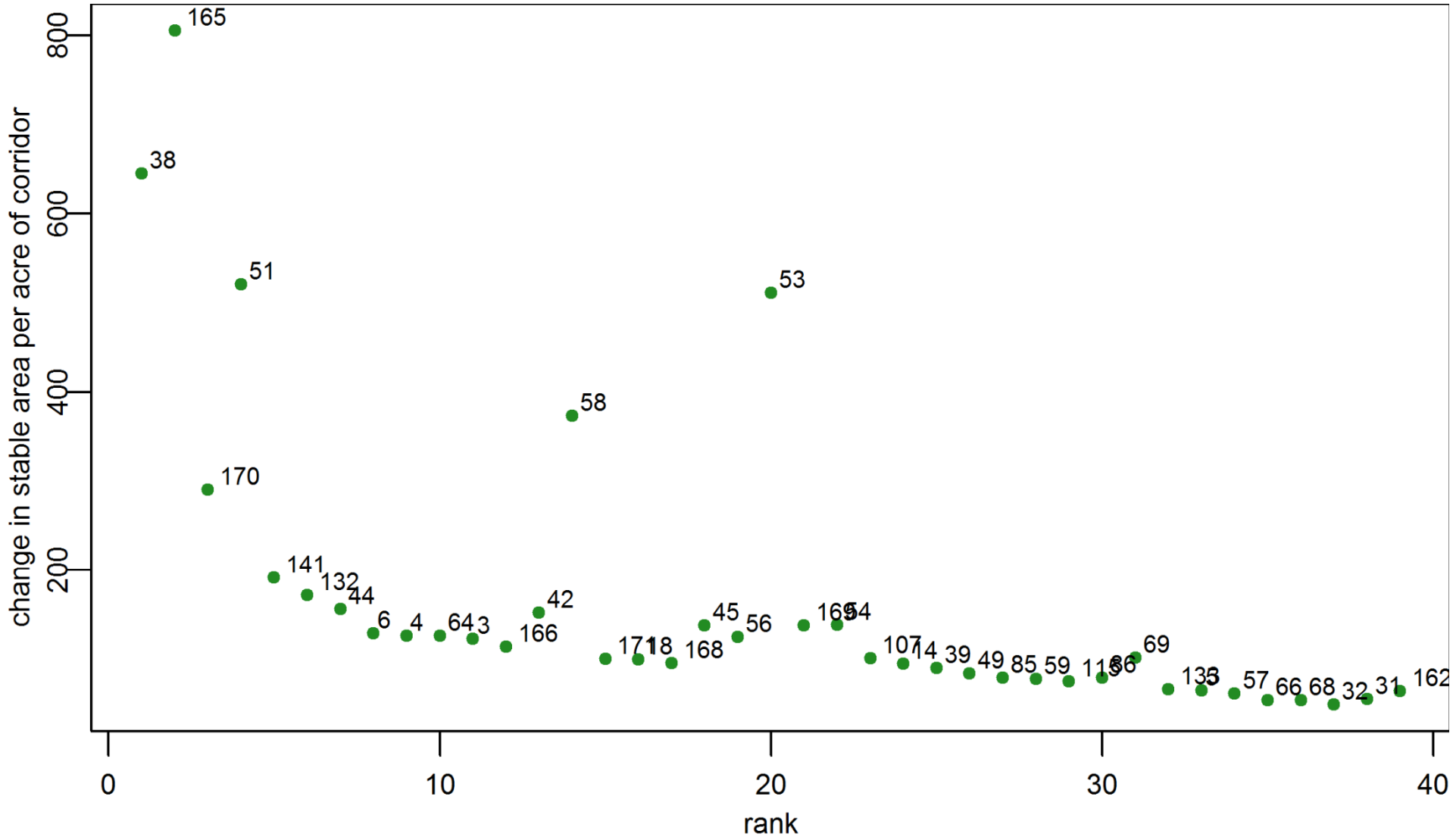
Very similar rank across

- Climate models
- Emissions scenarios

Pairwise correlation coefficients between **0.78-0.91**

PRE PEER REVIEW DRAFT RESULTS

Change in stable area per acre of corridor



PRE PEER REVIEW DRAFT RESULTS

GFDL A2

But…

- Assumption that ‘connected’ status will allow continued dispersal is a big one
- Additional climate variables important?
- Area not a great surrogate for cost in CA where land value is complicated…
- Need to incorporate land use change -- to ensure resources are allocated to areas that would otherwise be lost

Next steps

- How would species specific vulnerability be incorporated?
- Who wins/looses: changes in trailing vs. leading edges?
- Scale up to national extent?

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Acknowledgements

- Alan and Lorrie Flint, USGS
- California Essential Habitat Connectivity Project
- David Ackerly, Lisa Micheli, and the TBC3 working group
- CA LCC & Rebecca Fris
- Moore Foundation & Gary Knoblock

More info:
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California Landscape Conservation Cooperative

Webinar Series

CaliforniaLCC.org

Thank you for joining us. A recorded version of this webinar will be available on our website in about a week.

A CALCC Symposium is scheduled for November 5, 2012 beginning at 1:00pm at the CALCC offices and includes 4 presentations on Climate Change. These will also be broadcast as webinars.
See californialcc.org for more information.

If you have questions about the webinar, contact Rebecca Fris at 916-278-9415.

October 24, 2012