

# Growing Resilience

*Toward a New Paradigm in Agriculture:*  
Collaboratively Developing New Crops  
to Survive and Fight Climate Change

Nate Kleinman

Co-Founder, Experimental Farm Network



Union Beach, NJ - November 2012



Source: National Geographic

**now you see it**



photo: William O. Field

**now you don't**



photo: Bruce F. Molnia

Muir Glacier, Alaska: August 13, 1941 and August 31, 2004

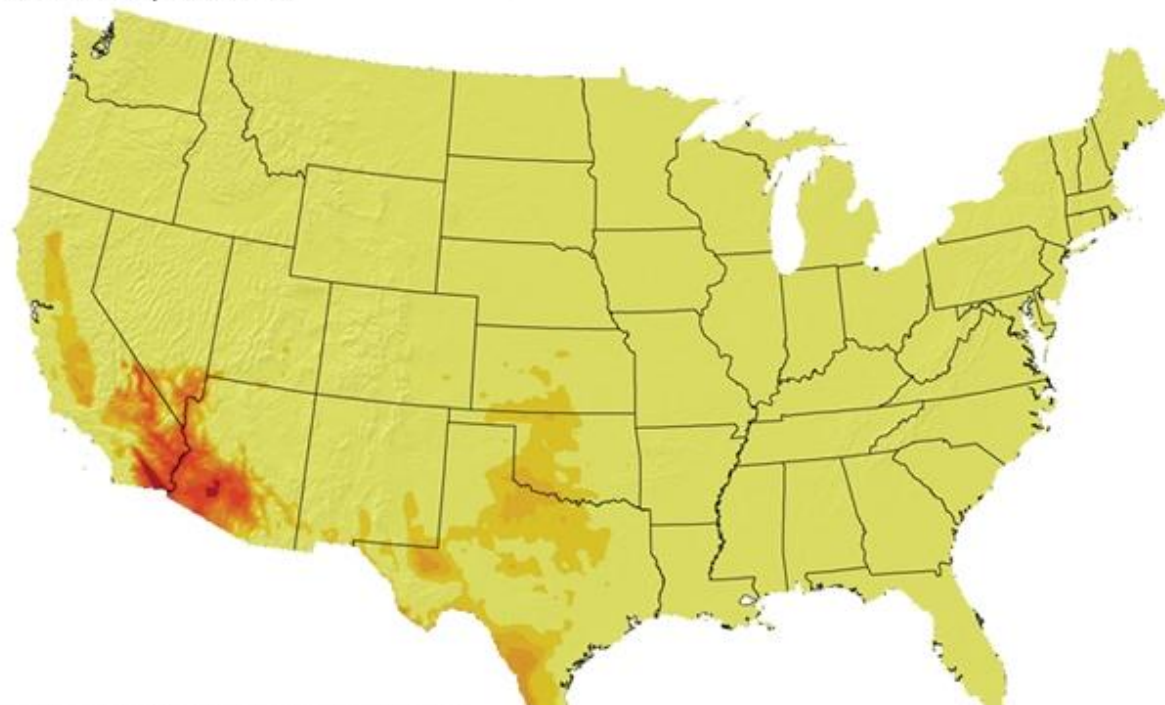


**CLIMATE 365**

[climate365.tumblr.com](http://climate365.tumblr.com) | [go.nasa.gov/climate365](http://go.nasa.gov/climate365)



