

The Tree-Ring Record of Drought over North America

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RD Griffin

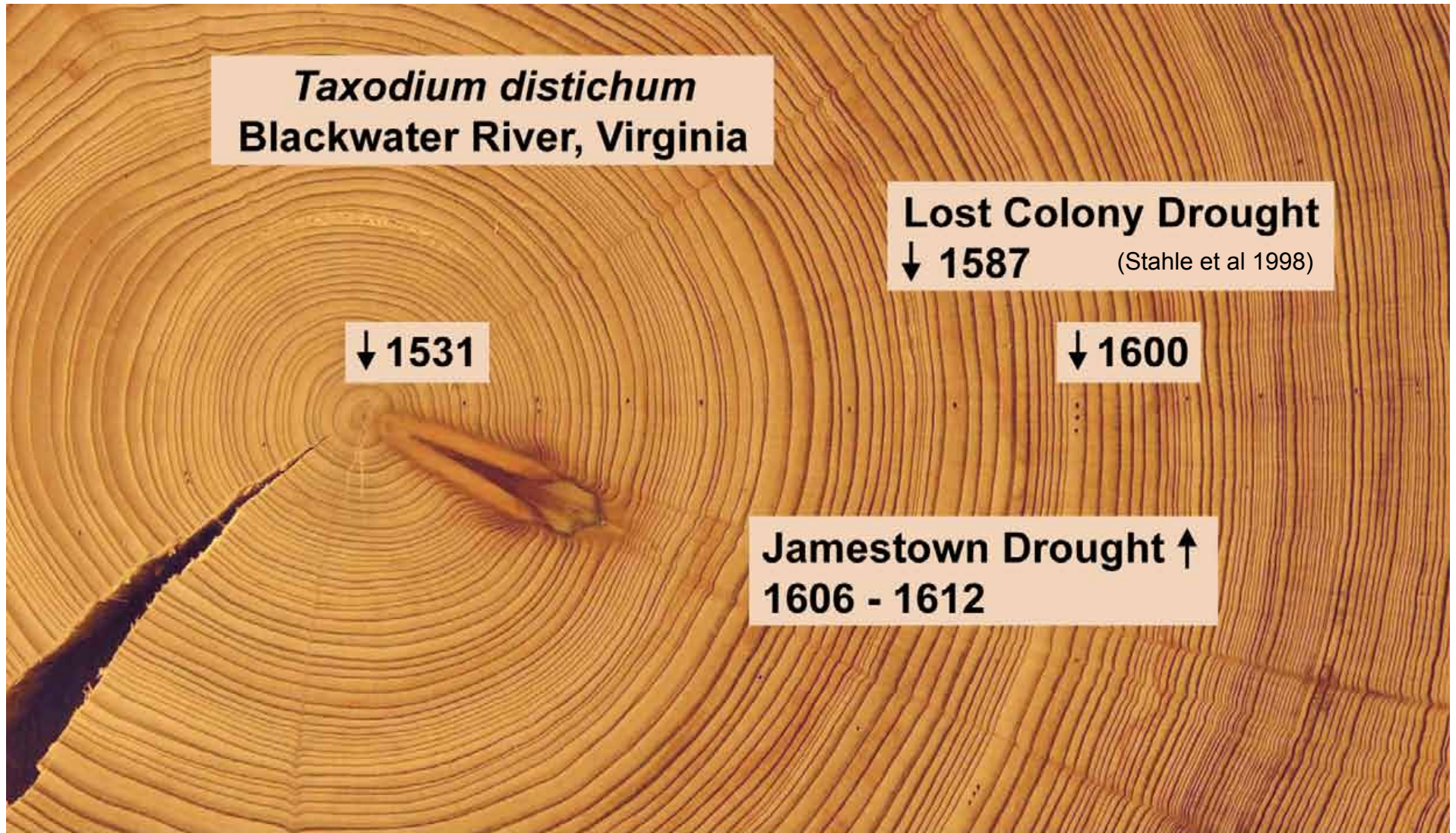
Juniperus occidentalis, Yosemite, California



