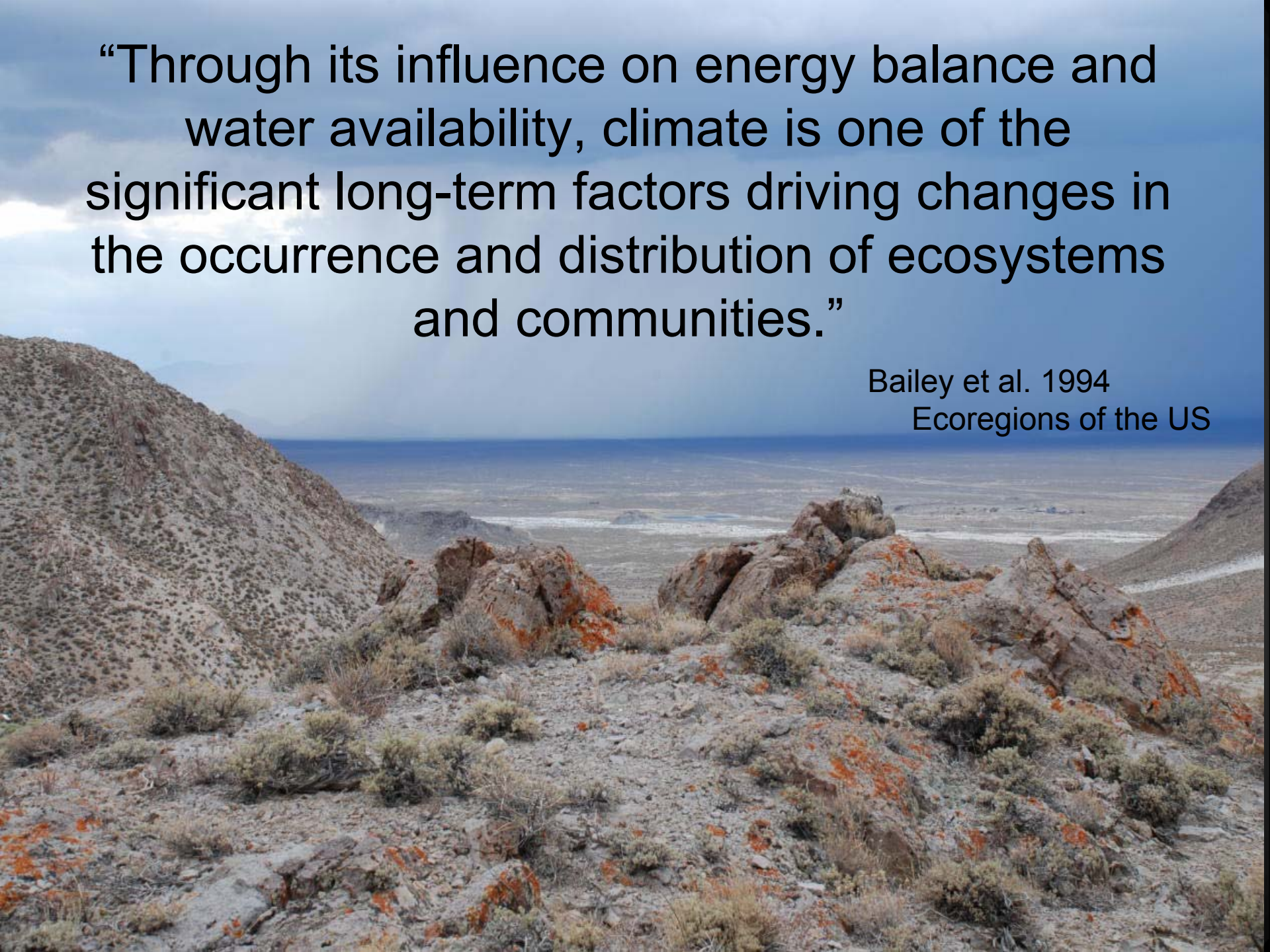
Preparing for the Future by Looking at the Past

or is it

Asking the Right Scientific Questions?