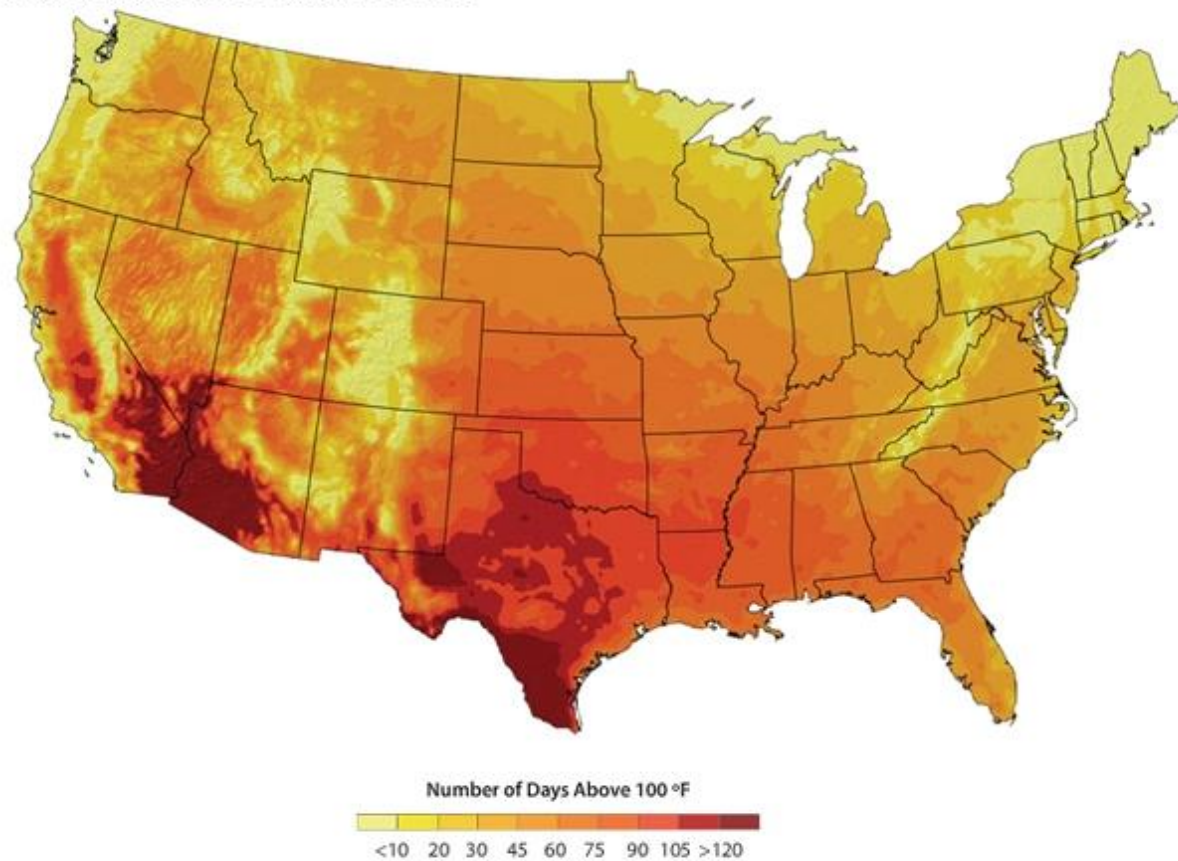
Recent Past, 1961-1979



Number of Days Above 100 °F