RD Griffin

Taxodium distichum, Black River, North Carolina

Dendrochronology



Tree-Ring Dating = the most accurate and precise dating method in geochronology

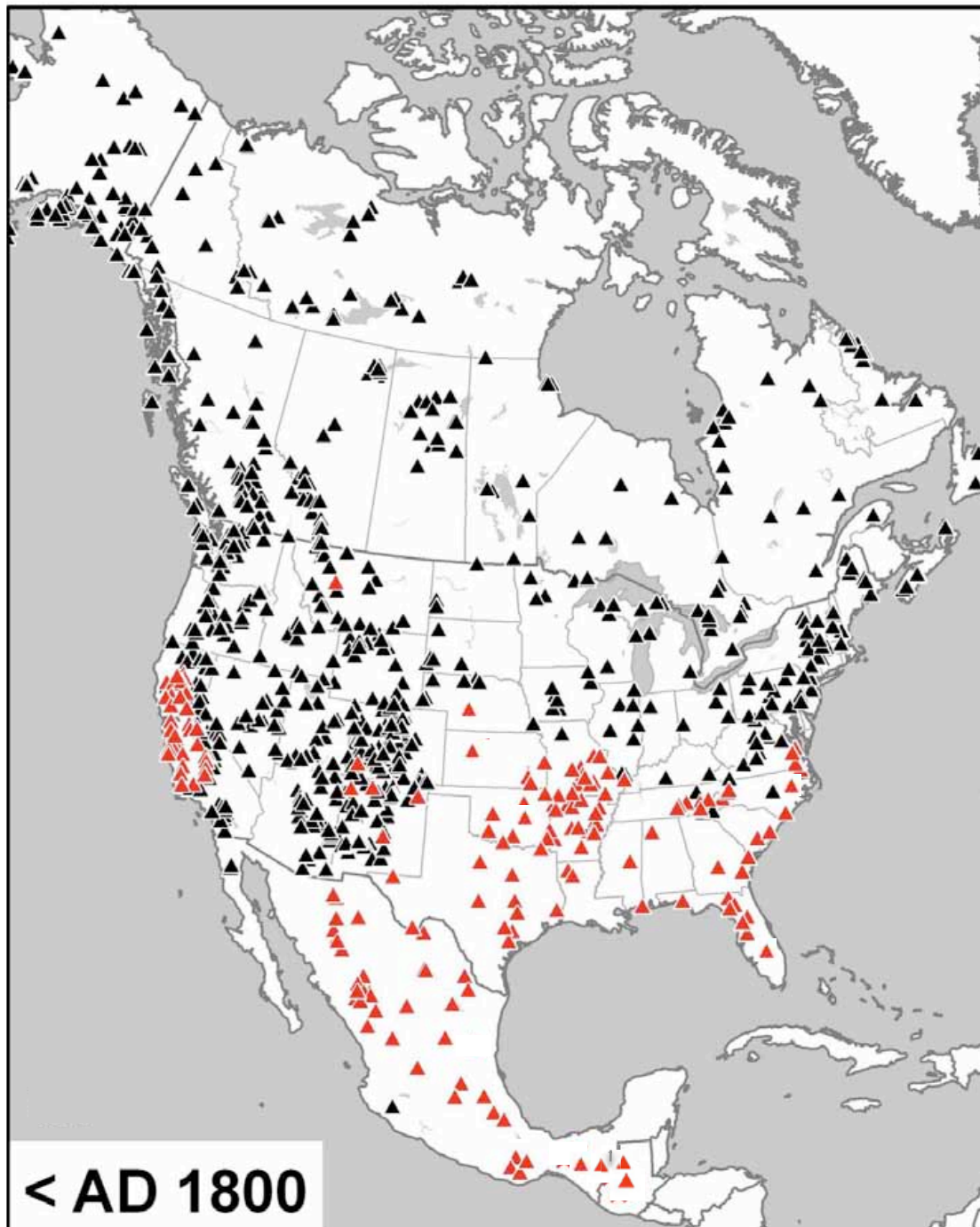
North American Tree-Ring Chronologies

Eastern species

- White Oak Group
- Hemlock
- Baldcypress
- Tulip Poplar
- Overcup Oak
- Northern Red Oak
- American Chestnut (relict wood)
- Eastern Red Cedar
- Northern White Cedar
- Red Pine
- Shortleaf Pine
- E. White Pine
- Red Spruce

Western species

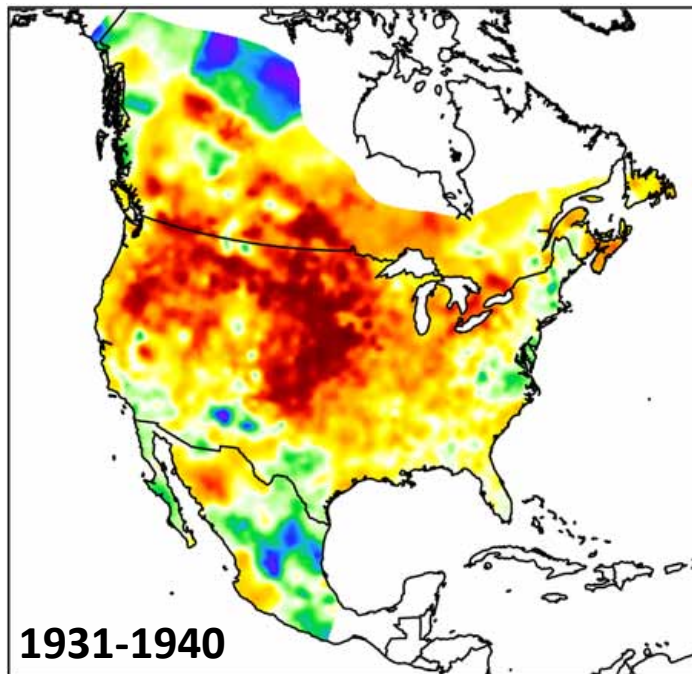
- Ponderosa Pine
- Douglas-fir
- Big Cone Douglas-fir
- High Elevation Conifer
- Mountain Hemlock
- Other Conifer
- Pinyon Pine
- Western Juniper
- Blue Oak / Valley Oak



