MIDWEST AGRICULTURE LAND USE HISTORY AND THE PRAIRIE LANDSCAPE, CURRENT AND FUTURE LAND USE, LAND OWNERSHIP AND PRESSURES ON LAND USE DECISIONS

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Sustainable Bioenergy Landscapes
Workshop 2- Midwest Grain landscapes
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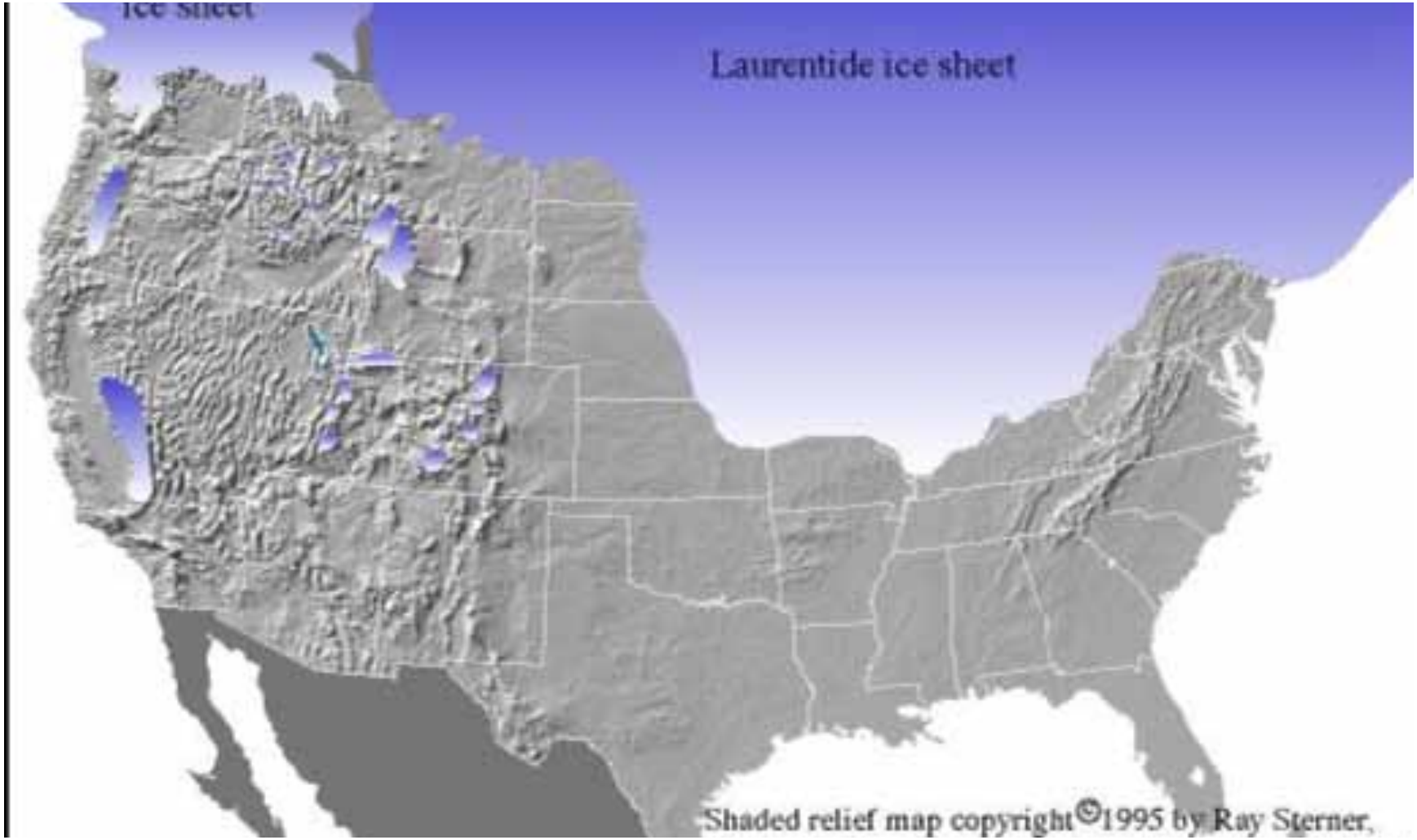
Argonne NATIONAL LABORATORY

REETZ Agronomics

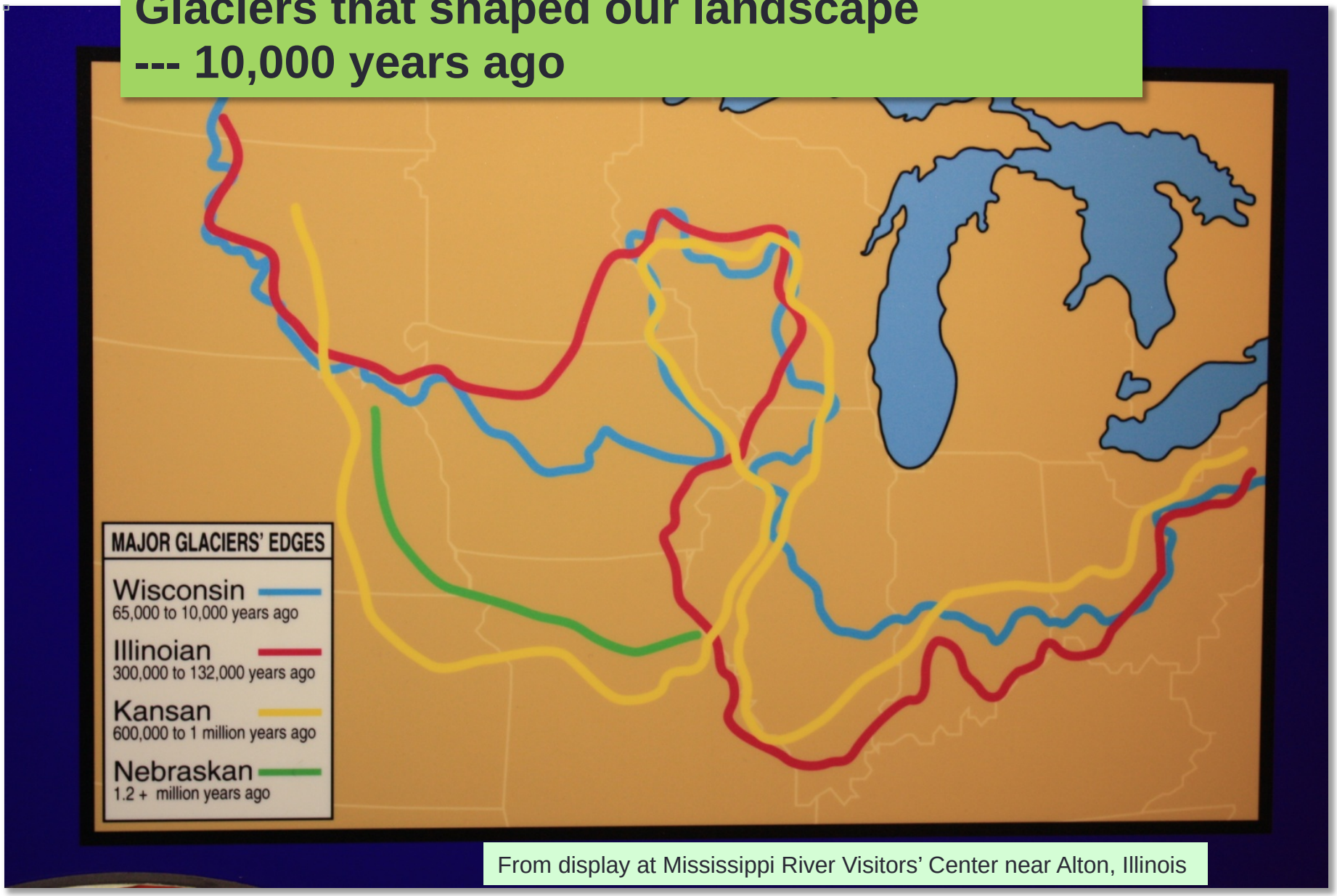
10,000 years ago – *1,000+ ft. of ice covered the Northern Midwest.*