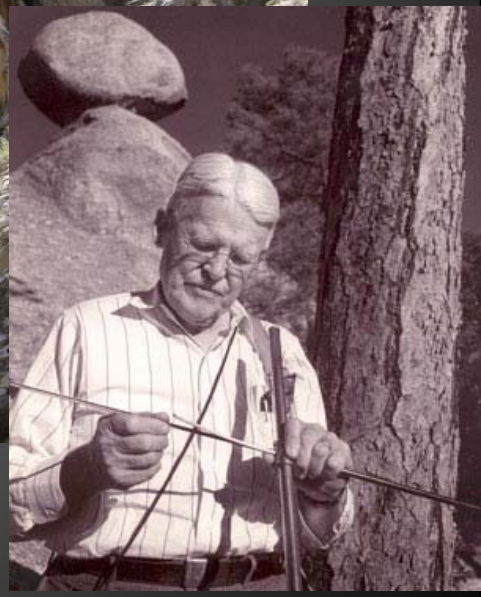
Rick Miller
Eastern Oregon Agricultural Research Station
Oregon State University



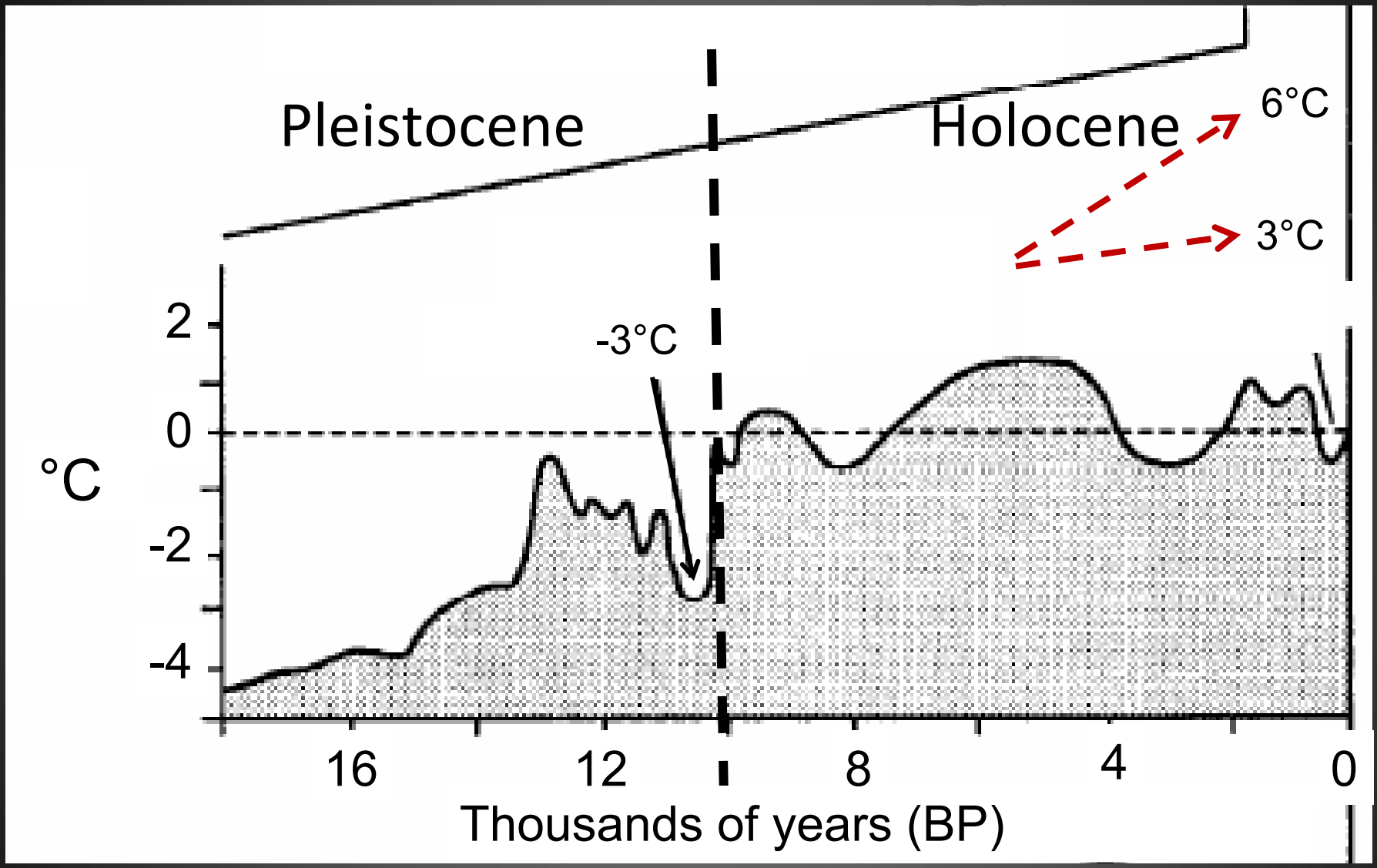
"Through its influence on energy balance and water availability, climate is one of the significant long-term factors driving changes in the occurrence and distribution of ecosystems and communities."