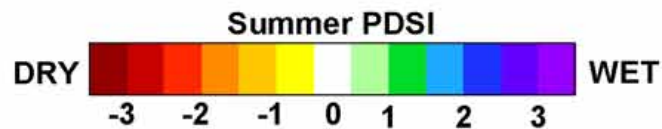
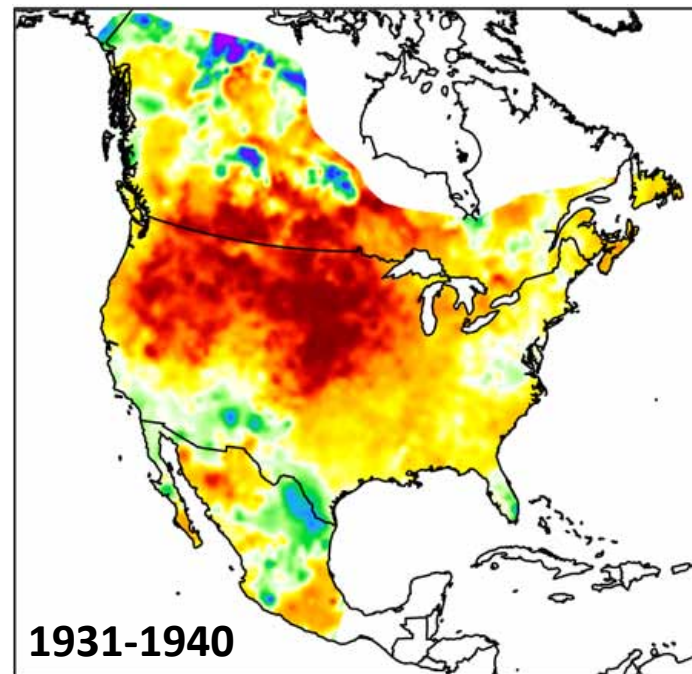
Over 2000, finest high resolution paleo dataset
Red = University of Arkansas & INIFAP (Mexico)
Typical chronology = 60 cores from 30 trees
Complex species & climate, but 5 main taxa

The Dust Bowl Drought

Instrumental PDSI



Tree-Ring Reconstructed PDSI



Palmer Drought Index (Cook et al 2004, 2010;
Stahle et al 2007)

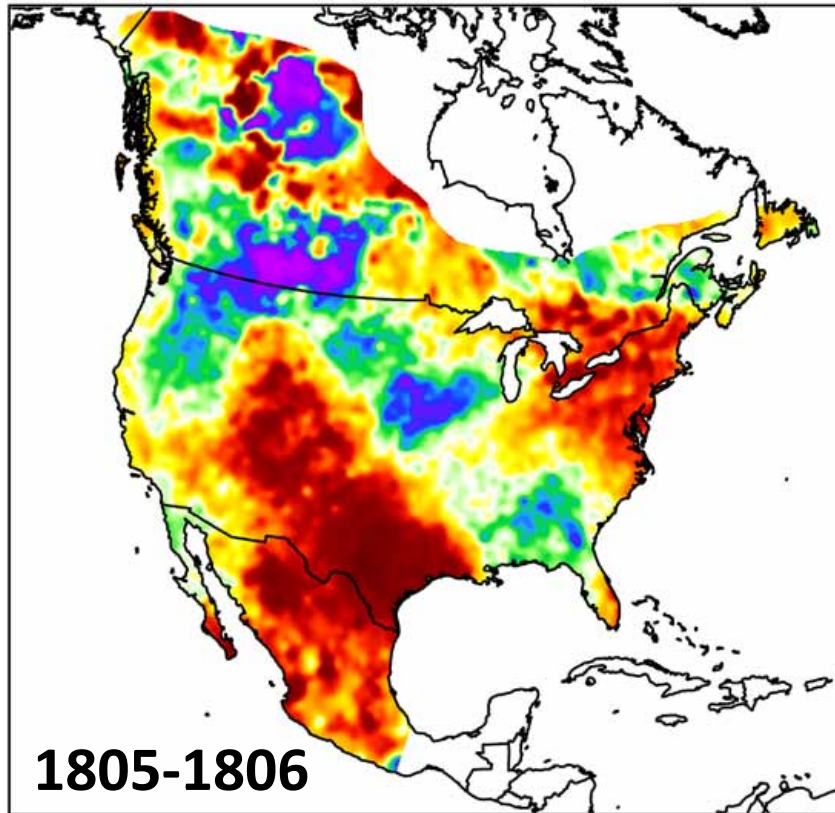
Spatial fidelity, Coast-to-coast dryness,
Worst drought in 350 years

Impact & drought itself aggravated by poor
land use practices?

