

# Iowa City Rotary

*October 12, 2021*

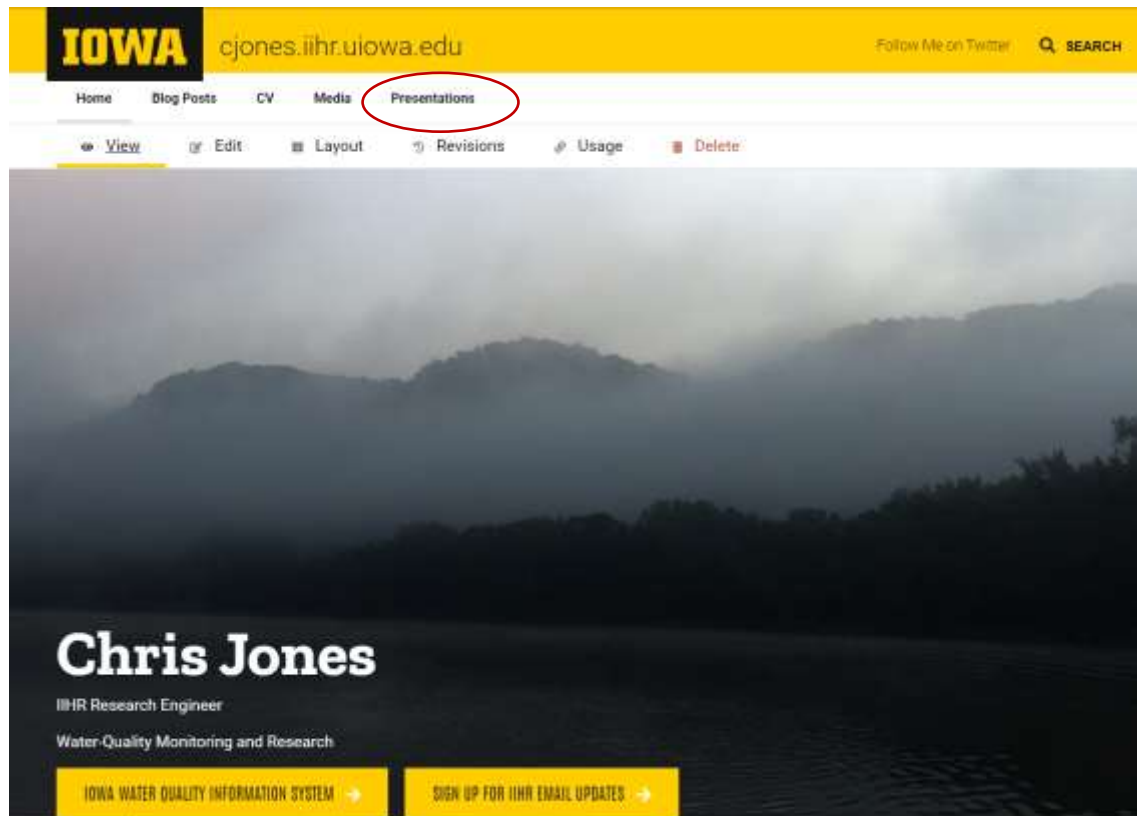
**Chris Jones, Research Engineer**

[christopher-s-jones@uiowa.edu](mailto:christopher-s-jones@uiowa.edu)

## Slides Available at:

<https://cjones.iihr.uiowa.edu/>

- Grew up in Ankeny, IA
- Went to Simpson College in Indianola, IA
- PhD work at Montana State University (1987)
- Managed commercial analytical testing laboratory in MN, 1988-1999
- Consulting work for water and wastewater utilities, MN, 1999-2003
- Des Moines Water Works, supervisor of water quality, 2003-2011
- Iowa Soybean Association, environmental scientists, 2011-2015
- UI, 2015-present





