Iowa's Water Quality

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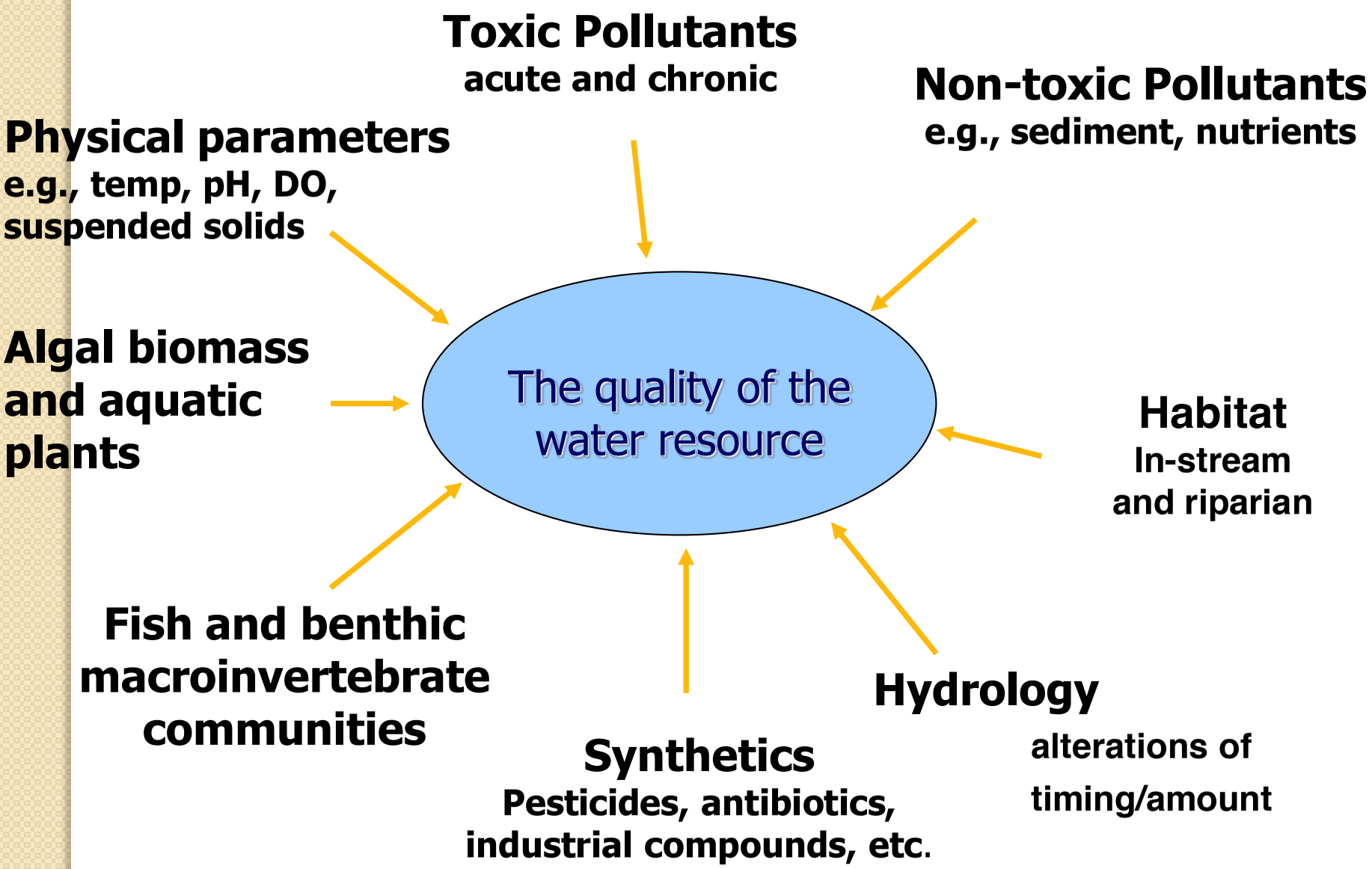
Take home message #1:

Water Quality is not a single issue


Toxic Pollutants
acute and chronic
Non-toxic Pollutants
e.g., sediment, nutrients
Physical parameters
e.g., temp, pH, DO, suspended solids
Algal biomass and aquatic plants
The quality of the water resource
Habitat
In-stream and riparian
Fish and benthic macroinvertebrate communities
Synthetics
Pesticides, antibiotics, industrial compounds, etc.
Hydrology
alterations of timing/amount

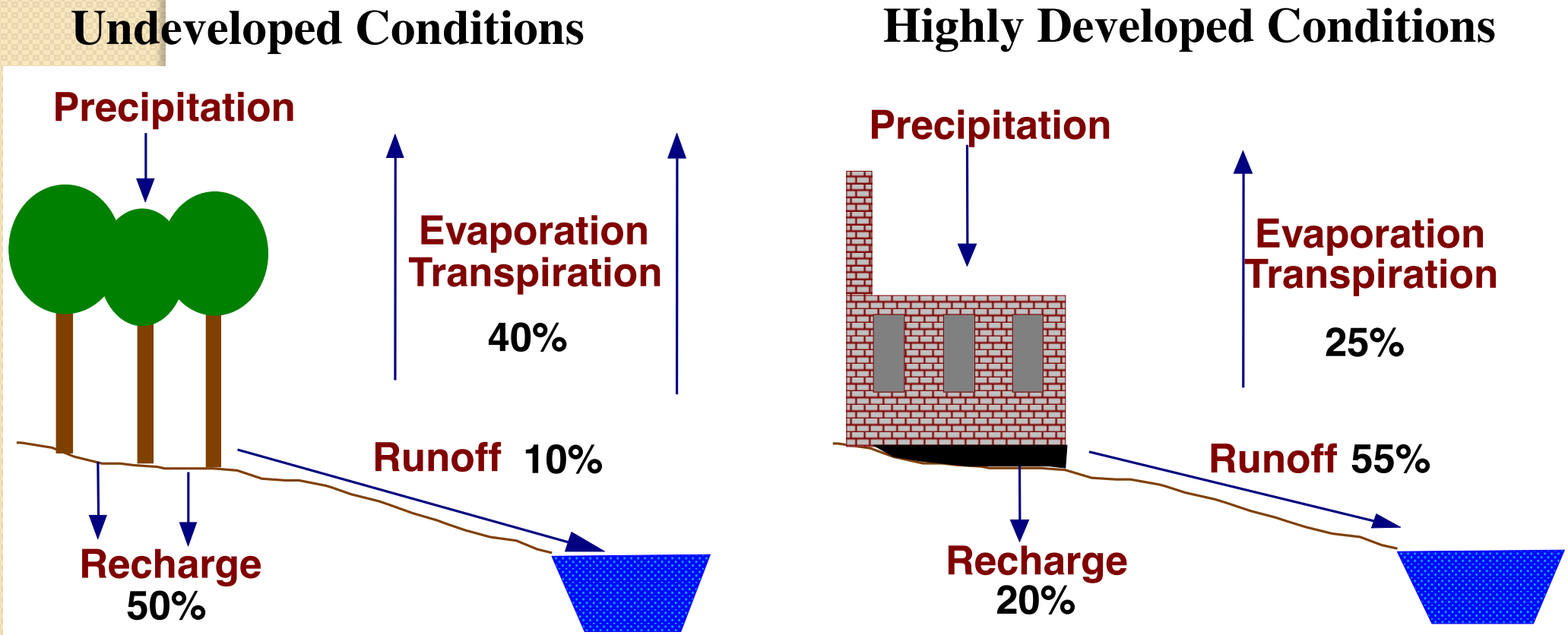
Lags in the system means it can take years, decades, or longer to see changes in water quality

Lack of comprehensive, long-term, systematic data collection makes tracking changes in water quality challenging……

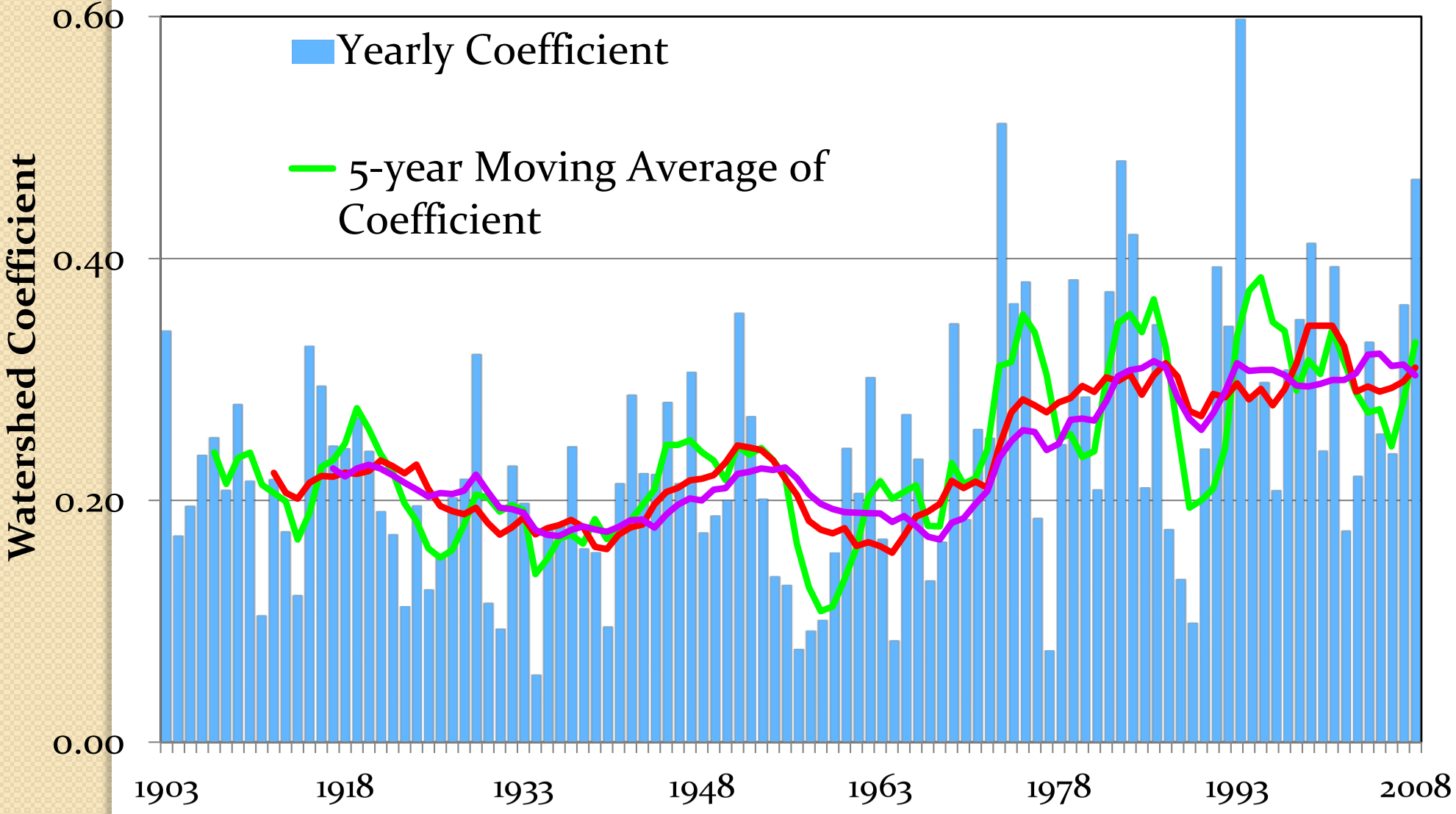
Take home message #2:

