

Lewis A. Moran Reforestation Center

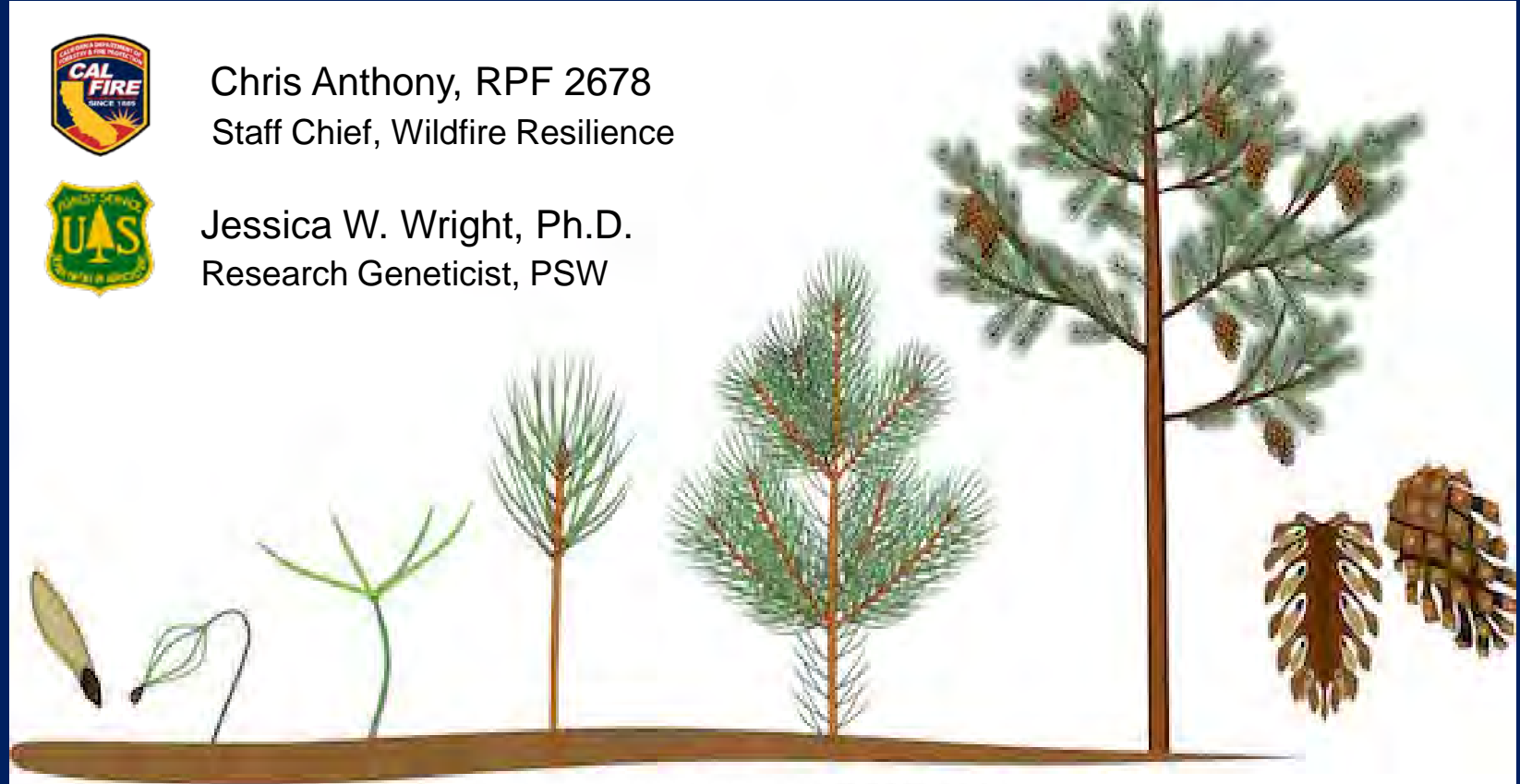
Adapting to and Planning for a Changing Climate