Bailey et al. 1994
Ecoregions of the US

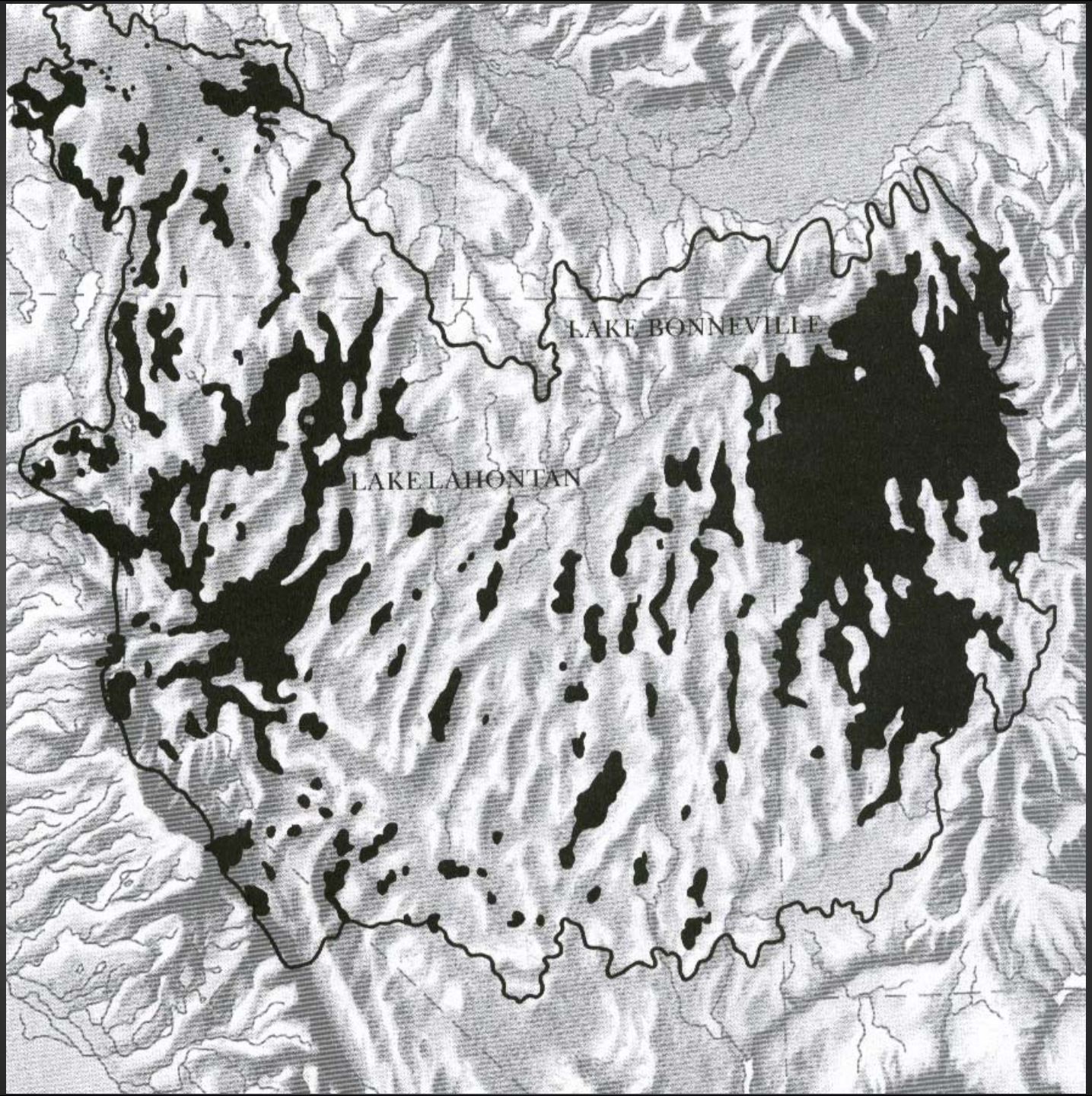
Bristle Cone in the White Mountains - 8,700 tree ring record



