Water and land requirements

to grow biofuel crops in the USA

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Biofuels Workshop
Baker Institute
Rice University
August 20th

Outline

1. Comparison of water and land requirements for different fuel crops
2. Results of scaling up production.
3. Water quality implications
4. Summary and recommendations

Geographic and plant variability*

Assuming car can drive 16 miles on one gallon of ethanol
(or 2/3 of the mileage from gasoline)

23 gwpm - corn grown in Iowa

50 gwpm - corn grown in Nebraska

90 gwpm - sorghum grown in Nebraska

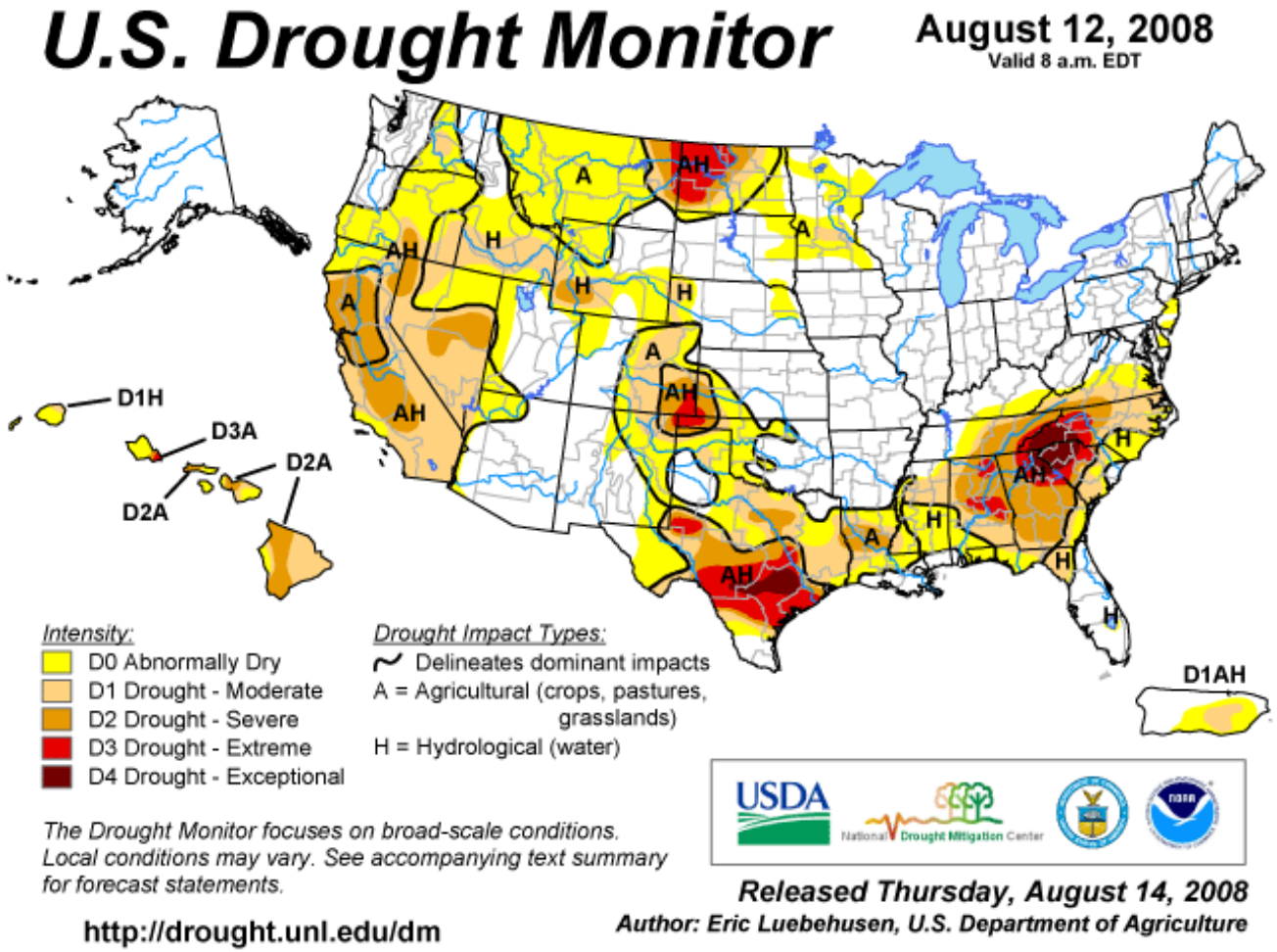