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WILDFIRE RESILIENCE PROGRAM

LEWIS A. MORAN REFORESTATION CENTER



CONE COLLECTION AND CONE PROCESSING



SEED PROCESSING



SEED BANK



TREE MORTALITY



NURSERY OPERATIONS



**GREENHOUSE
RESTORATION**



CAMP FIRE



NURSERY OPERATIONS



CARR FIRE



WHISKEYTOWN LAKE NRA
OAK BOTTOM MARINA

NURSERY OPERATIONS





SHADE HOUSES



FUTURE GREENHOUSE





United States
Department of
Agriculture

Forest
Service

The California Seed Zone Map and Post-fire Reforestation in a Warmer Future

Jessica W. Wright

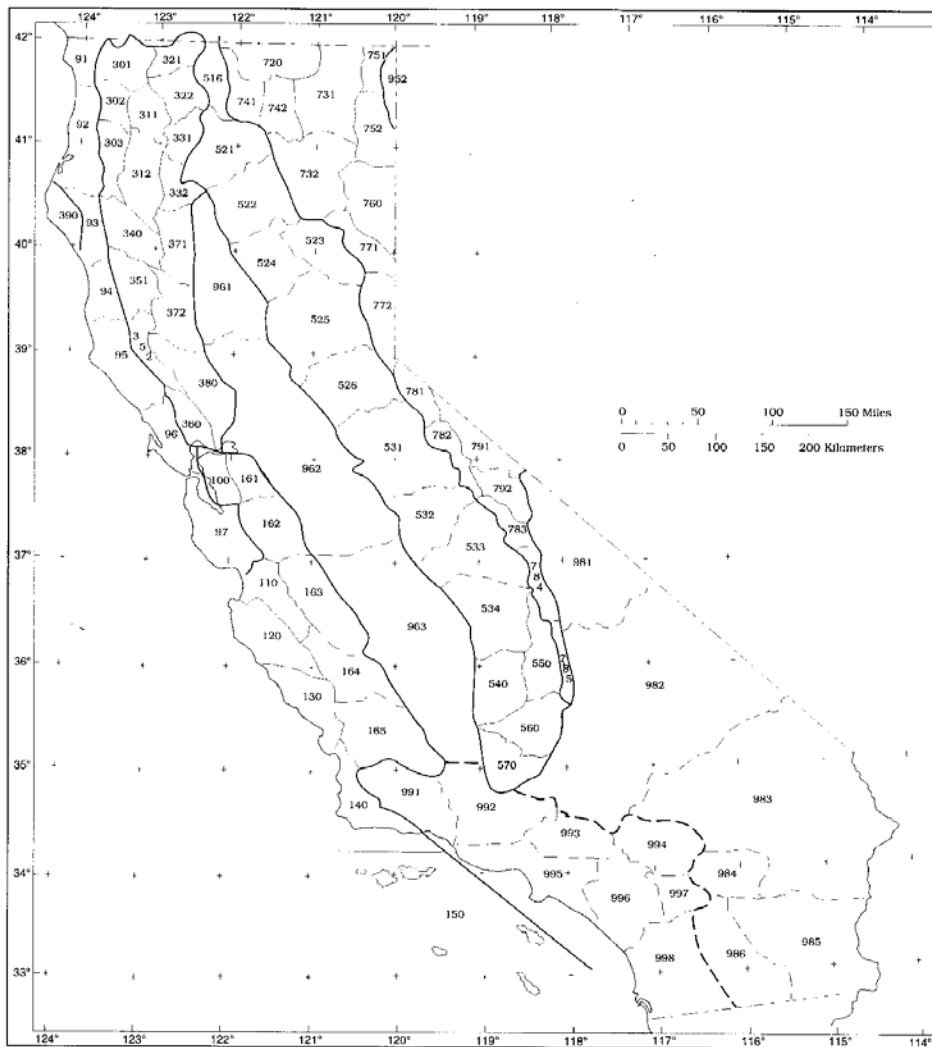
USDA Forest Service

Pacific Southwest Research Station

Davis CA

June 10, 2020

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Reforestation projects currently utilize Seed Zones:

- Pine seeds are moved safely within a 500 foot elevation band within each seed zone.
- Determine cone collecting needs for the region.
- Only one map for all tree species
- Goal: to develop provisional seed transfer guidelines based on the CA seed zone map to maximize the success and productivity of reforestation projects

CALFIRE funded collaborative approach

CALFIRE
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UC Davis:



Jim Thorne



Joseph
Stewart



Ryan
Boynton



Michelle Stern
(USGS/ UCD)

Questions

- What are the best seed sources for reforestation projects?
 - Provenance Test Data
- Is the California Seed Zone map the best approach?
 - Climate data sets

Testing on the ground: Provenance tests

- “Gold standard” for testing how trees grow in a novel climate
- Historical tests available
- New “operational” tests are being evaluated