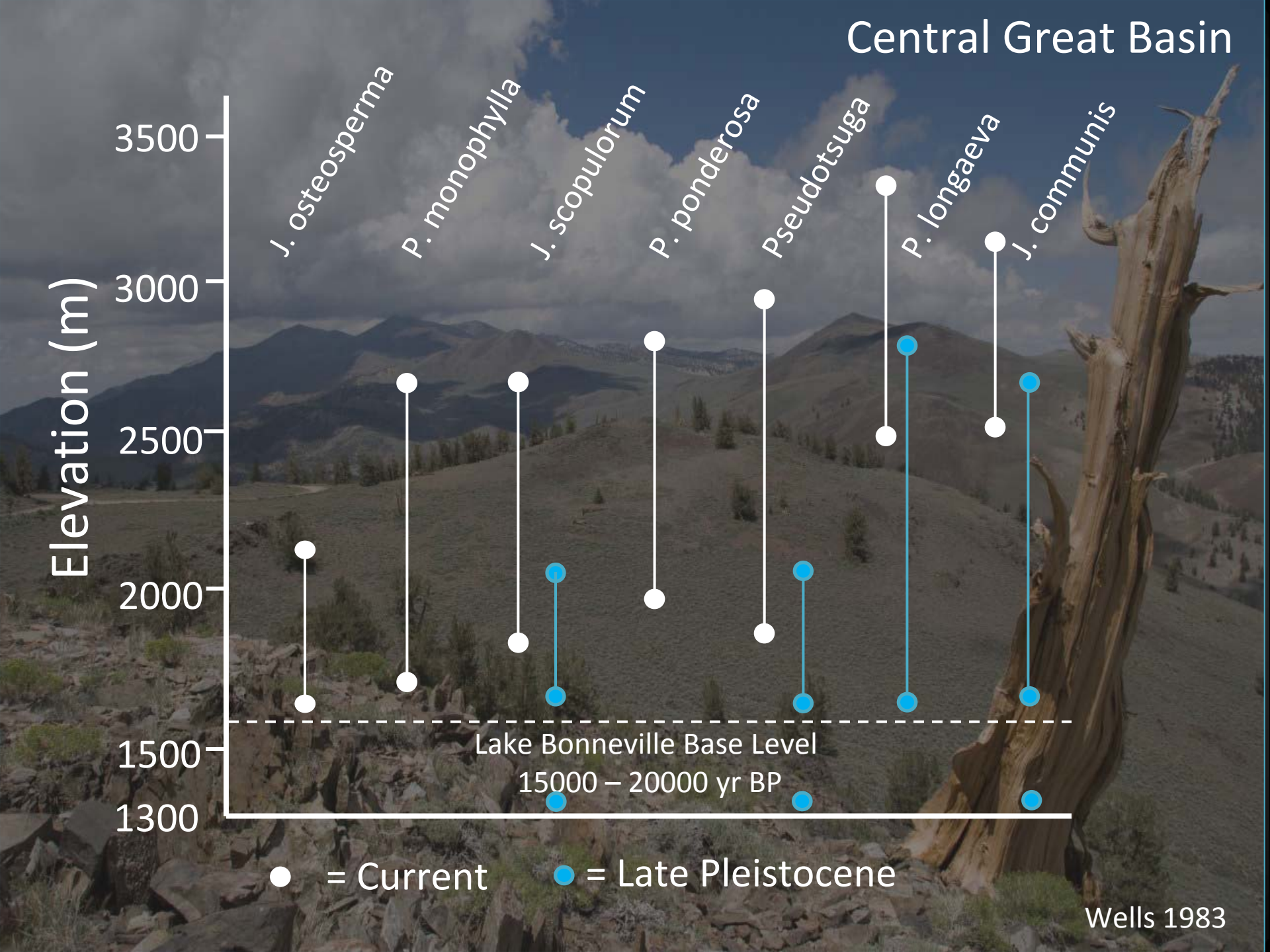
A.E. Douglas father of dendrochronology



From Eddy and Bradley 1991
& Tausch et al. 1993


LAKE BONNEVILLE
LAKE LAHONTAN

Elevation: [~3°C (500 m)−1].