Alteration of Iowa's hydrology has played a key role in our water quality issues

Decreased infiltration, increased runoff = more mobilization of contaminants

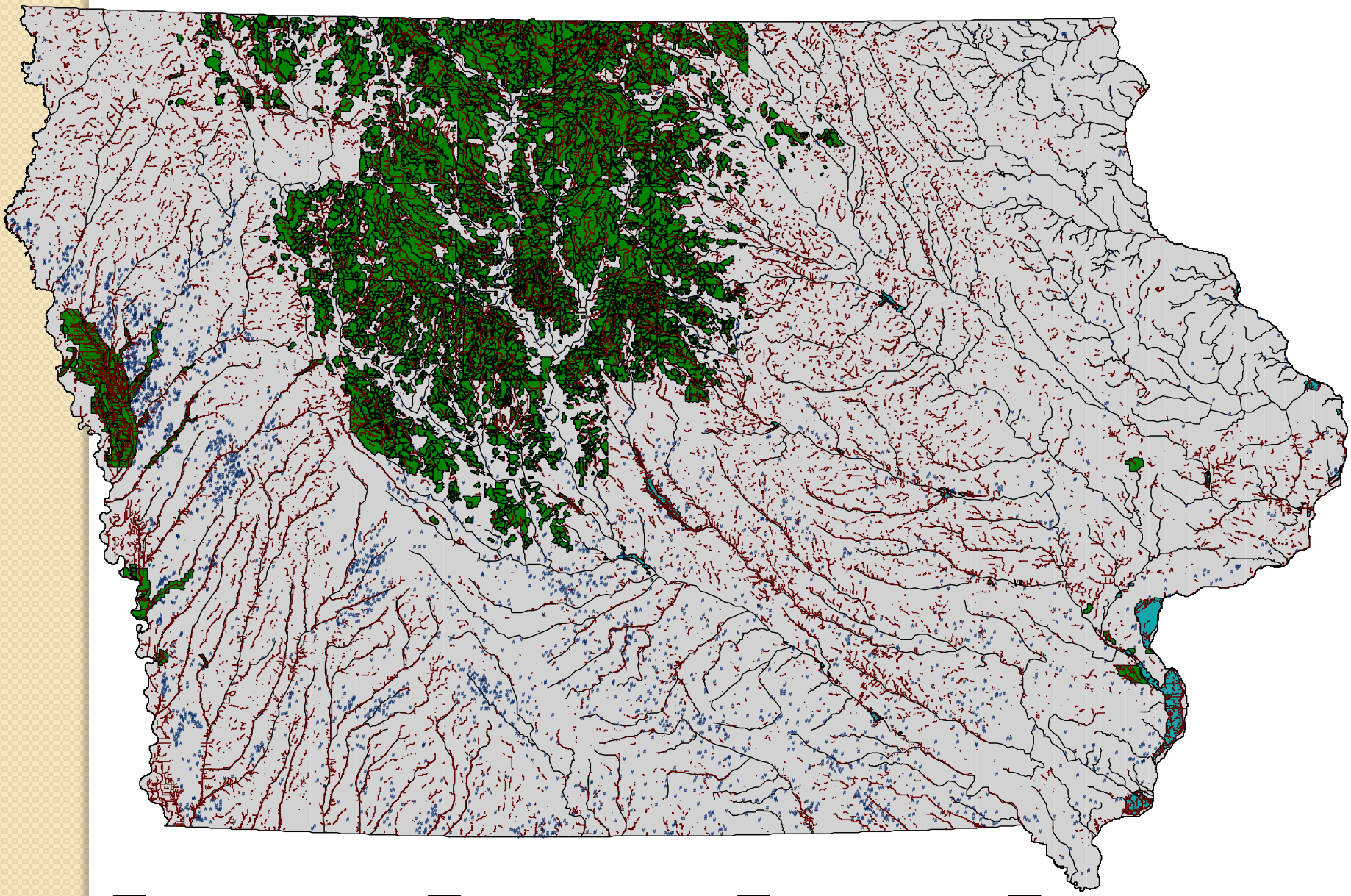


Cedar River at Cedar Rapids: Watershed Coefficient 1903 thru 2008



Middlemis-Brown, R. and Skopec, M., 2009

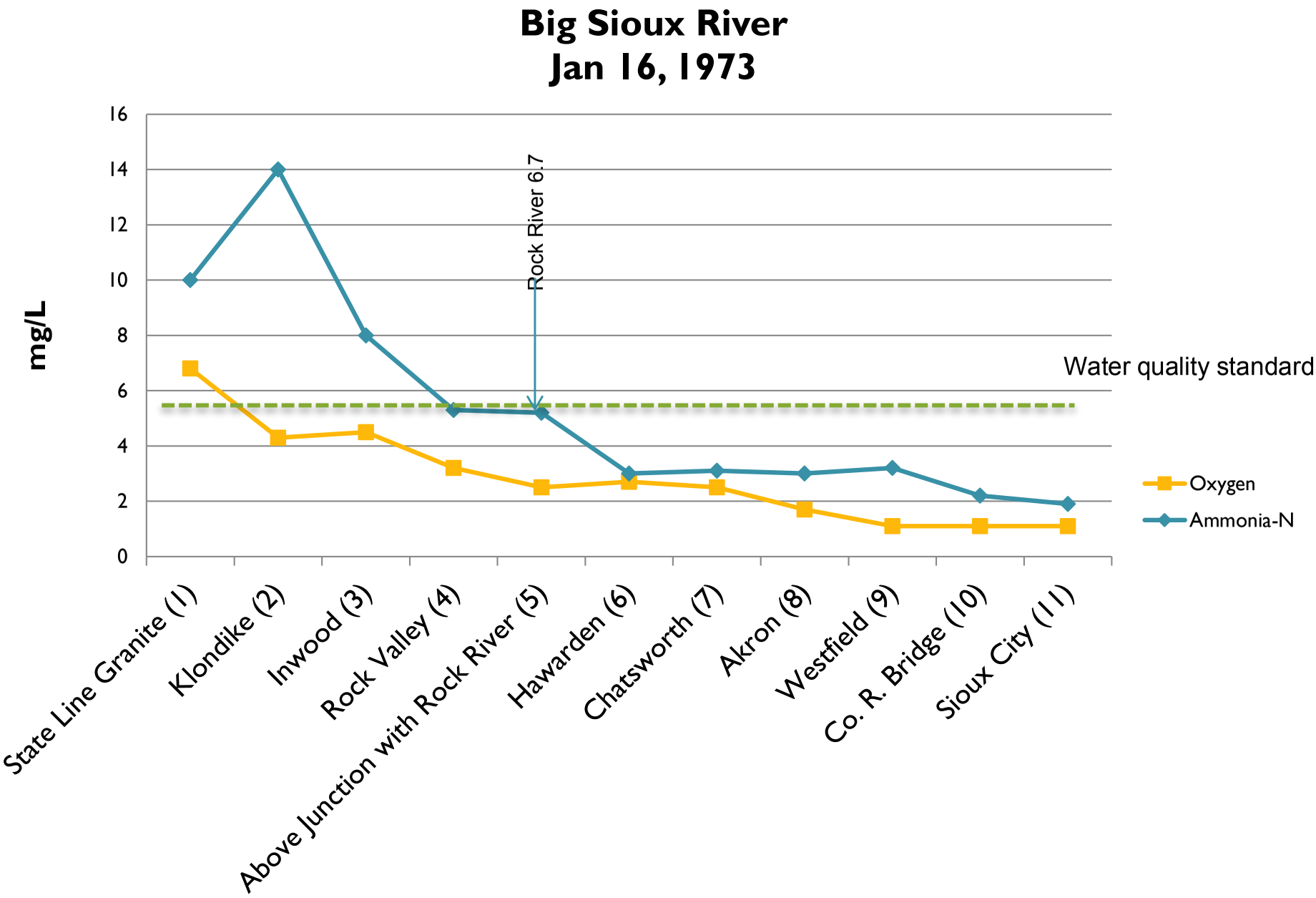
Hydrologic Alterations