## IIHR Water Quality Sensor Network

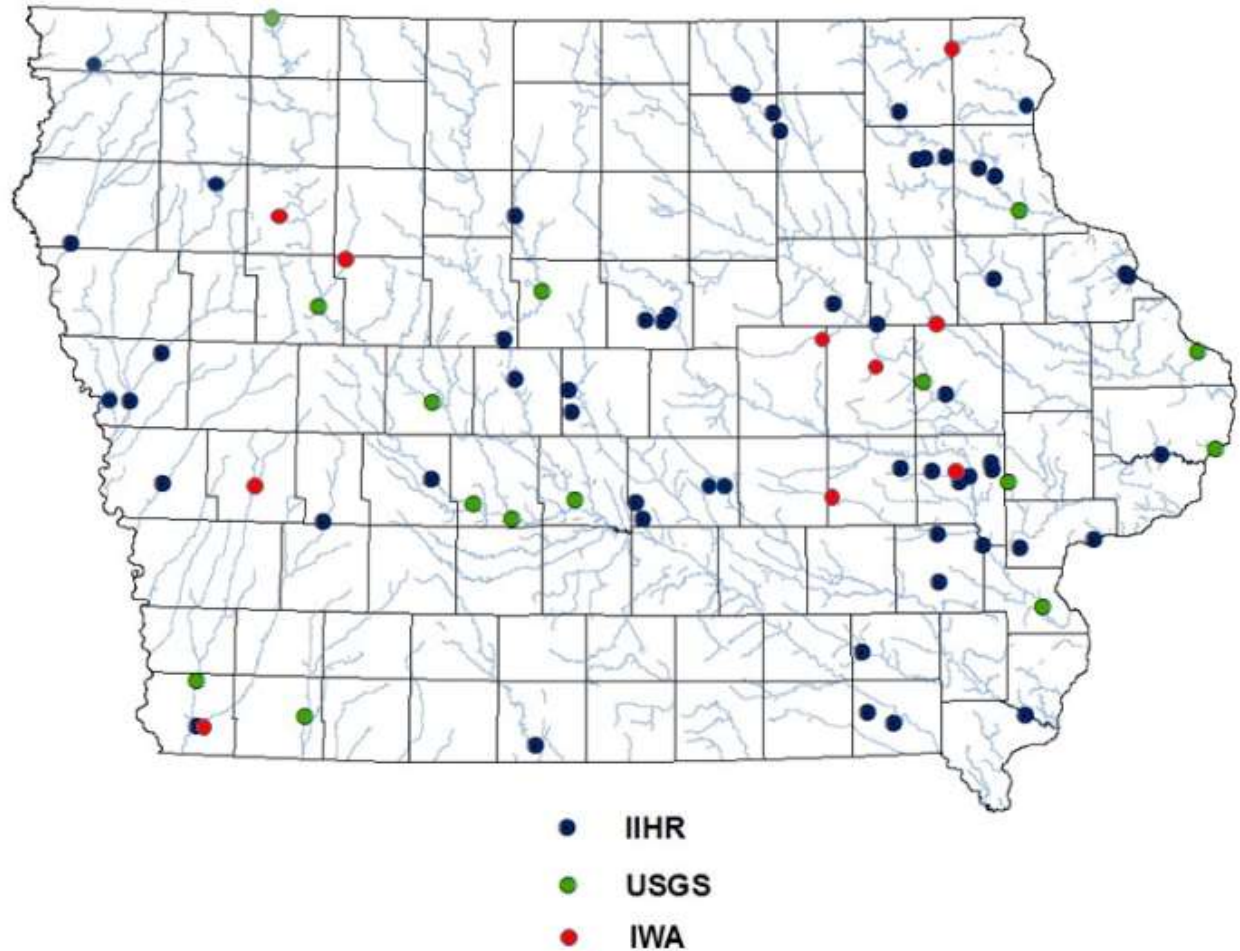


## Sites

70+ sites Nitrate-N

20-25 sites

- Temperature
- pH
- SC
- DO
- Turbidity

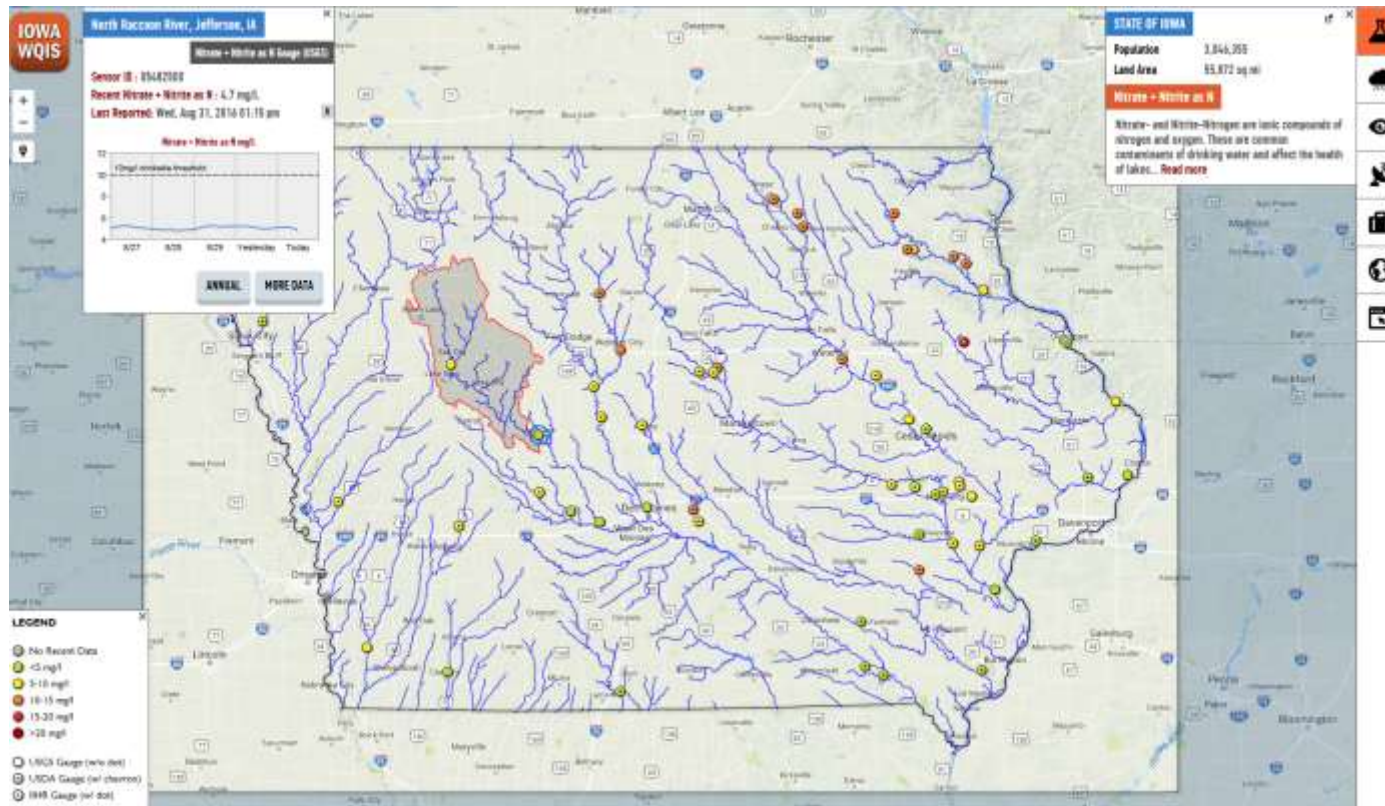


## Site infrastructure





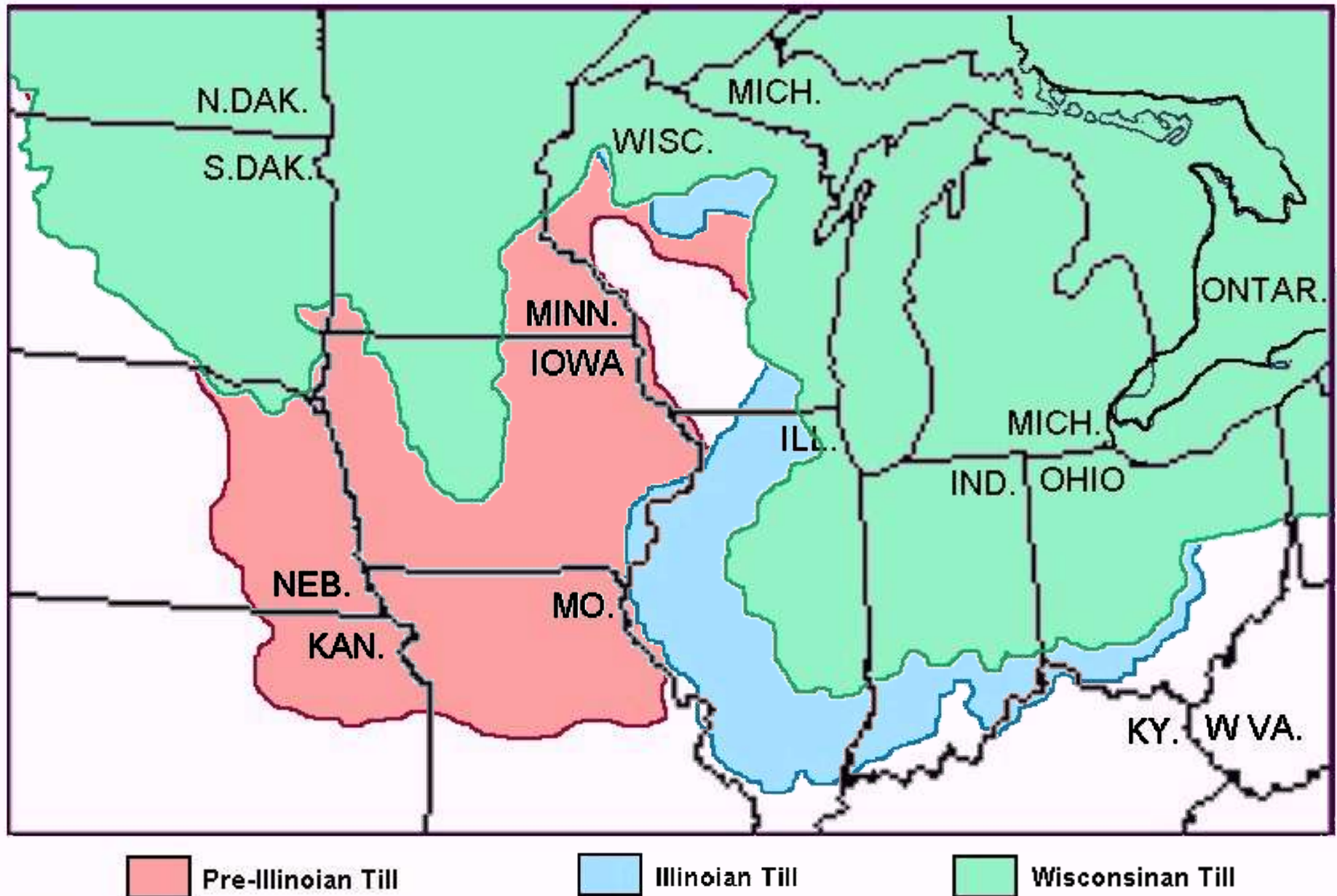
# Iowa Water Quality Information System



[iwqis.iowawis.org/](http://iwqis.iowawis.org/)

<http://iwqis.iowawis.org/app/?datetime=2017-06-06T13:00>

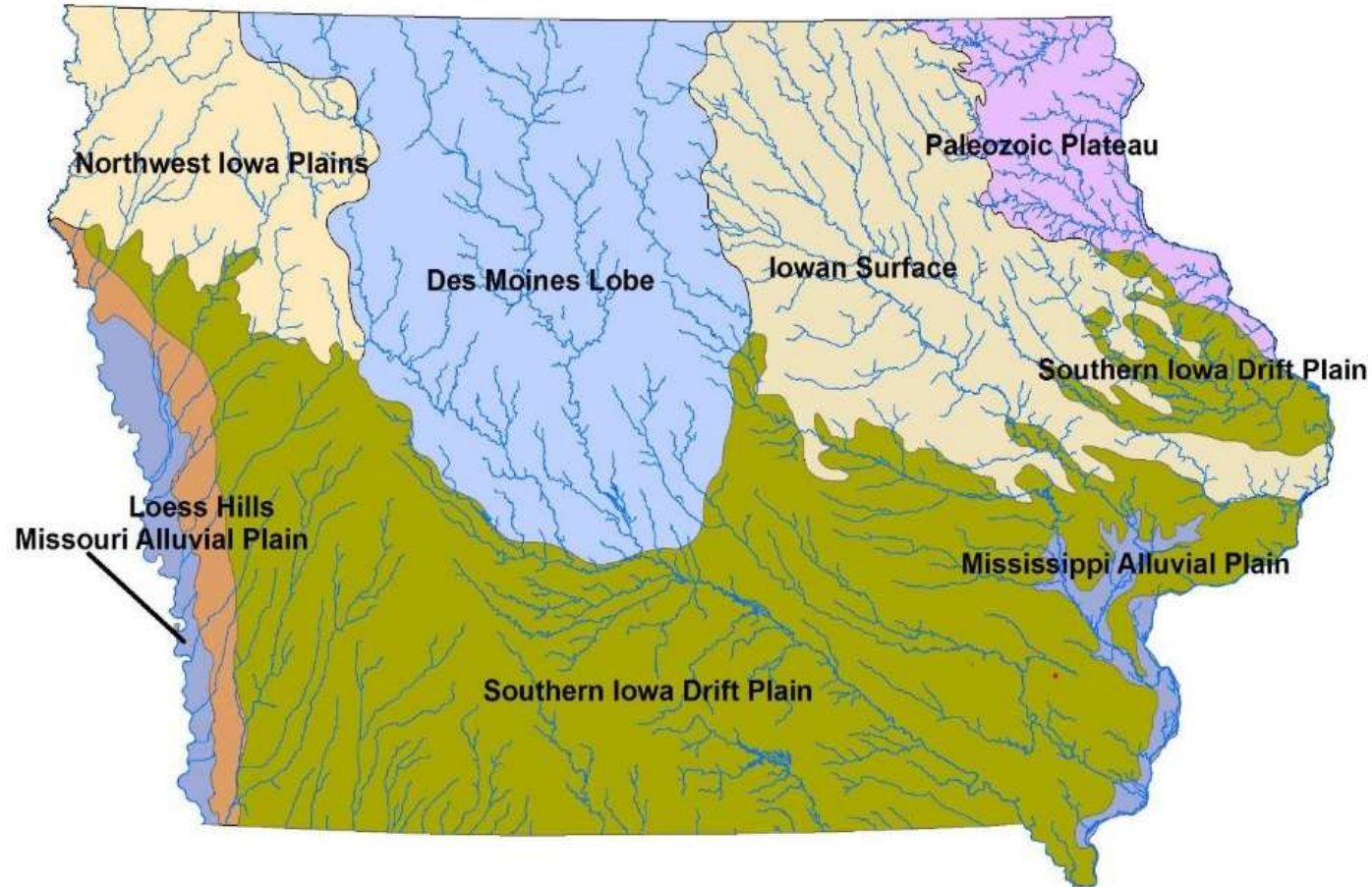
30,000 – 10,500 years



Slide courtesy of K. Schilling, Iowa Geological Survey



# Iowa Landforms





# Climate

Millett, B., Johnson, W.C. and Guntenspergen, G., 2009. Climate trends of the North American prairie pothole region 1906–2000. *Climatic Change*, 93(1-2), pp.243-267.