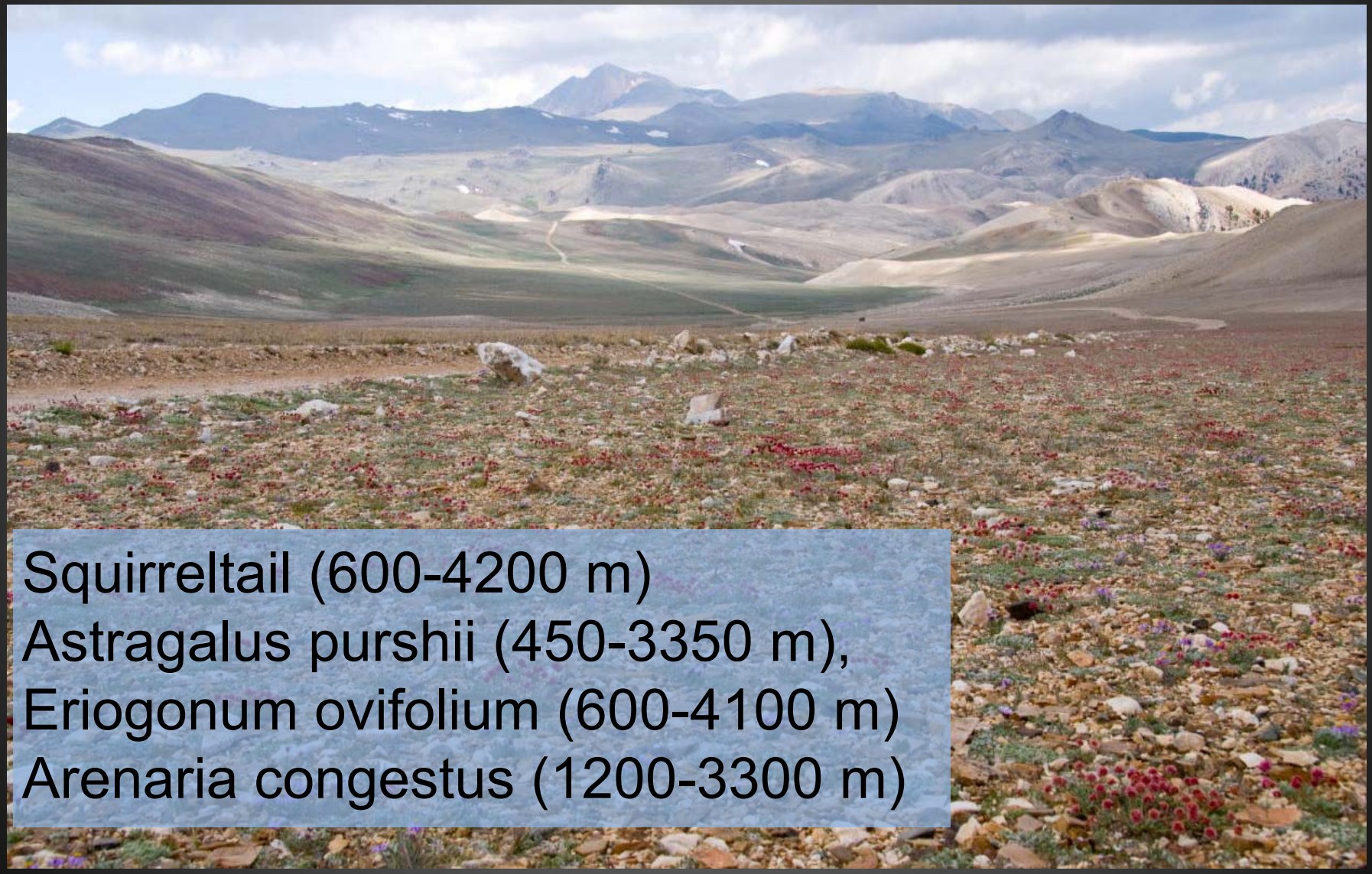

Central Great Basin
Elevation (m)
3500
3000
2500
2000
1500
1300
J. osteosperma
P. monophylla
J. scopulorum
P. ponderosa
Pseudotsuga
P. longaeva
J. communis
Lake Bonneville Base Level
15000 – 20000 yr BP
= Current
= Late Pleistocene
Wells 1983

