Status and Priorities of Soil Management in USA

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Soil Science Grand Challenges (SSSA)

1. **Food and Energy Security**. Develop site-specific soil management solutions that maximize soil agroeosystem services, minimize soil disturbance, and concurrently increase soil carbon reserves while reducing the nutrient, water, and pesticide inputs

2. **Climate Change**. Need to identify biological and geochemical soil processes controlling carbon storage and emissions of greenhouse gases (CO_2, CH_4, and N_2O) from soils and to develop management practices to reduce emissions.

3. **Waste Treatment and Water Quality**. Manage the soil-based re-use of waste—industrial and stormwaters – in rural and urban environments to maximize water infiltration and storage and minimize damage to aquatic systems and reduce dependence on groundwater.

4. **Human and Ecosystem Health**. Harness the microbial diversity of soil to develop new pharmaceuticals, deactivate pathogens in waste material and contaminated water, and prevent impairment of watersheds.

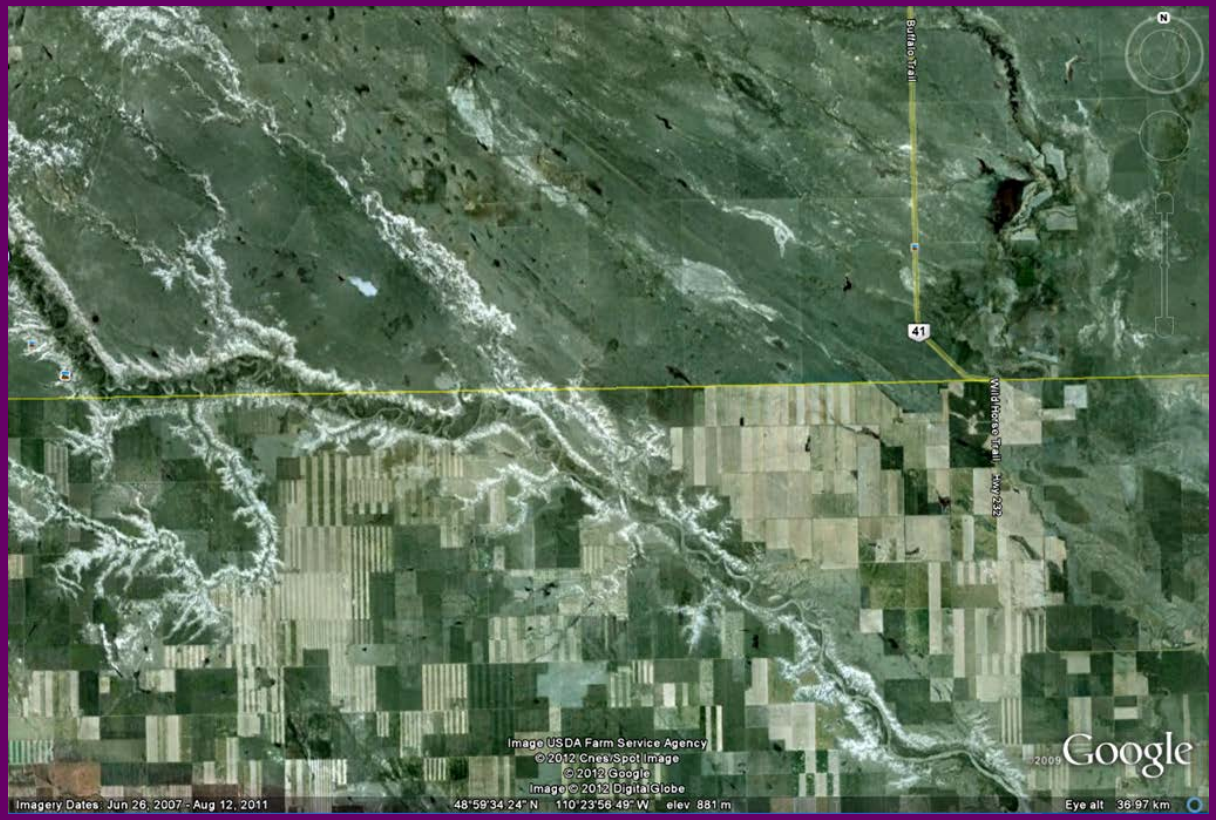
Drivers

- Grain Prices