Environmentally-mediated migration

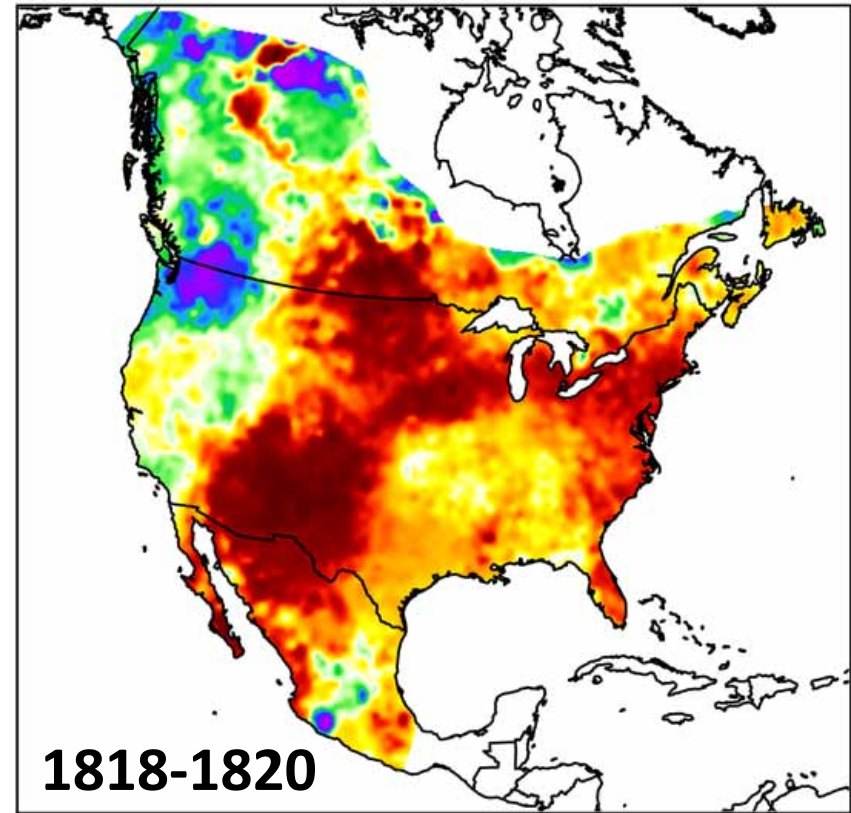


Historical Validation of the Tree-Ring Reconstructions?



Zebulon Pike Expedition

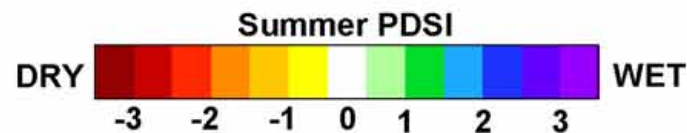
(Colorado-New Mexico-Chihuahua-Texas)
1806-1807: like 'the sandy deserts of Africa'



Stephen Long Expedition

(Nebraska-Colorado-Arkansas)
1820: 'wholly unfit for cultivation'