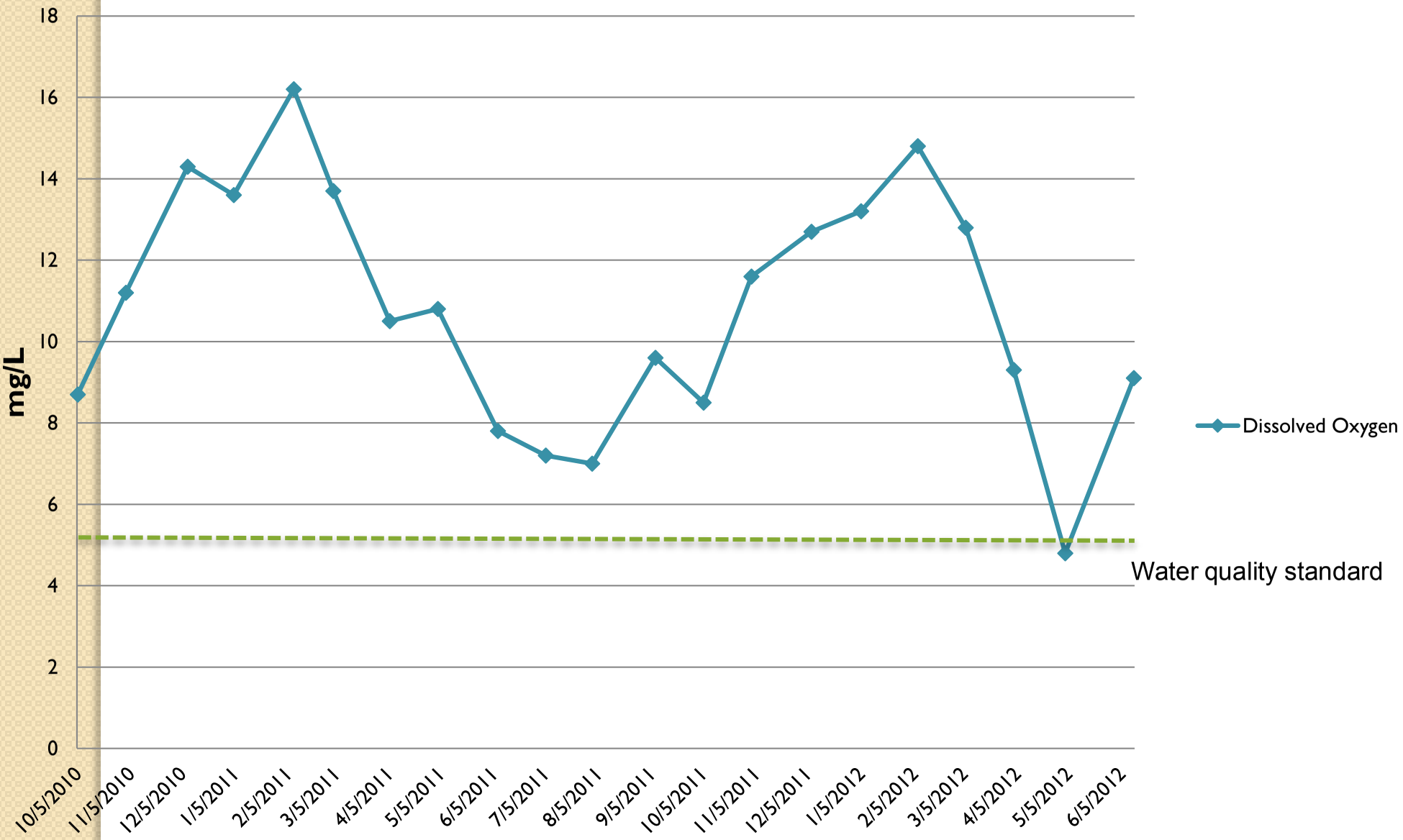
Take home message #3:

Water Quality has ***improved*** for ***some contaminants*** – largely due to CWA and municipal wastewater treatment.

Big Sioux River Example



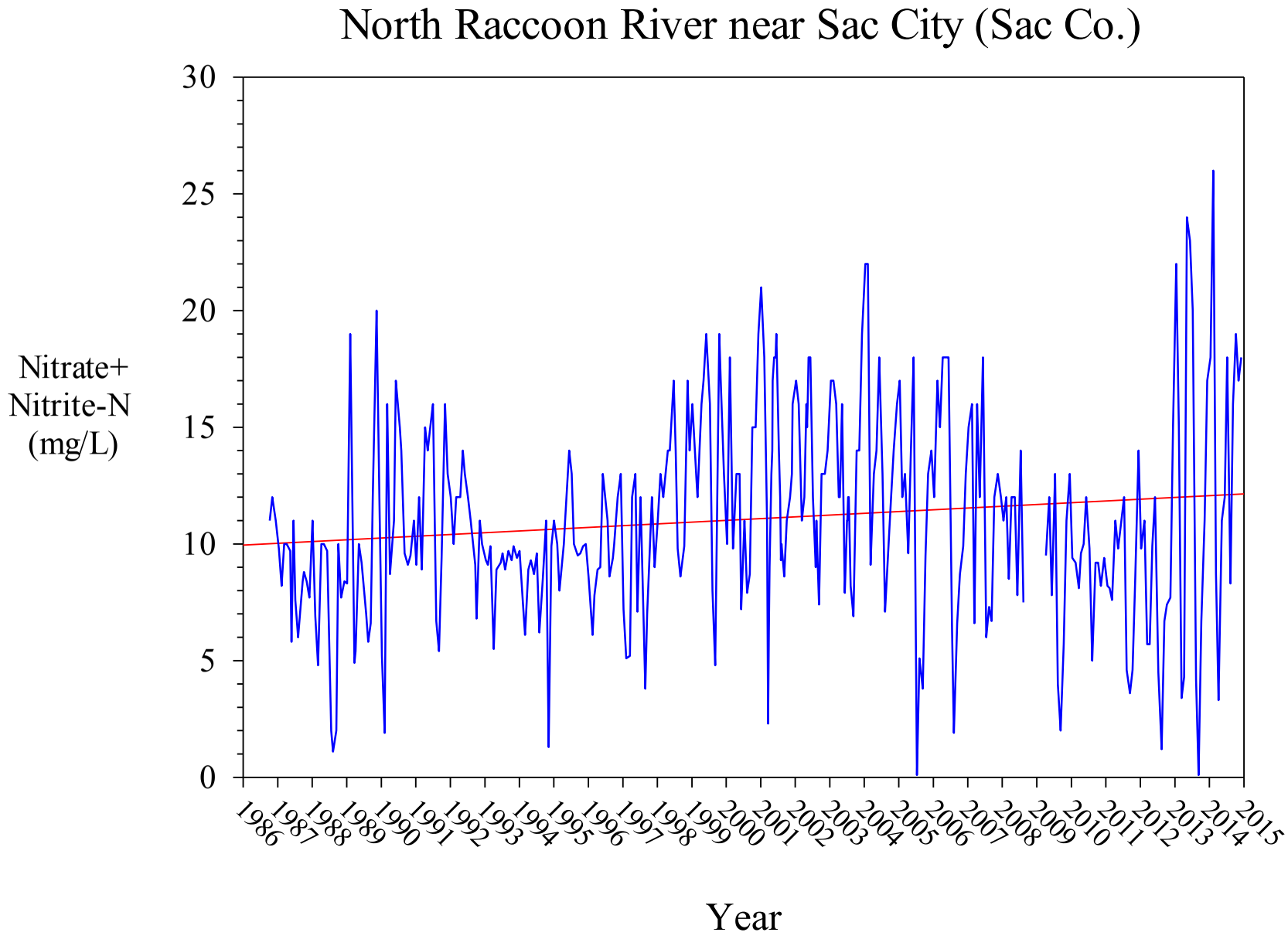
Big Sioux RIver at Akron
2010 - 2012



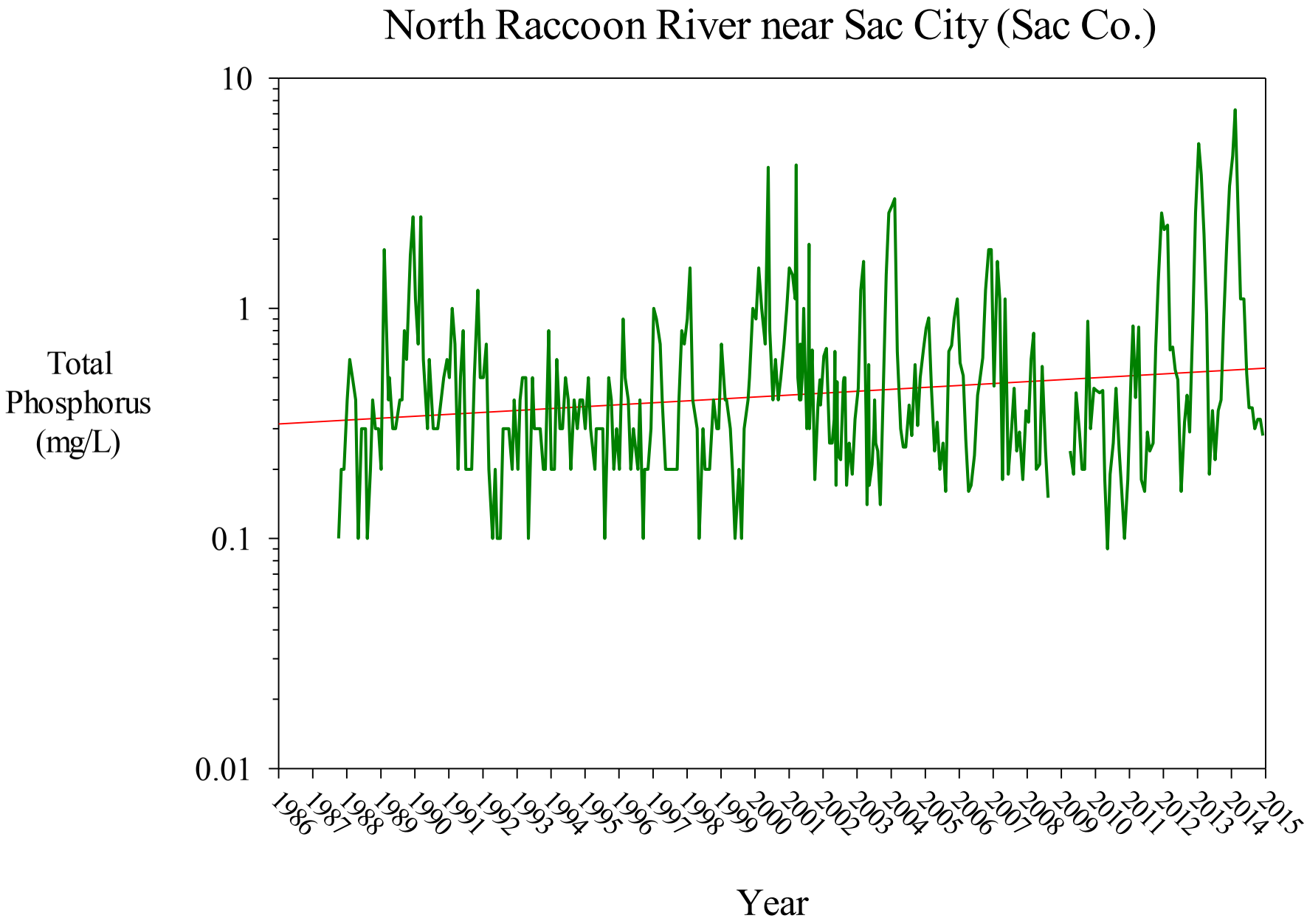
Take home message #4:

There is work left to do……..