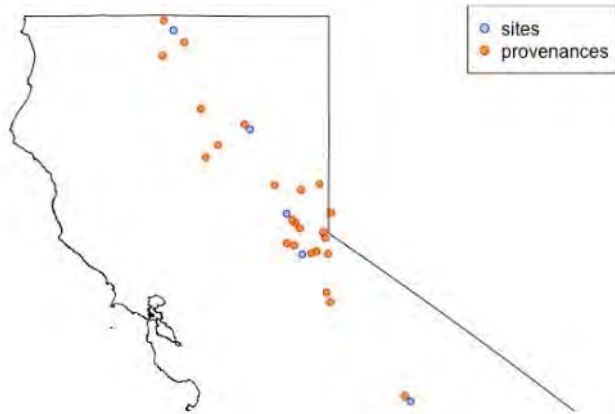


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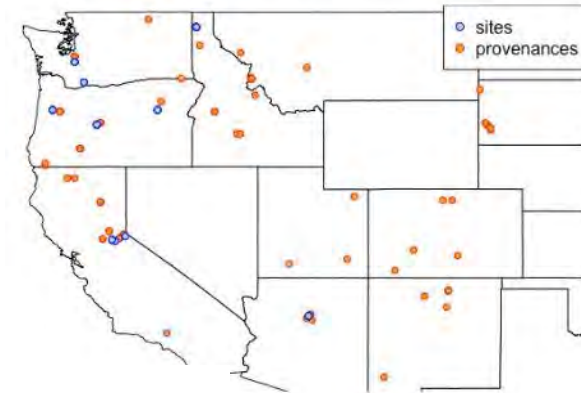
White fir