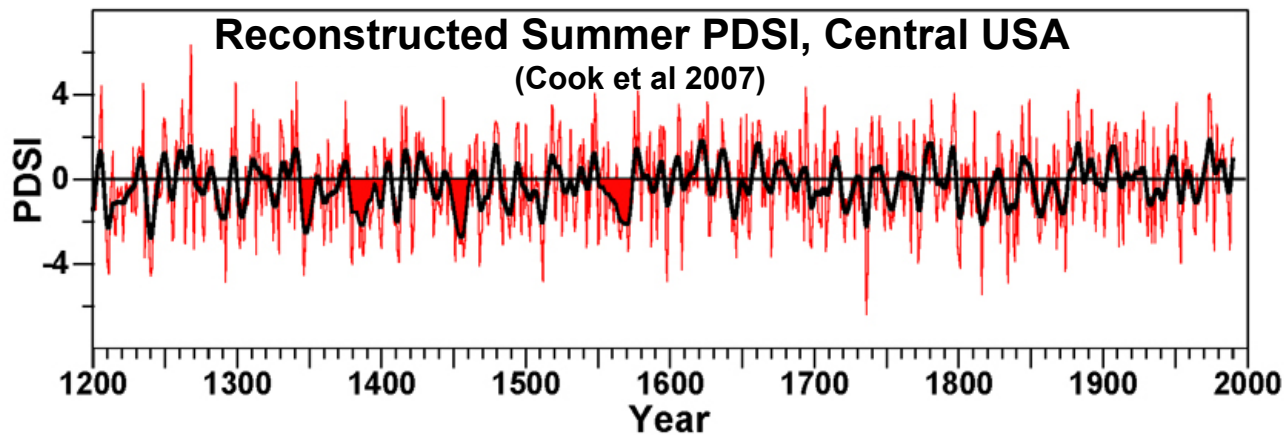
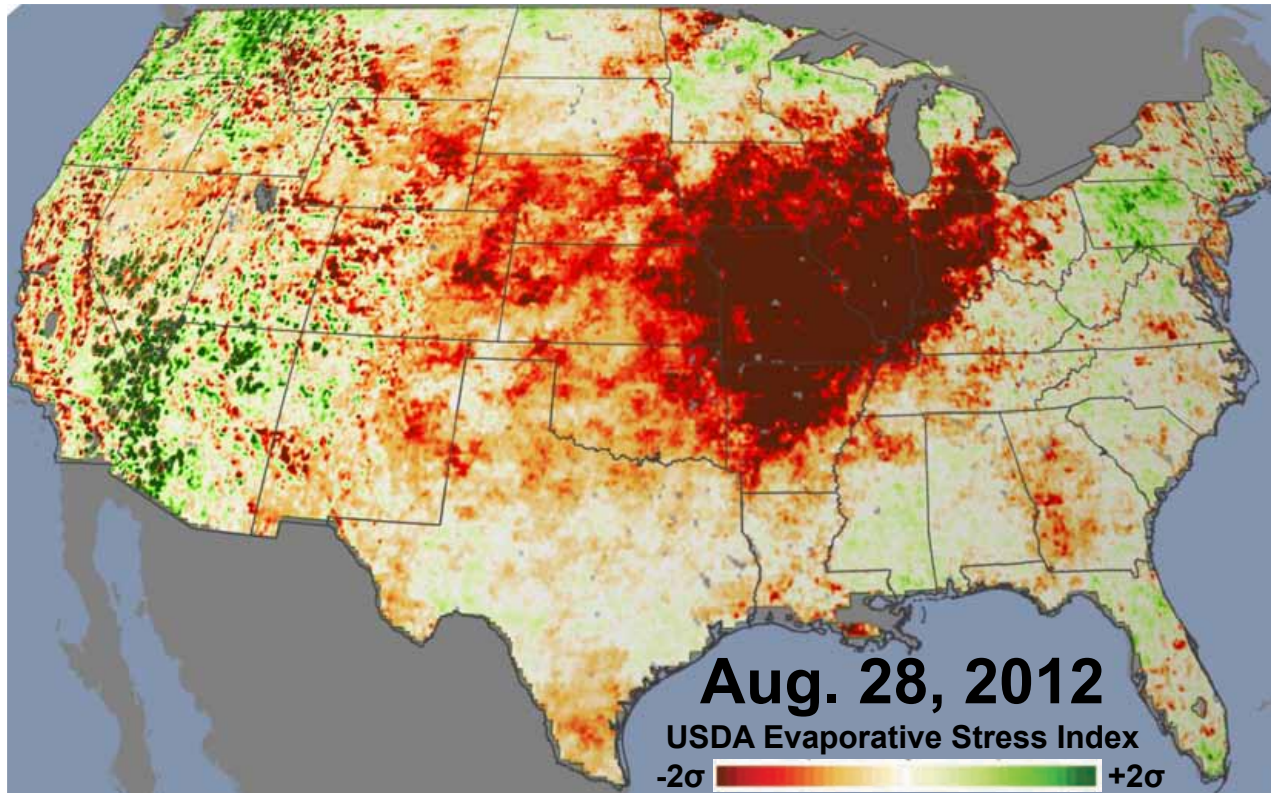
'The Great American Desert'



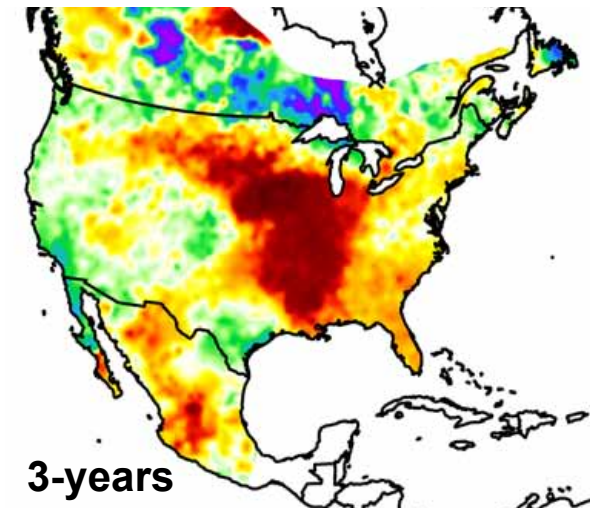
(Cook et al 2007)

