

Climate Change and Climate Preparedness

Jerry Schnoor

Department Civil and Environmental Engineering
Center for Global & Regional Environmental Research
University of Iowa





Image courtesy of NASA/GSFC

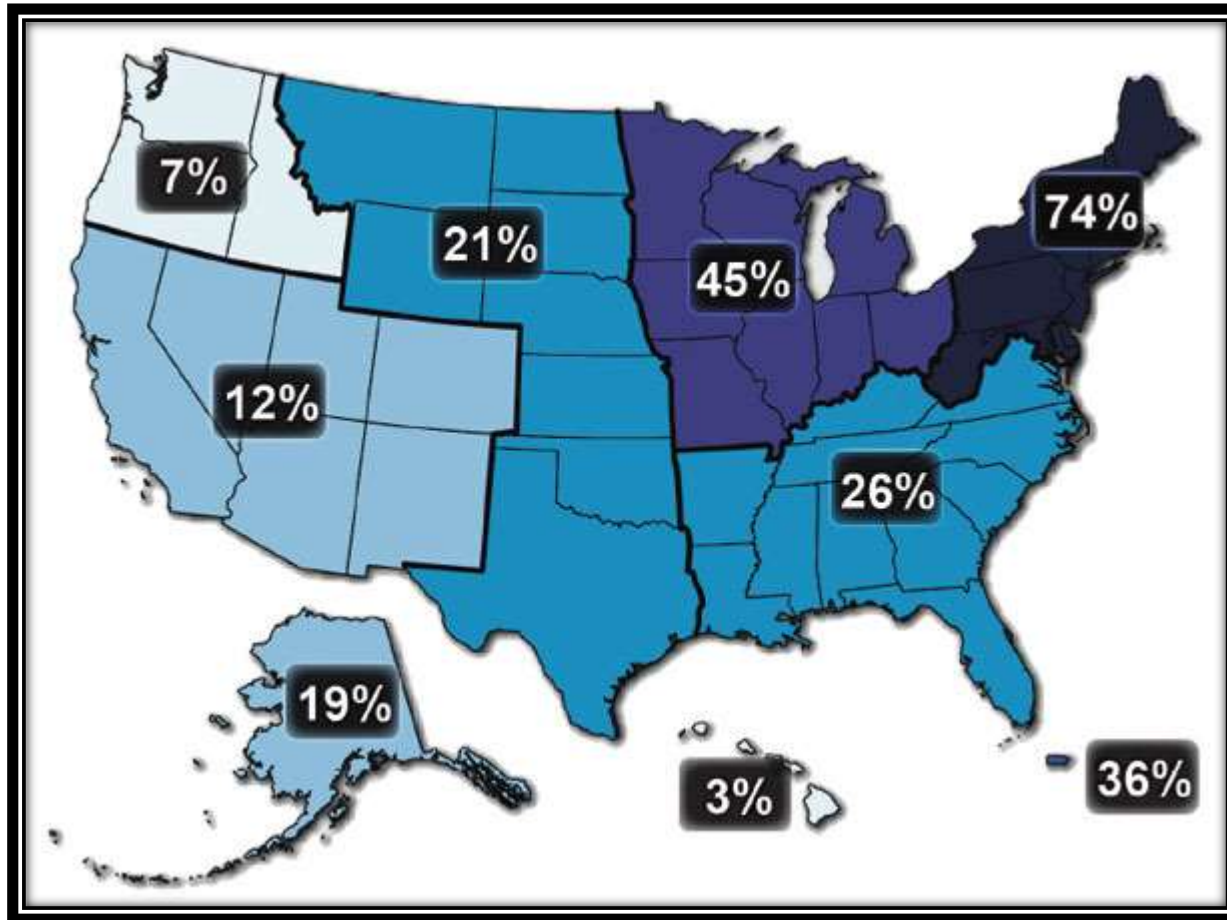
Climate Change Impacts

- In Iowa, we have seen an increase in *very heavy precipitation* in spring and summer over the past 40 years
- *Warmer nights, milder winters, longer growing season* (8-9 more frost-free days in past century)



Very heavy precipitation events much more frequent

Percentage Change in Very Heavy Precipitation, 1958 - 2011



Percent increases in the amount of precipitation falling in very heavy events: the heaviest 1 percent of all daily events. As the globe warms, these heavy precipitation events will become more common.