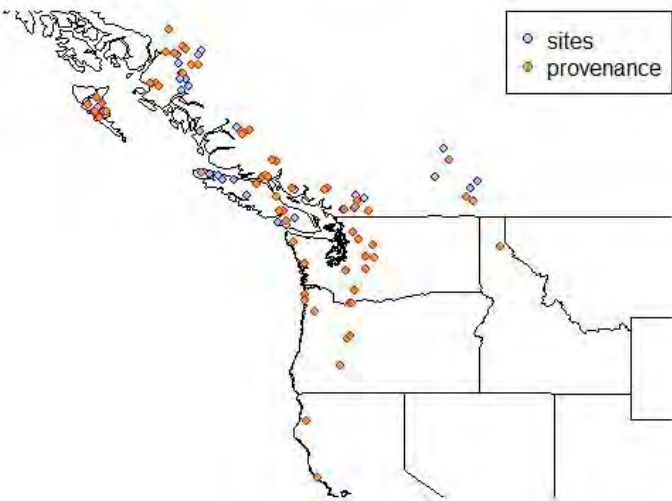
Douglas fir



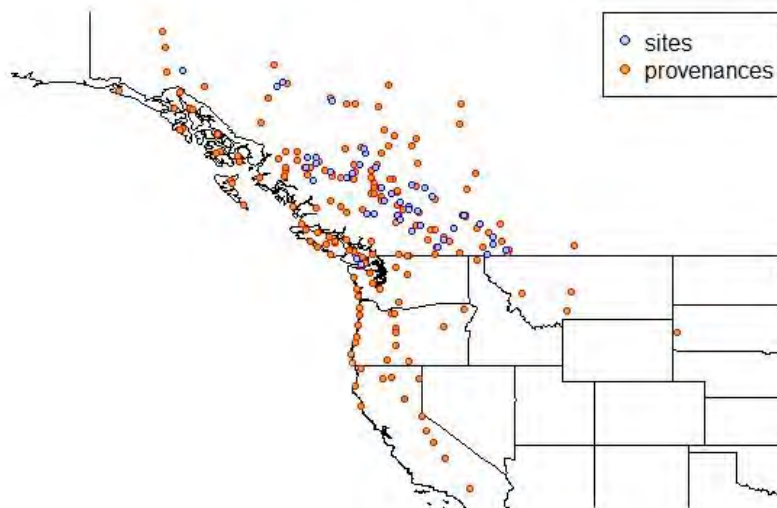
Ponderosa pine

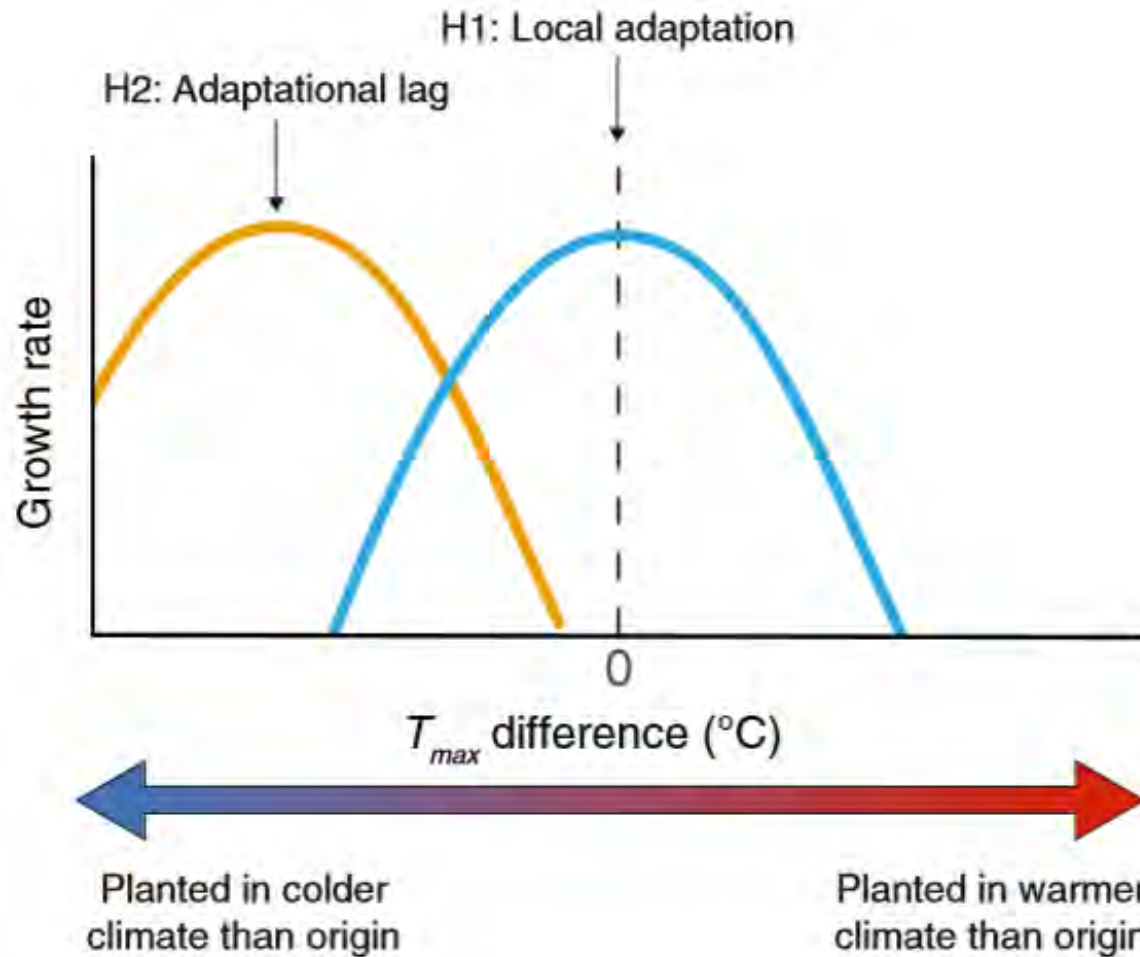


Western Hemlock