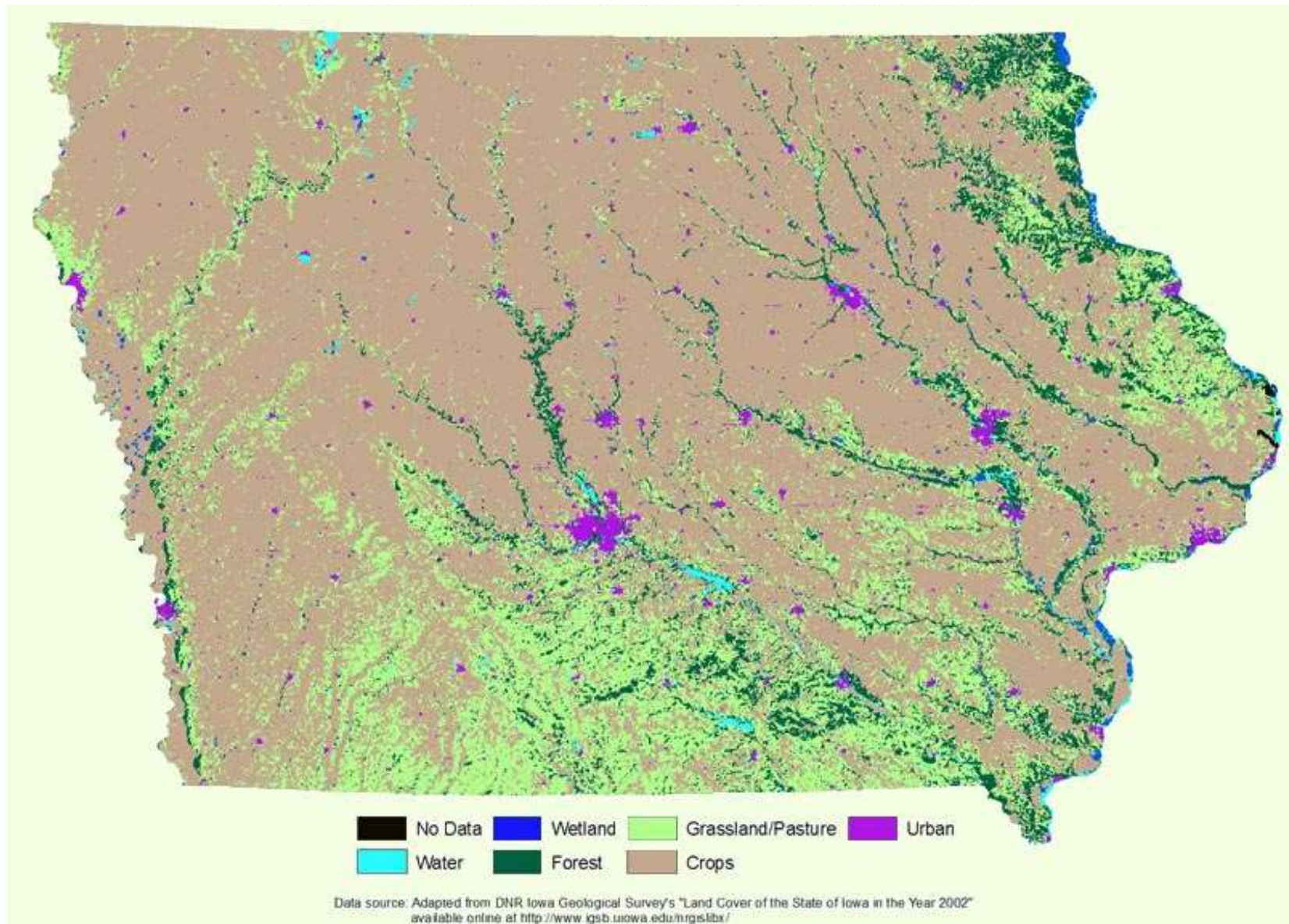
Fig. 1 Map of the Prairie Pothole Region (PPR) of North America based on ecoregion classification (Omernik 1987, 1995)







# Iowa Land Cover





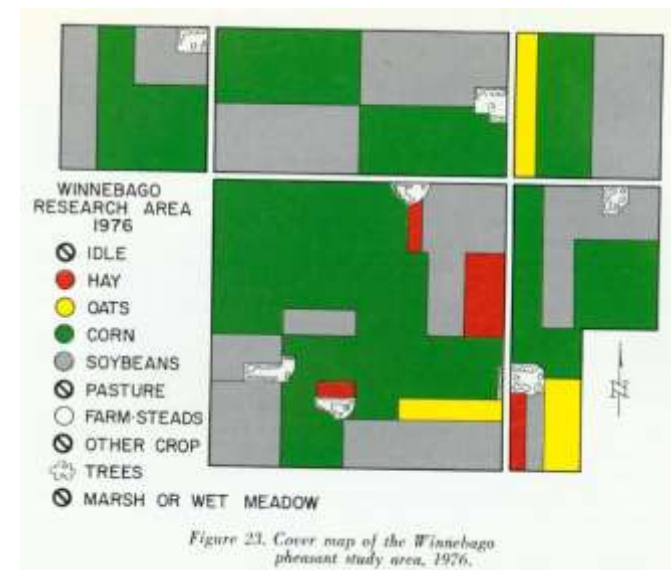
### The Problem:

- 70% of land in corn-soy rotation
- 13,000 square miles used for ethanol production
- 25 million hogs
- 4 million beef cattle
- 80 million laying chickens
- 5 million turkeys
- 4 million broiler chickens
- 220,000 dairy cows

1941



1976





# LEAKY SYSTEM





**Sandy or gravel bottom**

**Wide, shallow streams**

**Gently-sloping banks  
with vegetation**

**Water table close  
to surface**

**Perennial vegetation**





Excavating a large ditch using steam power, circa 1910.