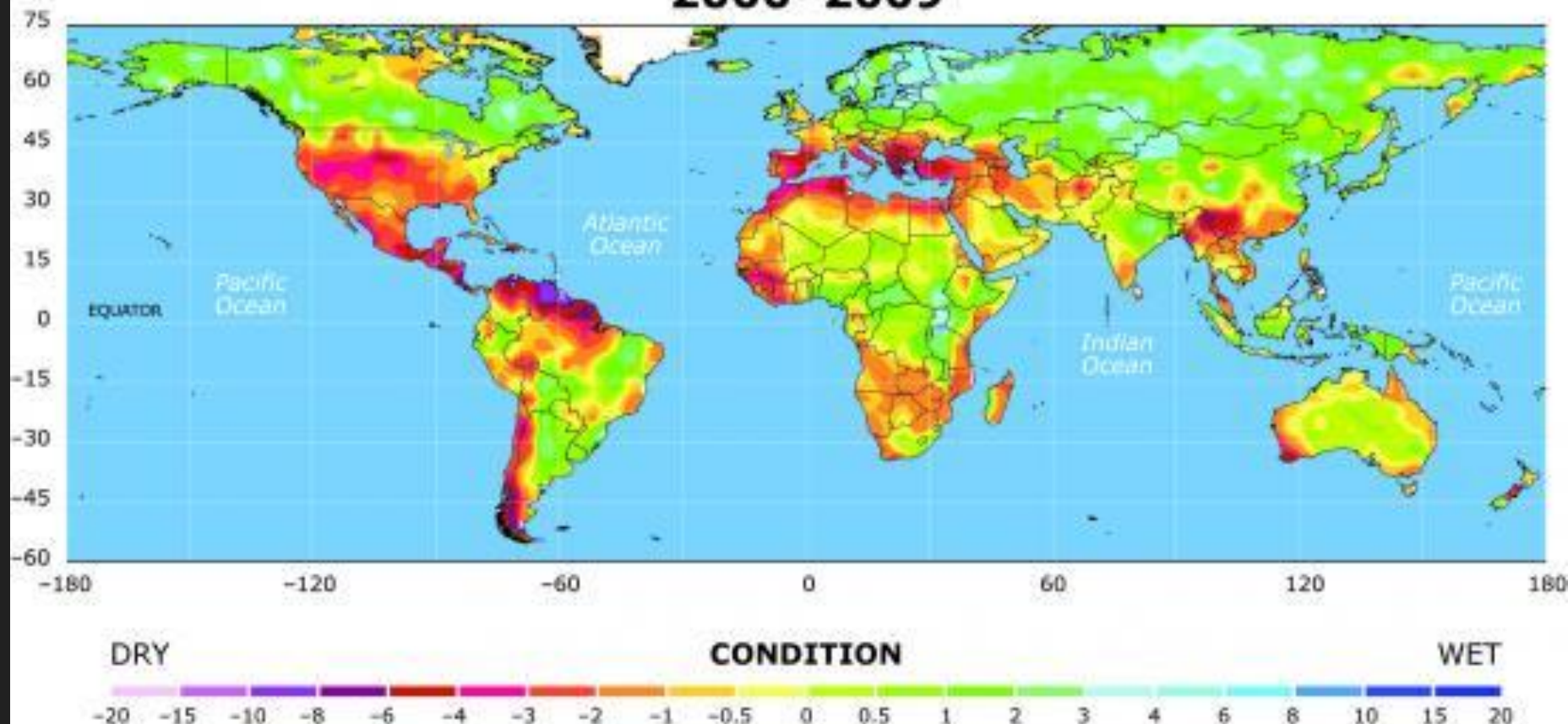


Higher Emissions Scenario, 2080-2099



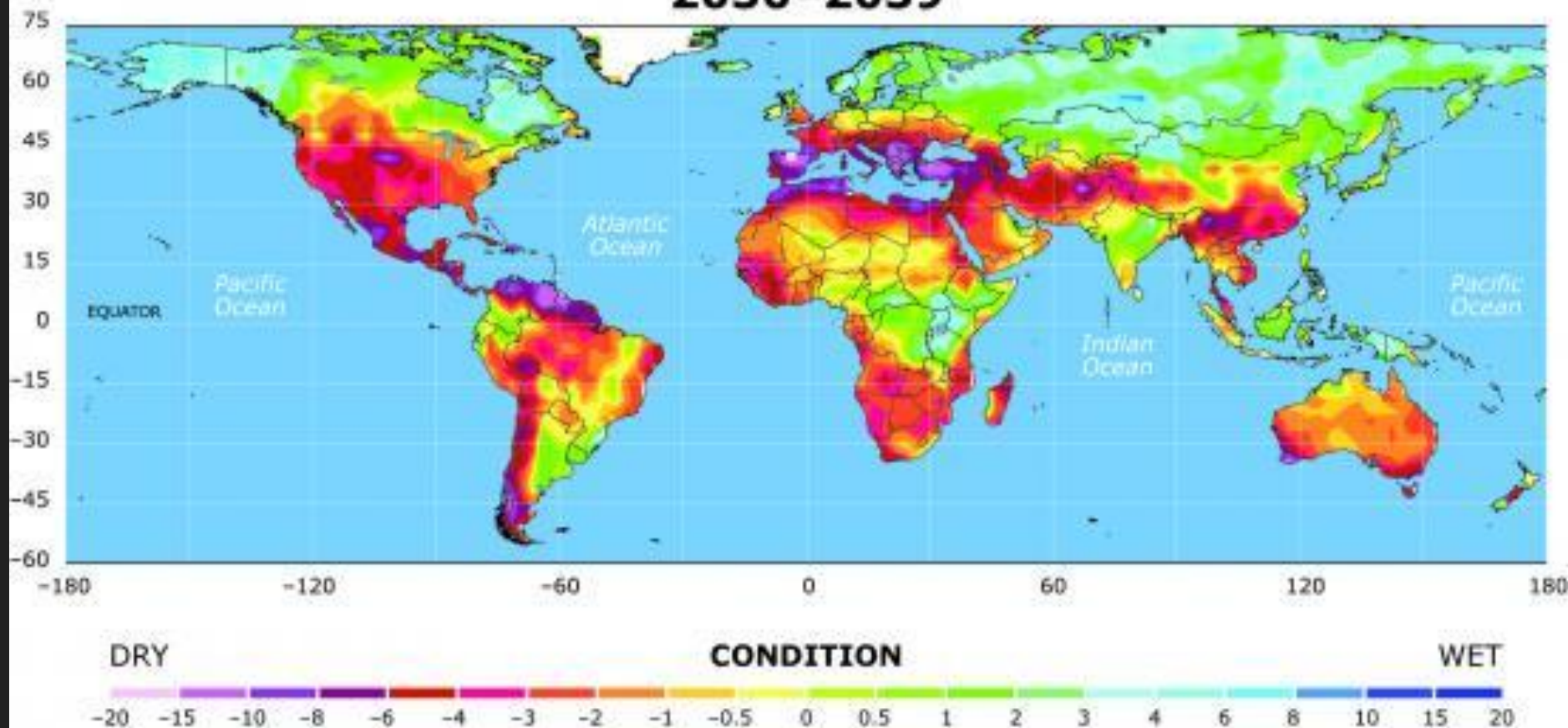
Source: Climate.gov