Temperature = +1.5°C to -1°C
Precipitation amounts and season

Migration, Adaptation, Extinction

Movement of upper tree line response to temperature

Ecological Amplitude
White Mountains 3500 m

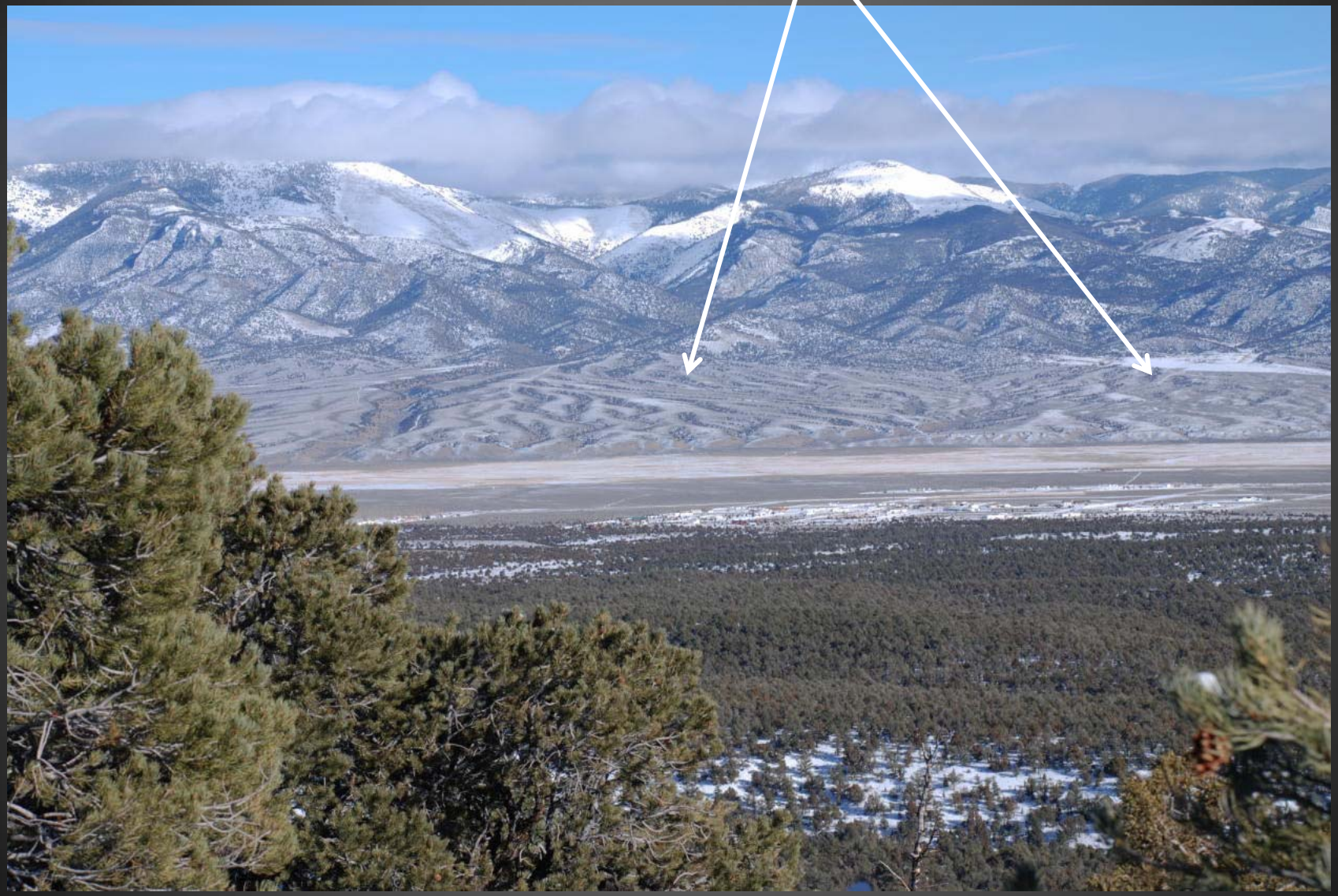


Alpine & Subalpine species

Raspberry buckwheat (*Eriogonum gracilipes*) confined to dolomite areas in the subalpine and alpine, 3,000 to 4,000 m (10,000 – 13,000 ft)