Hand digging tile, Boone Co. IA. ca 1914

Source: 'An Iowa album: a photographic history, 1860-1920' by M. J. Bennet, University of Iowa Press, Iowa City, Iowa

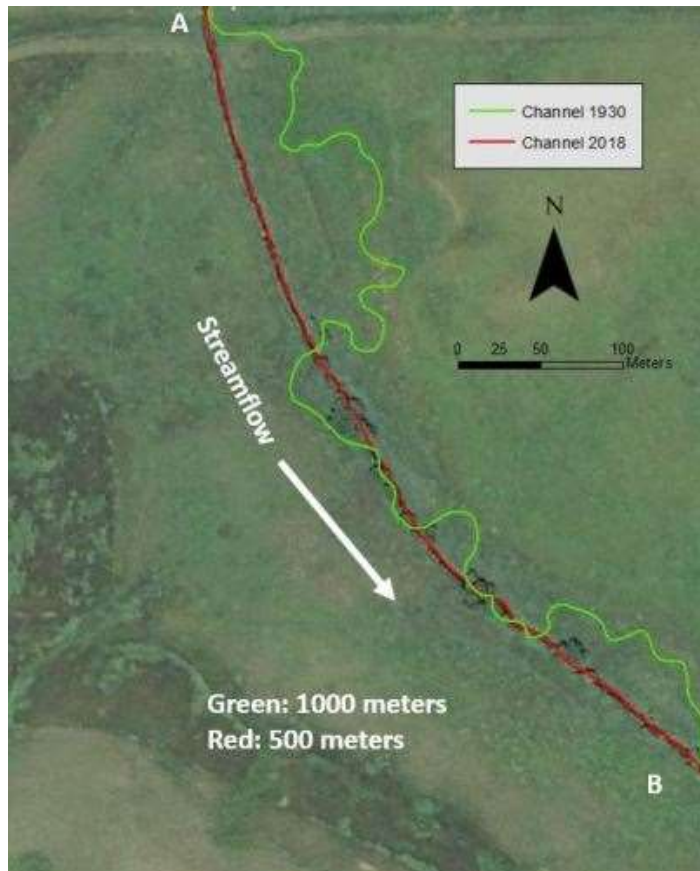




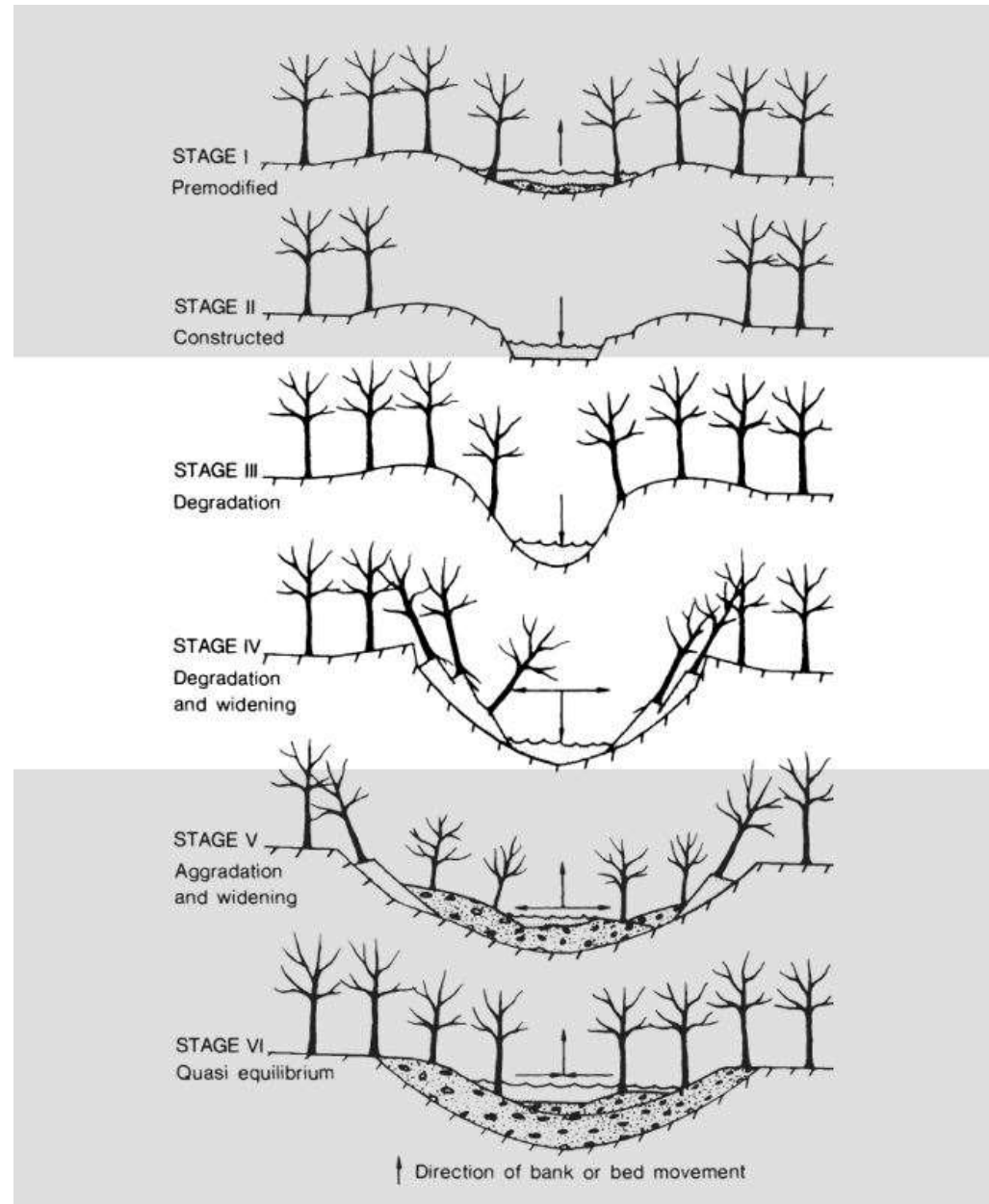




# Stream Incision

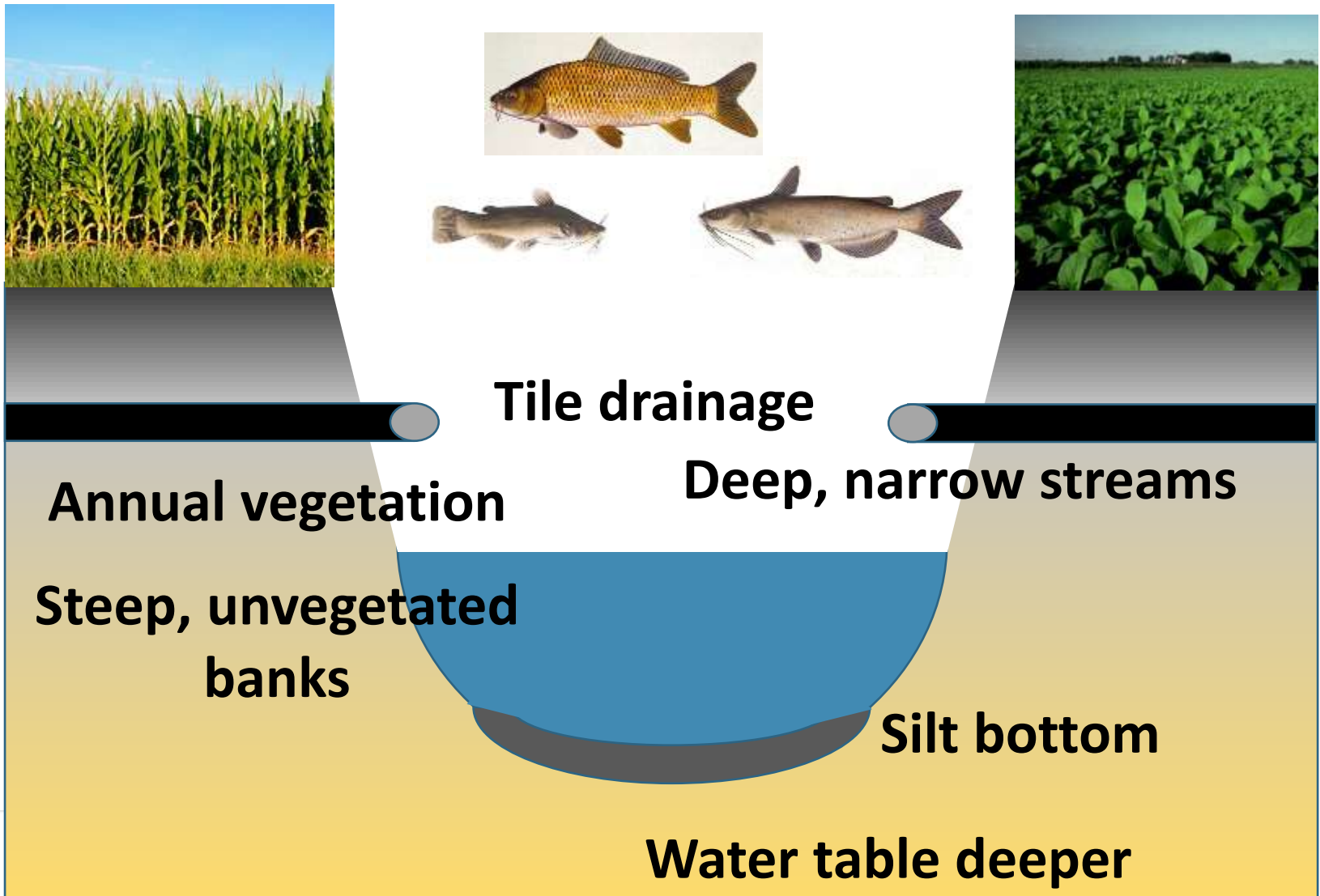