Aerial view over Greenland, June 10, 2012…H. F. Reetz

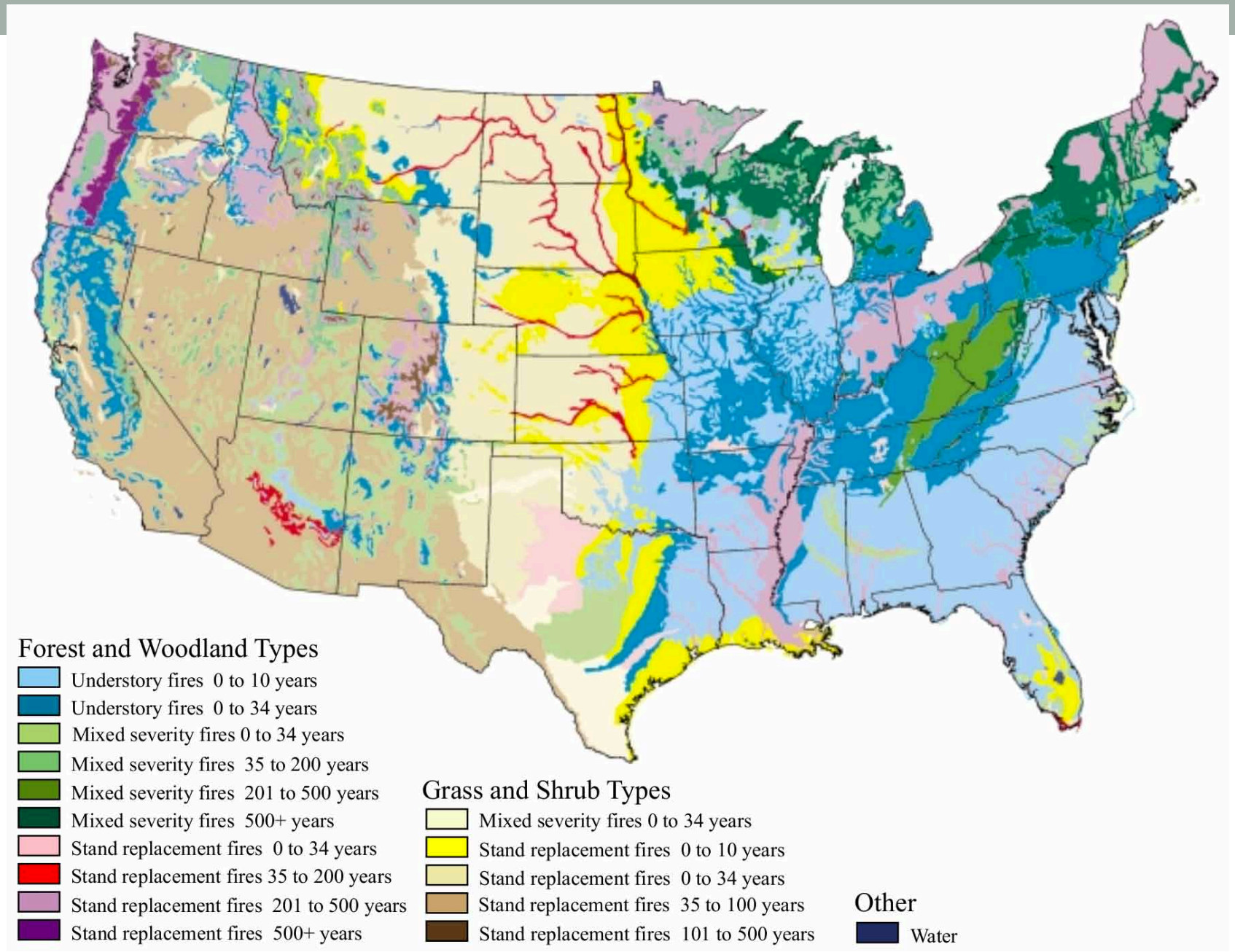
Most Recent Glaciation



Glaciers that shaped our landscape --- 10,000 years ago



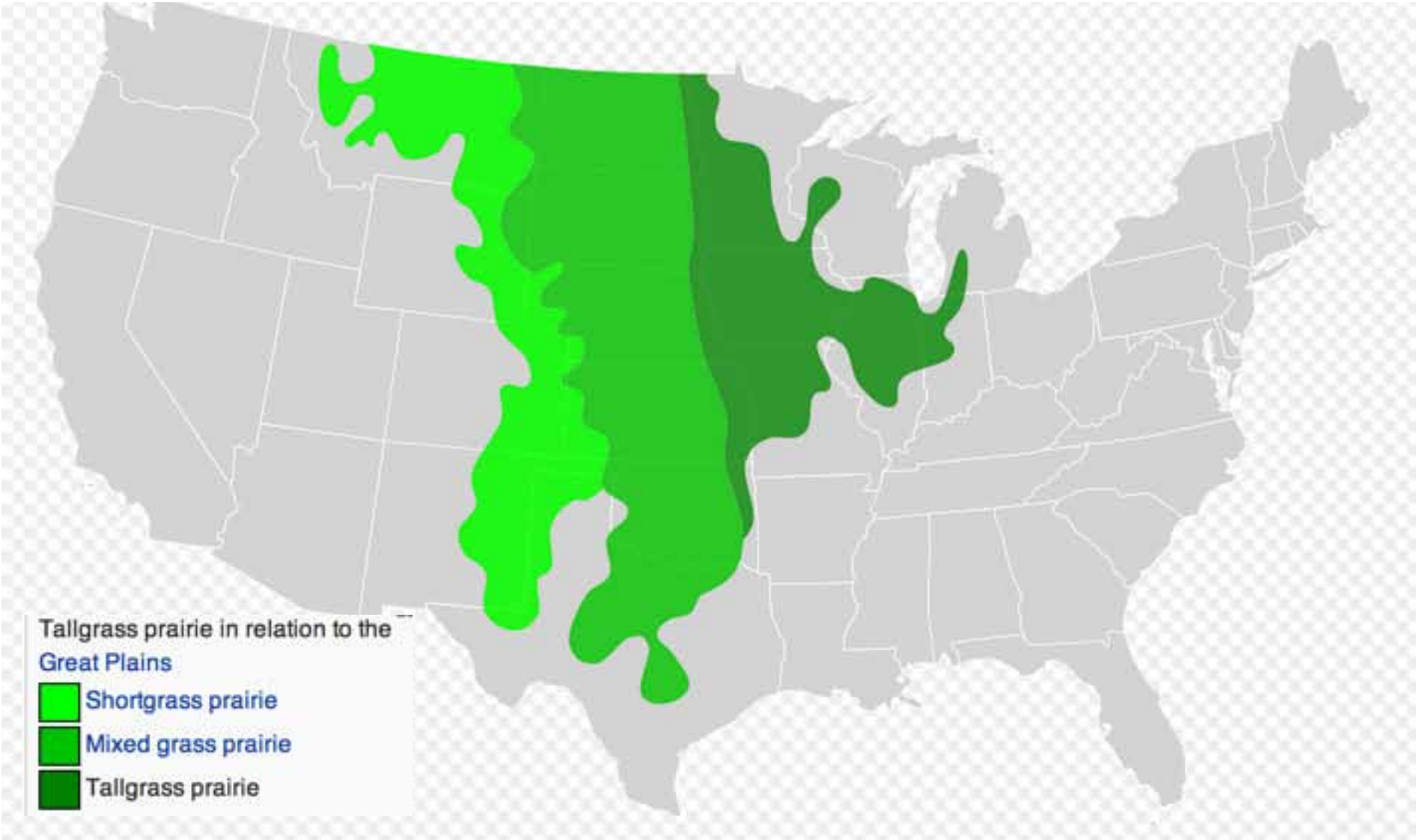
From display at Mississippi River Visitors' Center near Alton, Illinois


Forest and Woodland Types
Understory fires 0 to 10 years
Understory fires 0 to 34 years
Mixed severity fires 0 to 34 years
Mixed severity fires 35 to 200 years
Mixed severity fires 201 to 500 years
Mixed severity fires 500+ years
Stand replacement fires 0 to 34 years
Stand replacement fires 35 to 200 years
Stand replacement fires 201 to 500 years
Stand replacement fires 500+ years
Grass and Shrub Types
Mixed severity fires 0 to 34 years
Stand replacement fires 0 to 10 years
Stand replacement fires 0 to 34 years
Stand replacement fires 35 to 100 years
Stand replacement fires 101 to 500 years
Other
Water