2012 Corn Belt Drought

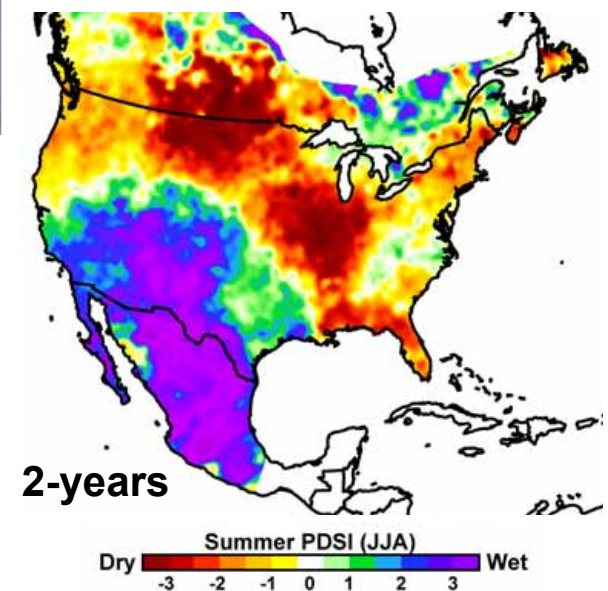
Warmest Year in US history, Record area under drought, Drought has not ended ...
... it can get worse ... probably will with unmitigated anthropogenic forcing ...