Images courtesy of B. Beck, ISU

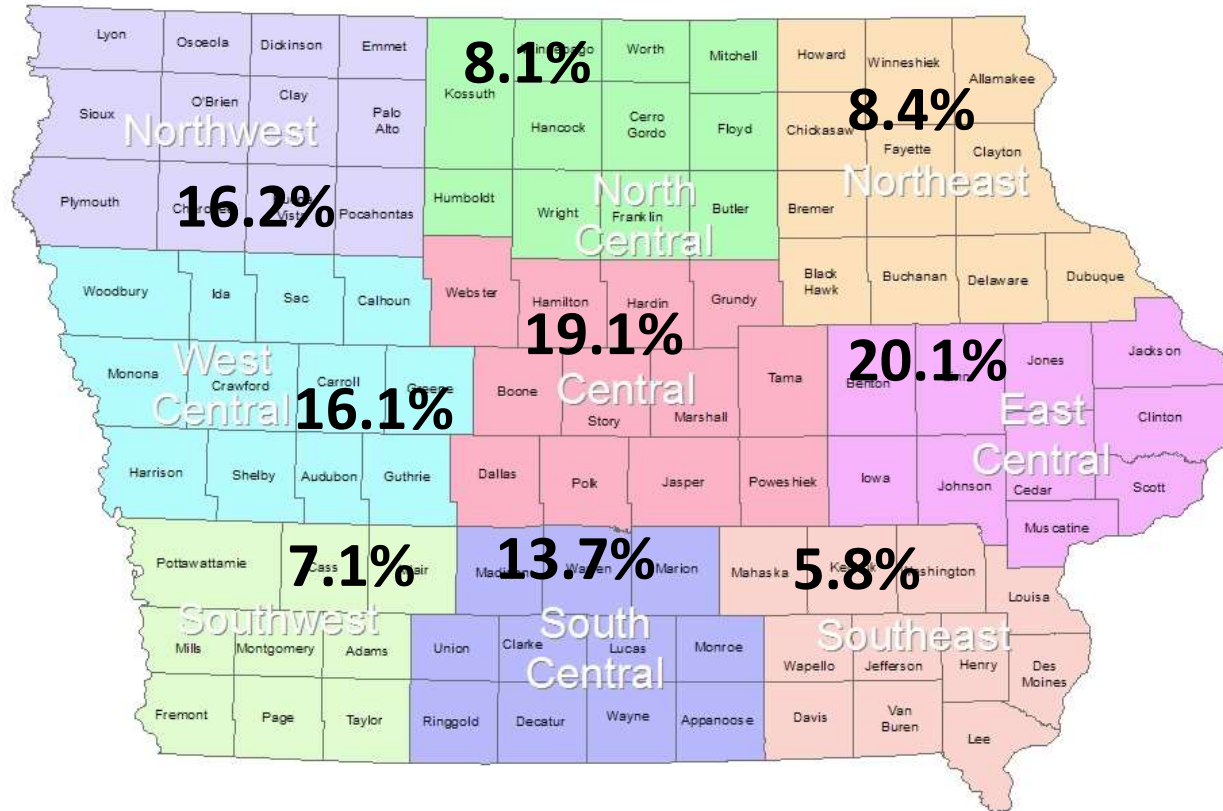








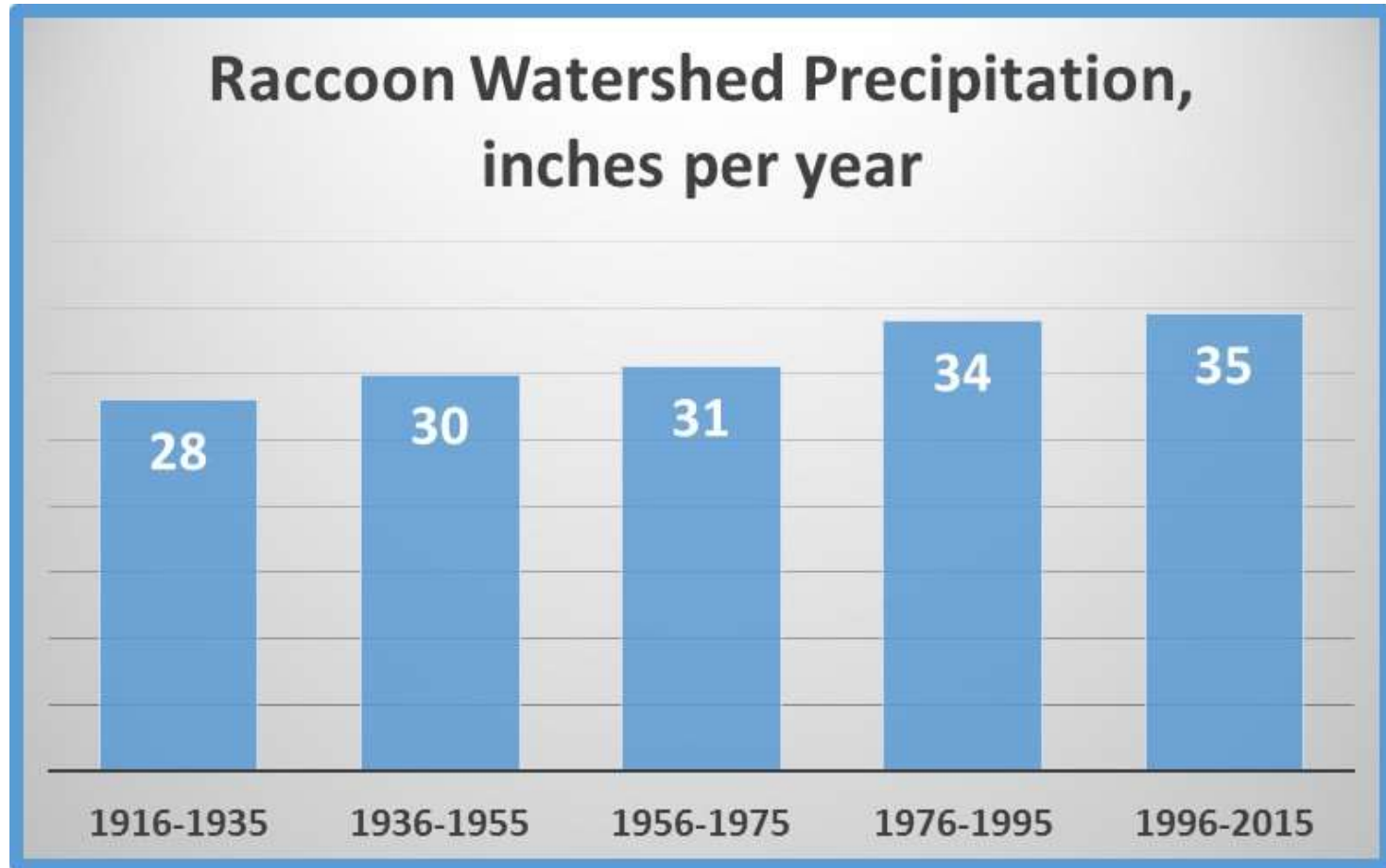
# It's Wetter: Increase over last century



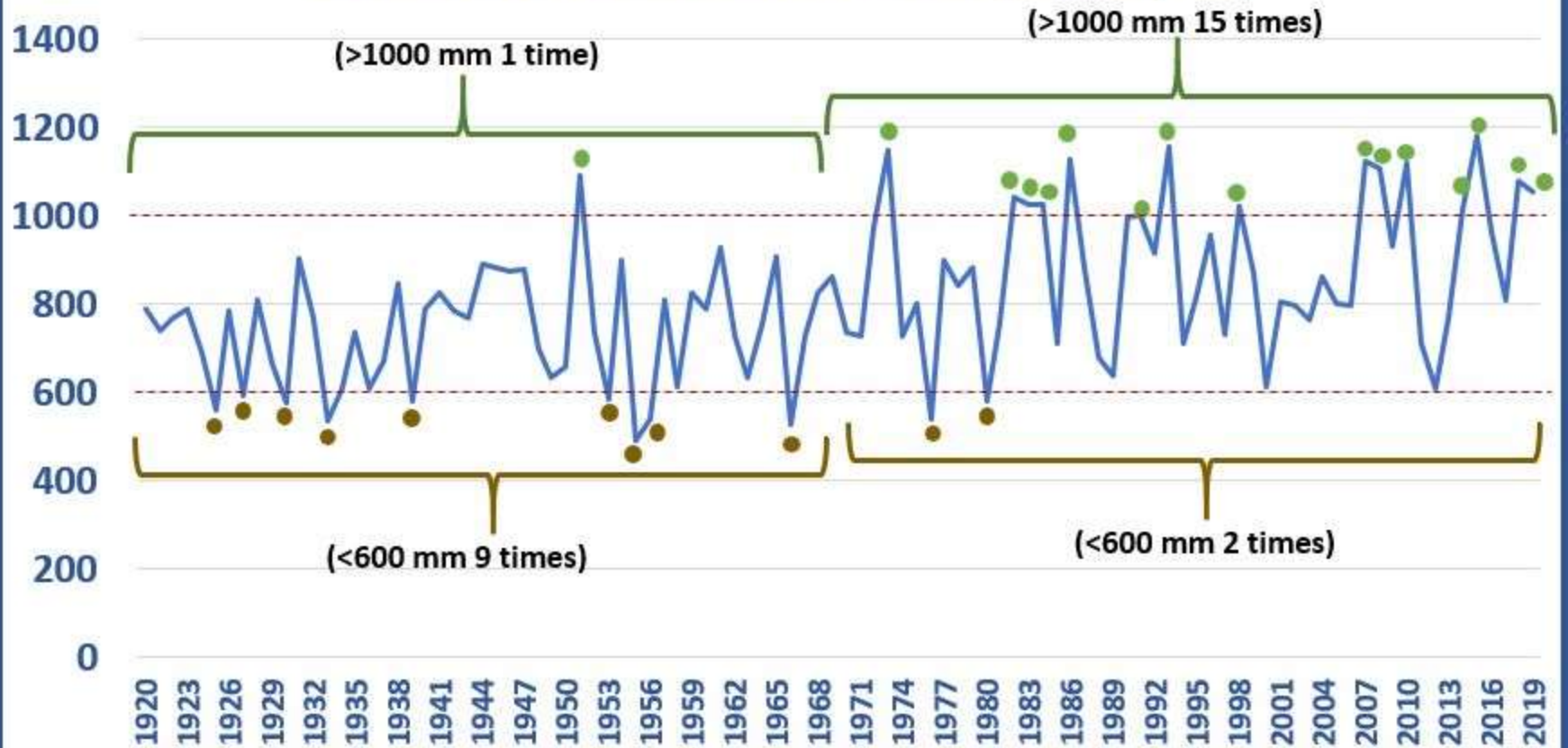
U.S. Department of Agriculture Crop Reporting Districts