Native Americans Managed Prairie for Bison Grazing

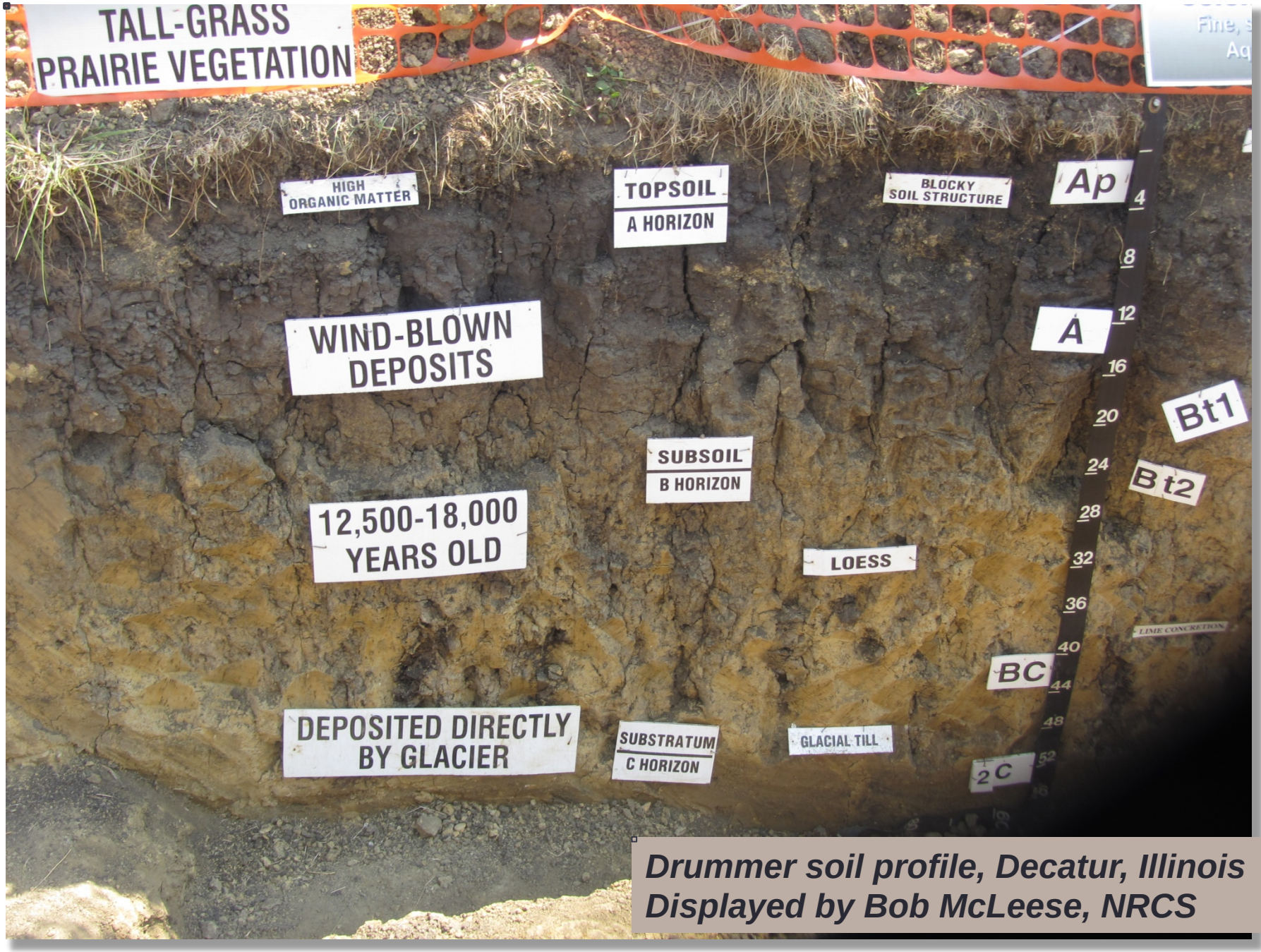
Roosevelt Nat'l Park, North Dakota
Photo by Harold Reetz

Prairie Ecosystems of the Continental US



The Prairie Landscape

- **Tall grass prairie**
  - *Big bluestem*
  - *Patches of woodland*
- **Oak-Hickory encroachment held off by burning**
  - *Natural firestorms*
  - *Managed burns by Native Americans to maintain hunting grounds*
- **Marsh and swampland common**
  - *“Malaria-infested swamps”*
- **Drainage and steel plow enabled agriculture to enter**
  - *Rangeland until mid 1800’s*
  - *Forage/grain rotations until mid 1900s*
  - *Dominant row-crop grain since 1970s*

