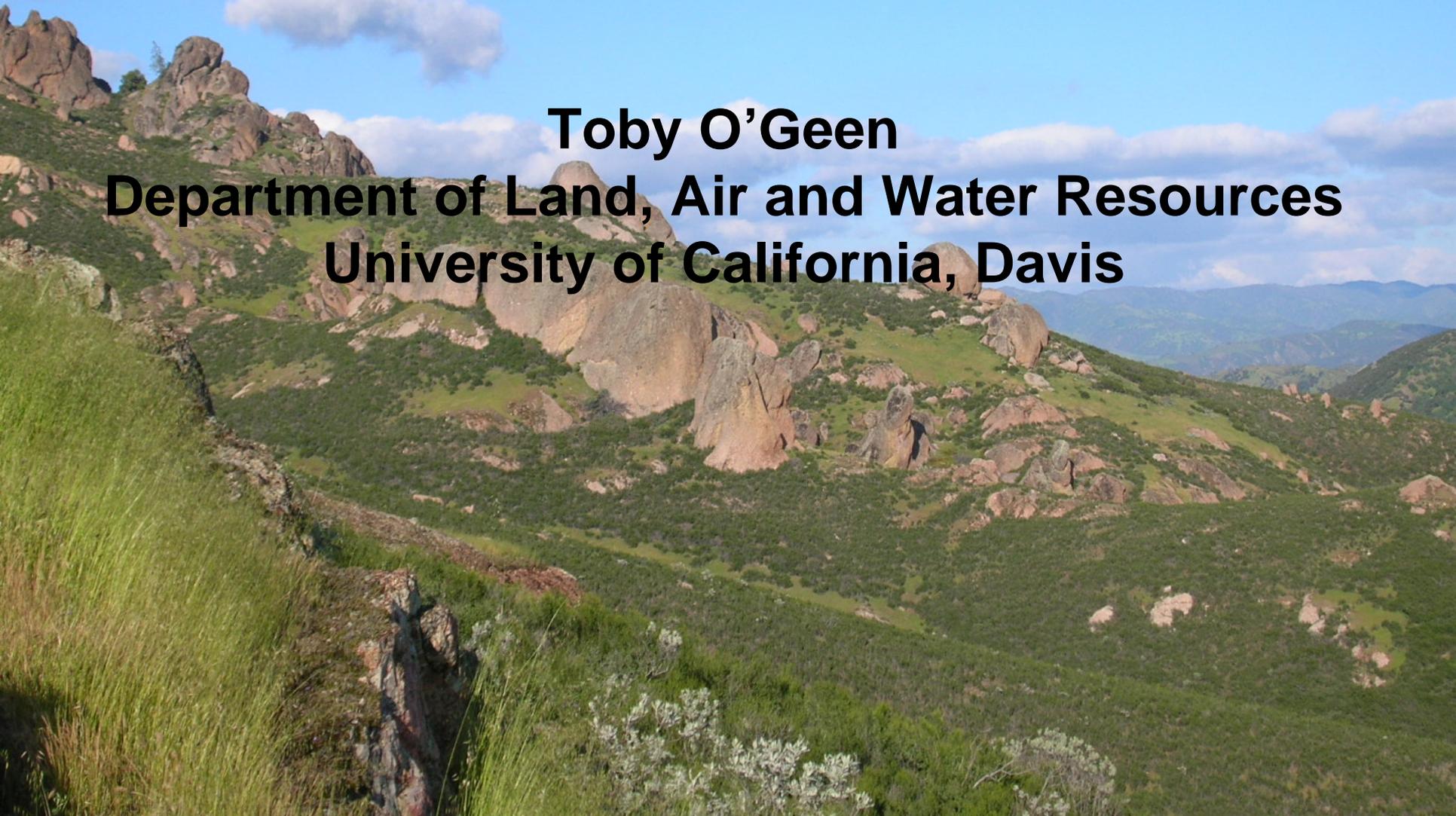


A New CREES Multistate Research Project: Benchmark Soilscales to Predict Effects of Climatic Change in the West

Toby O'Geen
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University of California, Davis

