Biomass Resources in the Midwest Region

Kimberley Mullins, et al.
University of Minnesota

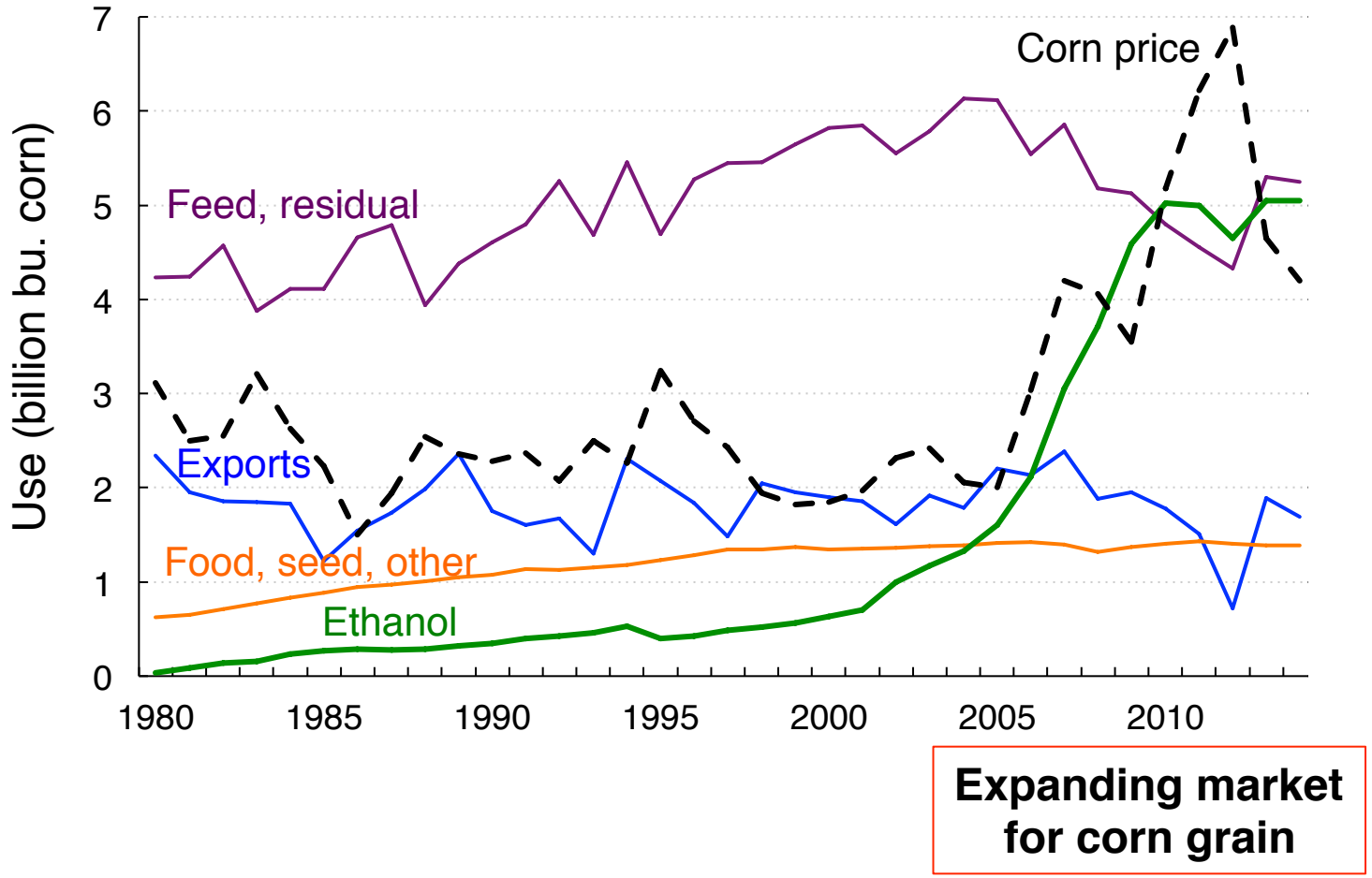
June 25, 2014 l Argonne National Laboratory

Biomass Resource Categories

- Plant residues
  - Corn stover, cereal grain straw, forestry residues
- Dedicated energy crops
  - Switchgrass, sweet sorghum, hybrid poplar
- Other
  - Municipal solid waste (MSW), algae

What is current resource availability?
Future availability?