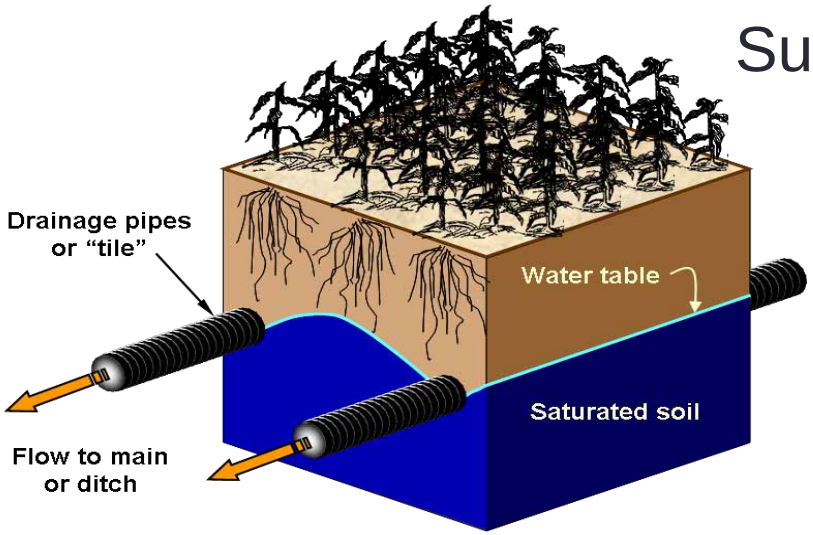


Drummer soil profile, Decatur, Illinois
Displayed by Bob McLeese, NRCS

Photo by Harold Reetz

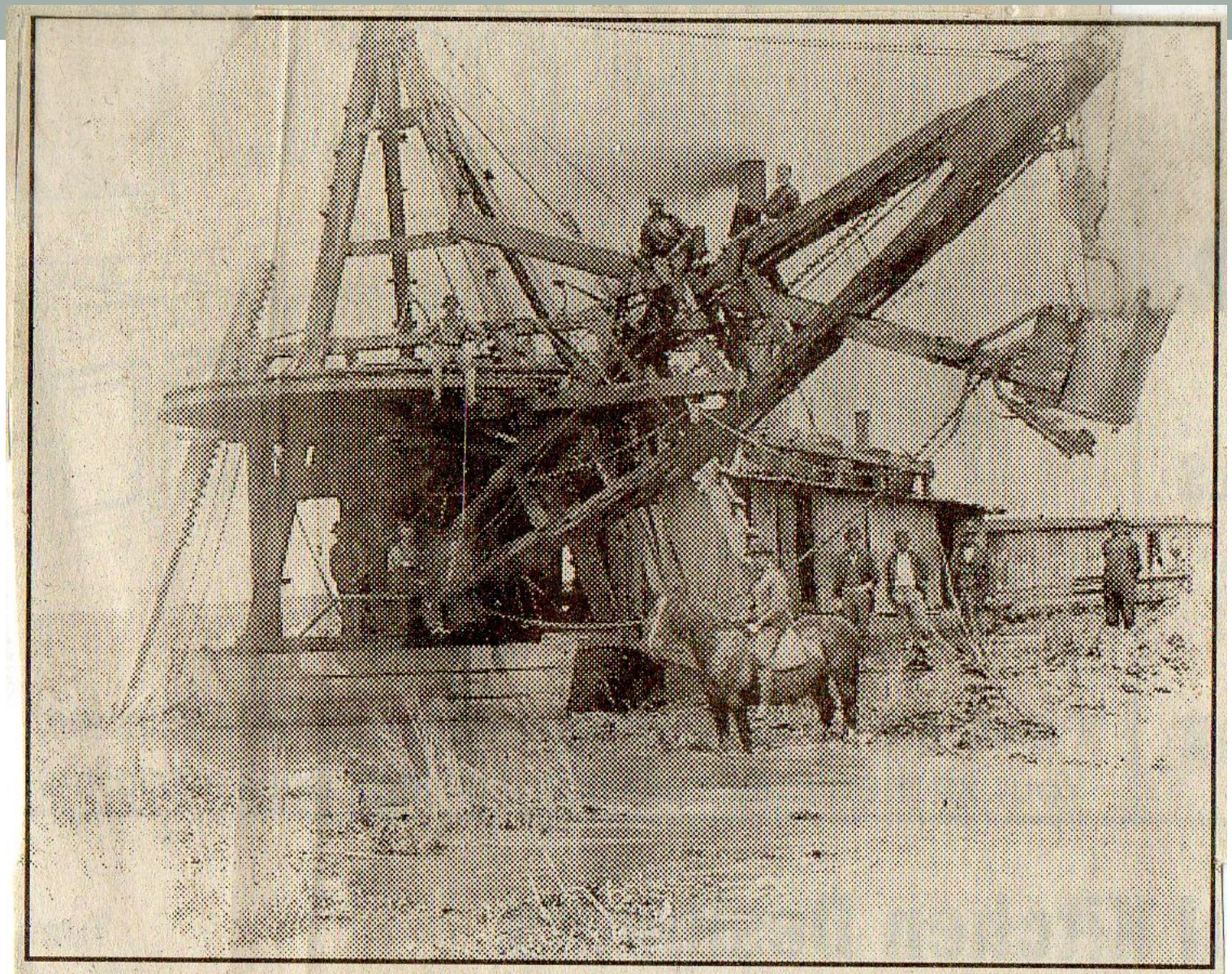
HOW DRAINAGE SHAPED OUR LAND---HOW IT WILL SET THE STAGE FOR FUTURE SUSTAINABLE PRODUCTION SYSTEMS

Artificial Drainage for Agriculture



Subsurface ("Tile") Drainage

Surface Drainage



This is a good shot of a slough on the wet central Illinois prairie more than 100 years ago. The dredge is digging a ditch that will drain the slough.