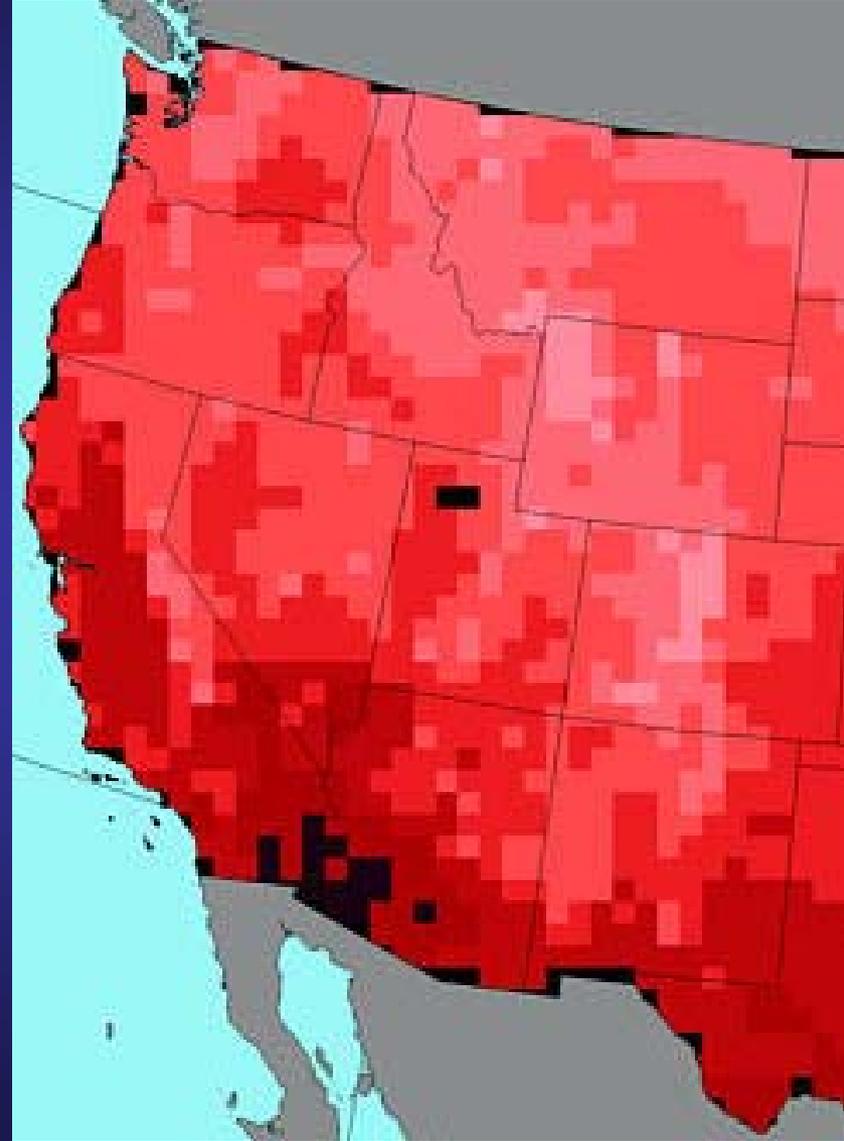
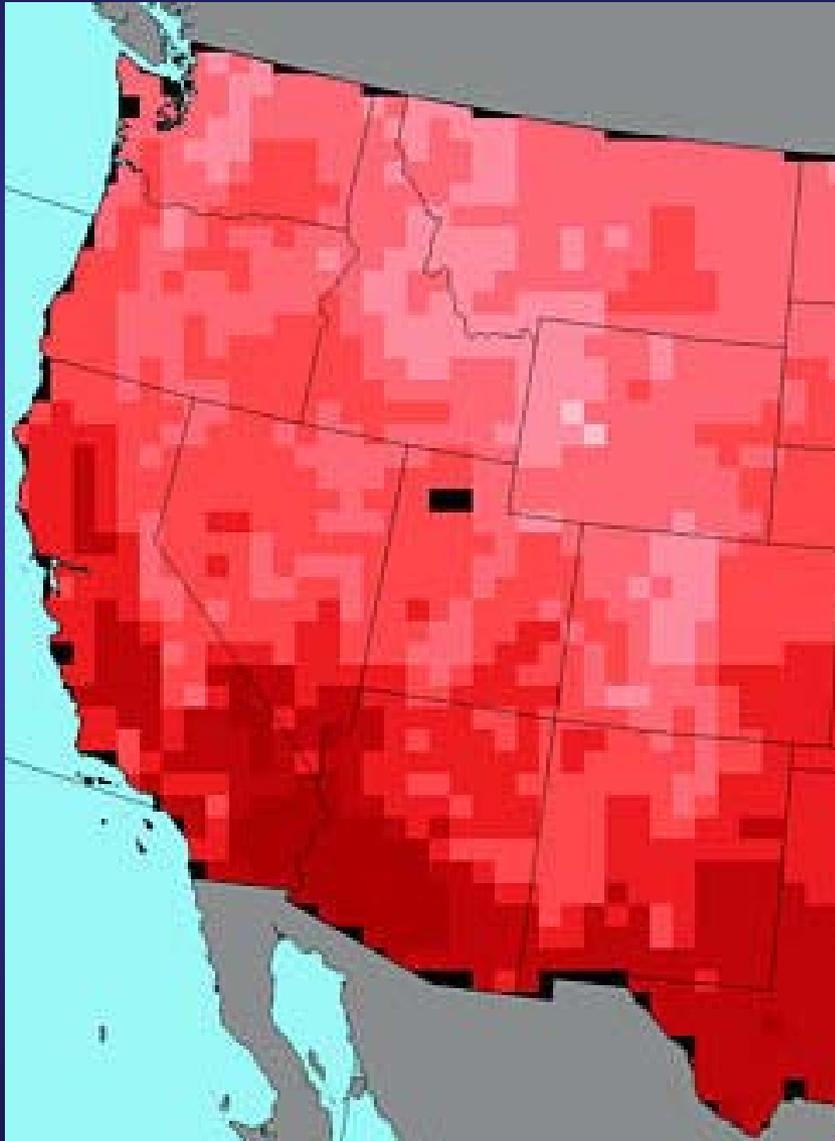
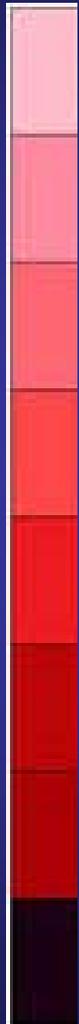


Climate Change: Mean Annual Maximum Temp.