Drought = decline in vegetation cover & increased erosion

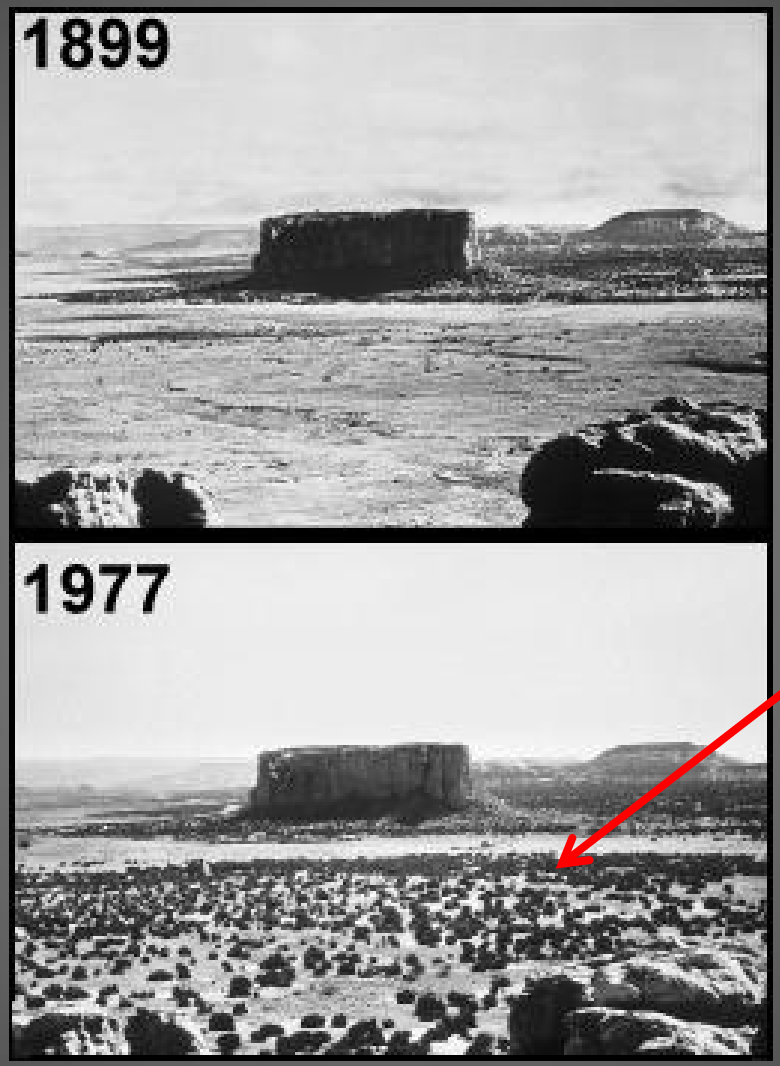
Building of Alluvial Fans



Transition Period

- Late 1800s: end of the Little Ice Age
- End of native burning, hunting, and food gathering
- Large build-up of livestock
- Decline in fire
- Introduction of new species
- Elevated CO_2 levels, and increasing air pollutants