From the ***News Gazette***, Champaign, IL

Laser & GPS guided drainage installation

Photos by Harold Reetz, 2012

2008 Illinois Cropland Data Layer

Land Cover Categories

(Ordered by Decreasing Acreage)

Agriculture

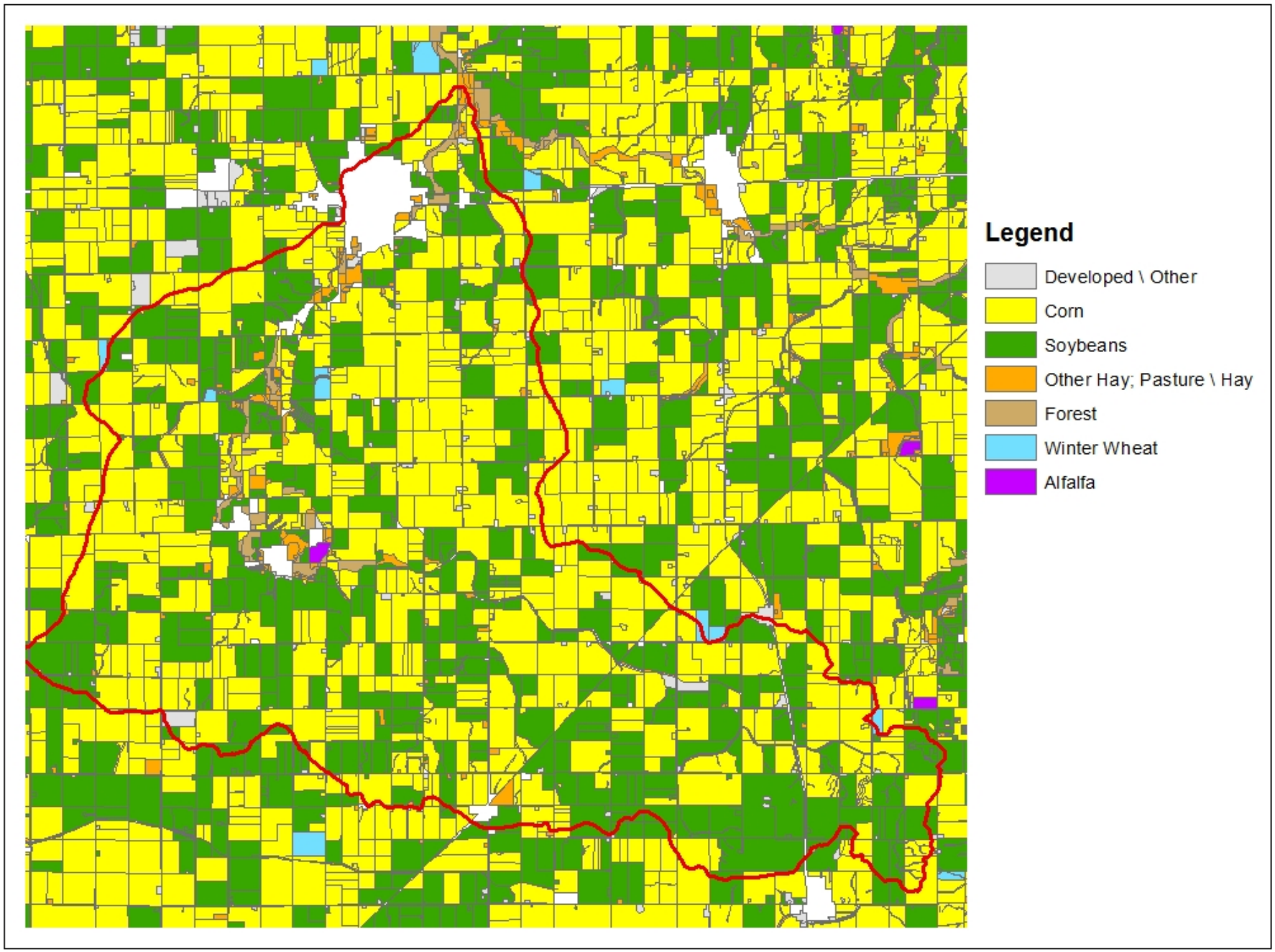
- Corn
- Soybeans
- Pasture/Grass
- W. Wht./Soy. Dbl. Crop.
- Winter Wheat
- Fallow/Idle Cropland
- Alfalfa
- Sorghum
- Misc. Vegs. & Fruits
- Seed/Sod Grass
- Dry Beans
- Other Crops
- Oats
- Clover/Wildflowers
- Potatoes
- Rice
- Sunflowers
- Rye
- Other Small Grains
- Peas