2000

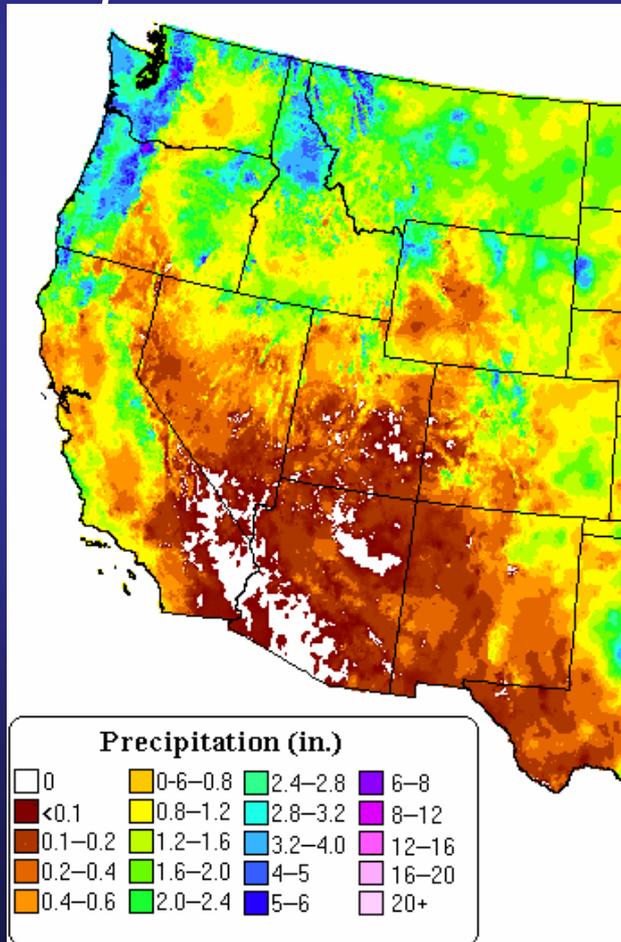
2099

°C

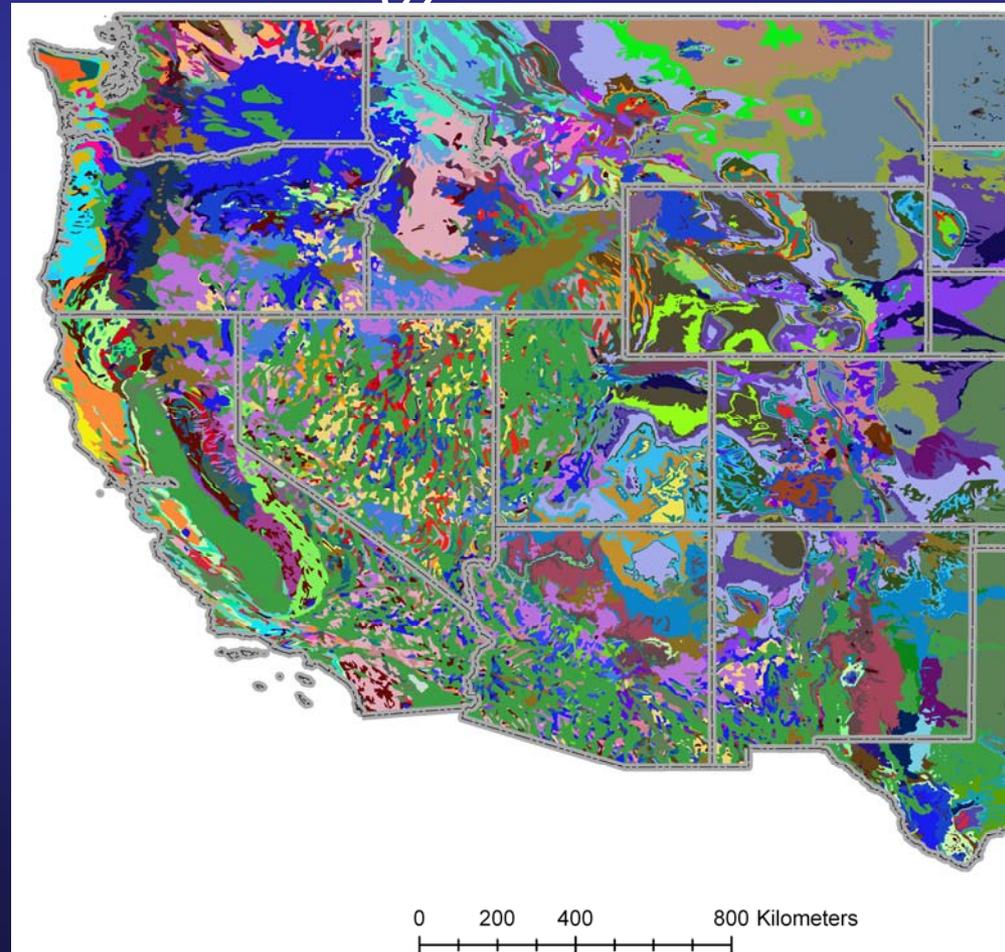


Use the variation in climate and parent materials in the west as a natural laboratory to study the impacts of climate change on soil and ecosystem services regulated by soil.