Current resources strongly tied to corn production.



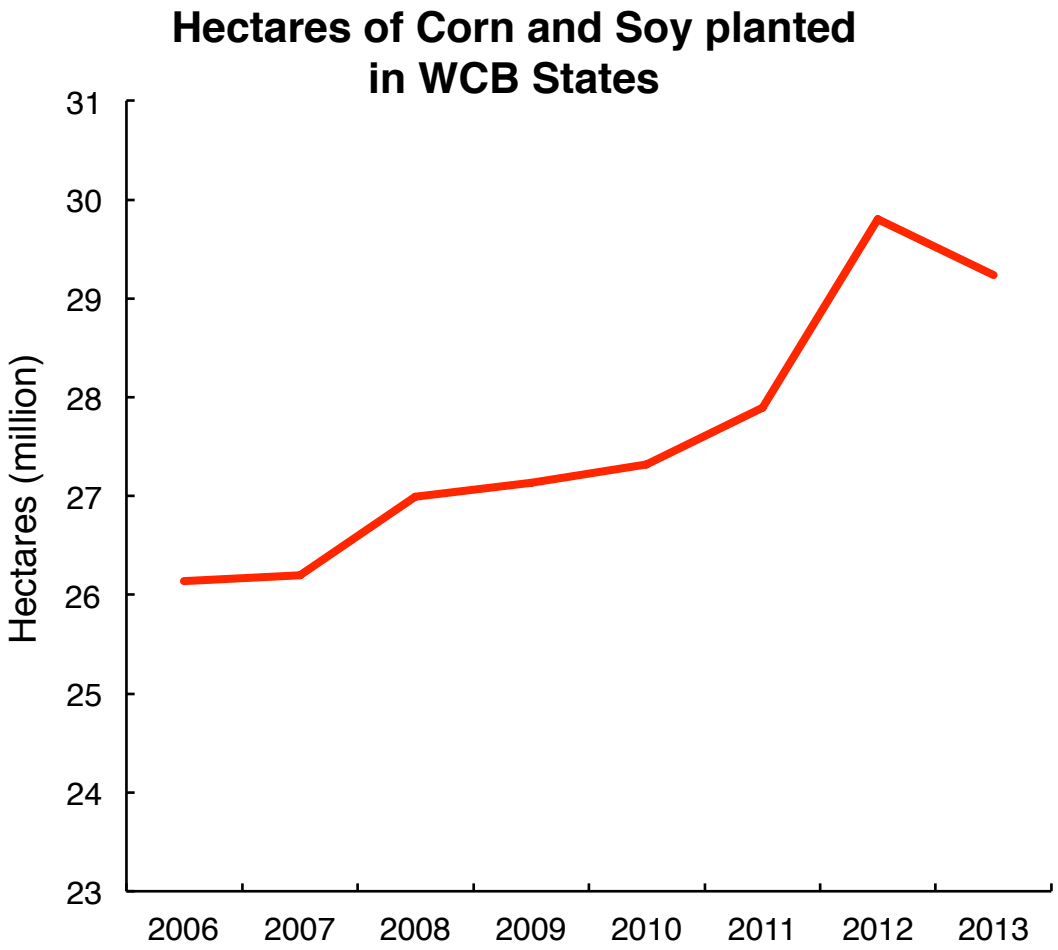
Source: USDA, Economic Research Service Feed Grains Database