'Turn of the Century' 1799-1801



'Tambora Aftermath' 1816-1817

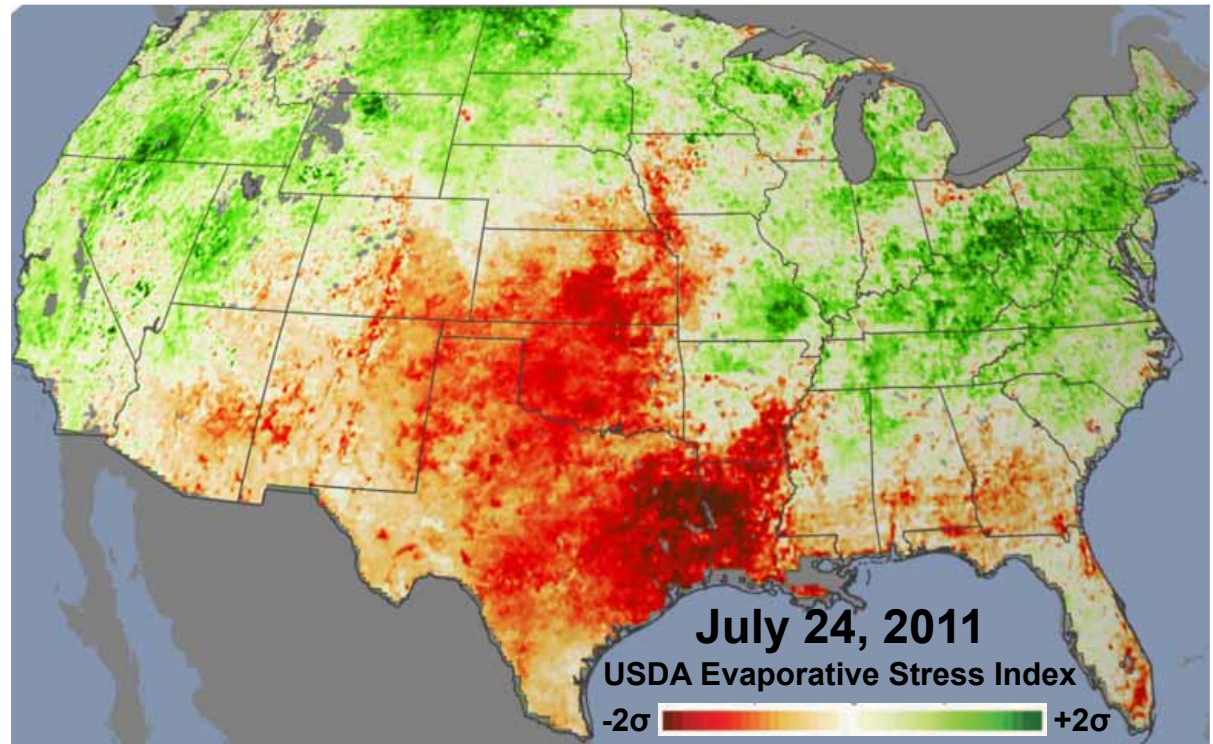


2011

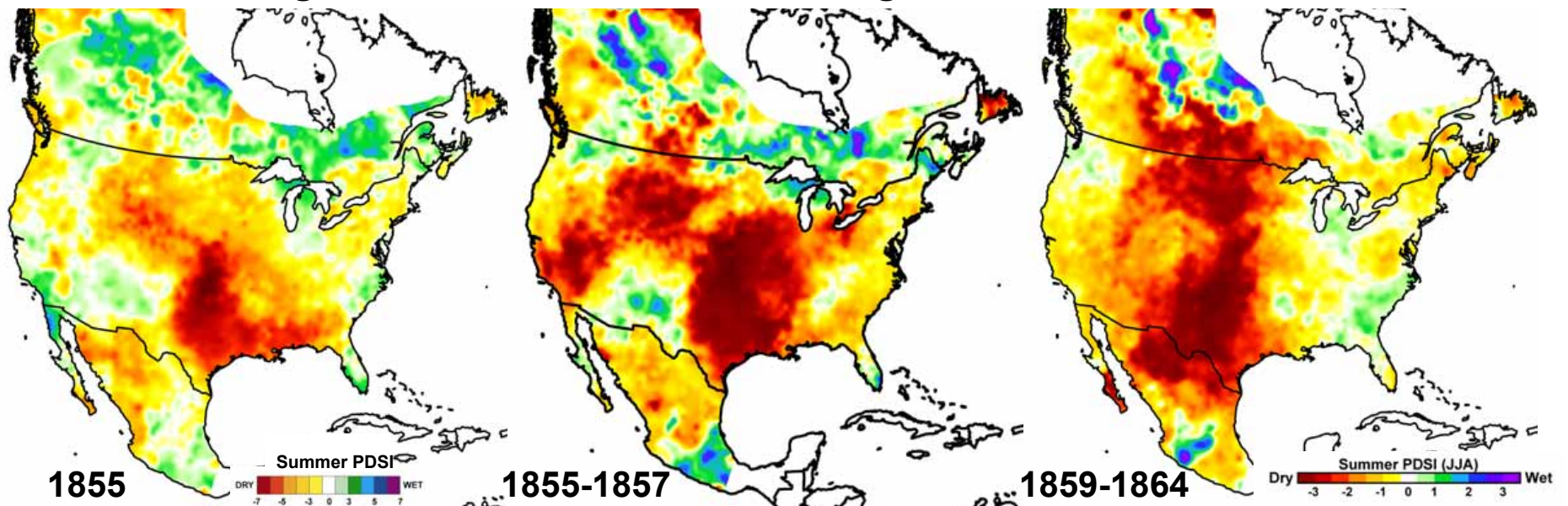
Record Drought in Texas

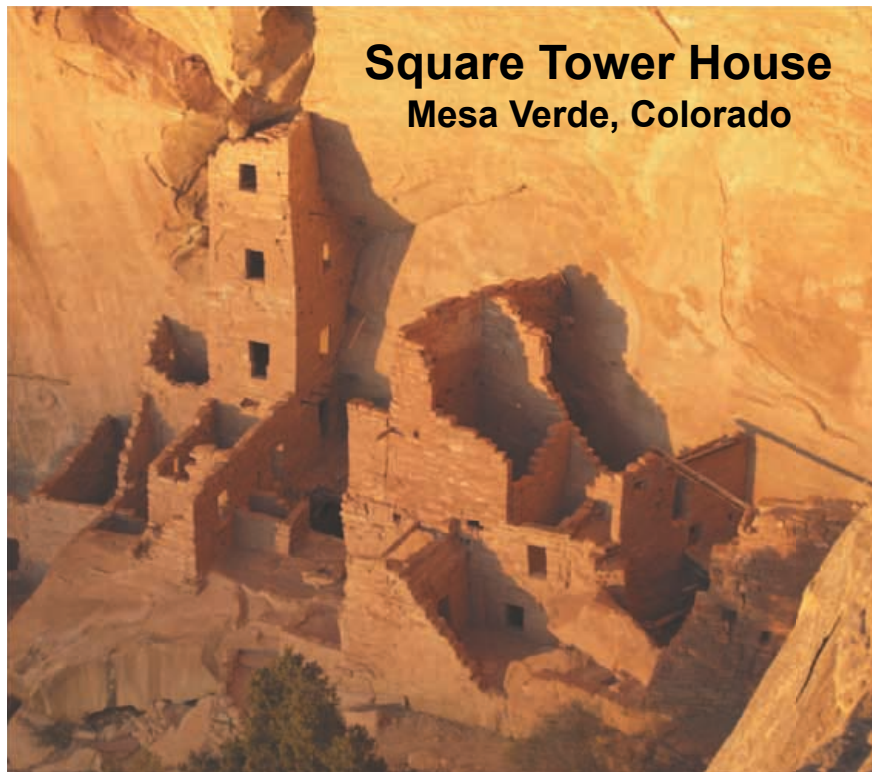
Civil War Drought

(two famous drought anomaly patterns prevailed, Dust Bowl & Tex-Mex regimes):