Precipitation in March



Geology of Western US



Objective 1

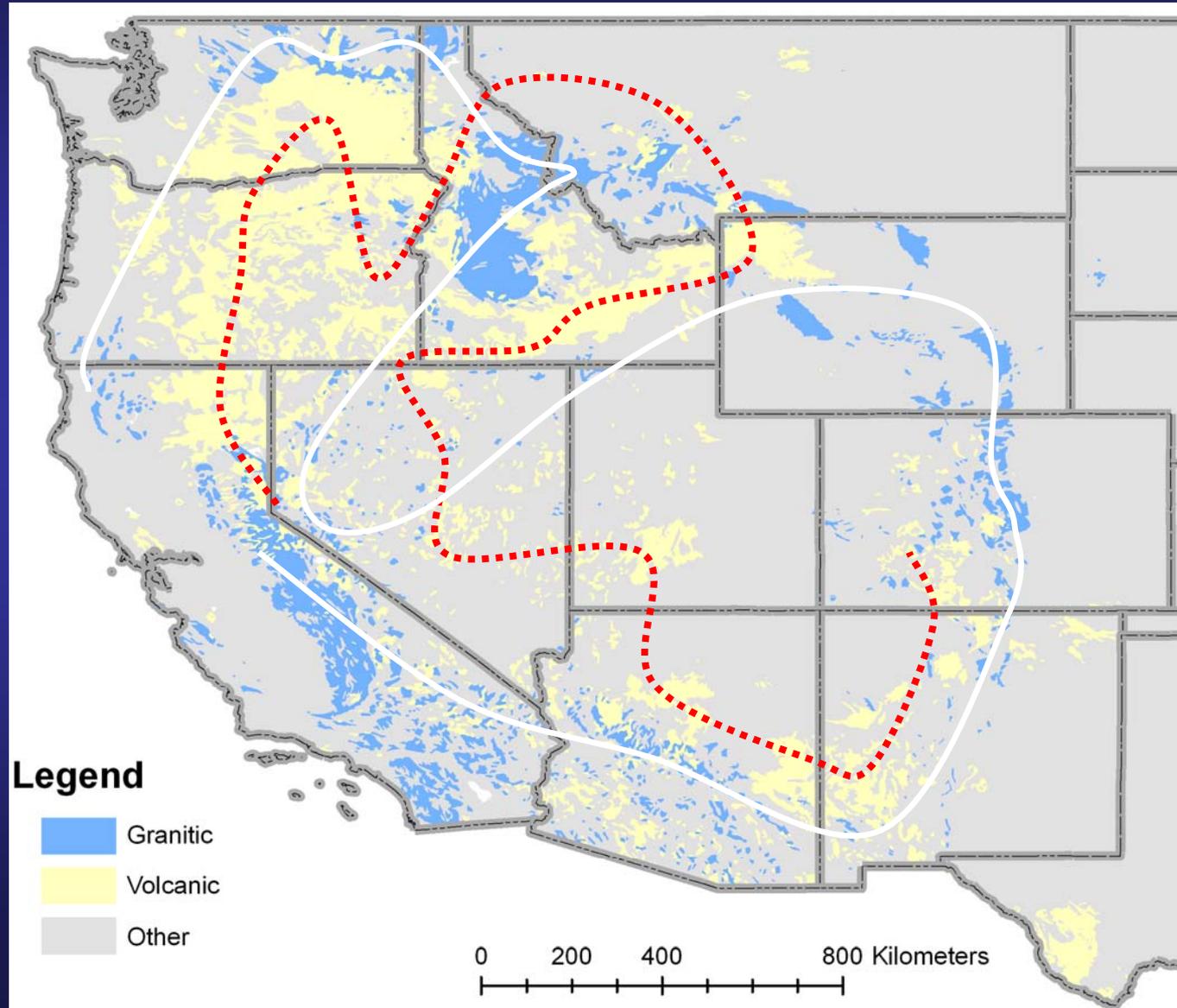
- **Establish benchmark soilscares to serve as study sites that fit into one of two regional bioclimatic sequences.**