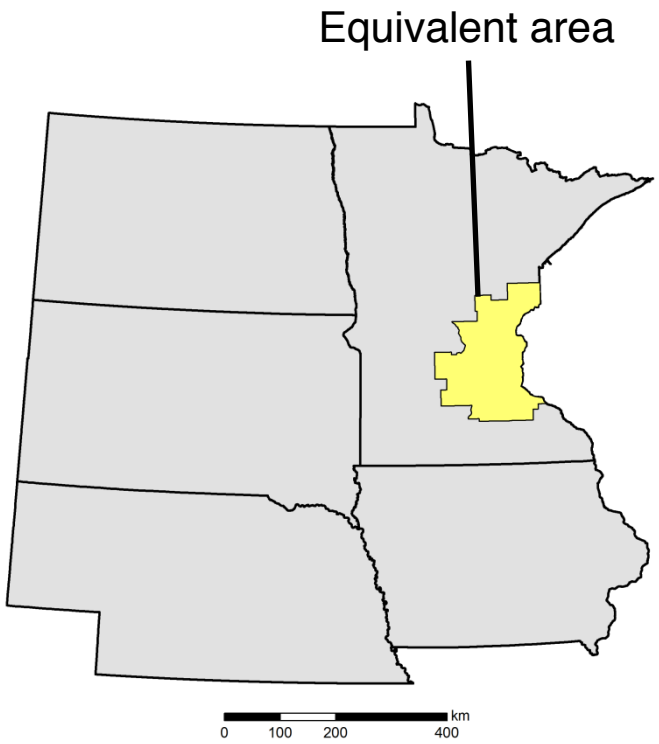
Findings of the USDA Economic Research Service (ERS)

"U.S. corn production has increased dramatically over the past decade. Until 2006, corn production increases were largely due to increases in corn yields. Since 2006, corn production expansion resulted from increases in corn acreage."

- The Ethanol Decade: An Expansion of U.S. Corn Production, 2000-2009. USDA ERS. August 2011.

At the landscape level, we see more corn/soy.





Western Corn Belt (WCB) States

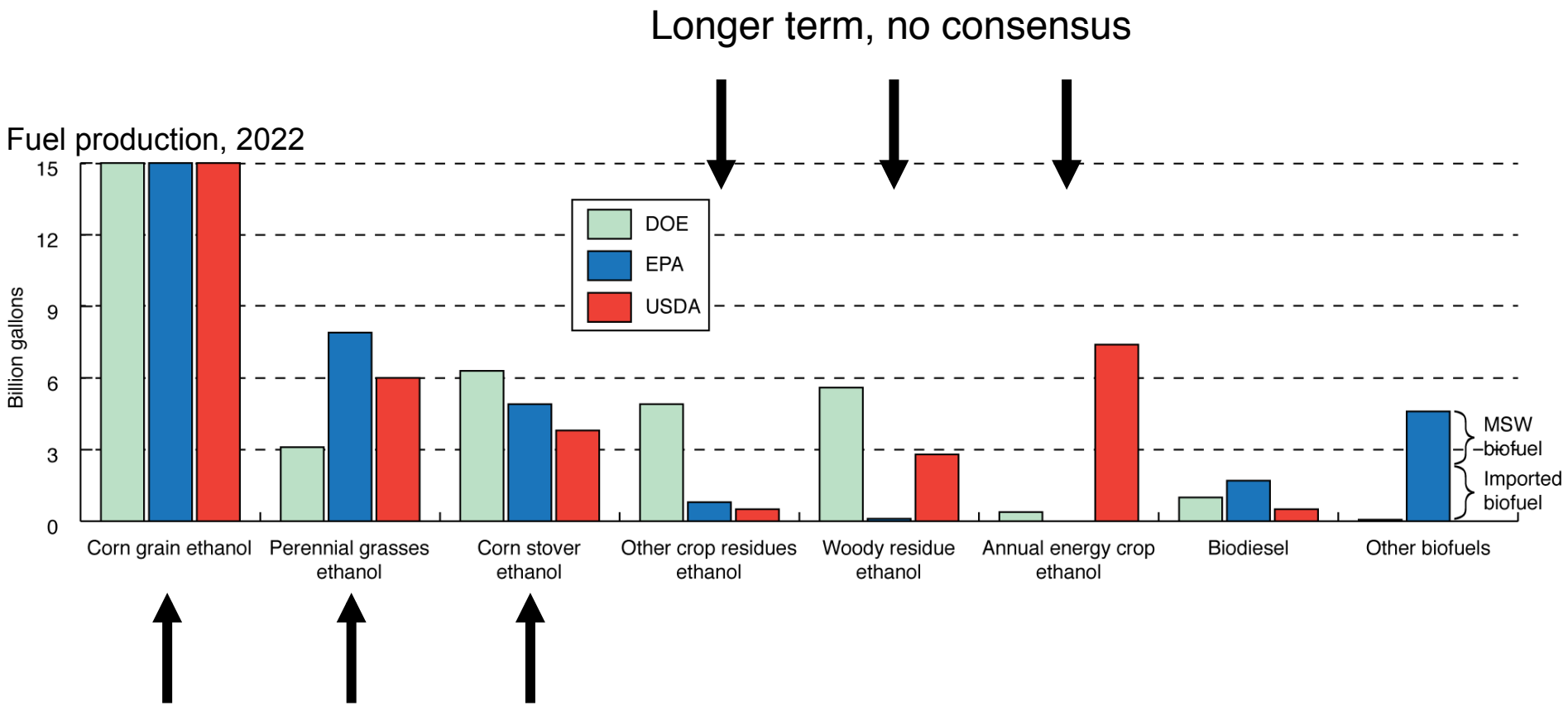
Source: USDA National Agricultural Statistics Service database.