Iowa Floods, June 2008 – high intensity rainfall events becoming more frequent

- Upper Midwest 10-20% more precip, 50% increase in events of 101.6 mm (4 in) in 100 yr
 - U.S. Climate Change Science Program, Product 3.3, 6/08
- 6% more storms per decade
 - Hartmut Aumann et al. (2008), *Geophysical Research Letters*, 45% increase in high clouds for every 1.8 °F increase in sea surface temperature using AIRS instrument on NASA's Aqua satellite
- Global rain rate increasing at 1.5%/decade (Wentz et al., (2007))



“Stationarity is dead...”
Milly et al., *Science*, 2008

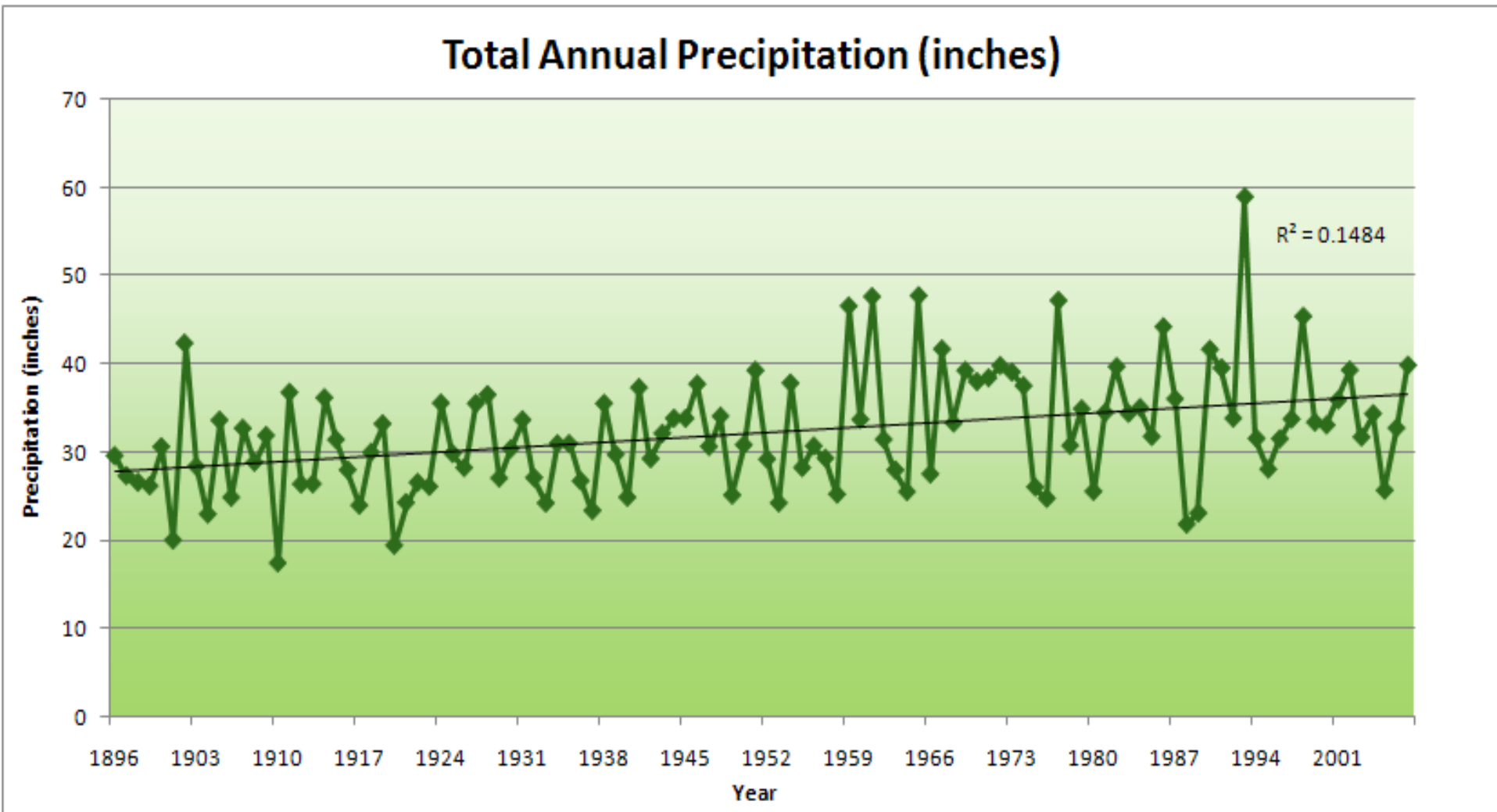
University of Iowa IATL Building June 14, 2008