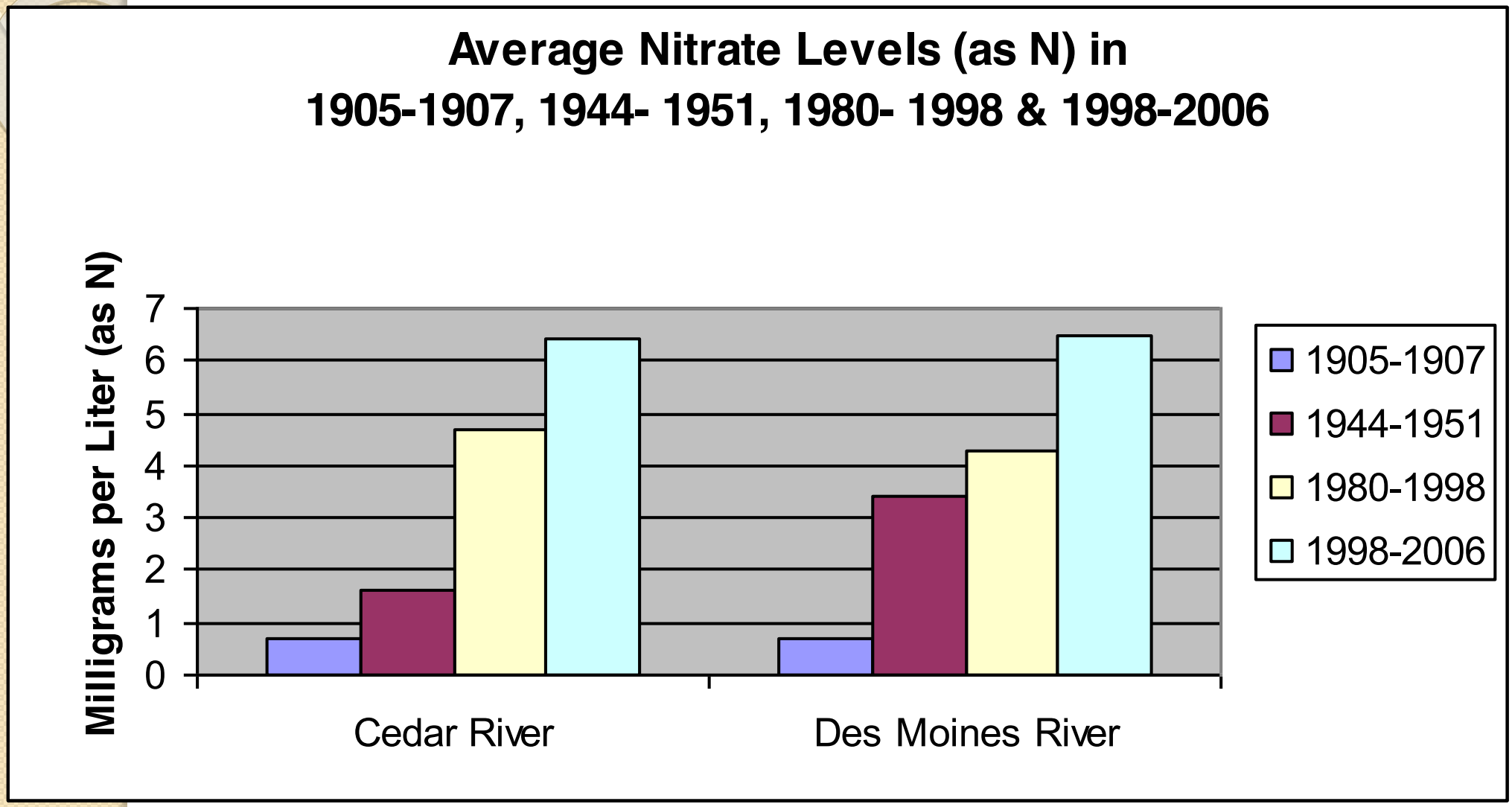
Iowa DNR Ambient Stream Monitoring (1986-2015)



Iowa DNR Ambient Stream Monitoring (1986-2015)

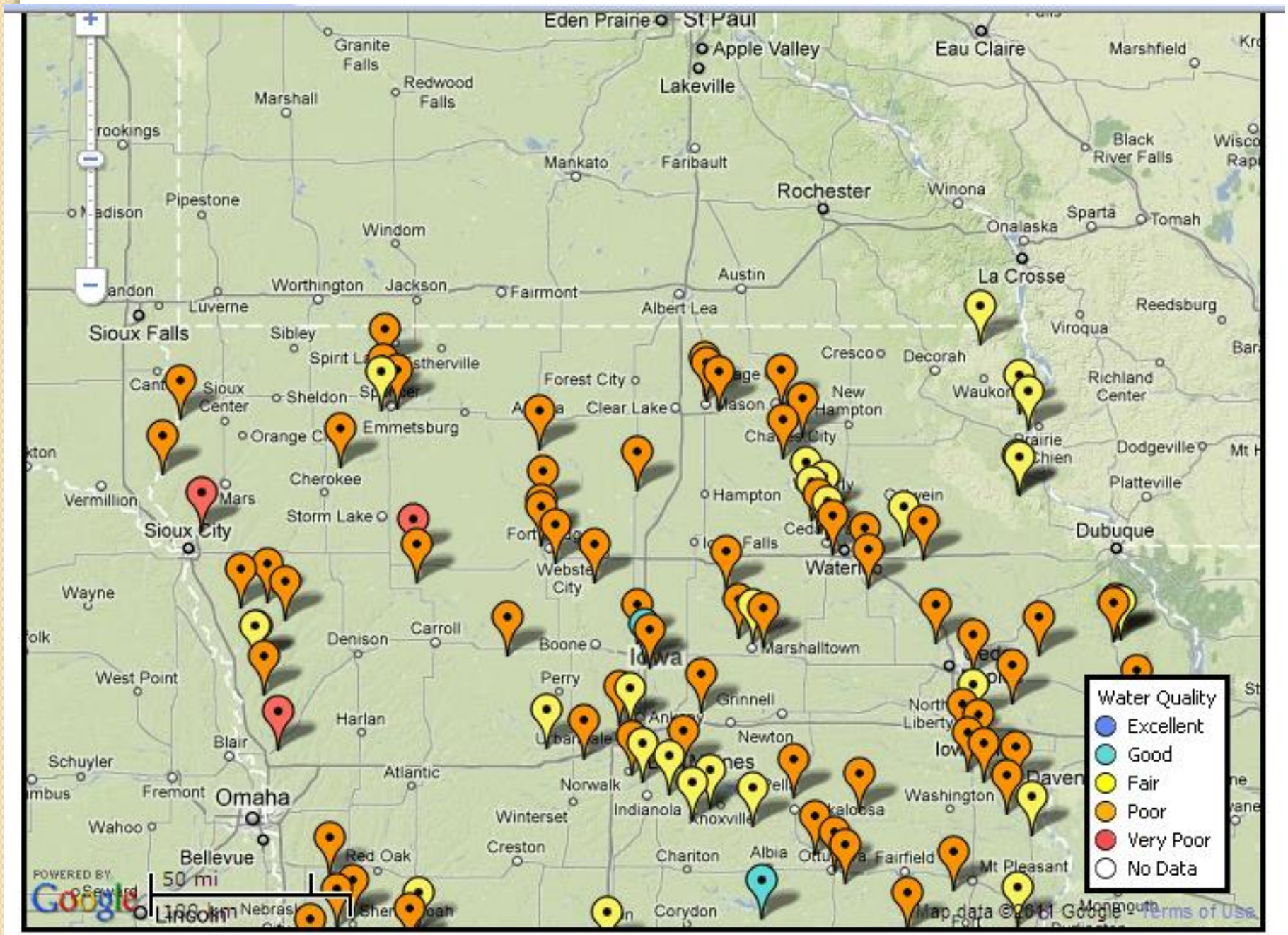


Nutrients



Graph Courtesy of Cedar Rapids Water Department; Data from USGS, Cedar Rapids Water Department and Des Moines Water Works

Iowa's Water Quality Index: All Years Average



Take home message #5:

Citizen Engagement is Key
(and monitoring in small watersheds is a must to show improvement)

Citizen Science

"As a Soil and Water Conservation District Commissioner, I am interested in water quality in local streams so that I can better inform the public. Data collected by IOWATER volunteers is used by the city of Ames to enhance the city's own monitoring program and is used as a 'first alert' for major problems such as sewer breaks. IOWATER data is also important for recommending conservation practices to agriculture producers, storm water managers and residents. More recently, IOWATER data collected in the Squaw Creek Watershed over the last 14 years has provided baseline water quality information for the newly formed Squaw Creek Watershed Management Authority to develop a 20-year plan to improve water quality in this major tributary to the South Skunk River." ~ *Erv Klaas, IOWATER Citizen Scientist*