1) Transported materials

2) Granitic or volcanic

Hypothetical bioclimatic sequences of benchmark soilscapes in the west

..... Volcanic
— Granite



Objective 2

- **Characterize biogeochemical, mineralogical, physical and morphological properties of soils**



- **Field support from regional offices**



- **Soil Survey Laboratory support for lab analysis**

Objective 3

- Monitor soil temperature and soil moisture (primary climatic drivers of pedogenesis).
 - Link monitoring to soil properties and measurable soil forming processes



Objective 4

- **Conduct experiments that quantify the impacts of soil forming processes on ecosystem services:**

Soil Forming Processes

Weathering & secondary mineral formation

Organic matter accumulation

Leaching

Bioturbation and effects of soil fauna

Ecosystem Services

Nutrient cycling

Carbon storage

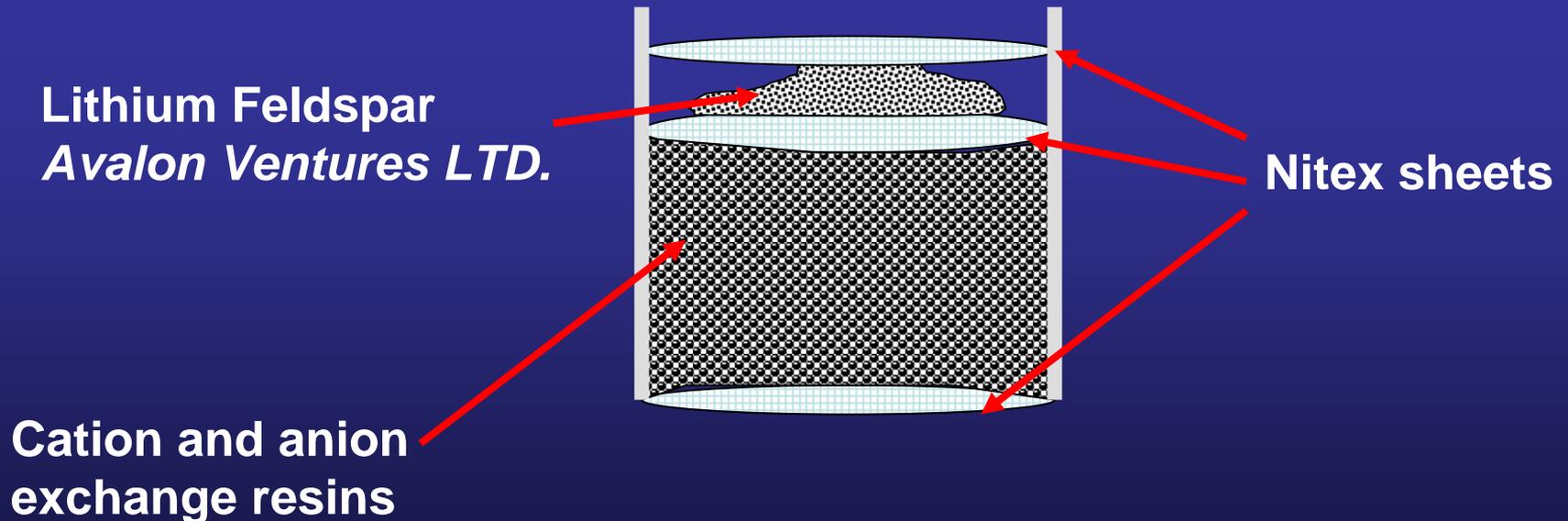
Biodiversity

Regulation of quantity and quality of water supply

Weathering Intensity: Lithium Feldspar Decomposition

Nutrient cycling

Ion exchange resin soil solution lysimeter



Degree of Leaching

regulation of quality and quantity of water supply

Dissolution of gypsum cylinders



Organic Matter Decomposition

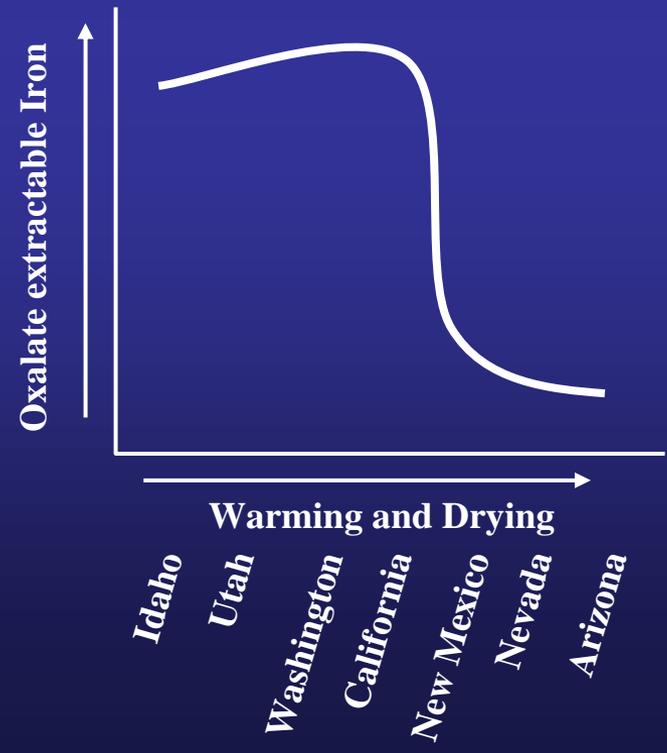
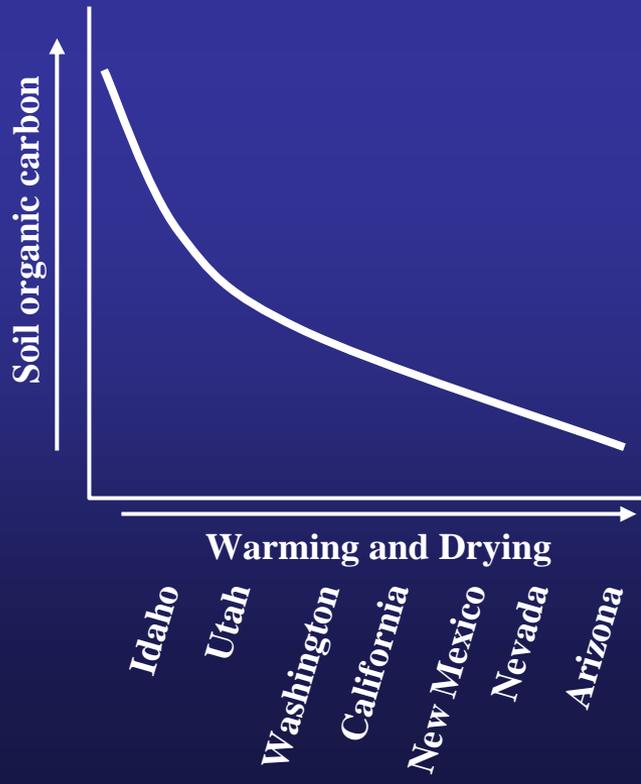
Nutrient cycling and fate of carbon



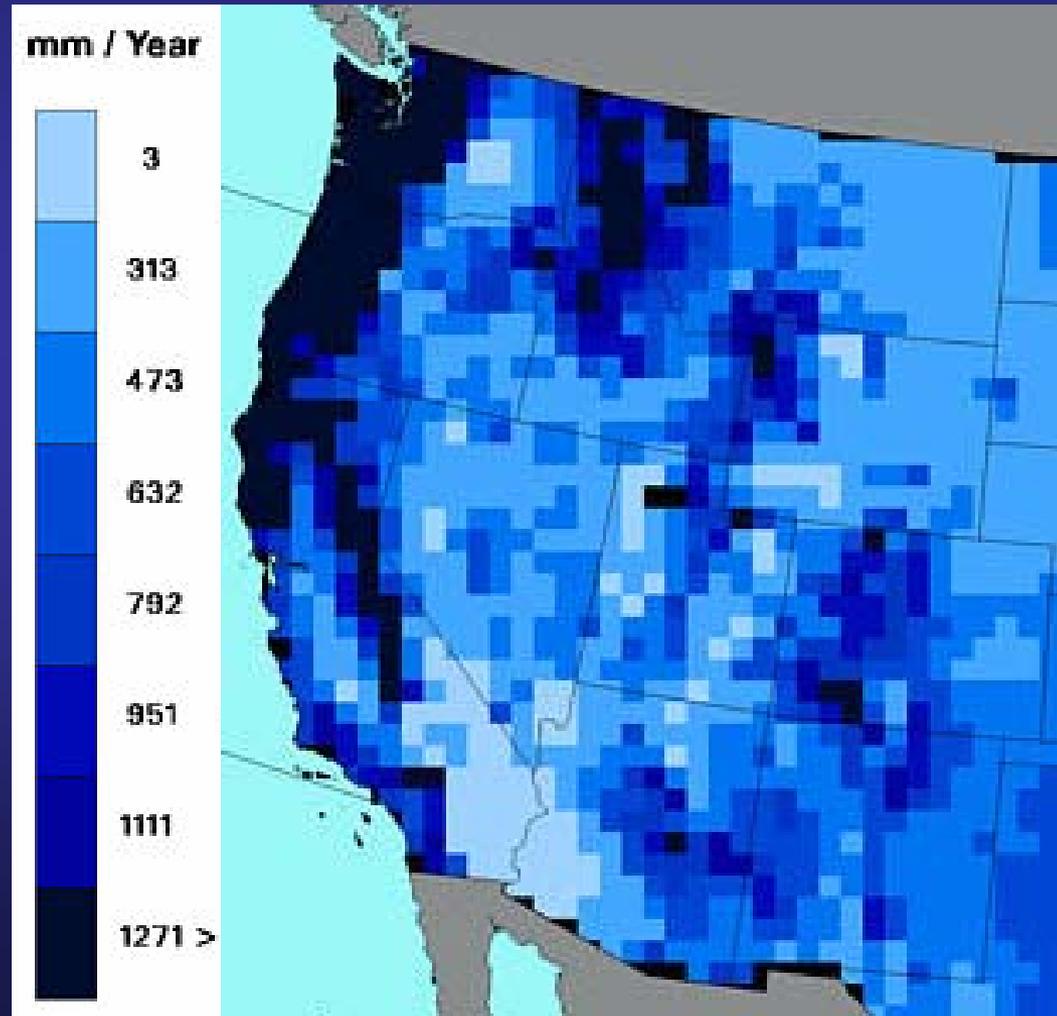
1) Stake condition before insertion, 2) 6 months, 3) 1 year, 4) 1.5 years, 5) 2.0 years. USDA Forest Service Rocky Mountain Research Station.