Cedar Rapids, Iowa June 14, 2008

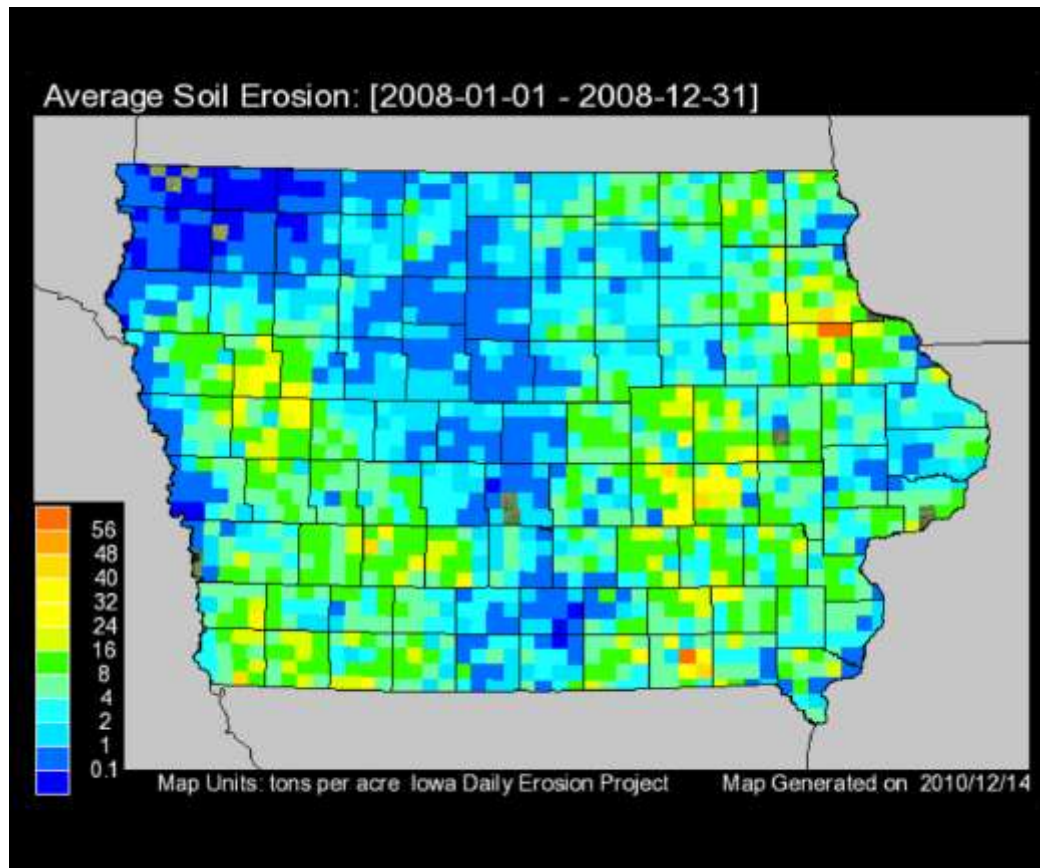


Cedar Rapids Data (Takle, 2009)



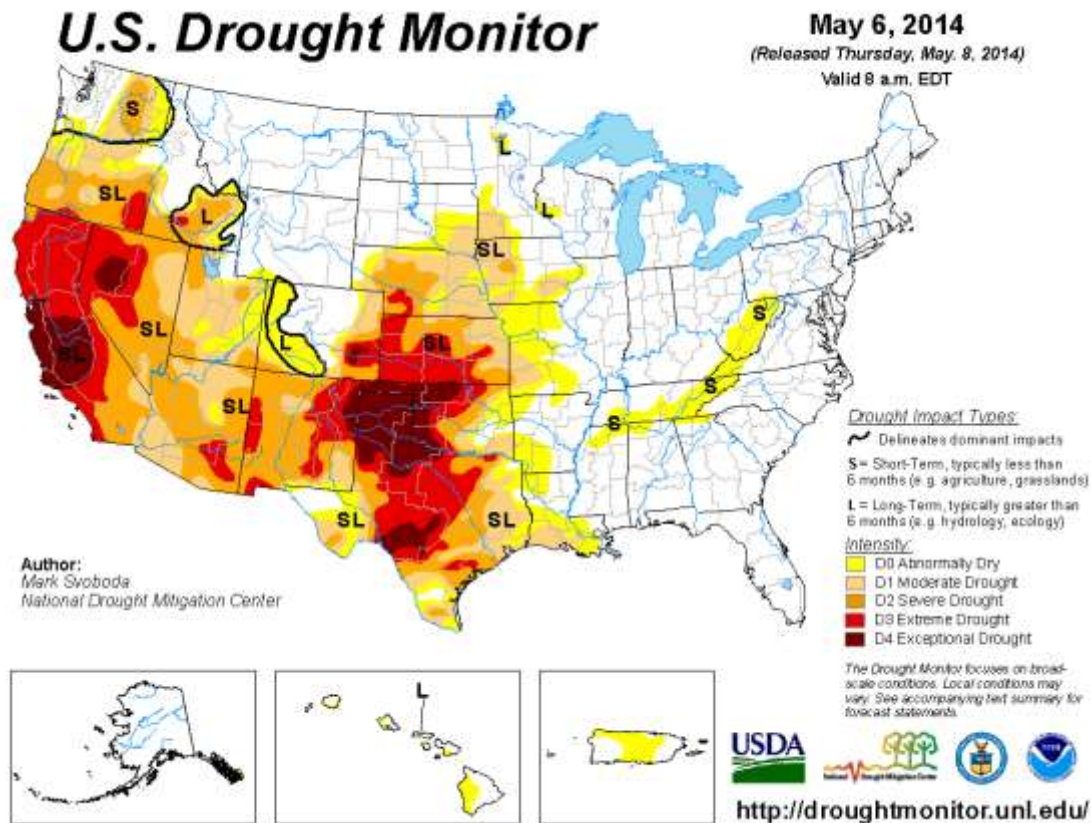
Iowa is experiencing more intense rainfall (floods), warmer winters and nights due to rising dew points (more moisture in the air).