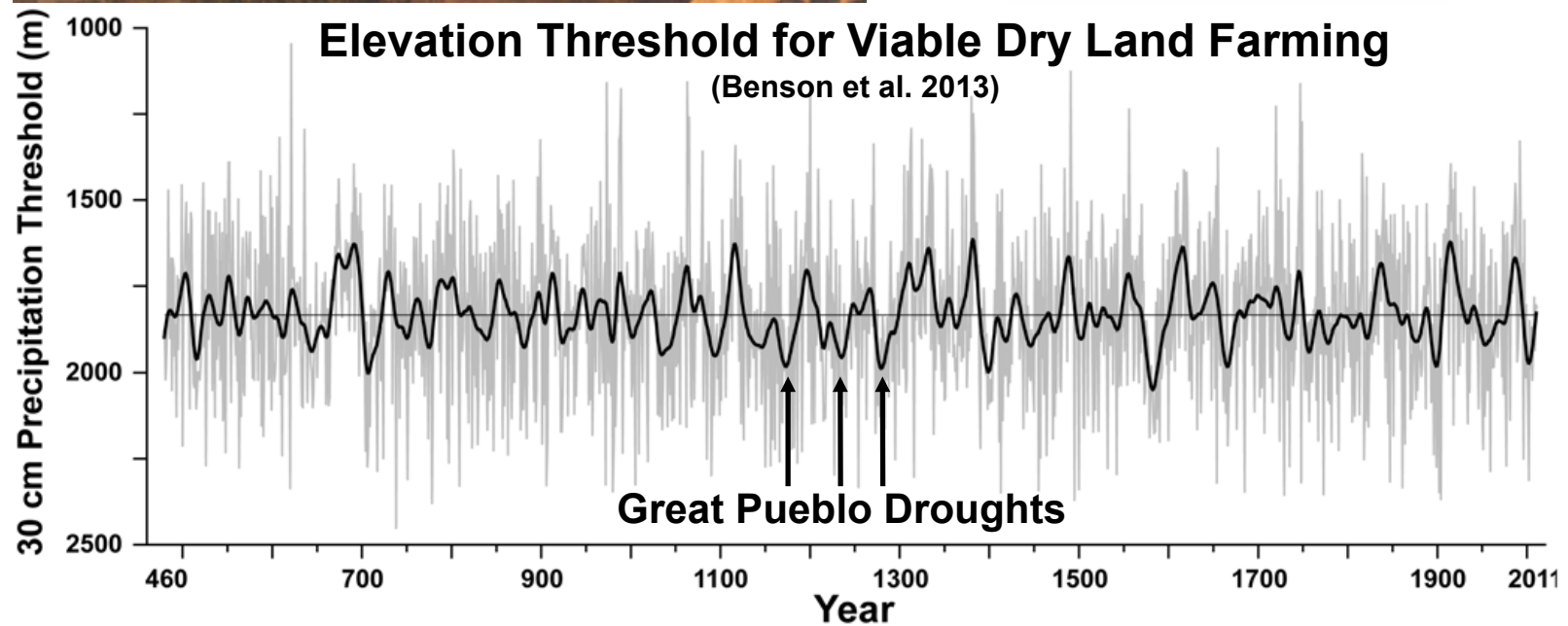
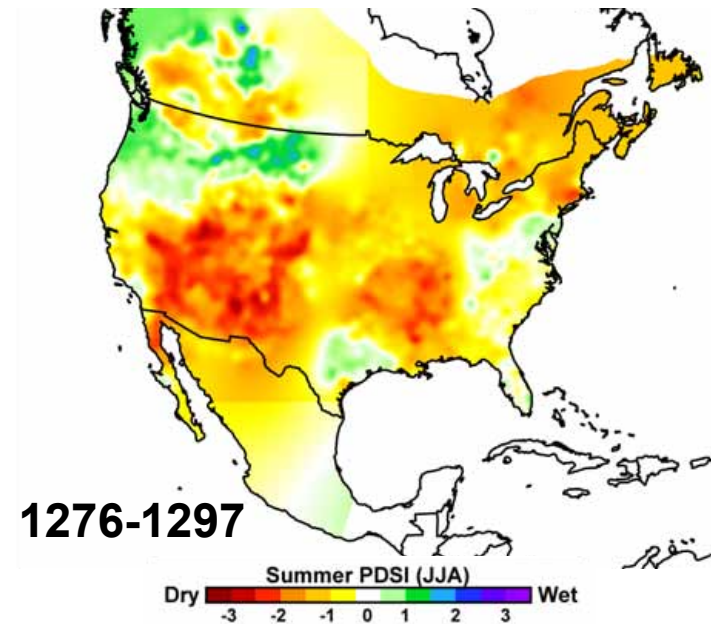
Progression of the 'Civil War Drought' from 1855 to 1864:





Great Pueblo Drought

(A.E. Douglass, 1935)



An Elevation Model for Anasazi Agricultural Potential 1278-1283

Gray = 'No Crop Zone' (6-year minimum elevation for maize viability >2000 meters)