IOWATER

Volunteer Water Quality Monitoring

www.iowadnr.gov/IOWATER

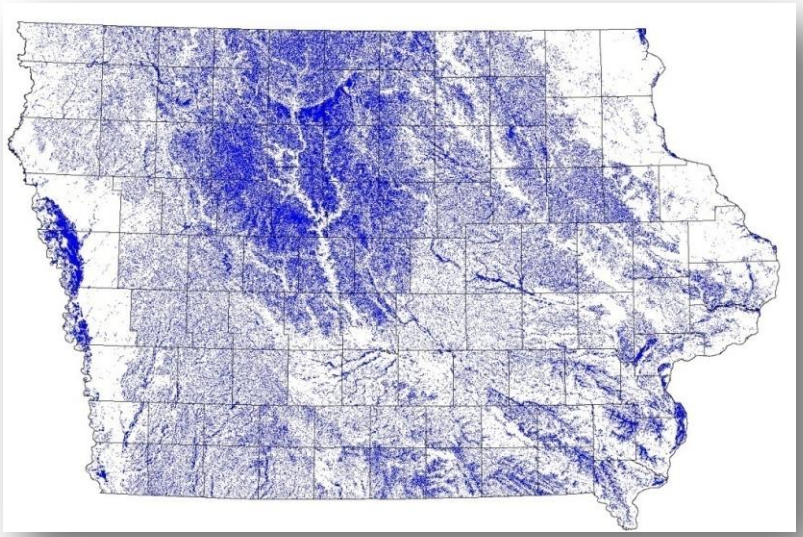
Mary.Skopec@dnr.iowa.gov

Additional Slides

Originally, Iowa's Water Flow and Quality Shaped by the Prairie

Rain caught in leaves, evaporates
If dribbled to ground, soaked into soil,
(did not run over ground surface)
Ground held water like a sponge, released it SLOWLY
Then, water absorbed by plant roots (transpiration)

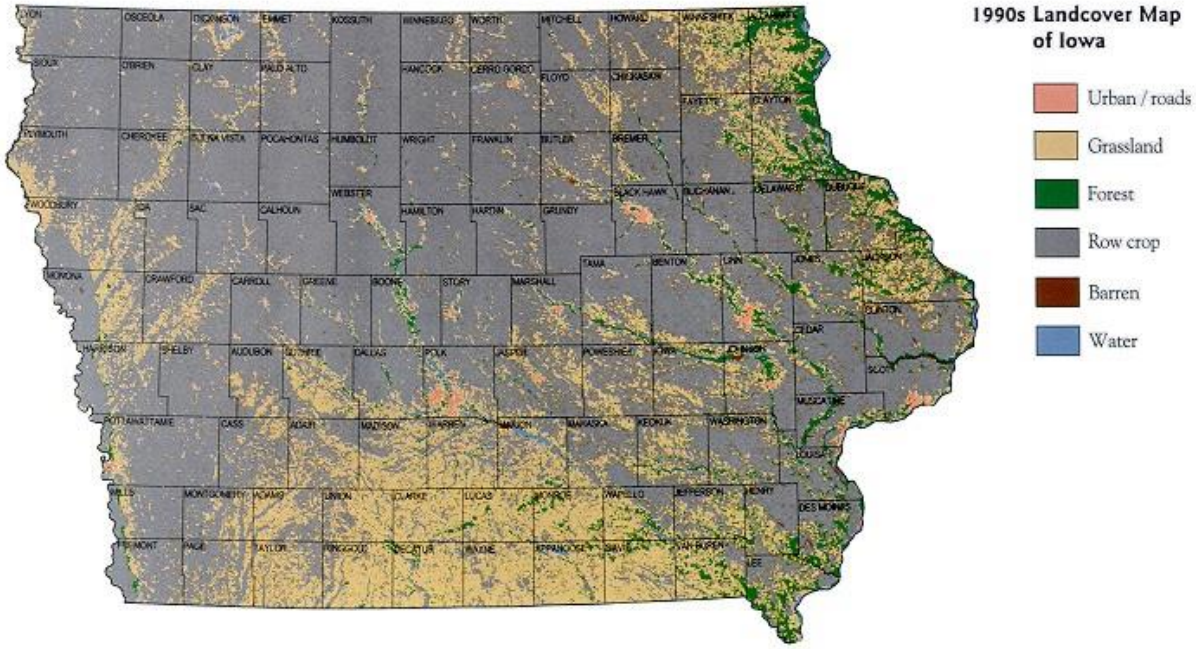
Water constantly released back to atmosphere