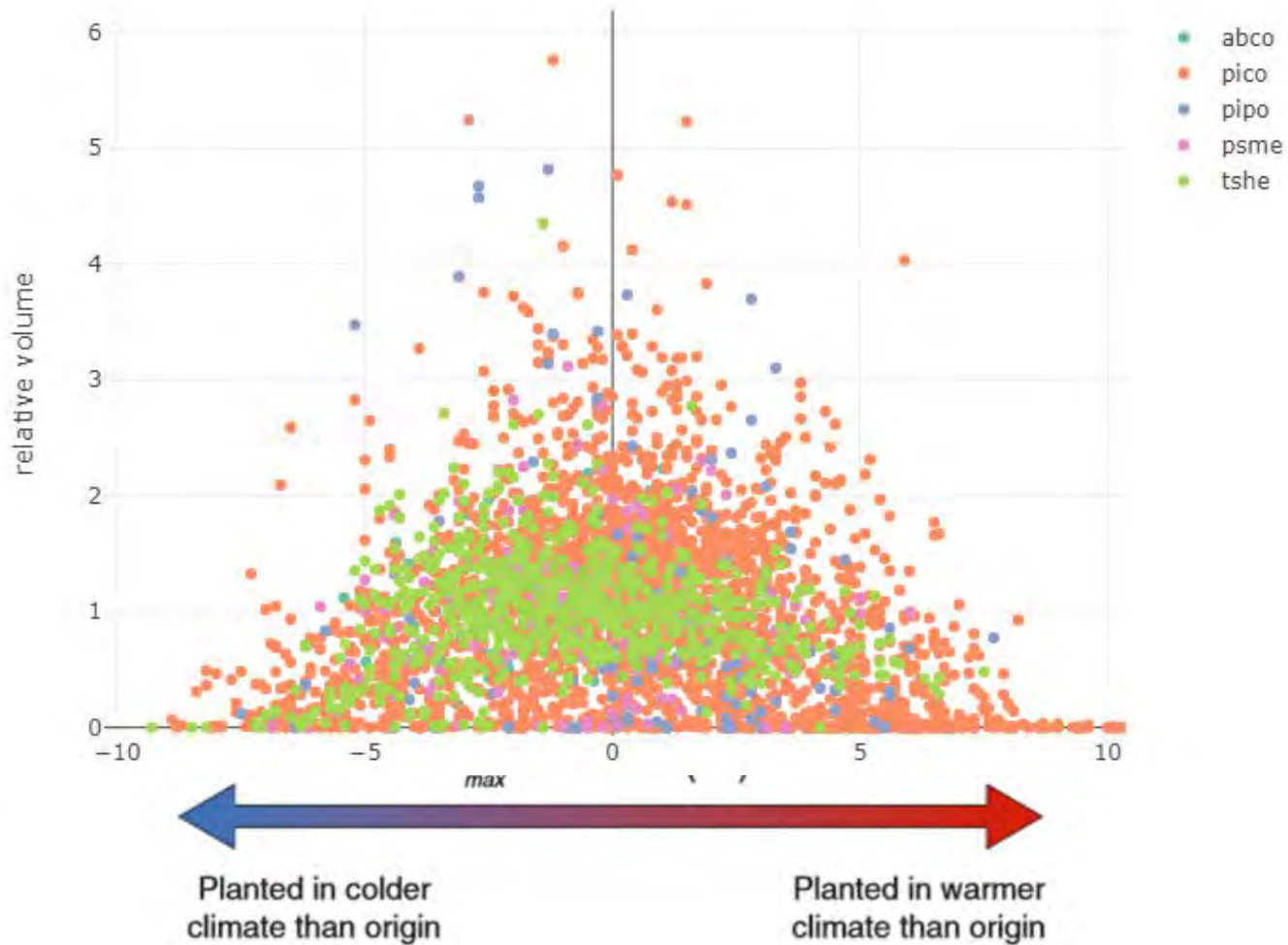


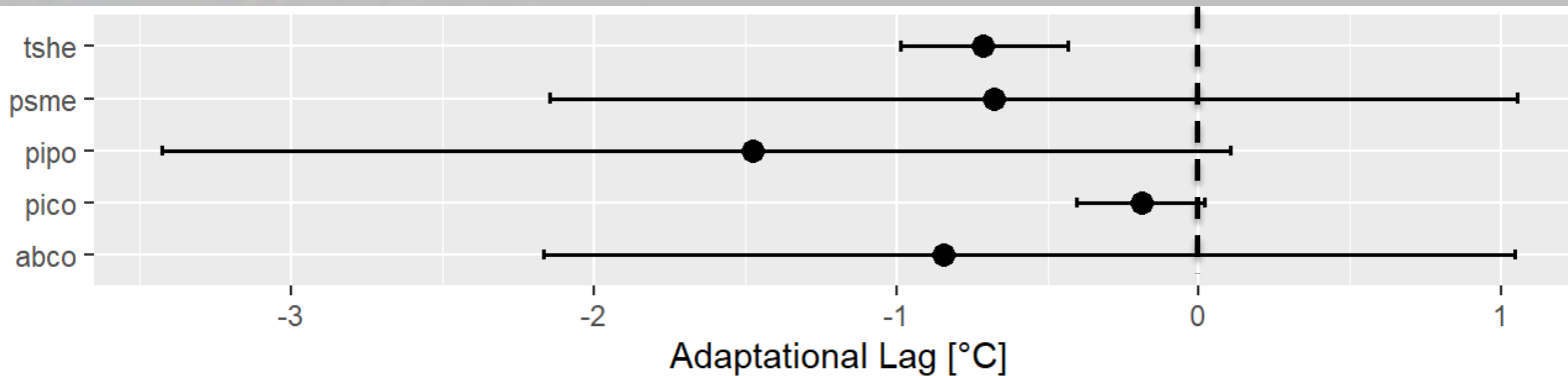
Lodgepole pine





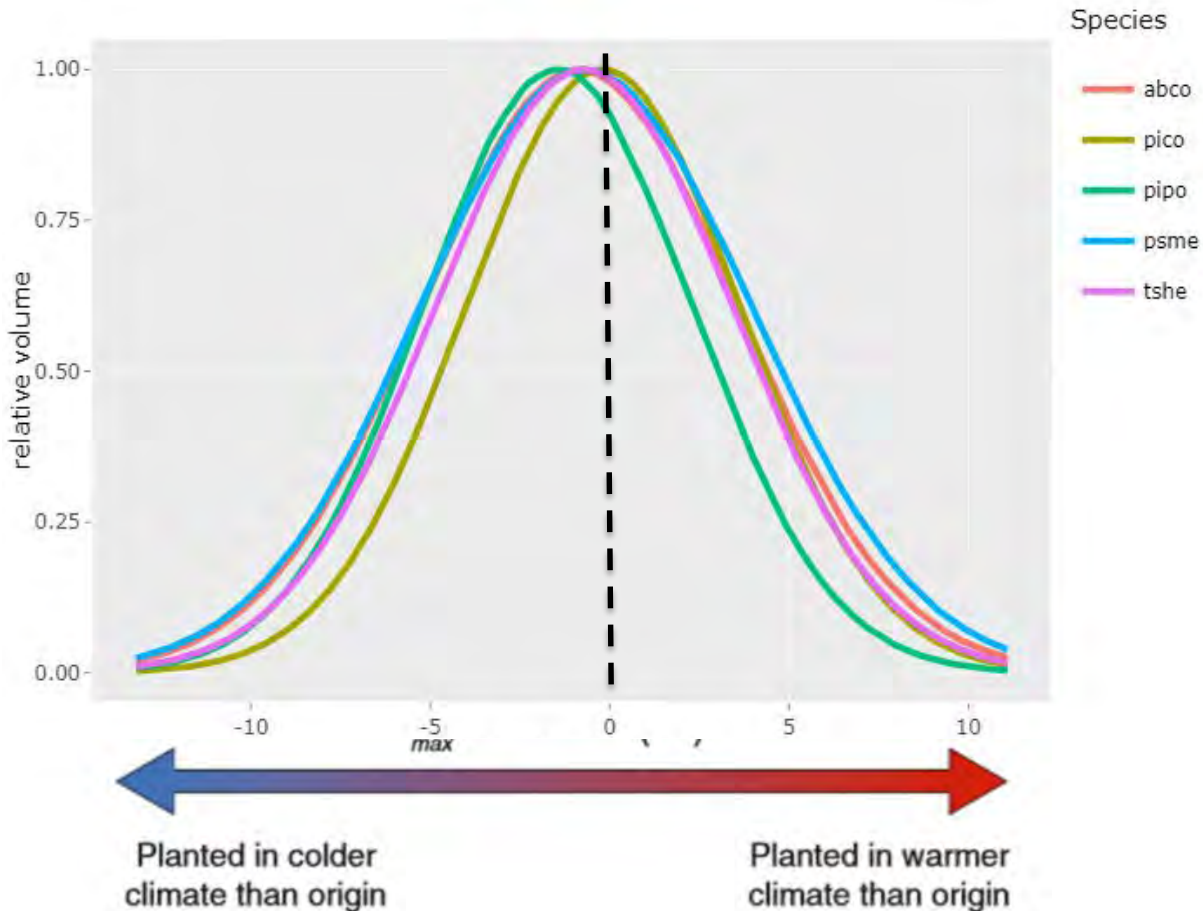
Data