115 gwpm - sorghum is grown in Texas

We should consider WHAT and WHERE we grow biofuel crops

Ask yourself: **Are you ready for 50 gwpm?**

***based on 2003 data**

Uncertainty from threat of droughts



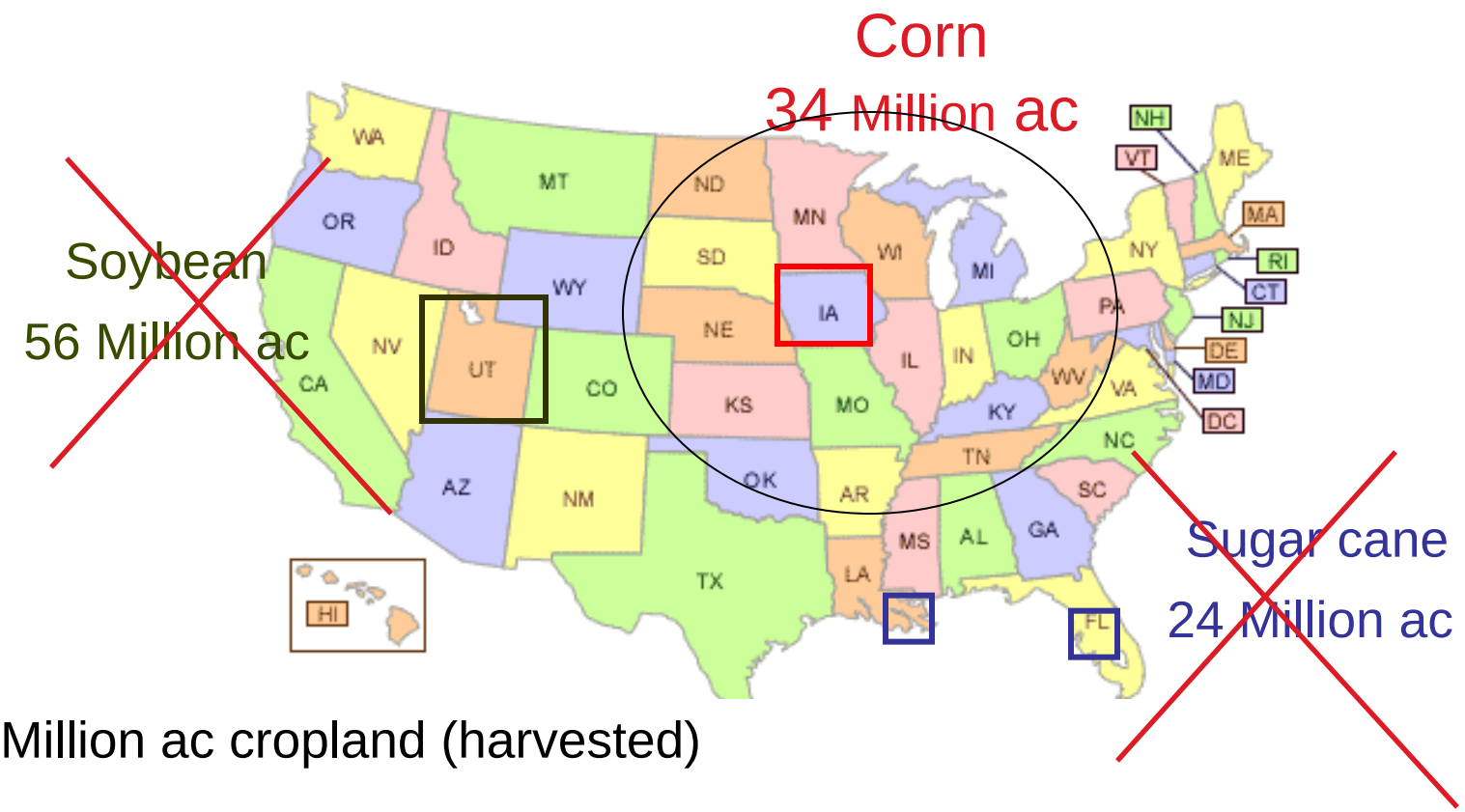
EIS Act (Dec 2007)

By 2020… 15% of 2006 gasoline consumption.

- 16 BGY ethanol from cellulosics

- 15 BGY ethanol from corn (by 2015)

Land



307 Million ac cropland (harvested)

Expansion probably limited to Midwest and NE

Result: Need 1.5 - 2 times as much corn land in the Midwest.

Cellulosics on CRP land

CRP is a program that pays farmers to not to grow crops In certain land.