Non-Agriculture

- Woodland
- Urban/Developed
- Water
- Wetlands
- Barren
- Shrubland

Current Land Use

Classified Landsat Image—Central Livingston County, Illinois



Indian Creek Watershed—Current Land Use

Land Ownership—Central Illinois

	2003	2004	2005	2006	2007	2008	2009	Change
% Owned	15	15	14	13	13	13	13	-2
% Crop shared	59	56	56	55	53	52	52	-7
% Cash rented	26	29	30	32	34	35	35	+9

87% is owned by someone other than the farmer!

Pressures on Land Use Decisions

- **Cost of production**
  - *Increasing land value*
  - *Increasing input costs*
- **Potential profitability**
  - *Lower grain prices*
  - *Higher costs*
- **Environmental issues**
  - *Water quality---local and Gulf of Mexico*
  - *Air quality*
  - *Ecosystem services*
- **Regulations**
- **Society pressures**
  - *Food source and production management*
  - *Science vs “philosophy”*
  - *Facts vs ignorance vs emotion*

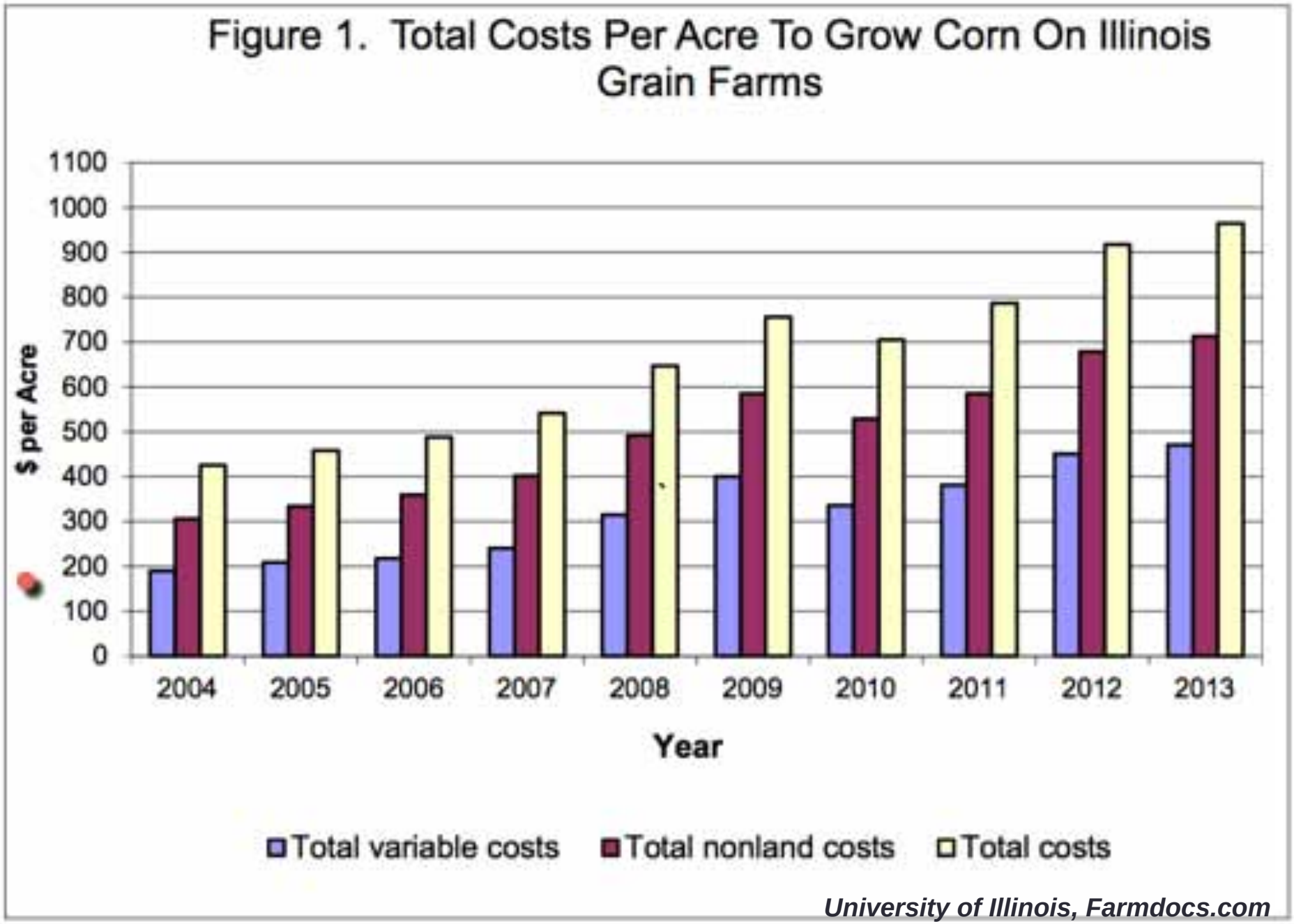
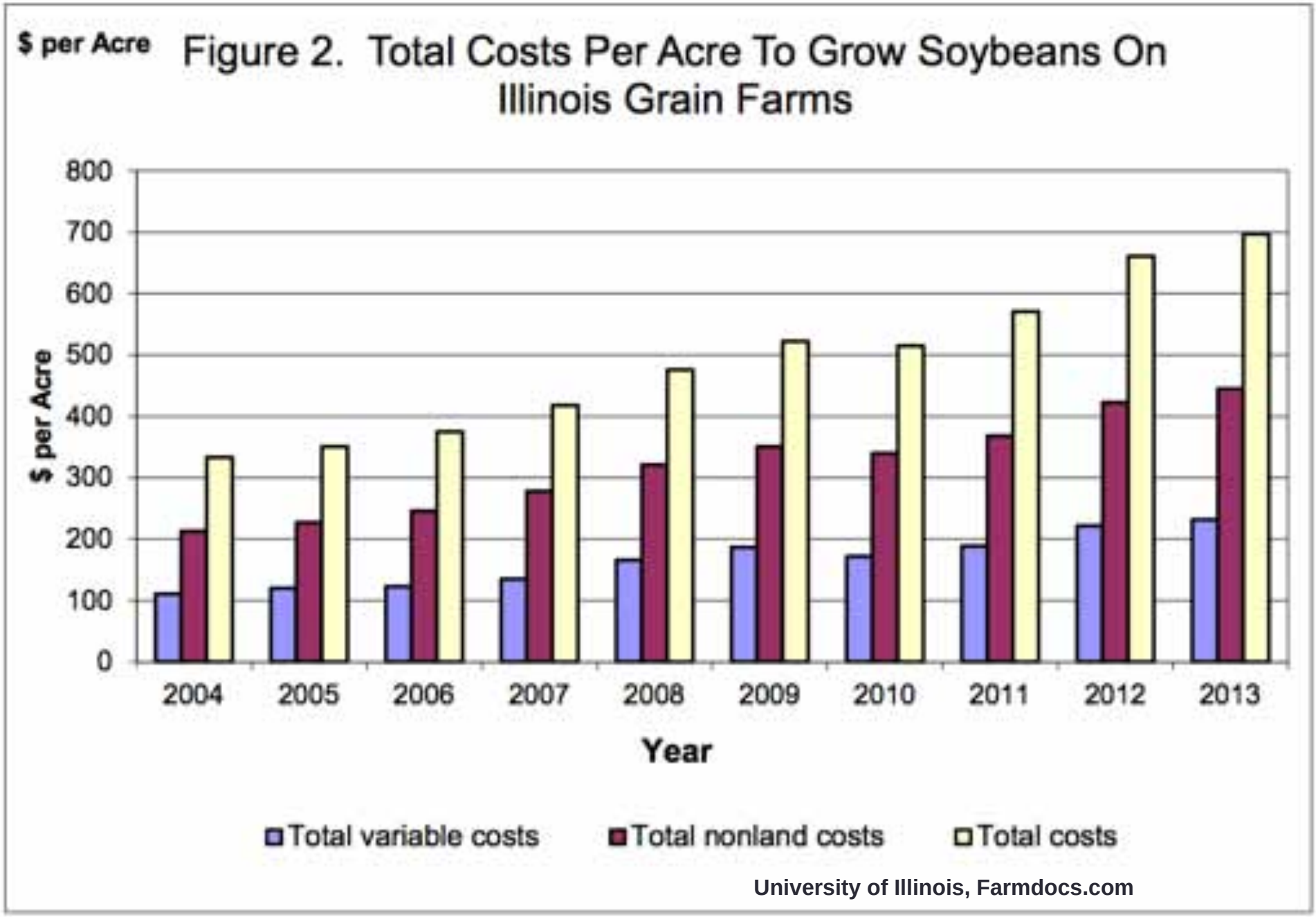