- Land Prices

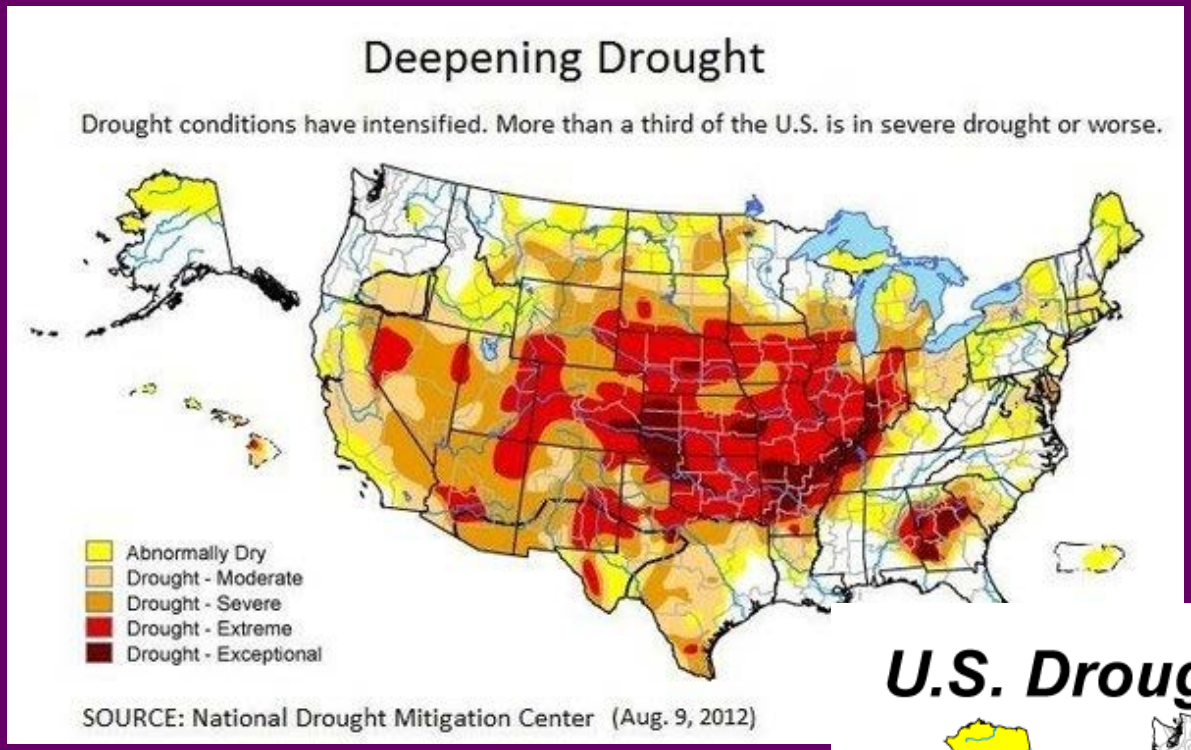
- Fuel Costs

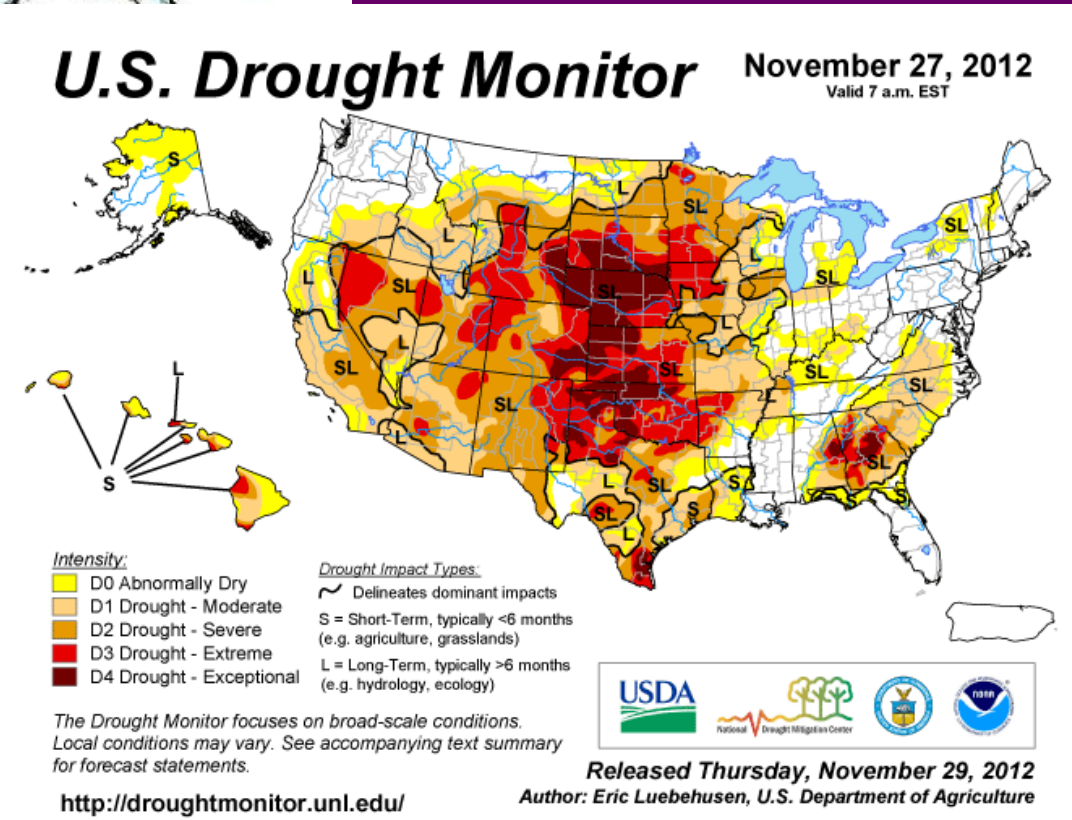
- Climate change

Due to anticipated impacts from climate change, deforestation, erosion, depletion of water resources, and other environmental problems, as well as potentially higher fuel prices, which could impact agricultural inputs, food security will increasingly become a concern in the coming decades.



Satellite image of contrasting land use along Canada-USA border (Alberta/Montana)





R. Lal[1], J. A. Delgado[2], J. Gulliford[3], D. Nielsen[4], C.W. Rice[5], and R.S. Van Pelt J. Soil Water cons. 2012

Grazing Lands

(Mark Nearing, personal communication)

Conservation practices to mitigate and adapt to climate change

1. Erosion prevention and protection from extreme weather events, which may be more damaging in the future.

2. Irrigation infrastructure to reduce water losses and increase irrigation efficiencies.

3. More diverse cropping systems to adapt to variable climates and new pest and disease pressures.

4. Develop crop varieties that are drought-tolerant and more resistant to heat stress, with higher N-use efficiencies.

Delgado et al, 2011; J. Soil Water Consn, Vol 66 - Best paper award

5. Improve the synchronization of planting and harvesting operations with shifts in the hydrologic cycle (rainy season).

6. Manage soil and crops to increase water-use efficiencies.

7. Value agricultural commodities for their water footprint or environmental traits.

8. Increase soil C sequestration to improve soil functions.

9. Increase N-use efficiencies for cropping systems.

10. Apply the concepts of precision/target conservation to increase conservation effectiveness across spatial and temporal variability.

Communicate Soil and Water Conservation

1. Teach the Value of Soil Carbon
2. Develop Communication that Connects Science to Land Managers
3. Develop Communication that Connects Science to the Public
4. Improve Historical Context: *Development of long-term data records, programs*
5. Ongoing Training: *Education programs and the mentoring of new personnel are important for maintaining an educated workforce*
6. Enhance Exchange

Research Pays Dividends Long Term.

-Research programs greatly contribute to soil and water conservation.

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