## 2000-2009



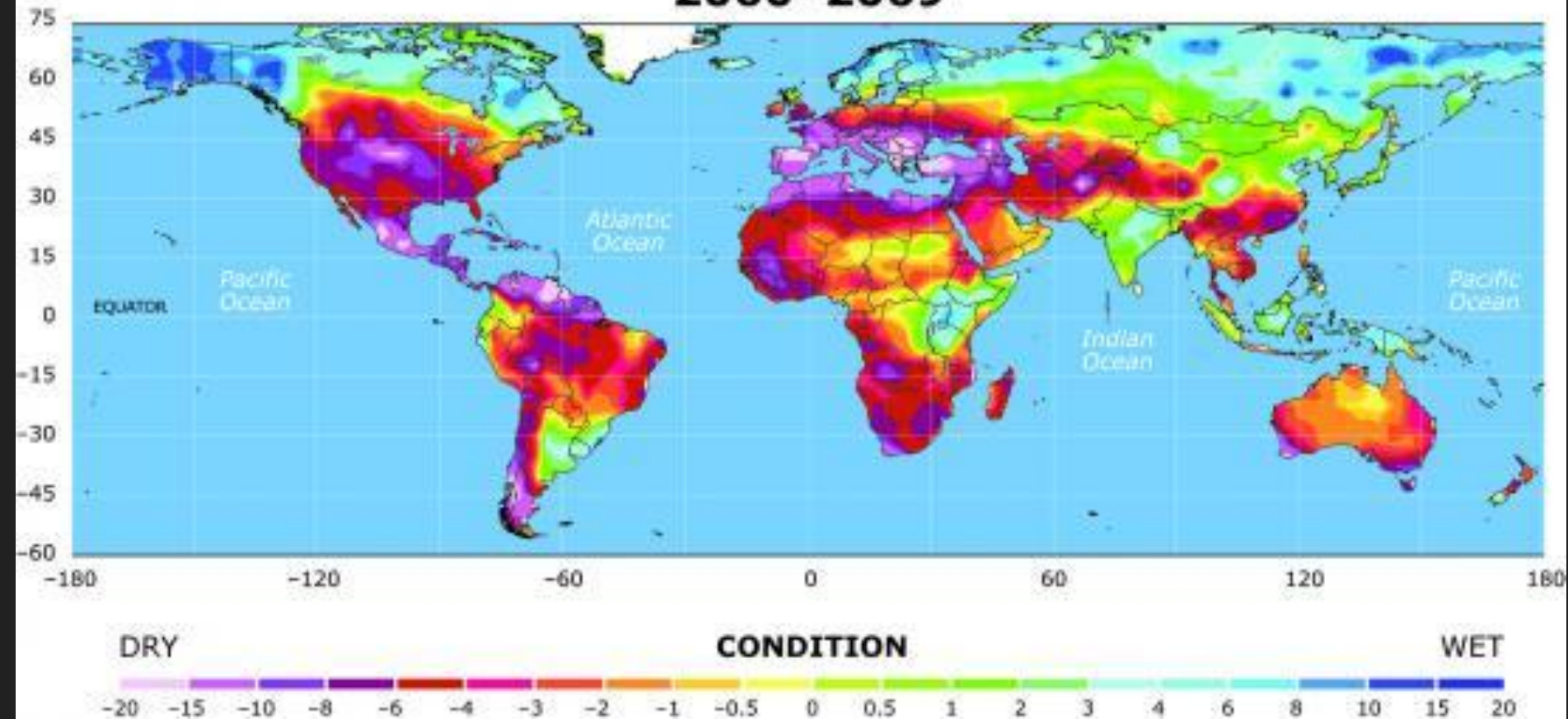
Source: National Center for Atmospheric Research