Figure 1. Total Costs Per Acre To Grow Corn On Illinois Grain Farms
$ per Acre
1100
1000
900
800
700
600
500
400
300
200
100
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year
Total variable costs
Total nonland costs
Total costs
University of Illinois, Farmdocs.com


$ per Acre
Figure 2. Total Costs Per Acre To Grow Soybeans On Illinois Grain Farms
800
700
600
500
400
300
200
100
0
$ per Acre
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year
Total variable costs
Total nonland costs
Total costs
University of Illinois, Farmdocs.com

farm.doc

NASS Yields and Time Trend for LIVINGSTONCounty, Illinois

DATA:

Year	Actual (bu./acre)	Detrended (bu./acre)
1972	120.6	172.3
1973	102.2	152.3
1974	78.8	127.3
1975	124.1	171.0
1976	121.3	166.7
1977	90.9	134.7
1978	119.1	161.3
1979	132.4	173.1
1980	81.7	120.9
1981	125.7	163.3
1982	139.9	175.9
1983	69.3	103.7
1984	99.0	131.9
1985	146.5	177.8
1986	125.1	154.8
1987	116.1	144.2
1988	41.8	68.5
1989	146.2	171.3
1990	132.3	155.8
1991	69.0	90.9
1992	156.0	176.4
1993	132.0	150.8
1994	156.0	173.2
1995	111.0	126.7
1996	146.0	160.1
1997	122.0	134.5
1998	132.0	143.0
1999	136.0	145.4
2000	147.0	154.8
2001	145.0	151.3
2002	138.0	142.7
2003	168.0	171.1
2004	181.0	182.6
2005	145.0	145.0
2006	176.0	174.4
2007	189.0	185.9

Summary Descriptors:

Crop: Corn

Location: LIVINGSTON

raw data	bu./acre
mean	123.44
median	128.86
std. dev.	30.18

detrended to 2005	
mean	148.20
median	153.36
std. dev.	26.20

Definitions:

Mean - average of the data

Median - central obervation when ranked high to low

Standard Deviation - measure of the relative variation about the mean

Raw - original data series from National Agricultural Statistical Service (NASS/USDA)

Detrended - data have been corrected for time trend and stated in terms of 2005 conditions

University of Illinois, Farmdocs.com

Table 1. Cost Per Acre for Growing Corn and Soybeans on Illinois Grain Farms Without Livestock in 2013