Objective 5

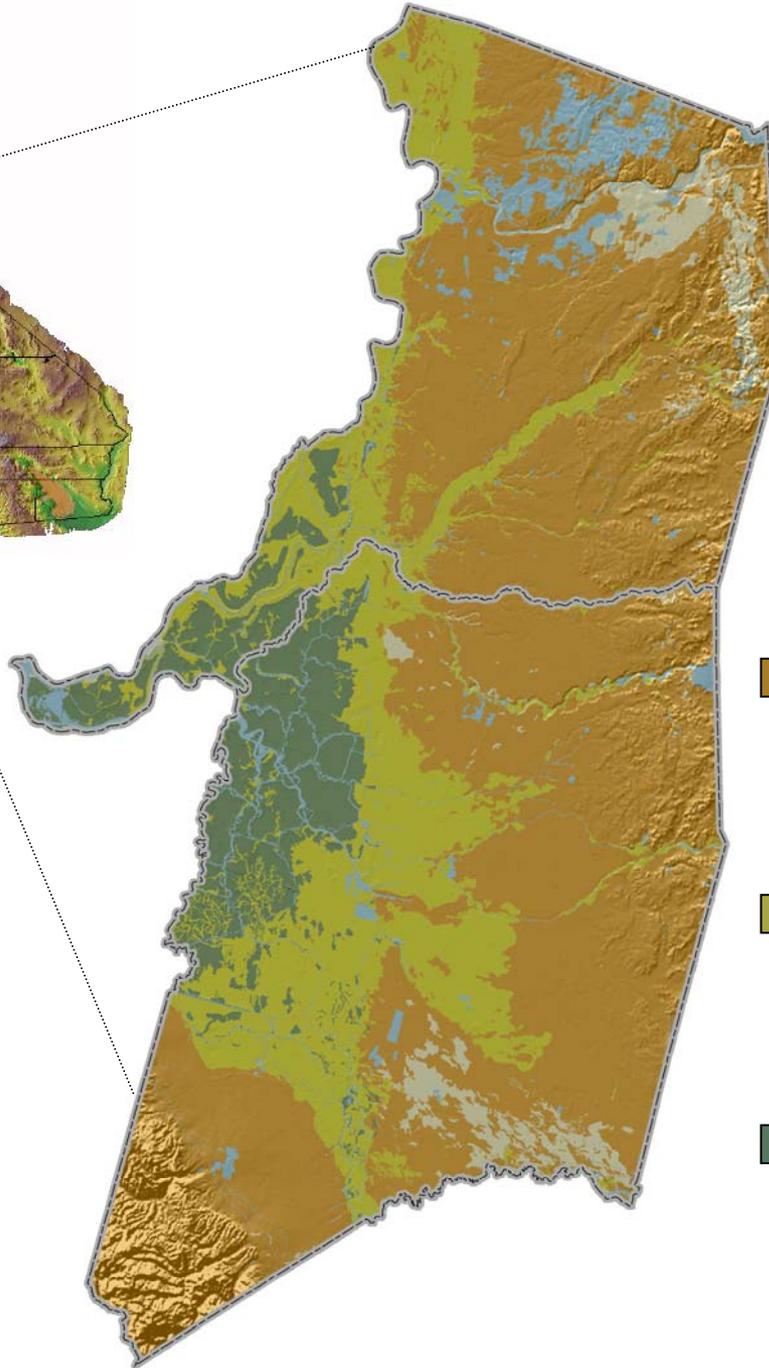
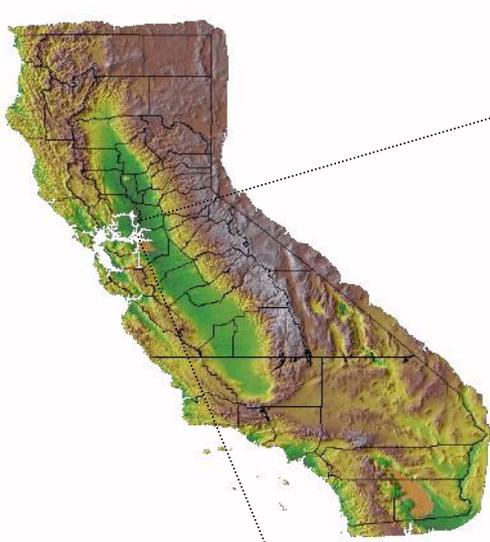
- Model impacts of climate on soil processes and ecosystem services regulated by soil.
 - Emphasize pedogenic thresholds that influence the timing and direction of soil and environmental change.