# It's Wetter



## Raccoon River Watershed Annual Precipitation (mm)





# Hypoxia, Aquatic Life



# Drinking Water

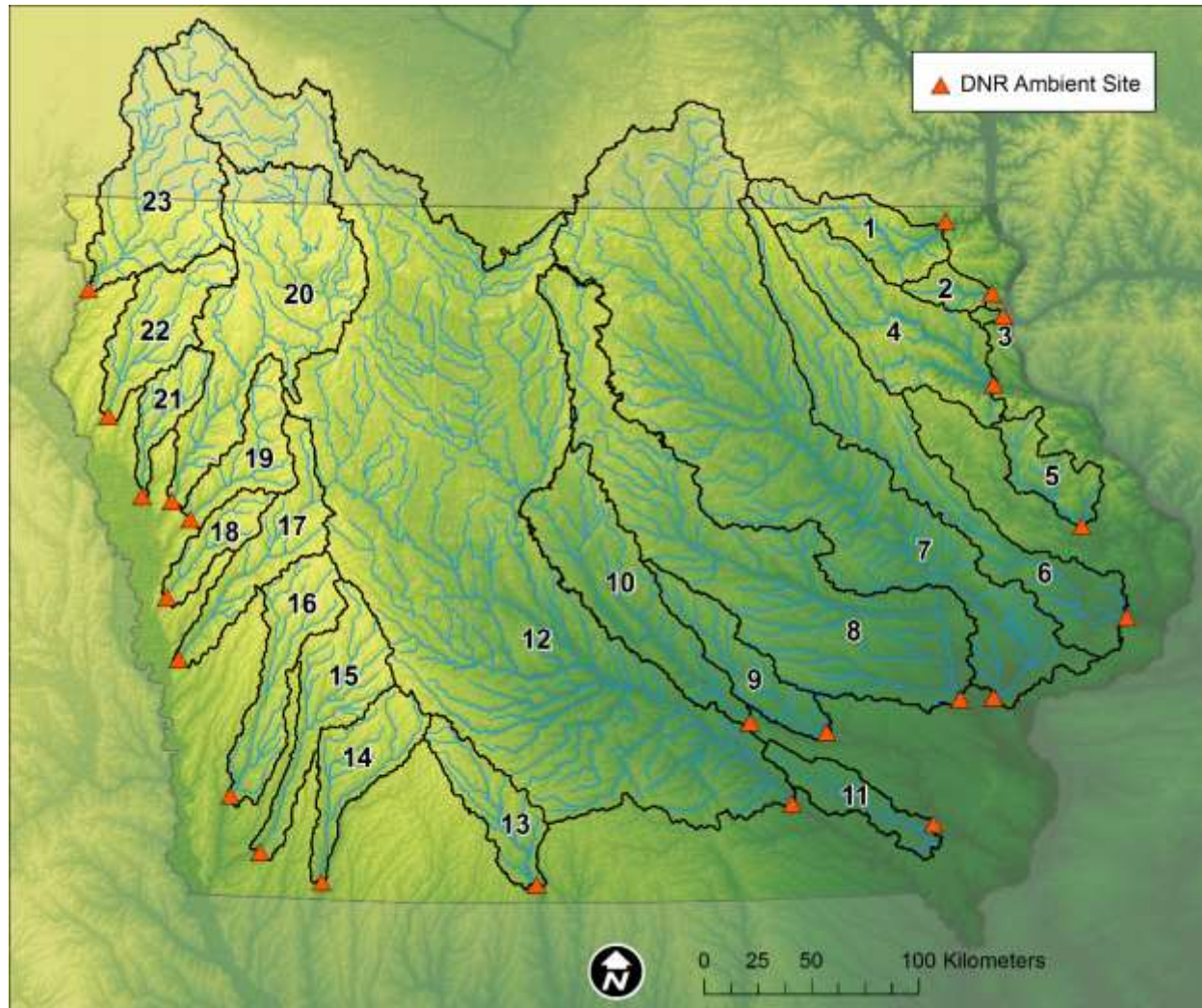


Toledo, OH



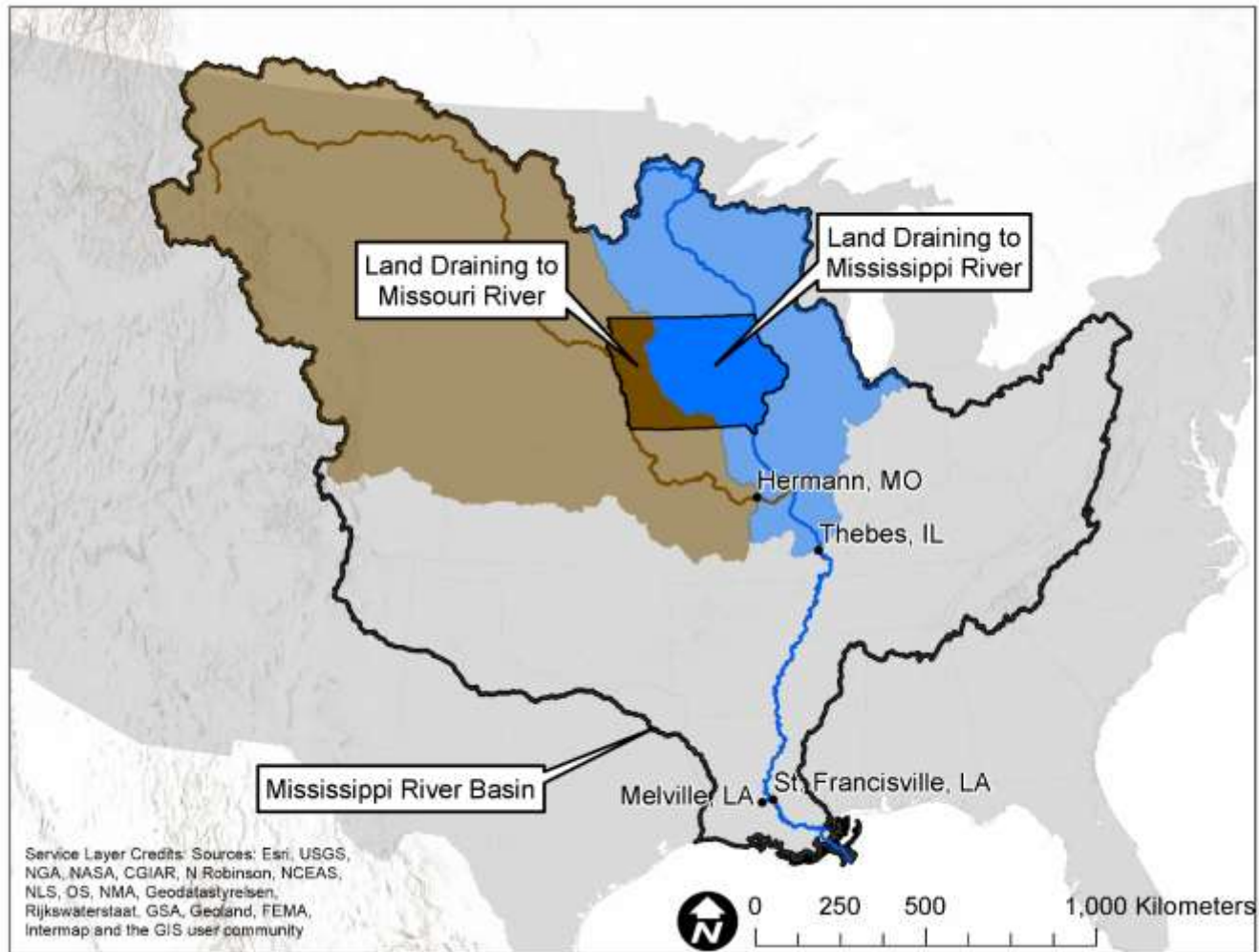
Des Moines, IA





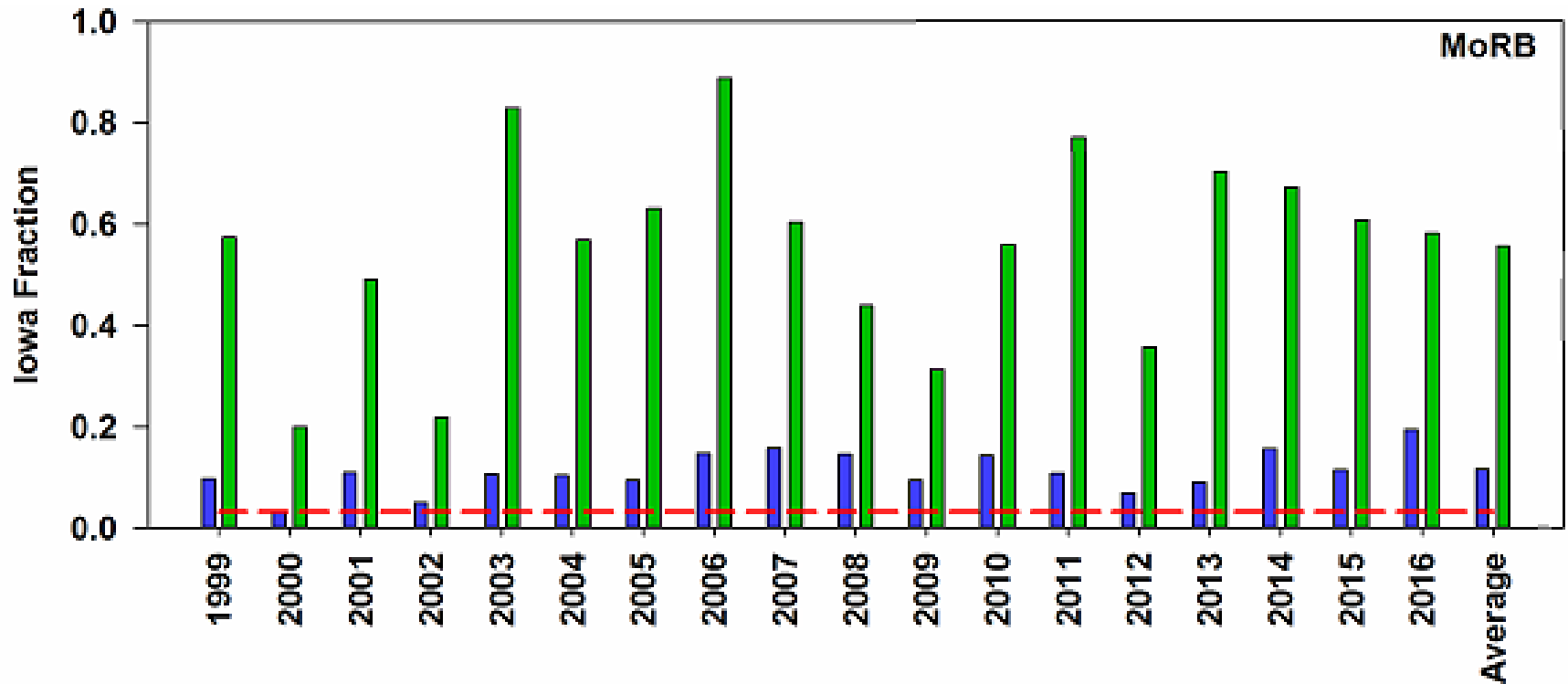
## DNR Ambient Water Monitoring Data: 1999-2016