- Low productivity land
- Sensitive to erosion
- Filter strips for agrichemicals
- Planted with switchgrass and poplar trees type plants

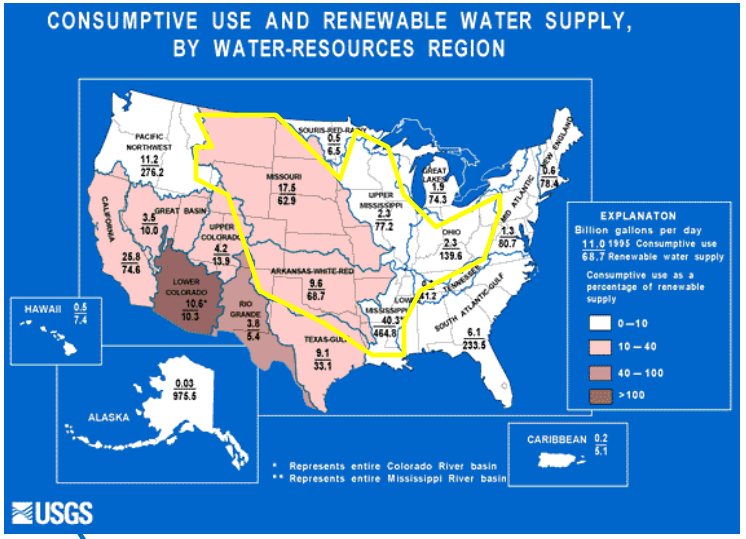
37 Million ac enrolled in 2007
35 Million ac in 2008

16 billion gallons of cellulosics like switchgrass: 31 M ac of switchgrass

Environmental benefits might disappear if not managed correctly

Water availability

MR BASIN BALANCE



Current

Thermoelectric = 23 tgpy

Agriculture = 4 tgpy

Other = 7 tgpy

Total = 34 tgpy (21% of MR flow)