**Link climate model predictions with our findings
to better understand the consequences of
regional environmental change.**

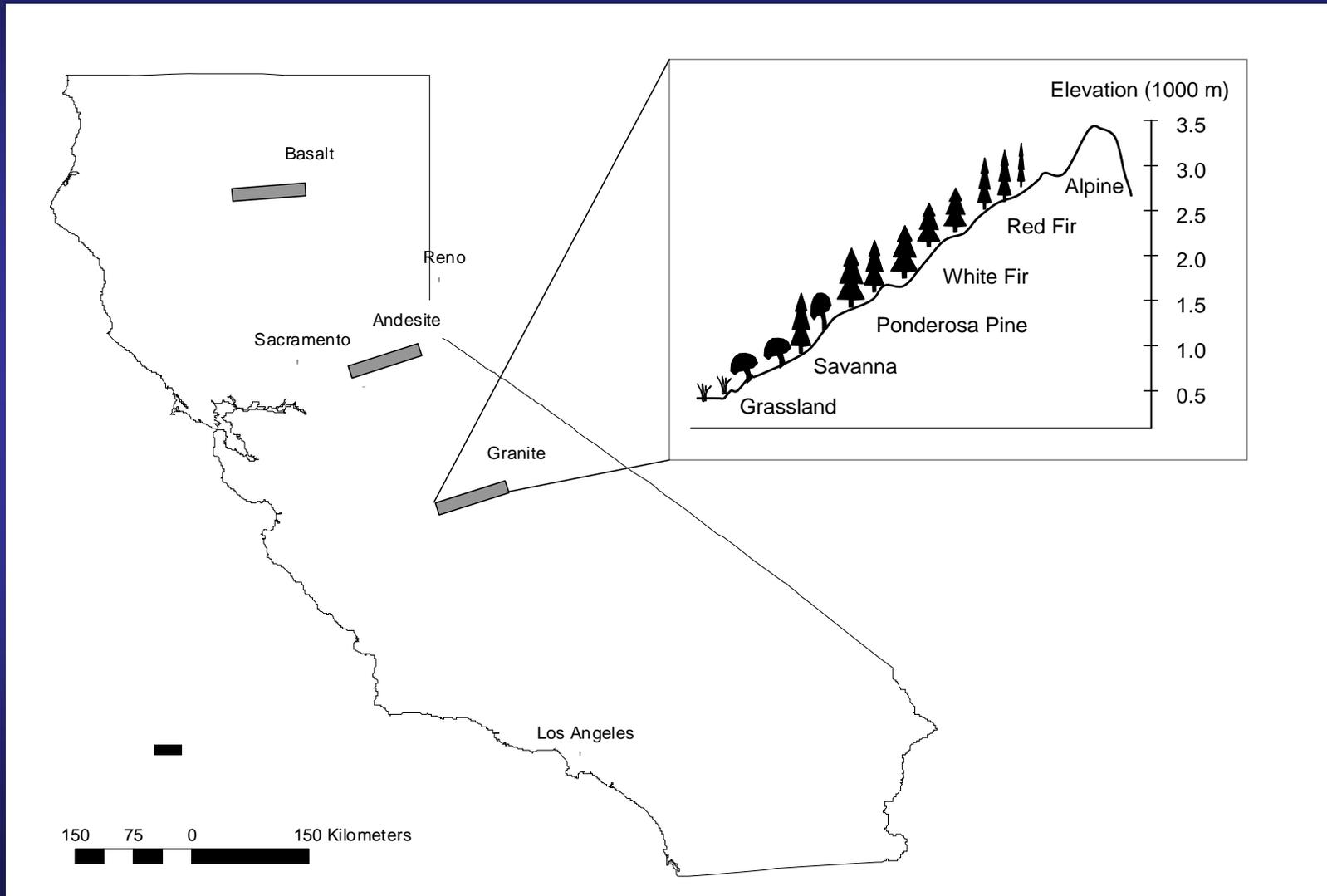


What is a benchmark soilscape?



- Old dissected terraces and alluvial fans
(Redding, San Joaquin, Corning)
- Recent alluvium and basin rim deposits
(Tokay, Columbia, Kingdon)
- Smectitic Basin Alluvium
Stockton, Capay

Example of a developmental sequence within the regional project



Biodiversity

Process: Bioturbation, organic matter accumulation



Background

Multistate Research Projects are administered by State Agricultural Experiment Station Directors and Cooperative State Research, Education and Extension Service USDA CREES.

Limited funds, regional problems, proof of concept for grants

In the past western pedologists were funded to support NCSS with no specific research question required.