Summary of Current Resources

- Lots of corn stover; perhaps more than before due to corn expansion
- Little availability of other listed feedstocks

More interesting question:
What resource base should we expect in the future?

Three agencies, three visions for future biomass resources and fuel production.



Source: Keeler et al. (2013) *Environ. Sci. Technol.* 47:10095-10101.

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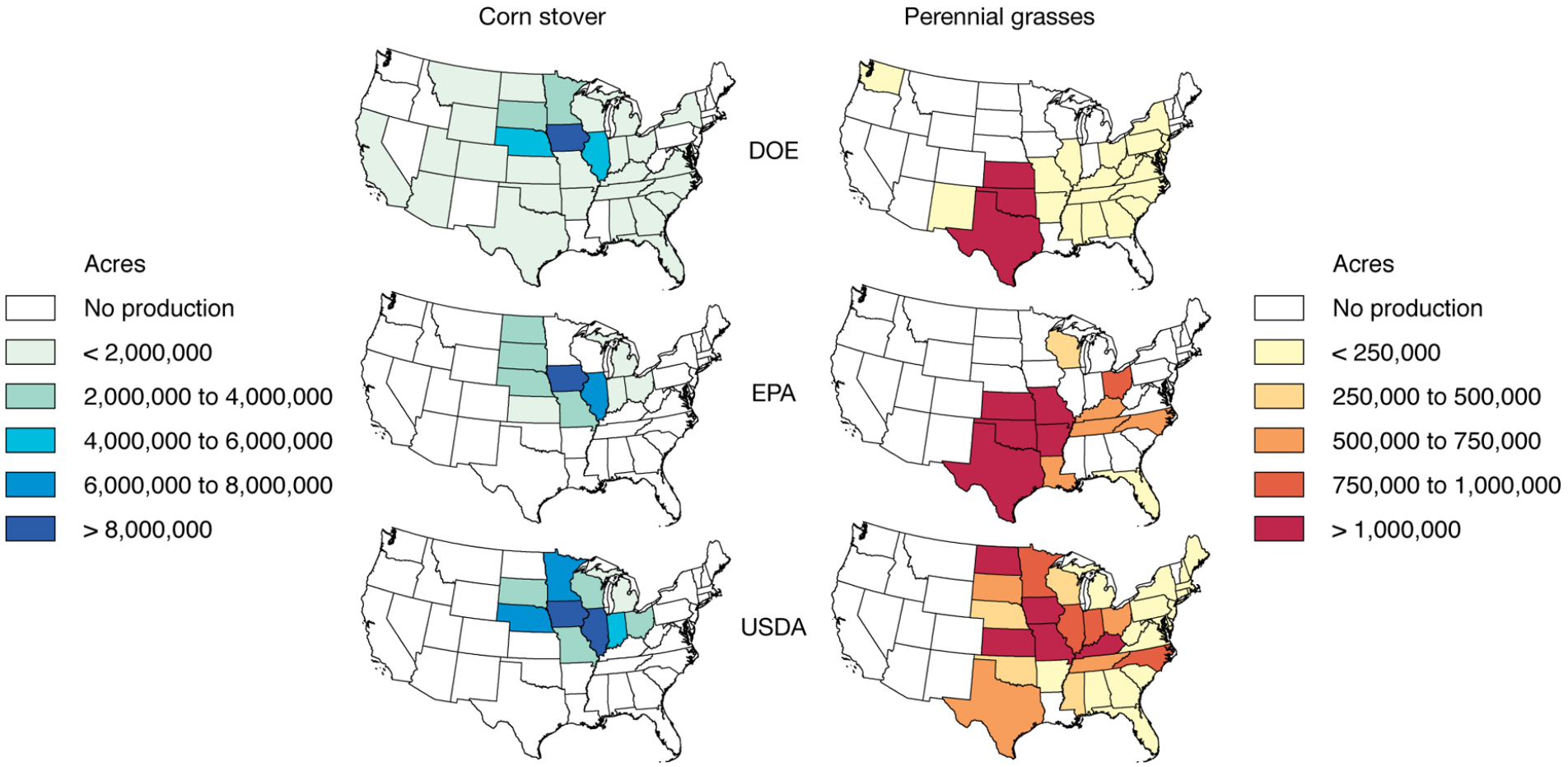