	Corn				Soybeans			
	Northern	Central [1] High	Central [2] Low	Southern	Northern	Central [1] High	Central [2] Low	Southern
Number of Farms	351	641	373	205	351	641	373	205
Acres in crop	900	698	691	699	406	580	587	670
NONLAND COSTS								
Variable Costs:								
Soil Fertility	$199	$193	$202	$198	$49	$65	$58	$63
Pesticides	60	66	66	66	35	40	42	46
Seed	118	114	120	111	68	73	64	64
Drying	29	24	19	17	1	1	2	1
Repairs, fuel and hire	82	63	69	76	70	55	62	71
Total variable costs	$488	$460	$476	$468	$223	$234	$228	$245
Percent change from 2012	5%	4%	3%	9%	4%	3%	5%	8%
Other nonland costs								
Labor	$48	$48	$49	$58	$43	$45	$48	$53
Buildings	25	16	20	24	13	14	14	14
Storage	5	8	7	3	2	4	2	2
Machinery depreciation	69	63	62	67	60	55	53	64
Nonland interest	55	51	47	44	45	46	41	45
Overhead	55	50	51	51	53	47	48	51
Total, other costs	$257	$236	$236	$247	$216	$211	$206	$229
Total, nonland costs	$745	$696	$712	$715	$439	$445	$434	$474
Percent change from 2012	6%	4%	4%	9%	6%	4%	5%	9%
LAND COSTS								
Taxes	$40	$40	$29	$22	$40	$40	$29	$22
Annually adjusted net rent	$248	$230	210	135	248	230	210	135
Total land costs	$288	$270	$239	$157	$288	$270	$239	$157
TOTAL, all costs	$1,033	$966	$951	$872	$727	$715	$673	$631
Percent change from 2012	6%	4%	5%	10%	6%	4%	5%	10%
2013 yields, bushels per acre	204	197	183	169	59	58	53	49
Nonland costs per bushel	$3.65	$3.53	$3.89	$4.23	$7.44	$7.67	$8.19	$9.67
Total, all costs per bushel	$5.06	$4.90	$5.20	$5.16	$12.32	$12.33	$12.70	$12.88
2009-2013 average yield	175	171	160	135	57	56	52	45
Nonland costs per bushel	$4.26	$4.07	$4.45	$5.30	$7.70	$7.95	$8.35	$10.53
Total, all costs per bushel	$5.90	$5.65	$5.94	$6.46	$12.75	$12.77	$12.94	$14.02

Note: The last two lines of the table are costs based on 2009-2013 average yields

[1] Soil productivity ratings of 86 to 100

[2] Soil productivity ratings of 56 to 85

University of Illinois, Farmdocs.com

Future Land Use

- **Dominance of corn and soybeans will continue**
  - *One of the best ecosystems in the world for these crops*
  - *Local and global demand growing*
  - *Infrastructure in place*
- **Increase in conservation**
  - *Grower initiative---conservation ethic*
  - *External pressures*
  - *Increased efficiency---and profitability*
- **Alternative crops**
  - *Forages---dependent upon livestock production*
  - *Vegetables---limited acreage potential*
  - *Bioenergy crops---market dependent; marginal land?*
  - *New crops---as technology and demand dictate*

The best management practices in the world are only effective with the farmer's participation.

What's in it for me?

(-) Apply for financial and technical assistance

(-) Install the practices

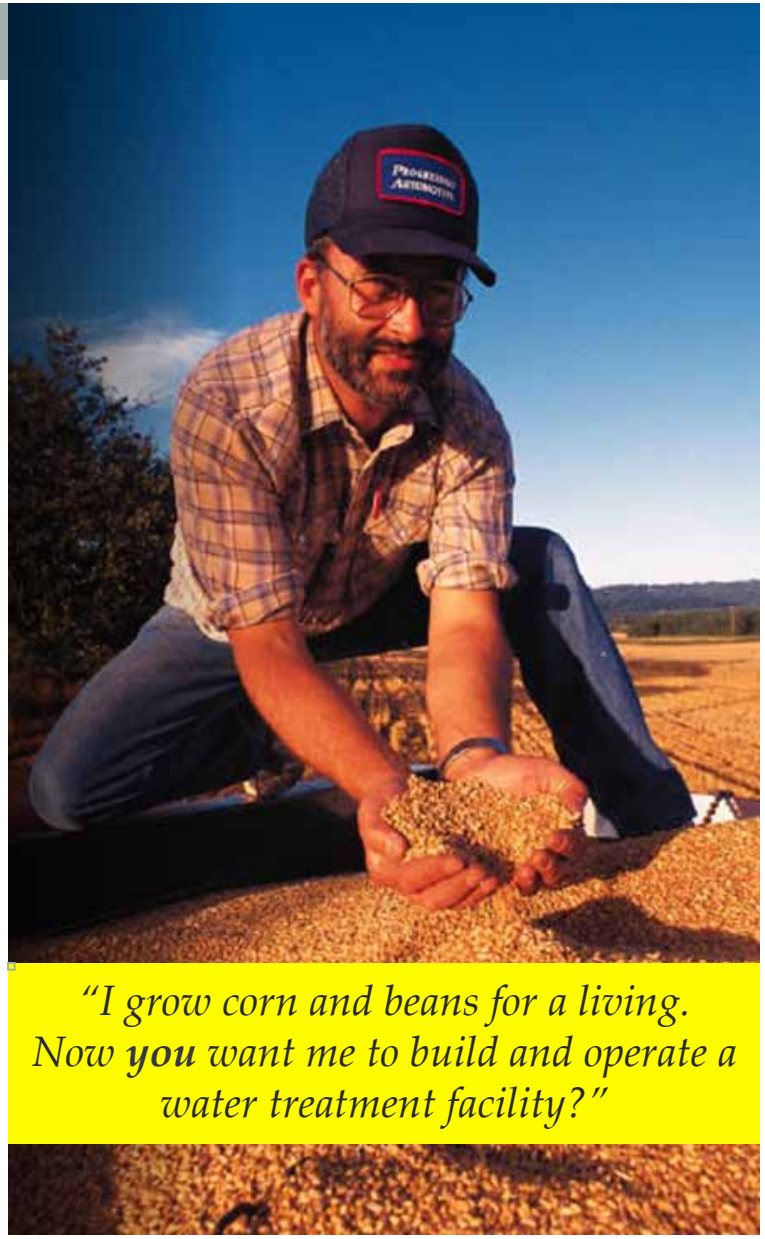
(-) Pay out of pocket expenses

(-) Sacrifice tillable acres

(-) Maintain and manage the practices and structures

(+) Ecosystem services markets?

- *Cost-share of installation investment*
- *Management incentives*



*"I grow corn and beans for a living. Now **you** want me to build and operate a water treatment facility?"*

Many management changes represent a significant capital investment---must be balanced by potential benefits.

Champaign County, Illinois

Thank you!

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