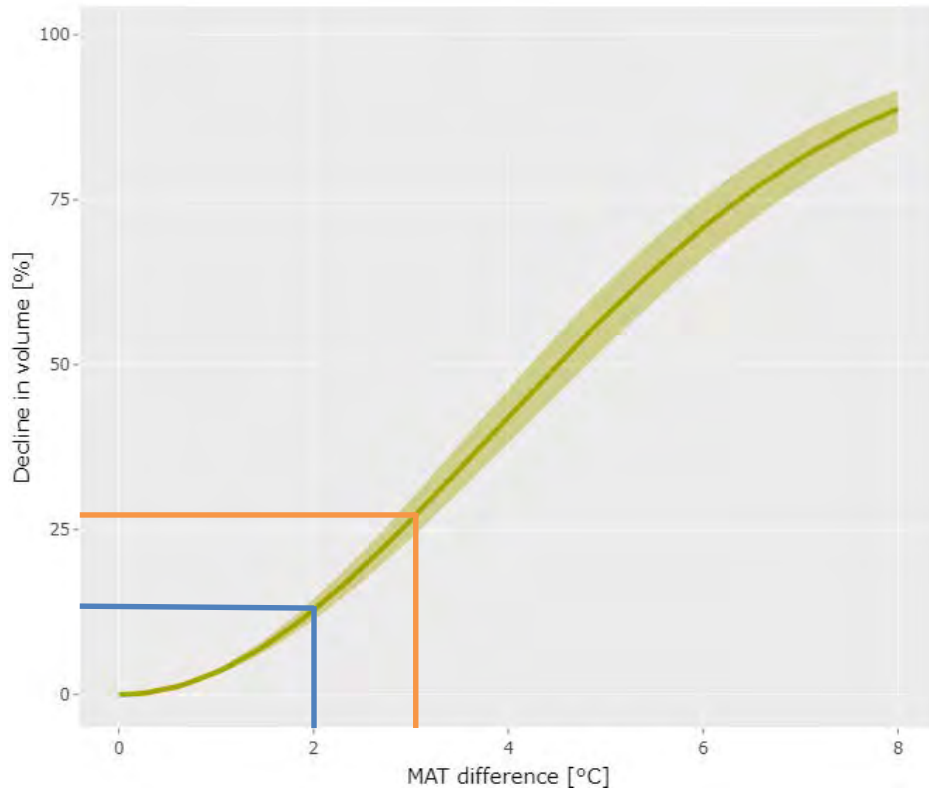
Evidence for adaptational lag in 5 conifer species

Important to consider in seed transfer- trees are already not adapted to the place