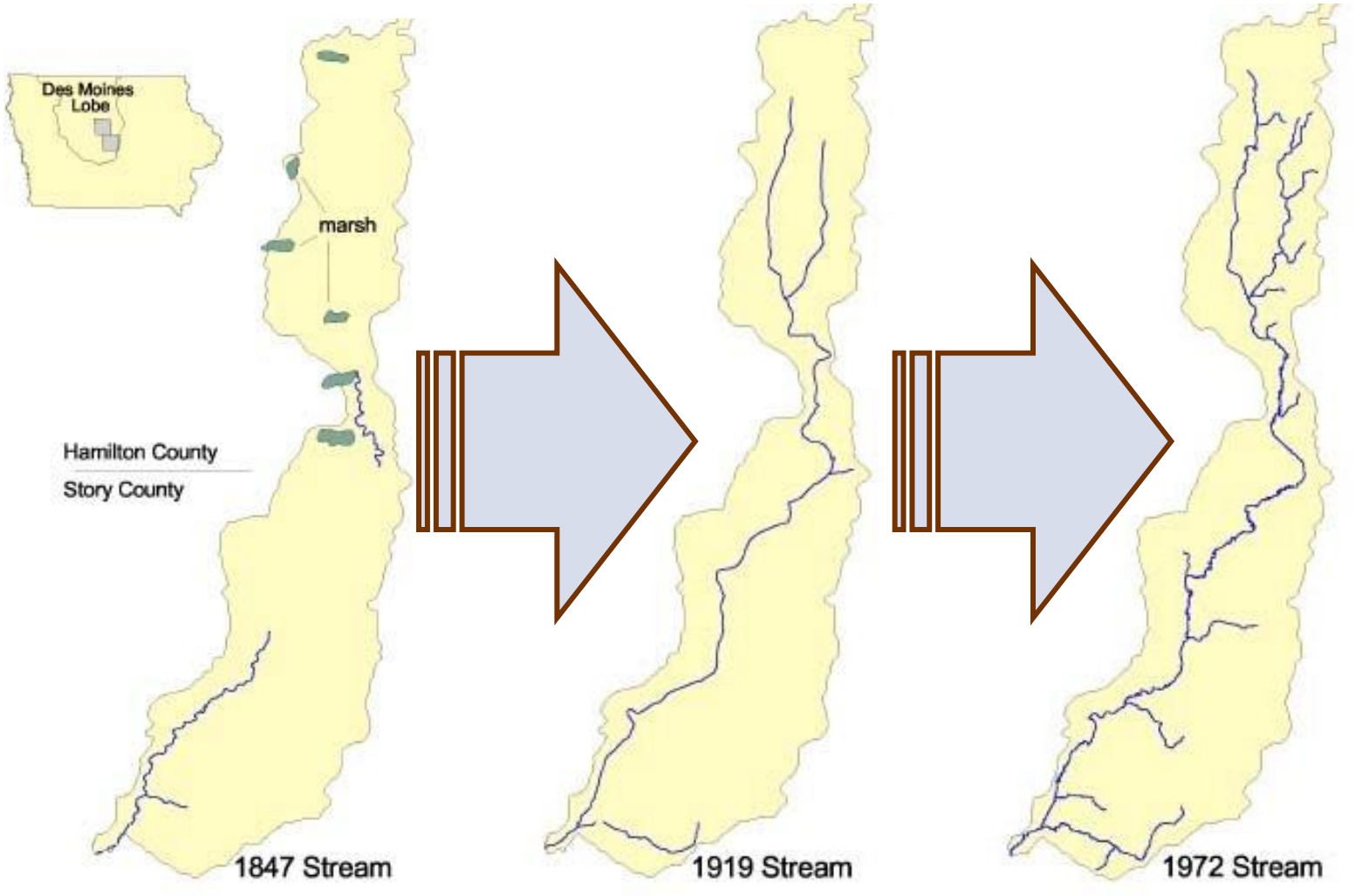
Credit Casey Kohrt, IDNR

Slide Source: Connie Mutel

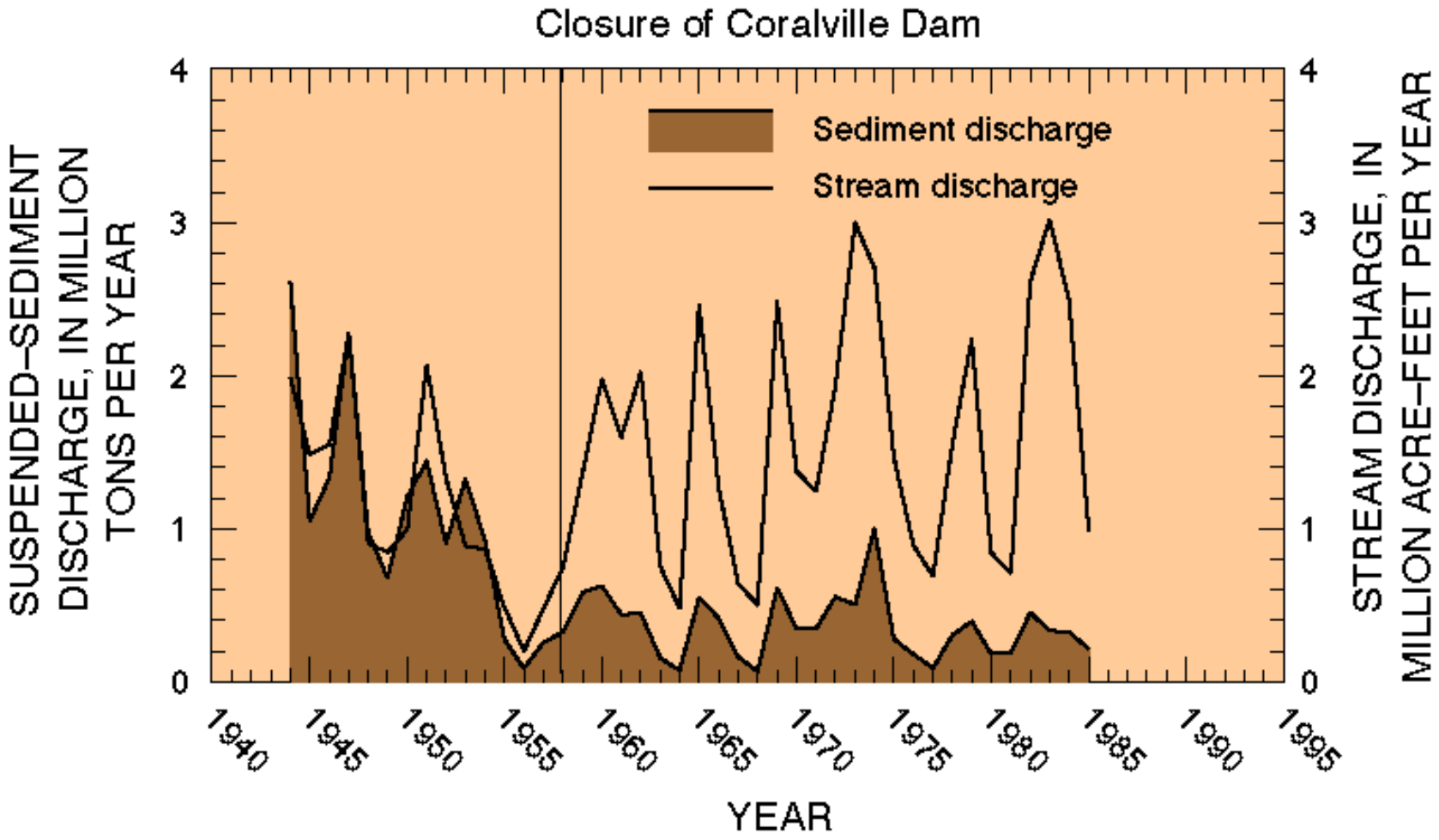
Land Use Altered



Increases in Drainage Efficiency

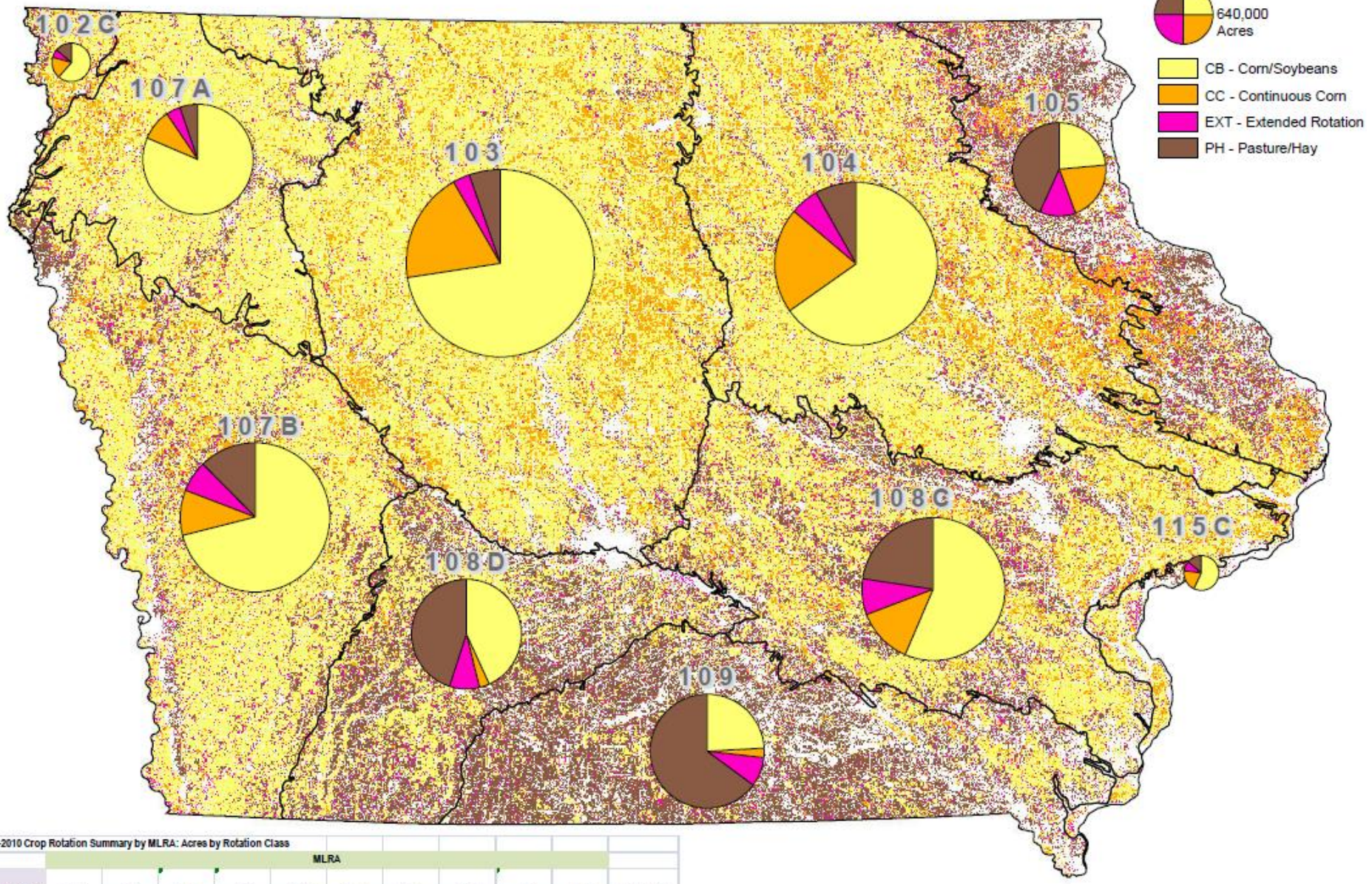


Kathy L. Andersen; Historic Alteration of Surface Hydrology on the Des Moines Lobe; Water Fact Sheet 2001-15



http://ia.water.usgs.gov/projects/nawqa/factsheets/fs-129/fig2.gif

Crop Rotations by MLRA 2006-2010

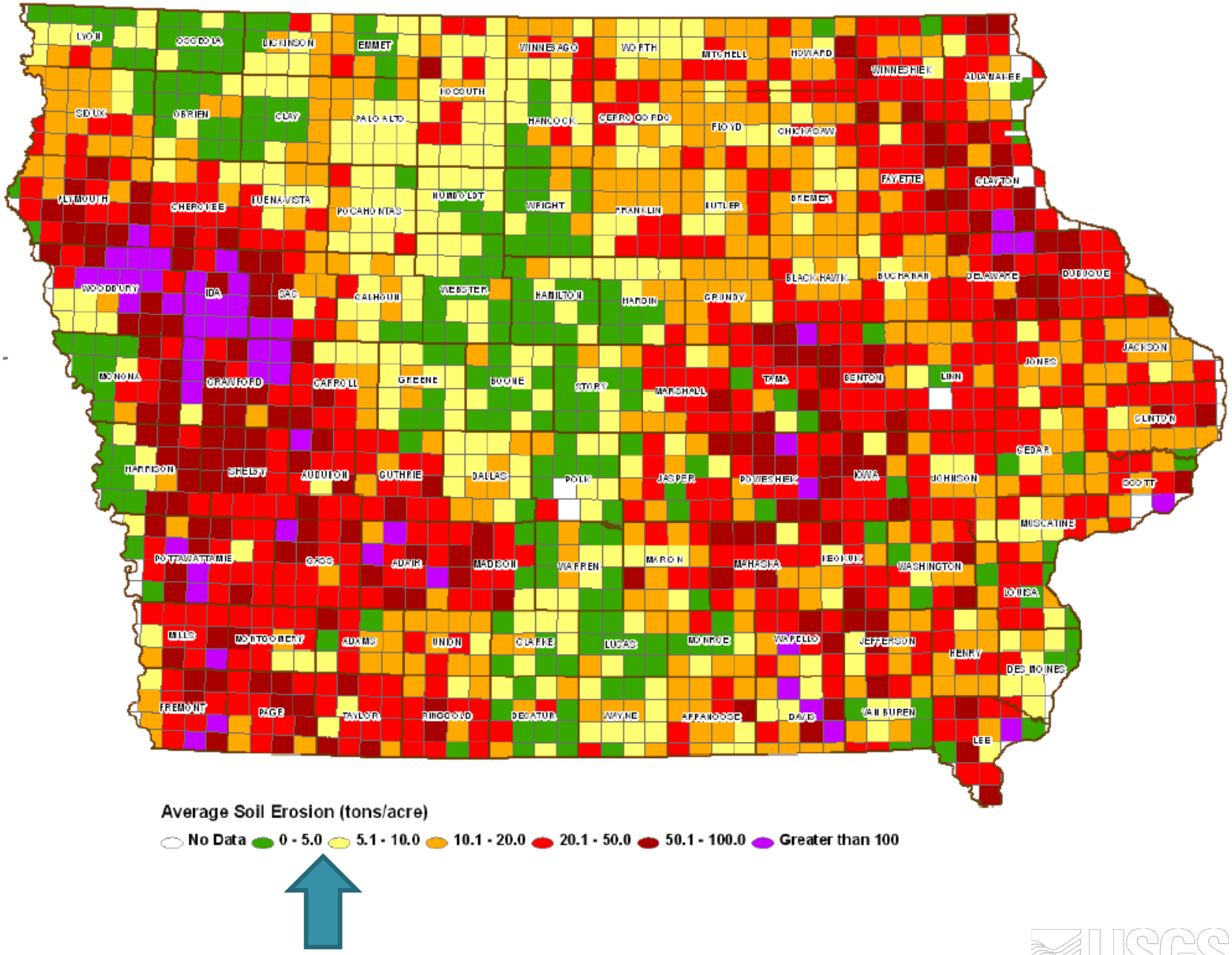


2006-2010 Crop Rotation Summary by MLRA: Acres by Rotation Class

	MLRA										
Rotation Class	102C	103	104	105	107A	107B	108C	108D	109	115C	Class Total
CB	170,150	4,737,173	3,196,747	381,385	1,833,614	2,938,063	2,137,446	960,322	582,198	127,776	17,064,874
CC	50,077	1,252,578	1,031,193	339,917	208,446	408,404	479,205	65,003	63,872	44,997	3,943,694
EXT	18,180	190,573	275,015	201,089	95,205	280,602	310,546	199,601	201,817	20,183	1,792,811
PH	38,865	351,362	402,027	705,143	118,910	510,586	855,005	999,998	1,564,762	31,536	5,578,193
MLRA Total	281,365	6,598,812	4,970,105	1,657,127	2,283,620	4,185,568	3,830,637	2,253,206	2,436,344	229,875	