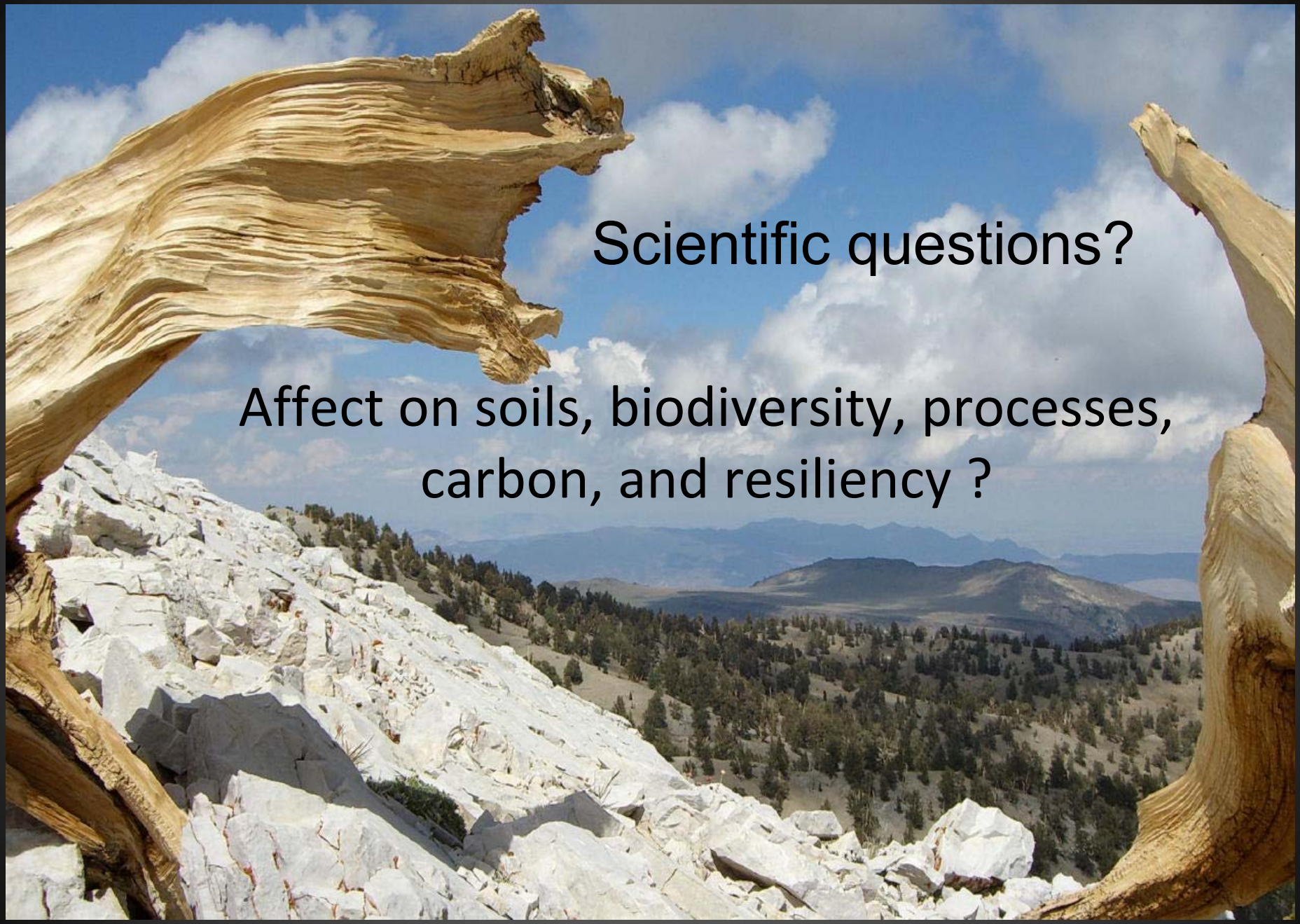
Large changes in vegetation



One-seeded juniper

Photo taken in 1899 by W. H. Jackson of Enchanted Mesa, 100 km west of Albuquerque, NM

Scientific questions?
What are the characteristics of desirable functioning communities?
What traits do species need?


Scientific questions?
Affect on soils, biodiversity, processes, carbon, and resiliency ?

Can we direct succession towards desirable trajectories?

New Steady States
(State-and-Transition Models)

Multiple Climate Scenarios

Current

I

II

III

IV

V

Climate models

Vegetation Tools?

< 250 mm (10 in)

Preparing for the plant communities of the future?