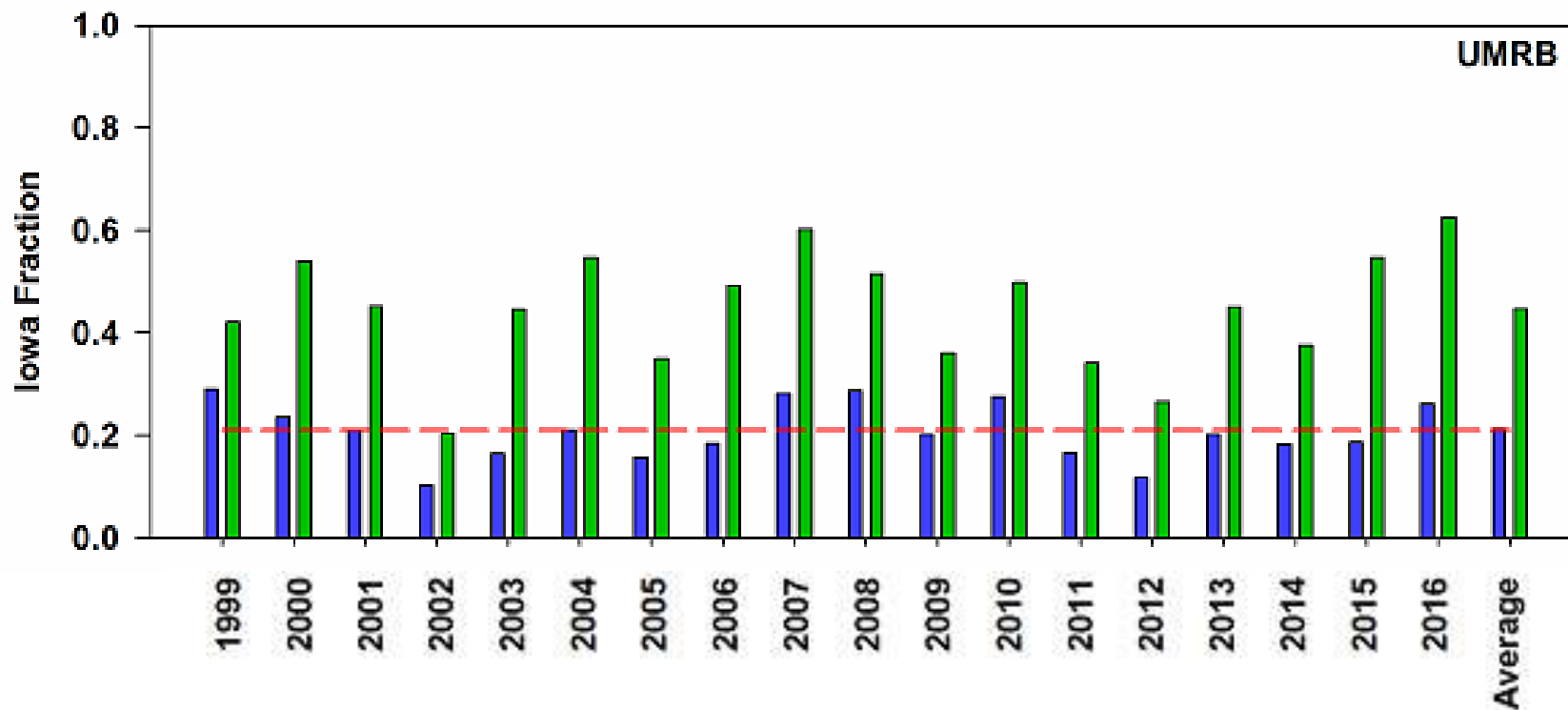


# Missouri



3.3% of the land  
12% of the water  
55% of the nitrate

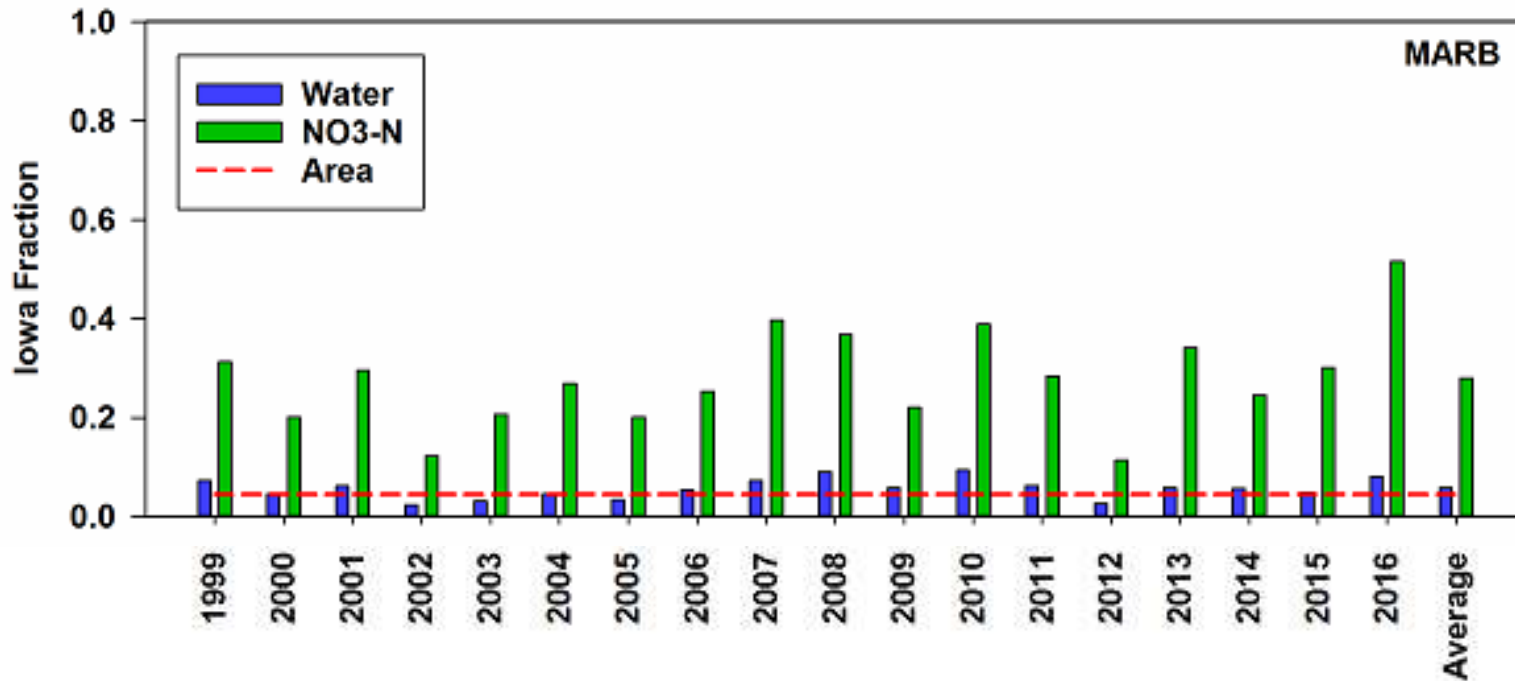
## Upper Mississippi



21% of the land  
21% of the water  
45% of the nitrate

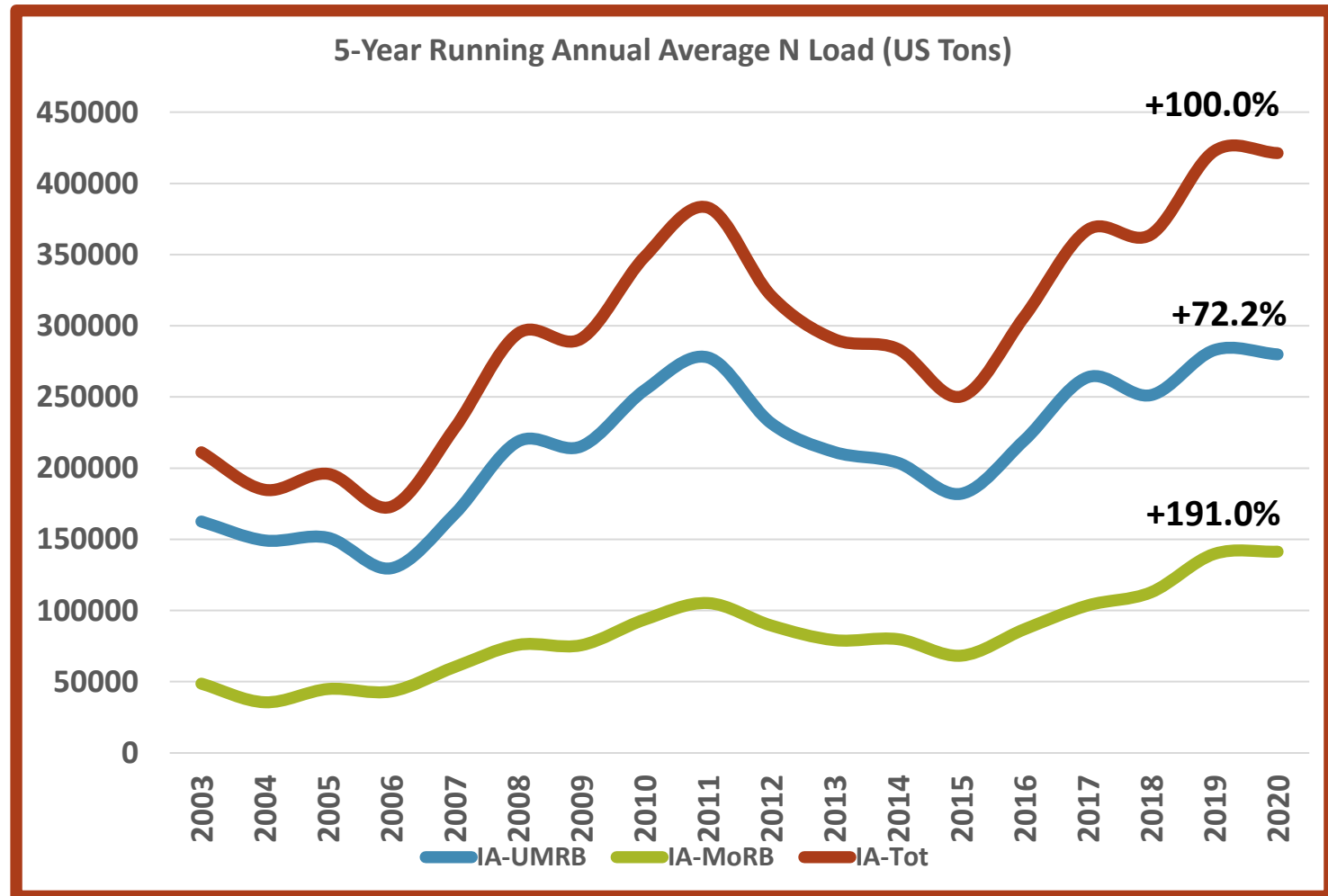


## Mississippi-Atchafalaya-Gulf of Mexico

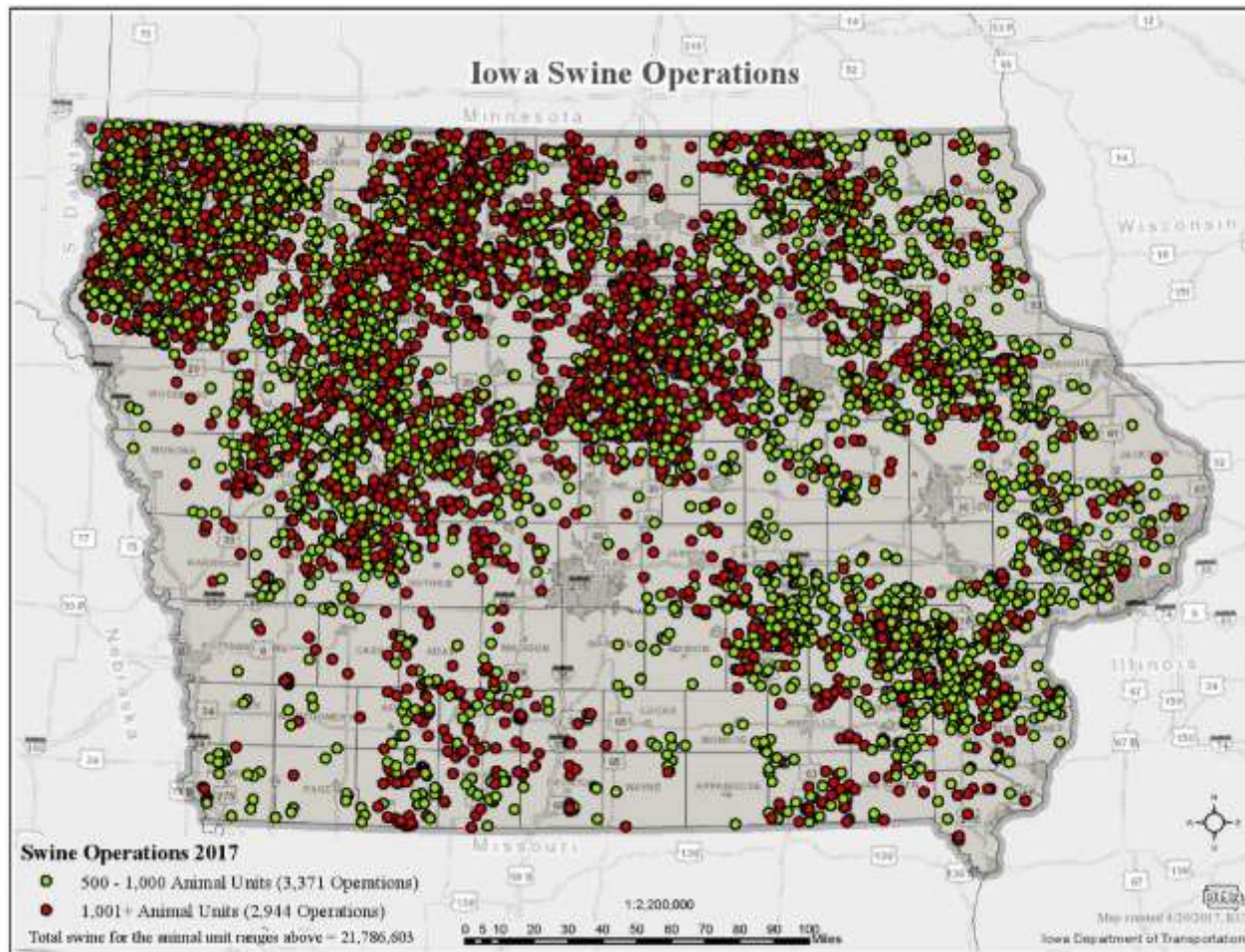


4.5% of the land  
5.9% of the water  
29% of the nitrate

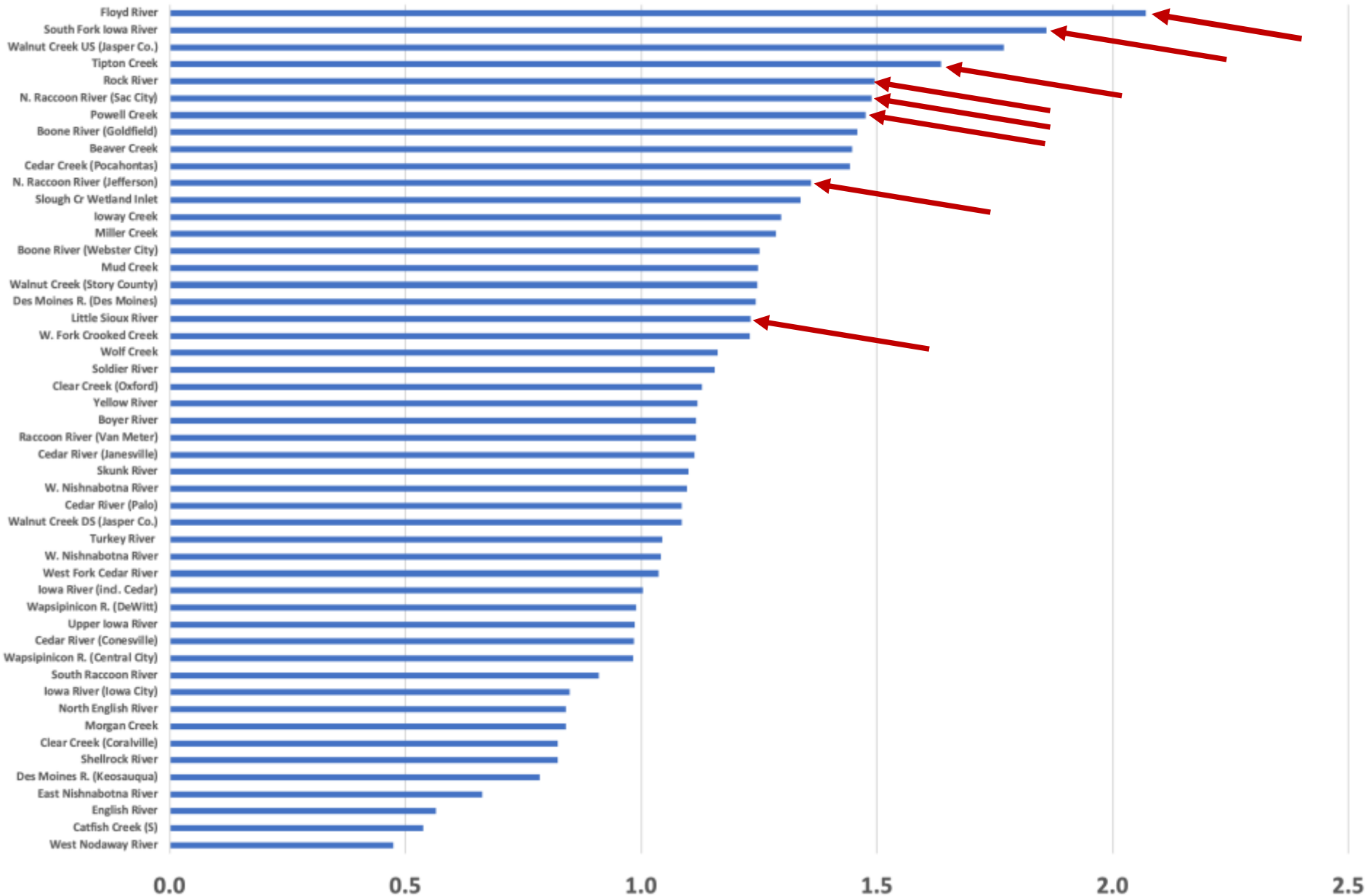
# How Much Nitrogen Leaves Iowa?