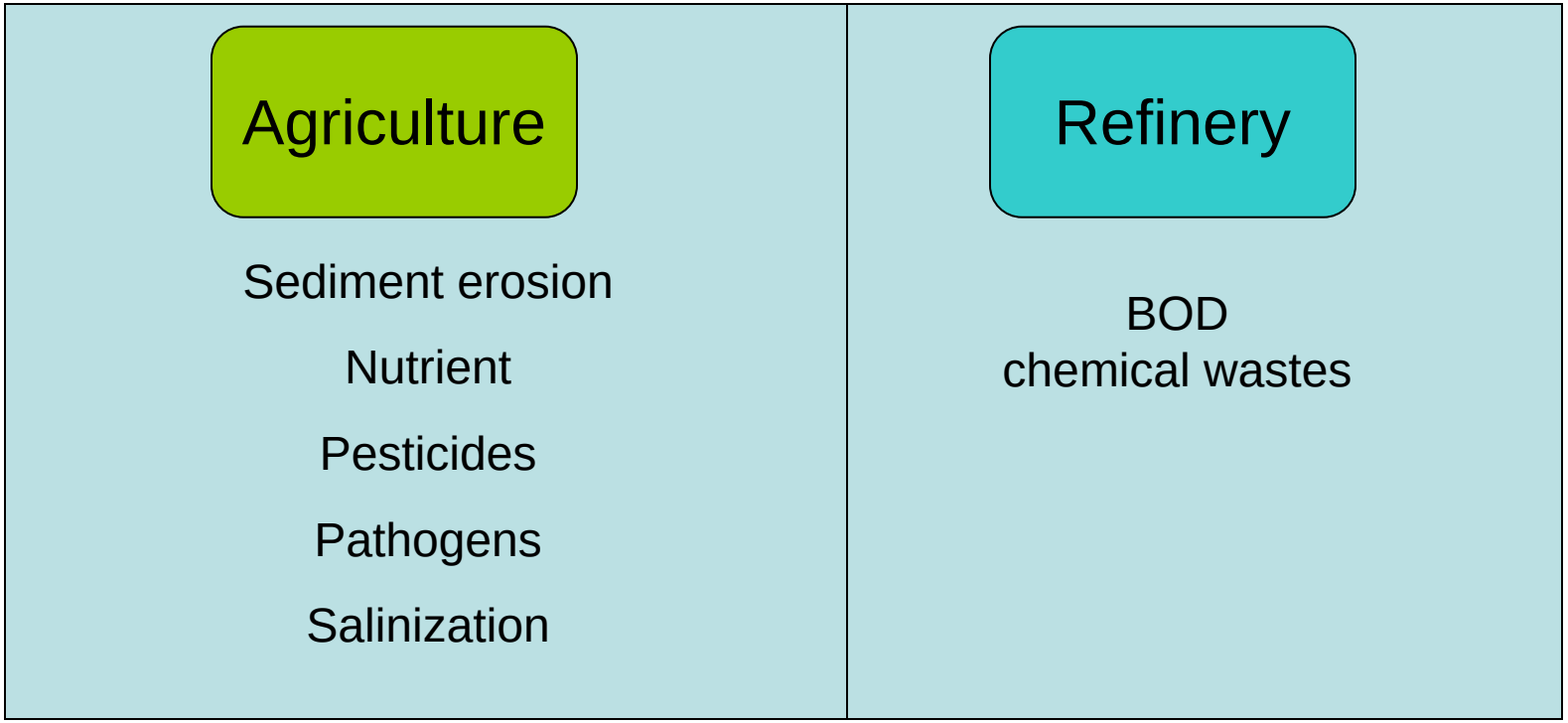
Projected growth

Corn expansion ~ 8 tgpy (2015) (use half of it)

TE expansion ~4.6 tgpy (2020)

Total= 42.6 tgpy (27% MR flow)

Water Quality

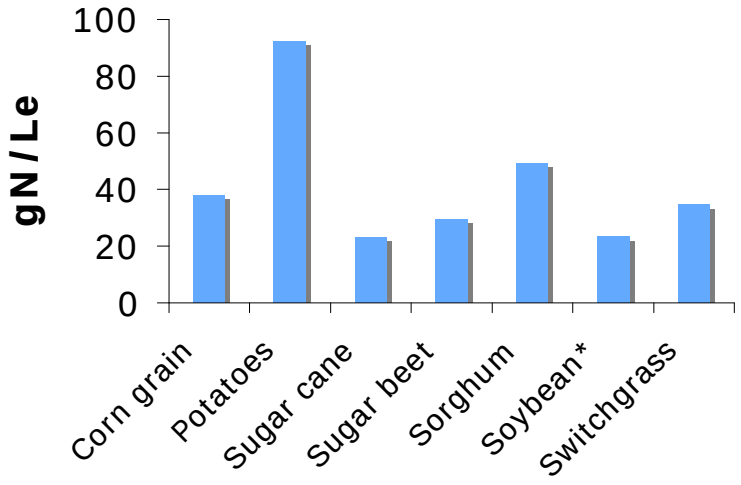


Difficult to regulate because they are non-point sources of pollution

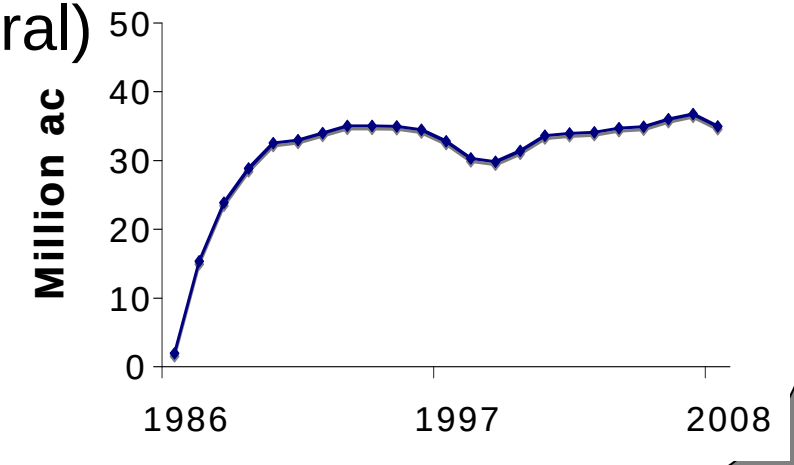
Point source pollution regulated by NPDES

Strategies to regulate non-point pollution

- Reduce input of agrichemicals



- Management practices
- Conservation Programs (Federal)



Summary

- Not all crops are equal
- Huge amounts of water and land.
- Competition with other users: Food, power generation.
- Water quality degradation
- Uncertainty of climate- droughts and floods need to be addressed to prevent unintended damage to the environment and the economy

Recommendations for policy

Chose crops with lower water and land footprint

Match climatic conditions and constrains to crop, rainfed is preferred over irrigated agriculture.

Establish an irrigation water pricing system that reflects true cost of water, to avoid water misuse.

Maintain conservation land (CRP) that act as erosion control and agrichemical filter.

Coordinate policies and programs. Ethanol subsidies and CRP go against each other.

CONSERVATION can be more effective to achieve the targeted 10-15% reduction in imported oil