Iowa Soil Loss in 2008



New report released on high soil losses <http://www.ewg.org/losingground/>

But adaptation will require infrastructure for increasing floods *and* droughts



What to do? Mitigation -- Energy efficiency and renewables (e.g., Iowa Wind Power)

- Iowa is third in the U.S. in nameplate capacity wind
 - It's cost competitive
 - Iowa has 5133 MW so far, about 24.5% of our electricity demand
 - Green collar jobs at wind turbine plants (6000 jobs)
- Wind power is clean and renewable, but we need to find methods to store it and a better grid to transmit it



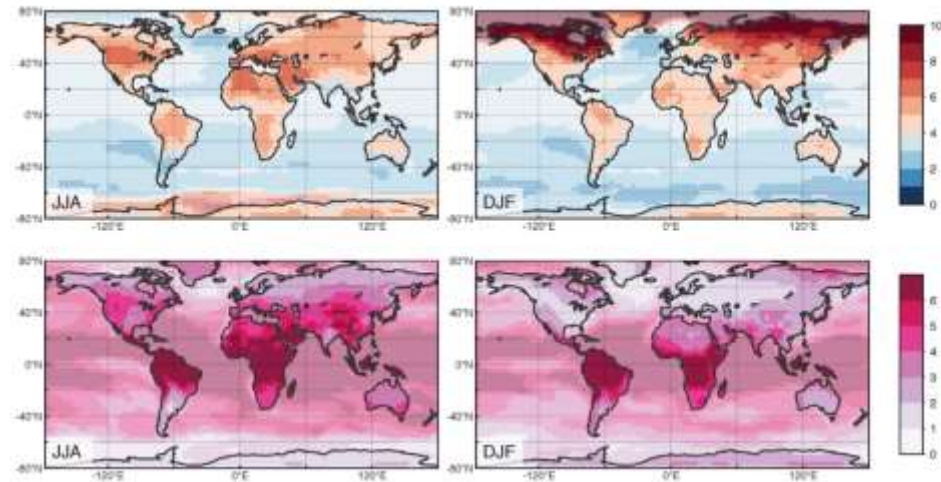
Some good news – U.S. emissions down in 2012 from 2005 base year

- U.S. emissions down by ~10%; lowest since 1994
- U.S. Fuel efficiency and GHG stds on cars/trucks
 - Fuel efficiency is improving 3-4% per yr
- New stds on coal-fired power plants & price of wind and natural gas



What can we do?

- *Adapt* to climate change
- *Mitigate* GHGs (reduce emissions)
- Create “Coalitions of the Willing” (citizens, NGOs, companies, cities)



*Projected climate change by 2099:
2.4-4 °C increase (World Bank, 2012)*

Efficiency, Big Wind, Small Solar, Natural Gas, & Carbon Fee/Dividend



- A proposal for the future:
 - Hyper-energy efficiency, big wind, small solar, electric vehicles to store power (vehicle-to-grid V2G)
 - Carbon fee (revenue neutral) to send clear price signal into marketplace
 - Shift subsidies from fossil fuels to renewables & mass transit, light rail, freight rail, bike trails, low C fuels

Conclusions

- Climate is already changing and we should *adapt to* and *mitigate* its effects
 - Adapt with a sustainable, resilient, and regenerative infrastructure
 - Mitigate with hyper energy efficiency, renewables, EVs and V2G, and nuclear (?)
- Transitioning from fossil fuel age will be the engine for economic development, jobs and wealth creation in the future