**2030-2039**





## 2060-2069





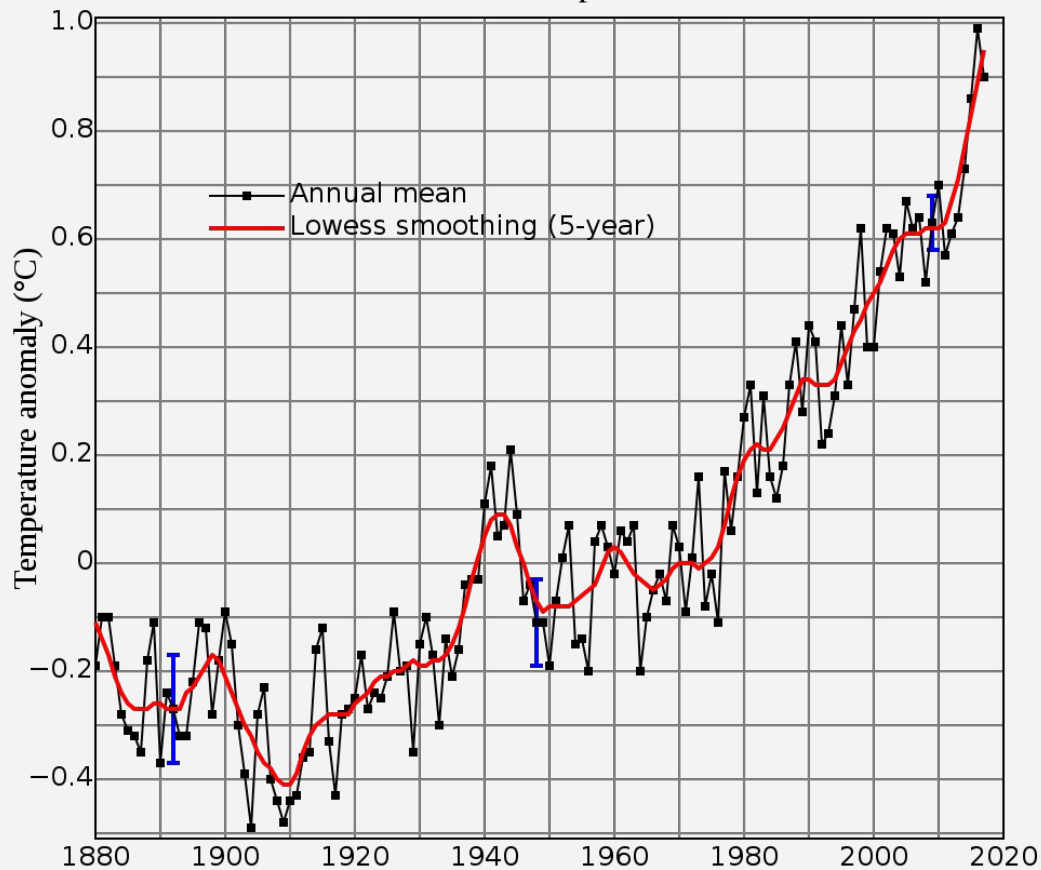




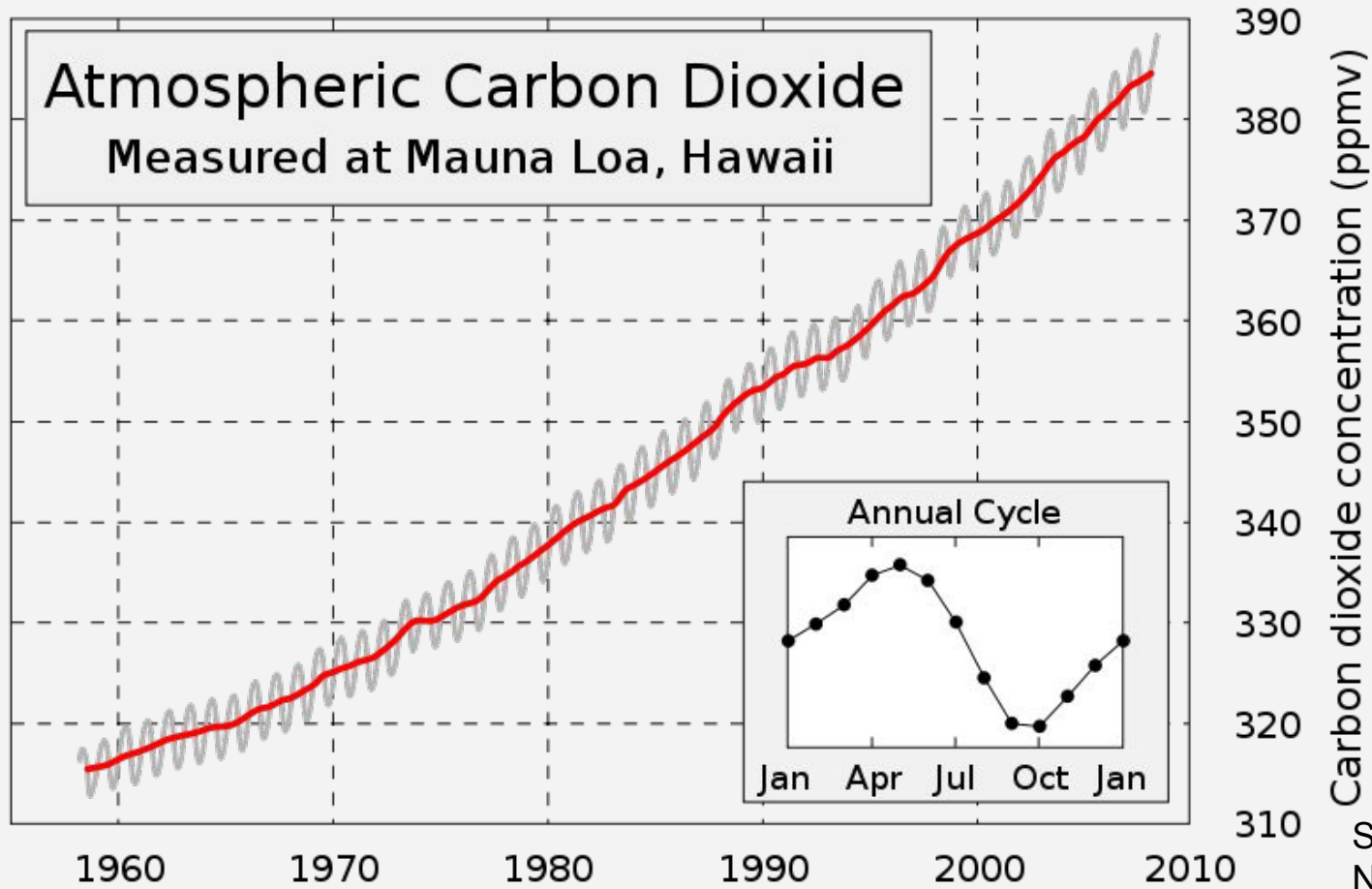




Global land-ocean temperature index

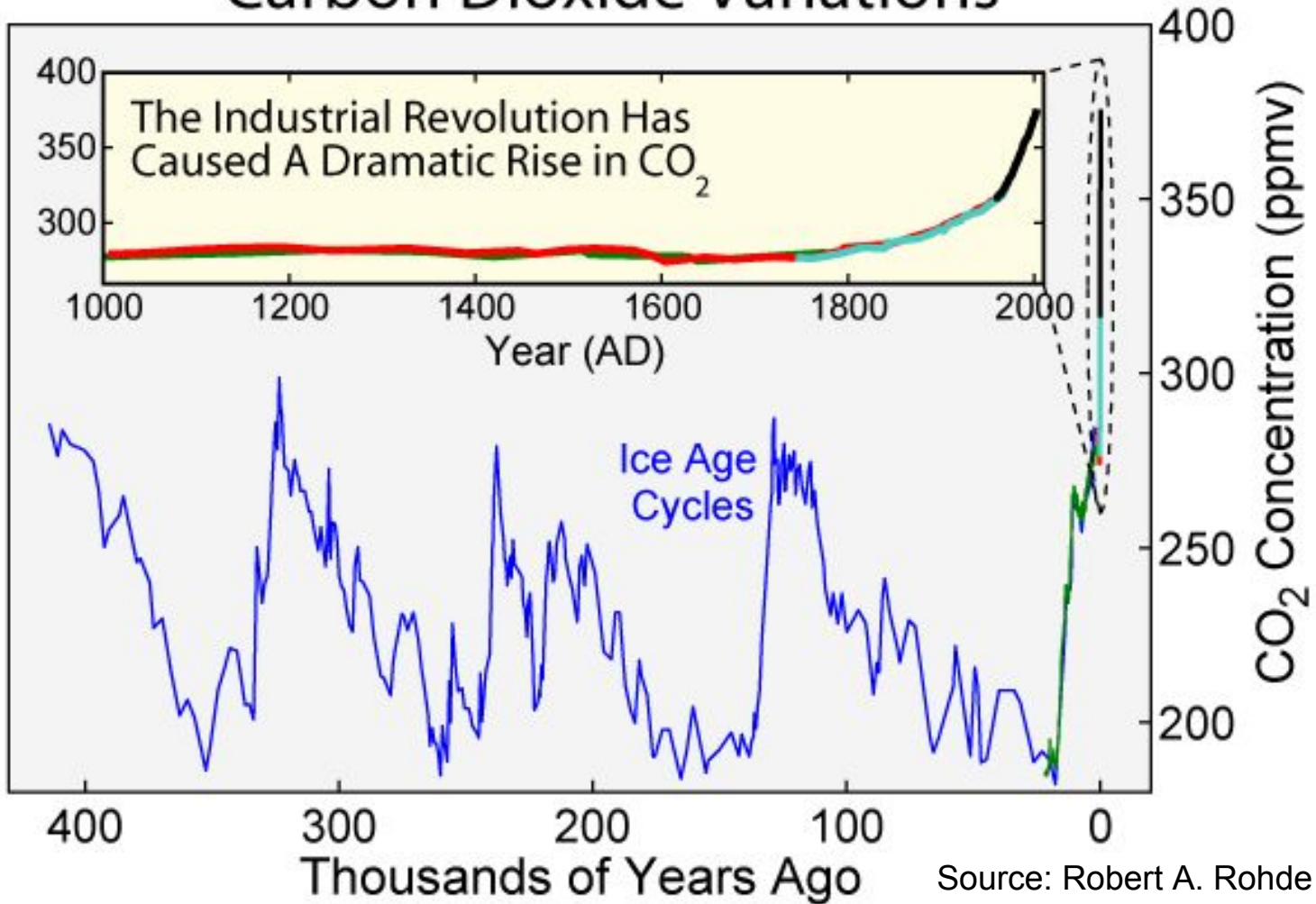


Source: NASA

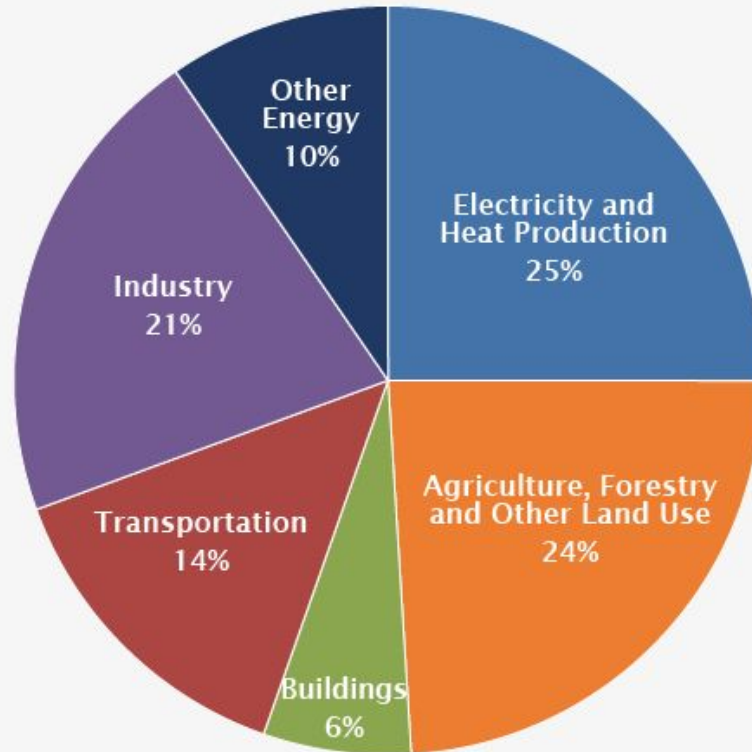


Source:  
NASA

# Carbon Dioxide Variations

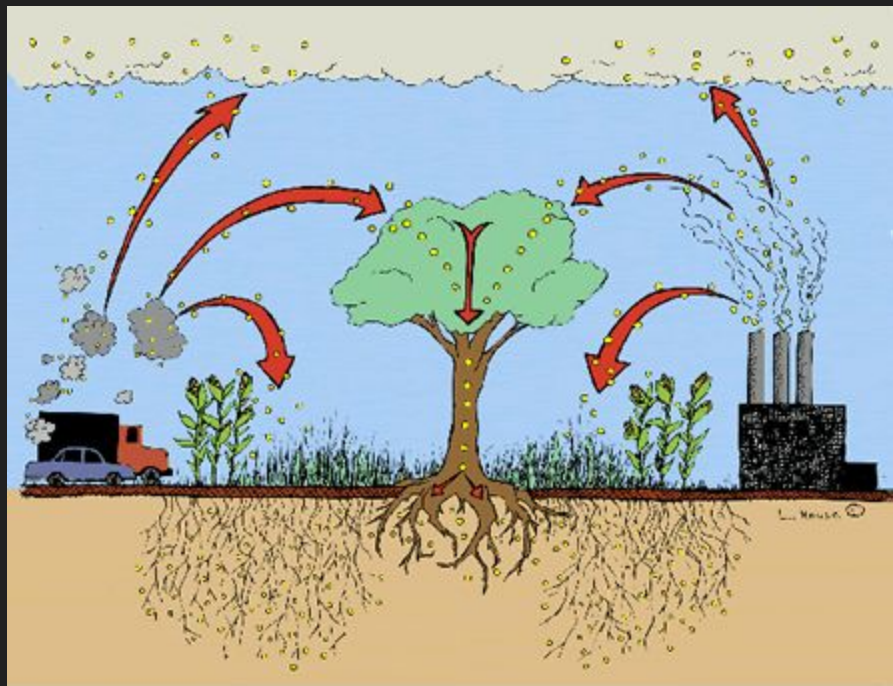