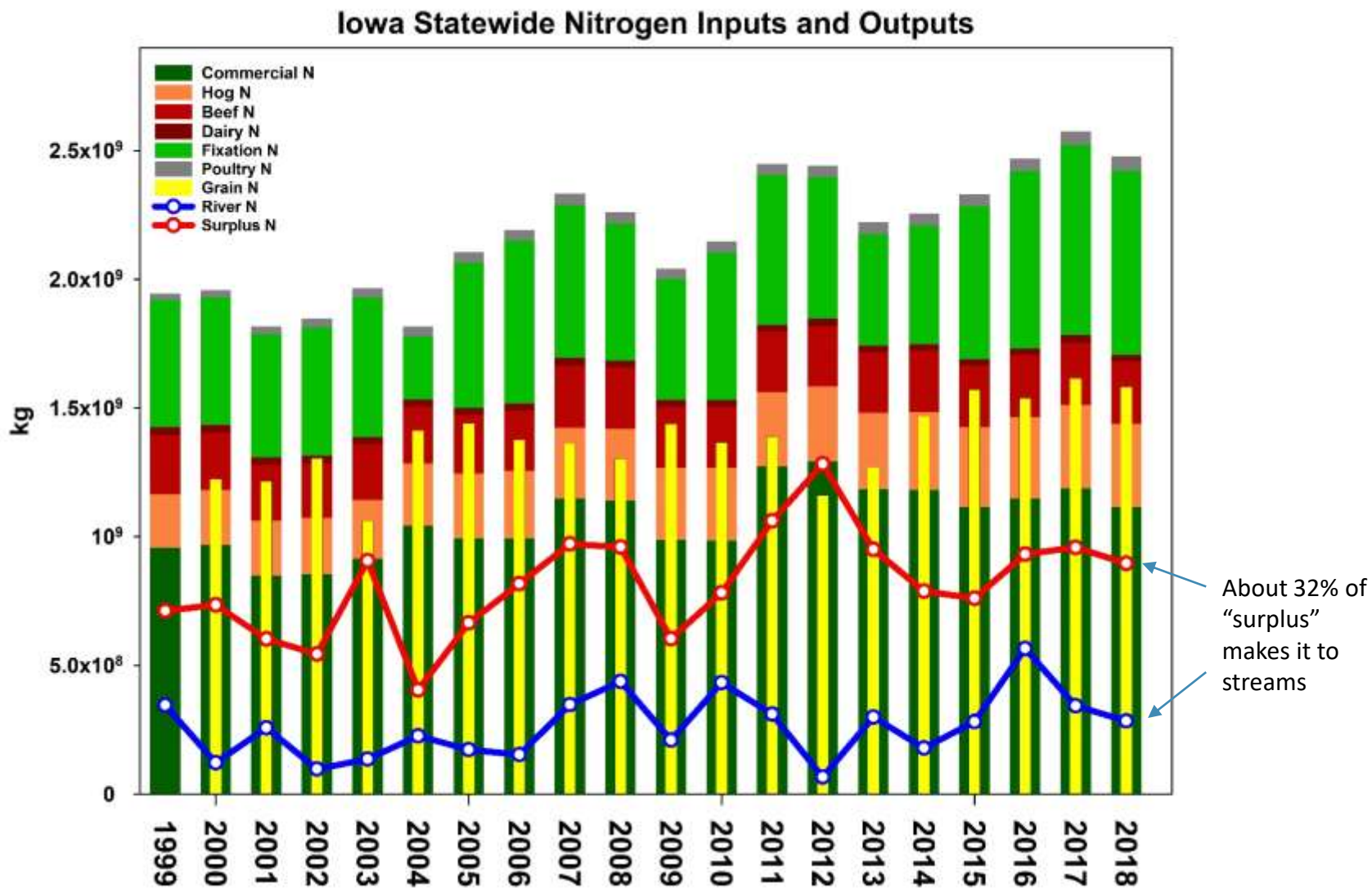




## Share of Statewide Nitrate Load / Share of Statewide Runoff





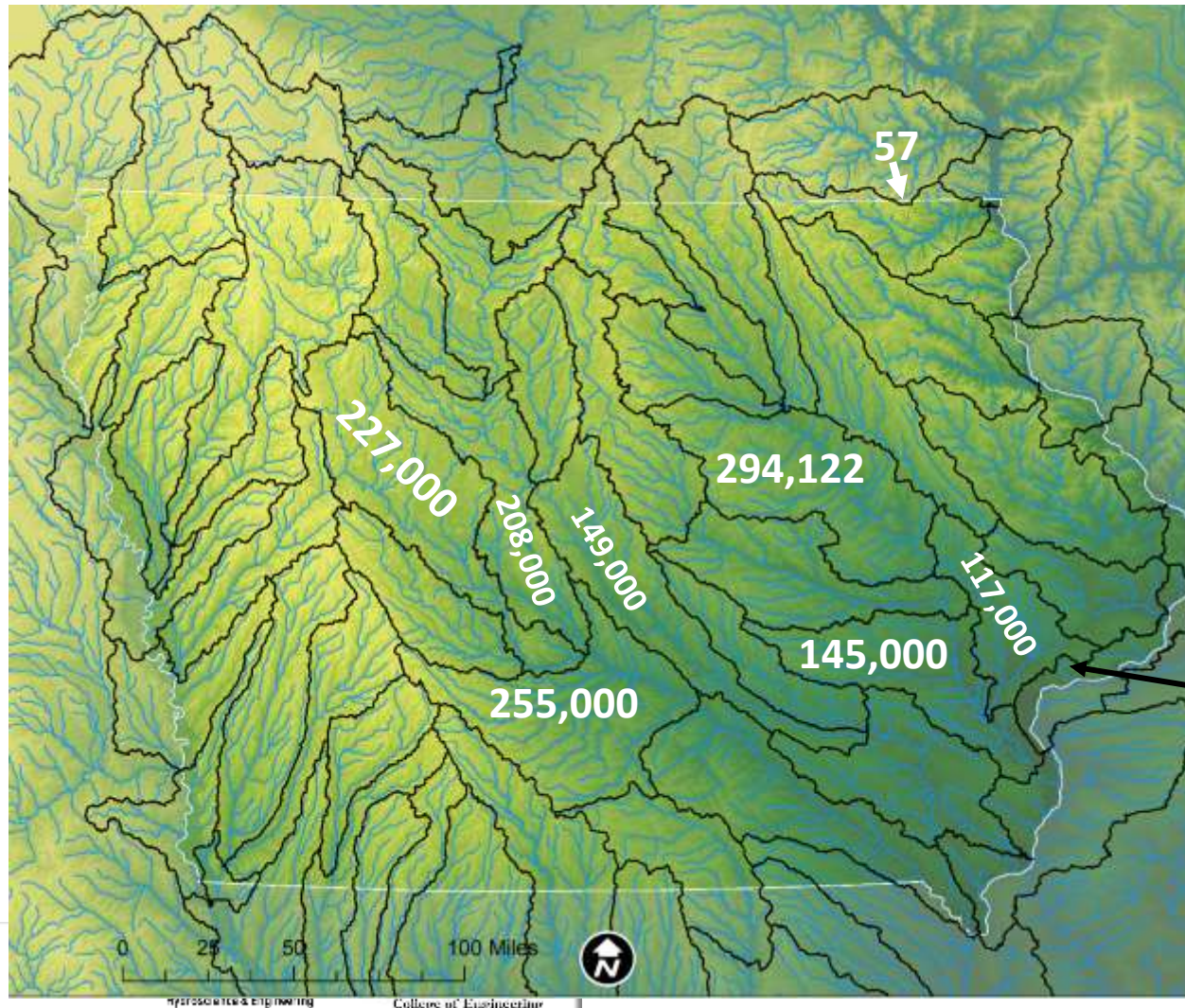


## Nitrogen Change (%) Since 1999

N Category	% change
River	83
Chicken	76
Turkey	59
Hogs	59
Surplus	51
Fixation	41
total inputs	36
Commercial	34
Grain N	27
Beef	10
Dairy	-11



## Iowa HUC 8 Watersheds

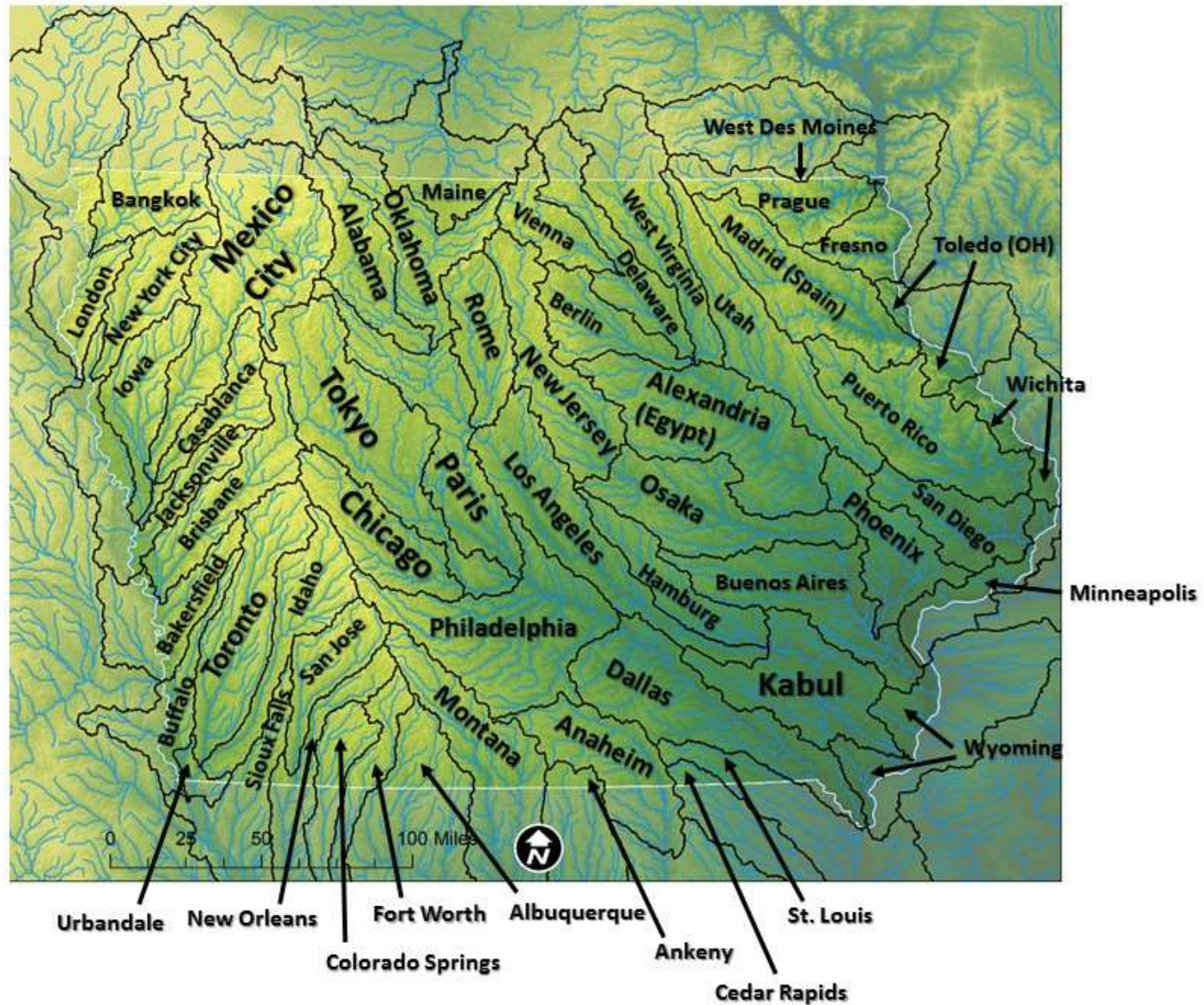


***Half of Iowa's  
Population lives in 8  
watersheds:***

- Middle Cedar
- Lake Red Rock
- North Raccoon
- Copperas-Duck
- Middle Des Moines
- South Skunk
- Lower Iowa
- Lower Cedar

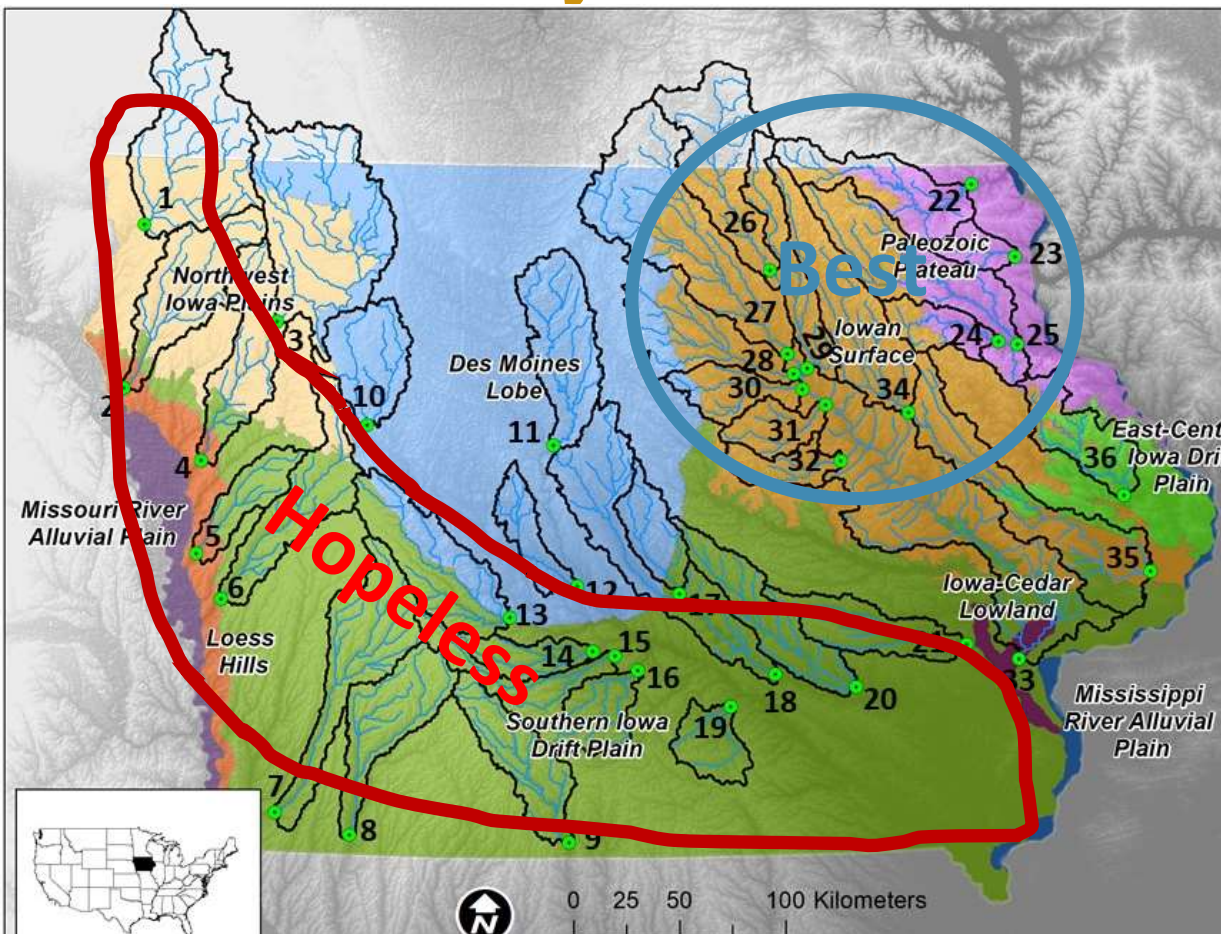
206,000







# Water Quality Index



Site	Rank	Map #	00-20
Wapsipinicon River at Independence	1	34	53.7
Cedar River at Janesville	2	29	51.7
Shellrock River at Shellrock	3	27	51.7
Cedar River at Charles City	4	26	48.9
Upper Iowa River at Dorchester	5	22	48.1
Yellow River at Ion	6	23	48.1
W. Fork of the Cedar River at Finchford	7	28	47.9
Boone River at Stratford	8	11	45.0
Turkey River at Garber	9	25	43.2
Beaver Creek at Cedar Falls	10	30	42.7
Blackhawk Creek at Waterloo	11	31	42.3
Wapsipinicon River at DeWitt	12	35	41.1
Wolf Creek at LaPorte City	13	32	41.0
Little Sioux River at Larrabee	14	3	40.3
Cedar River at Conesville	15	33	40.1
Thompson River at Davis City	16	9	40.0
Volga River at Elkport	17	24	39.9
Indian Creek at Colfax	18	17	37.9
Cedar Creek at Oakland Mills	19	19	37.4
North Skunk River at Sigourney	20	20	37.1
Beaver Creek at Grimes	21	12	36.8
South Raccoon River at Redfield	22	13	36.4
South River at Ackworth	23	15	36.2
South Skunk River at Oskaloosa	24	18	36.1
North Raccoon at Sac City	25	10	35.0
English River at Riverside	26	21	33.5
W. Nodaway at Shambaugh	27	8	33.3
North River at Norwalk	28	14	33.1
E. Nishnabotna at Shenandoah	29	7	32.8
Middle River at Indianola	30	15	32.4
Rock River at Rock Valley	31	1	32.2
Little Sioux River at Smithland	32	4	31.6
N. Fork Maquoketa R. at Hurtsville	33	36	29.9
Floyd River at Sioux City	34	2	26.8
Soldier River at Pisgah	35	5	26.4
Boyer River at Missouri Valley	36	6	26.0



## What Can Be Done?

1. Ban cropping in the 2-year Flood Plain
2. Ban fall tillage
3. Ban manure on snow and frozen ground
4. Make farmers adhere to ISU fertilization guidelines
5. Reformulate CAFO Regulations