where they are found but to a place with a colder climate

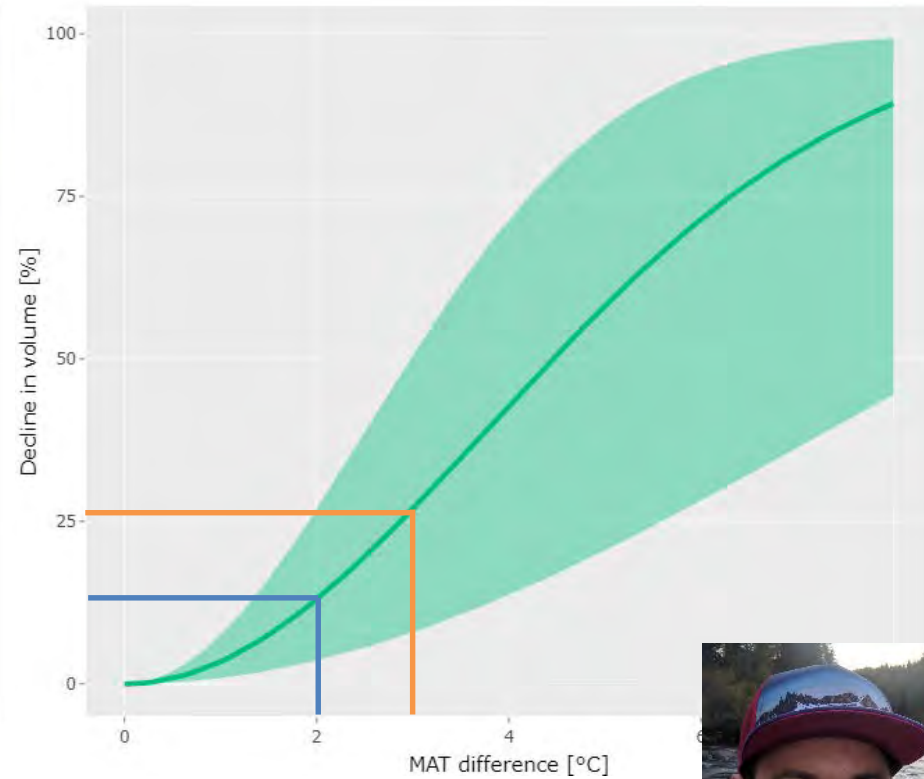


How much loss of tree volume can we expect if we don't move seeds?