## Global Greenhouse Gas Emissions by Economic Sector



Source: IPCC (2014)



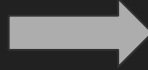


Source: ERS/USDA

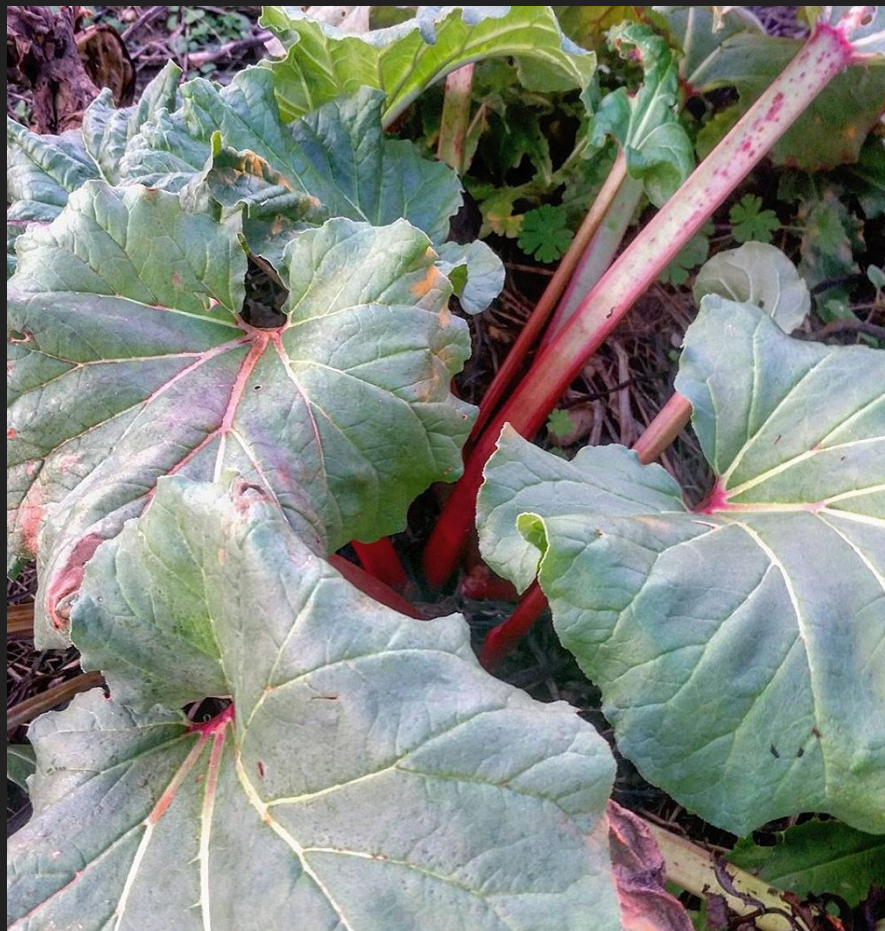
# EDIBLE PERENNIALS

























# BREEDING PERENNIAL STAPLE CROPS



































# Hybrid Hazels



[www.badgersett.com](http://www.badgersett.com)











# Growing Hybrid Hazelnuts

*The New Resilient  
Crop for a Changing Climate*



PHILIP RUTTER, SUSAN WIEGREFE,  
AND BRANDON RUTTER-DAYWATER





# Hybrid Chestnuts



[www.badgersett.com](http://www.badgersett.com)















Shagbark Hickory



Ultra Northern Pecan



'Burton' Hickory









*Annual winter wheat*



*Perennial wheatgrass*











# INDUSTRIAL CROPS





























## Jojoba Seed Oil













© Pedro Madruga







# NATIVE PLANTS































AND FINALLY:  
SORGHUM













































E-mail: [nathankleinman@gmail.com](mailto:nathankleinman@gmail.com)

Phone: 215-264-0446

[www.ExperimentalFarmNetwork.org](http://www.ExperimentalFarmNetwork.org)