Source: USDA NASS

Soil Erosion 2002-2010

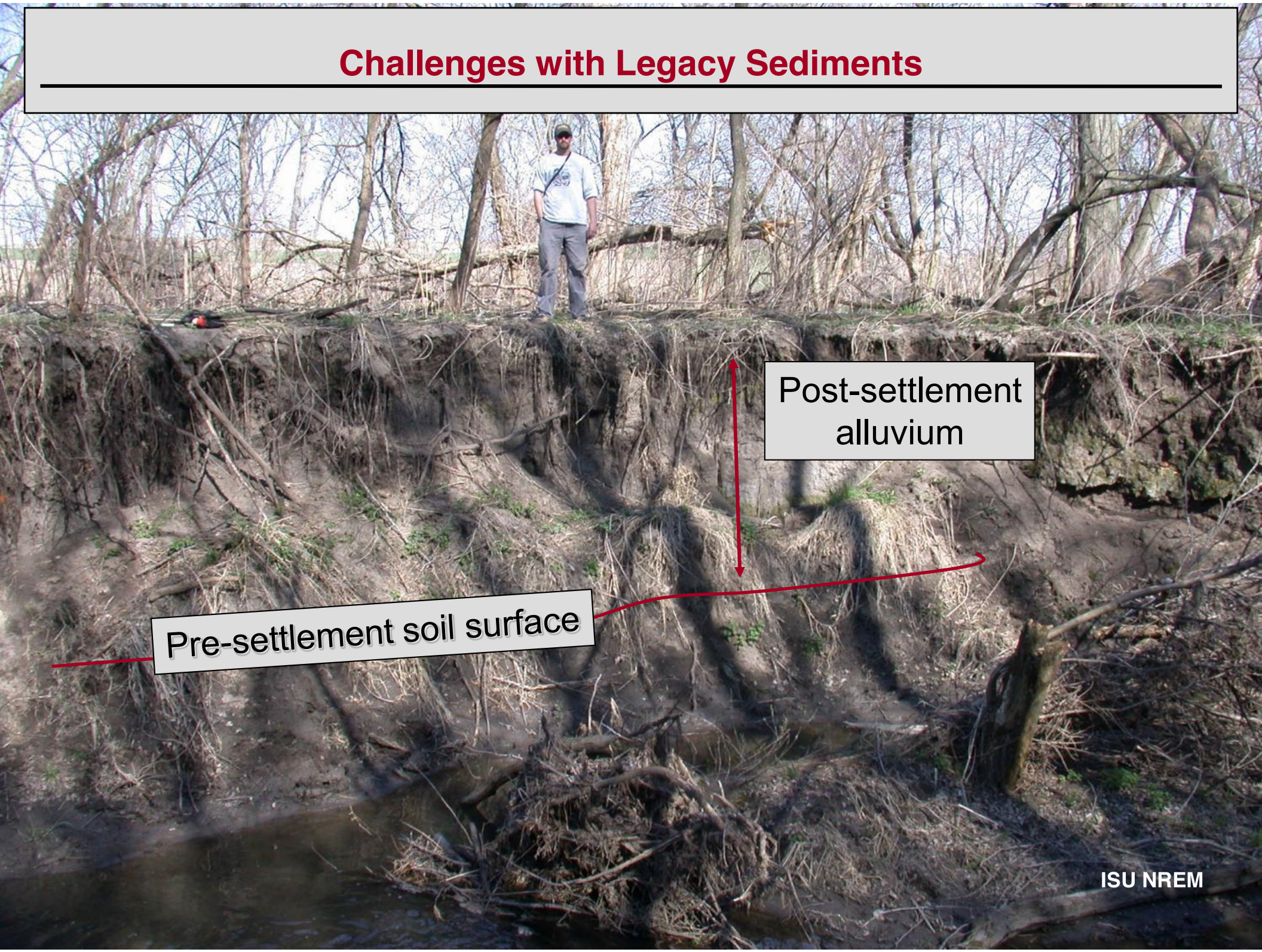


Source: "Losing Ground" by Cox, Hug, Bruzelius; 2011; www.ewg.org/losingground

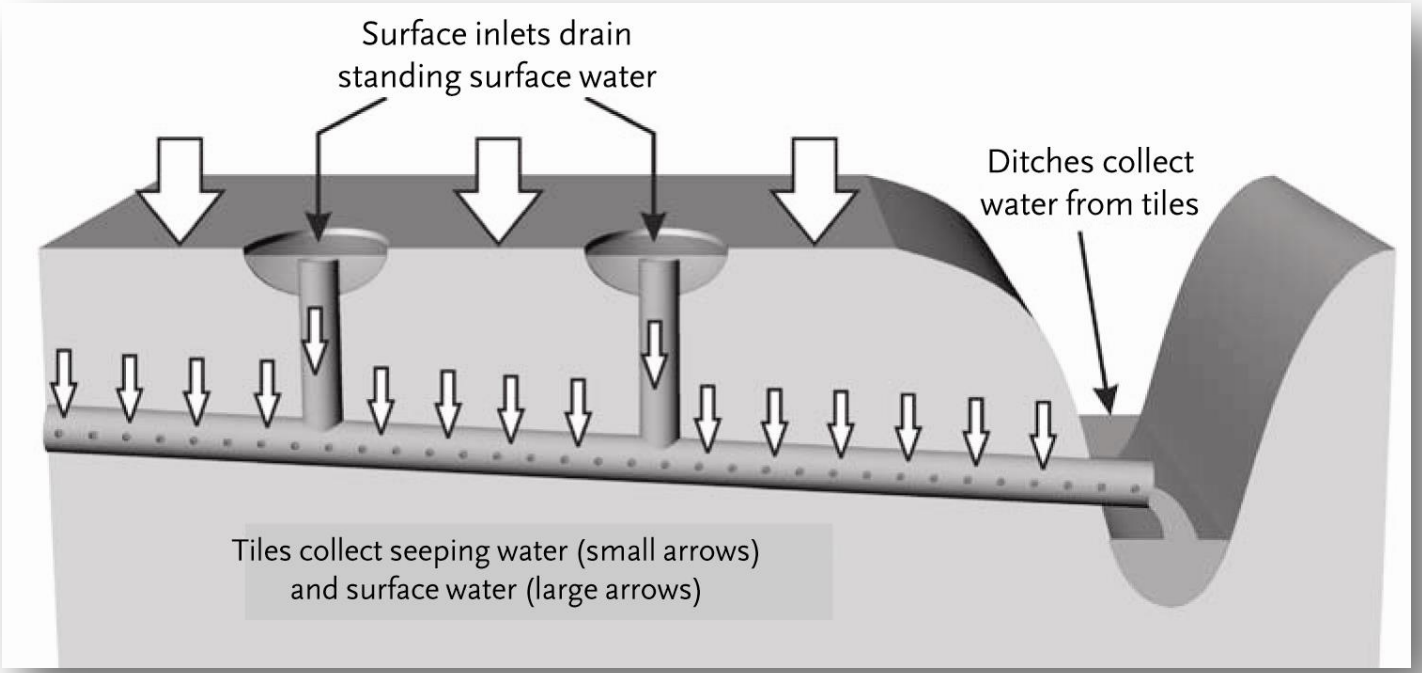
Bank Erosion – >50% of Sediment

Photo: Tom Marshall, IDNR

Challenges with Legacy Sediments



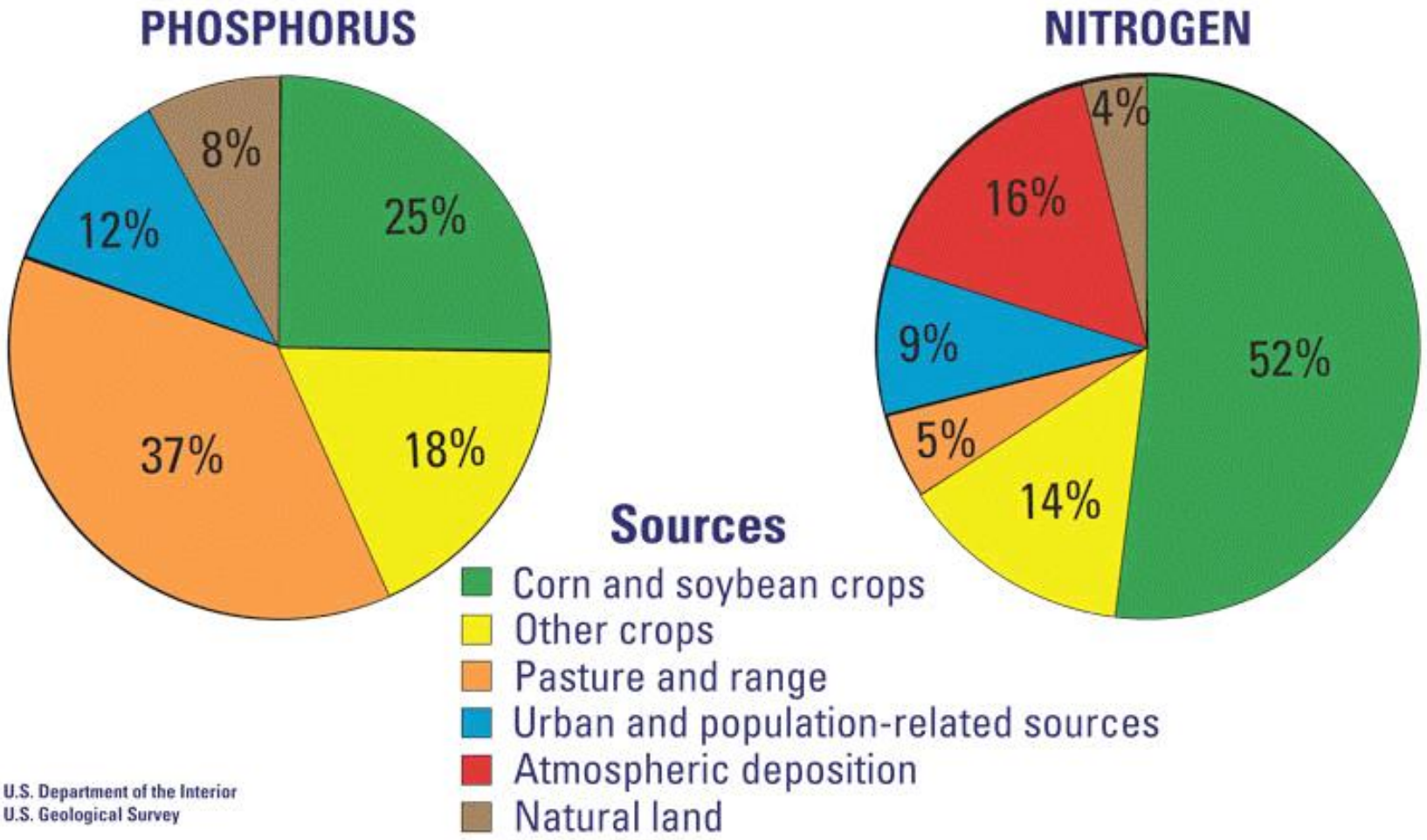
Hydrologic Modification



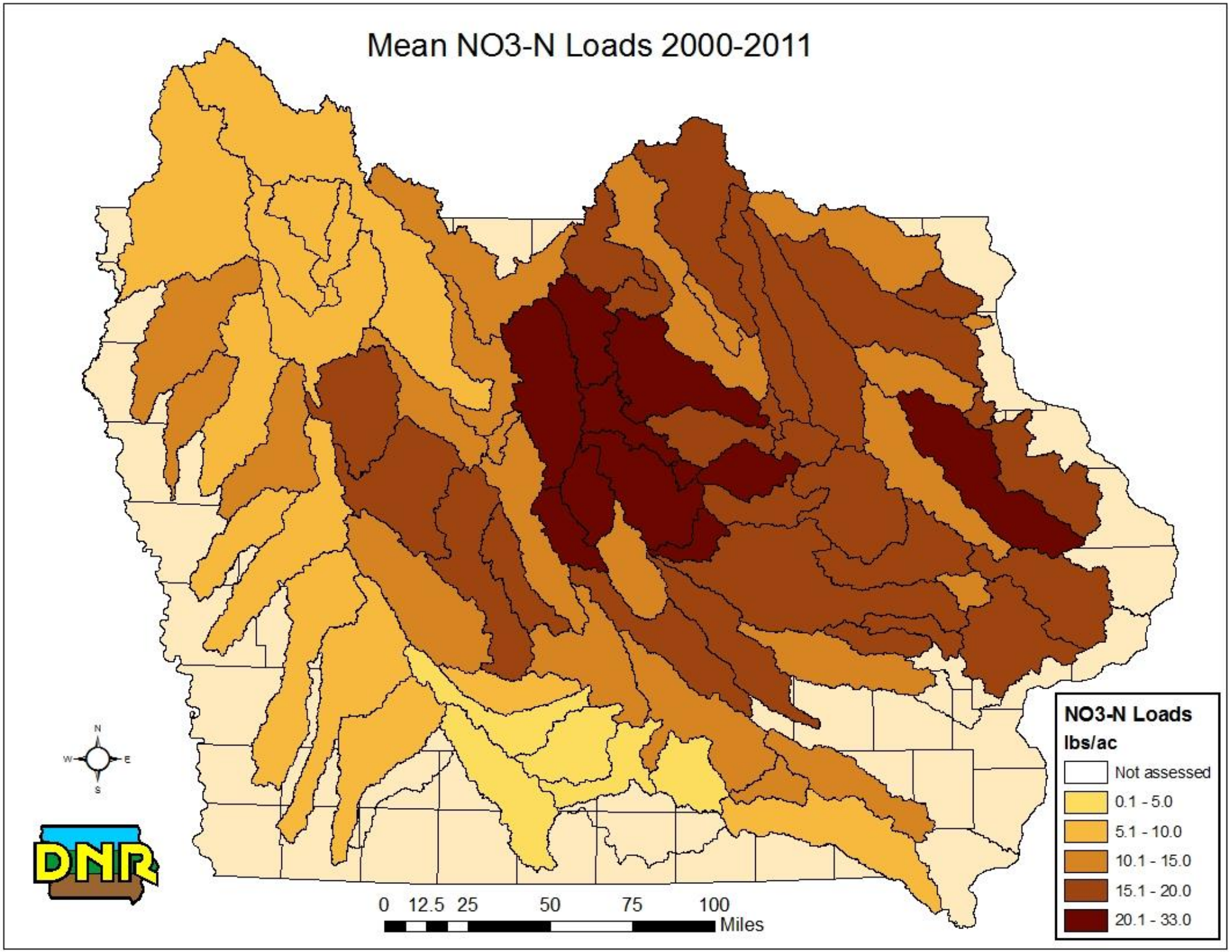