P. contorta



P. ponderosa



Questions

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 - Climate data sets

CA Seed Zone Climate and Hydrology Datasets

Michelle Stern, UCD/USGS

Ryan Boynton, UCD

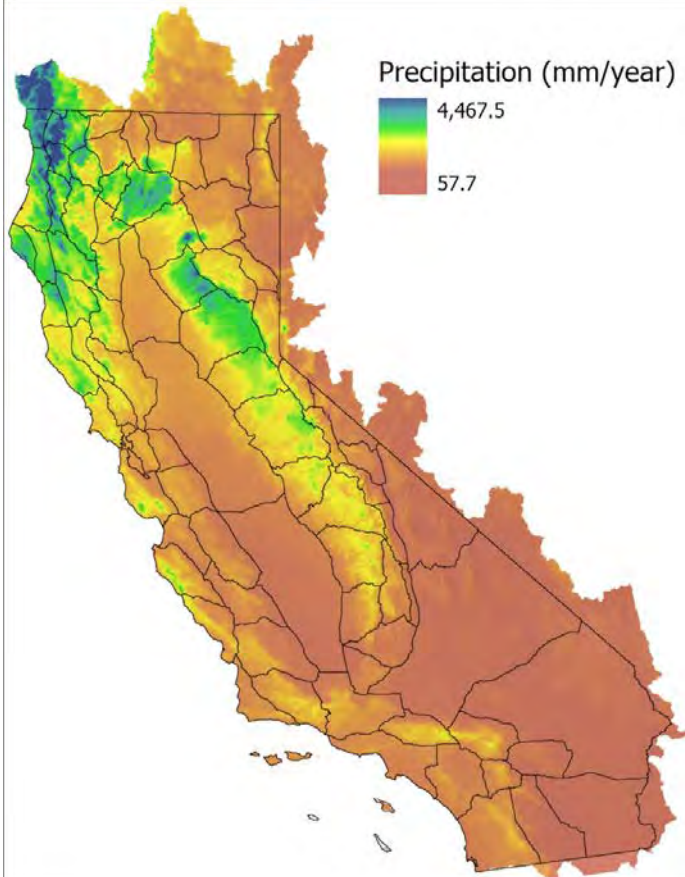
Lorraine Flint, USGS

Alan Flint, USGS



Station-based gridded climate data sets :

- PRISM
- TopoWx
- DayMet
- Livneh
- VIC
- ClimateNA
- CRU



Data Set Properties:

- Native Resolution
 - 800m-40km
- Available Time Period
 - 1895-2020
- Downscaling/ interpolation method
 - Range of regression and other modeling approaches
- Lapse Rate
 - Change in temp due to elevation
 - Fixed or variable
- Time step
 - Daily/monthly
- Future Scenarios
 - RCP 4.5, 8.5 etc
- Bias Correction methods
 - Livneh quartiles, none etc
- Variables included
 - Temperature, precipitation

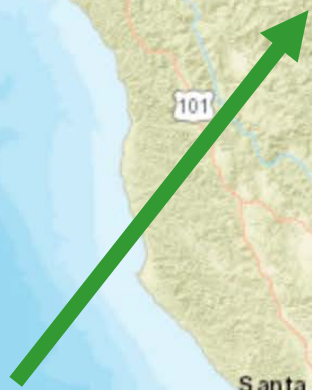




Seed zone and elevation bands with matching climate in 1981-2010

**Seed zone 526,
4000-4500ft**





**Seed zone 526,
4000-4500ft**

Seed zone and elevation bands with matching climate in 2039-2069 (hot/dry model)



Take home messages



- The California Seed Zone map has been used since the 1970s as a guide for seed transfer in reforestation projects
 - Only one map for all species
 - No way to account for a changing climate

CALFIRE/USFS/UC Davis/USGS

- Exploring how seed transfer using the map will be impacted by a changing climate
- Expanding what data is available for deciding where to get seed sources
- Results will help inform seed transfer and maximize the use of seed in the CALFIRE and USFS Seed Banks.