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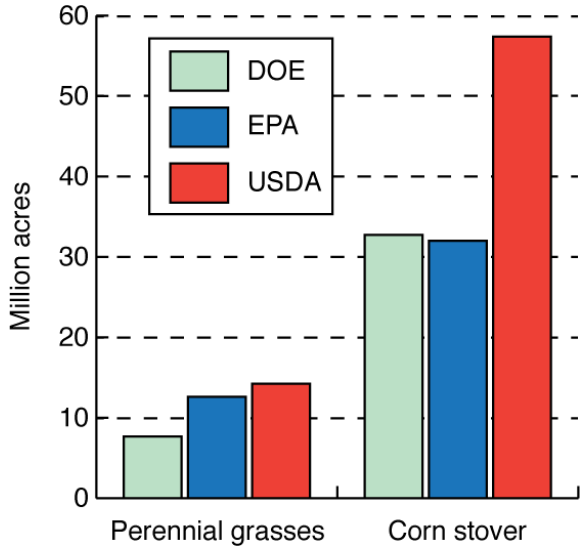
Supply-Side Issues

- Economics: narrow gap between willingness to pay, willingness to accept
  - Non-stover or residue crops will depend on price support mechanism (e.g. crop insurance, which is needed to address issue of risk to farmer)
  - Existing programs a start, though! (e.g. BCAP)

Supply-Side Issues

- Crop management practices, yield
  - Low input, low yield?
  - Yield key in our landscape considerations

USDA projects lowest corn stover etOH (~4 Bgal), but takes twice as much land as either EPA or DOE, due to more conservative harvest rate of corn stover (avg. 1 ton/ acre vs. 1.15 EPA, 2.8 DOE).



Demand-Side Issues

- Stable second-generation, cellulosic fuel industry yet to be established
- Expansion of markets for biomass in electricity generation, heating applications needed
- Creation of markets for ecosystem services provided by biomass resources
  - value in growing *and* selling biomass

Summary Remarks

- Recent increase in residue availability due to corn acreage increase
- Challenges remain for diversifying resource base beyond residues due to supply issues, demand issues -- tied to economics and policy that may influence

Acknowledgements

Funding sources:

DOE biomass program grant DE-EE0004397
USDA AFRI competitive grant 2011-68005-30411
EPA-STAR fellowships

Lab group:

Professor Jason D. Hill
Tom Nickerson
Brian Krohn
Ryan Noe
Bonnie Keeler

Contact:

kmullins@umn.edu
or
http://hill.cfans.umn.edu/