From "A Watershed Year"
Edited by Cornelia Mutel

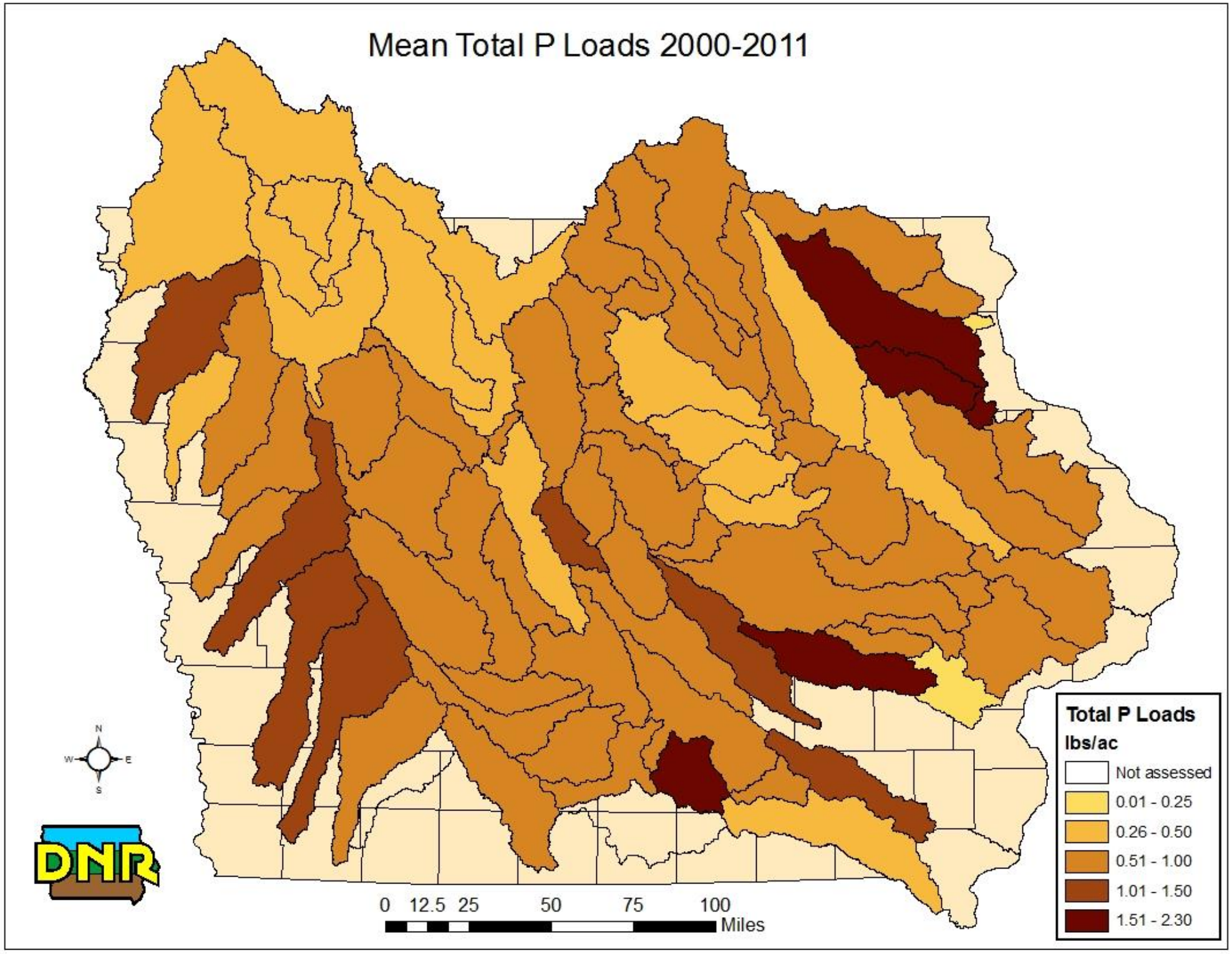
USGS
science for a changing world

Sources of nutrients delivered to the Gulf of Mexico



U.S. Department of the Interior
U.S. Geological Survey


Mean NO3-N Loads 2000-2011
N
W
E
S
DNR
0 12.5 25 50 75 100
Miles
NO3-N Loads
lbs/ac
Not assessed
0.1 - 5.0
5.1 - 10.0
10.1 - 15.0
15.1 - 20.0
20.1 - 33.0

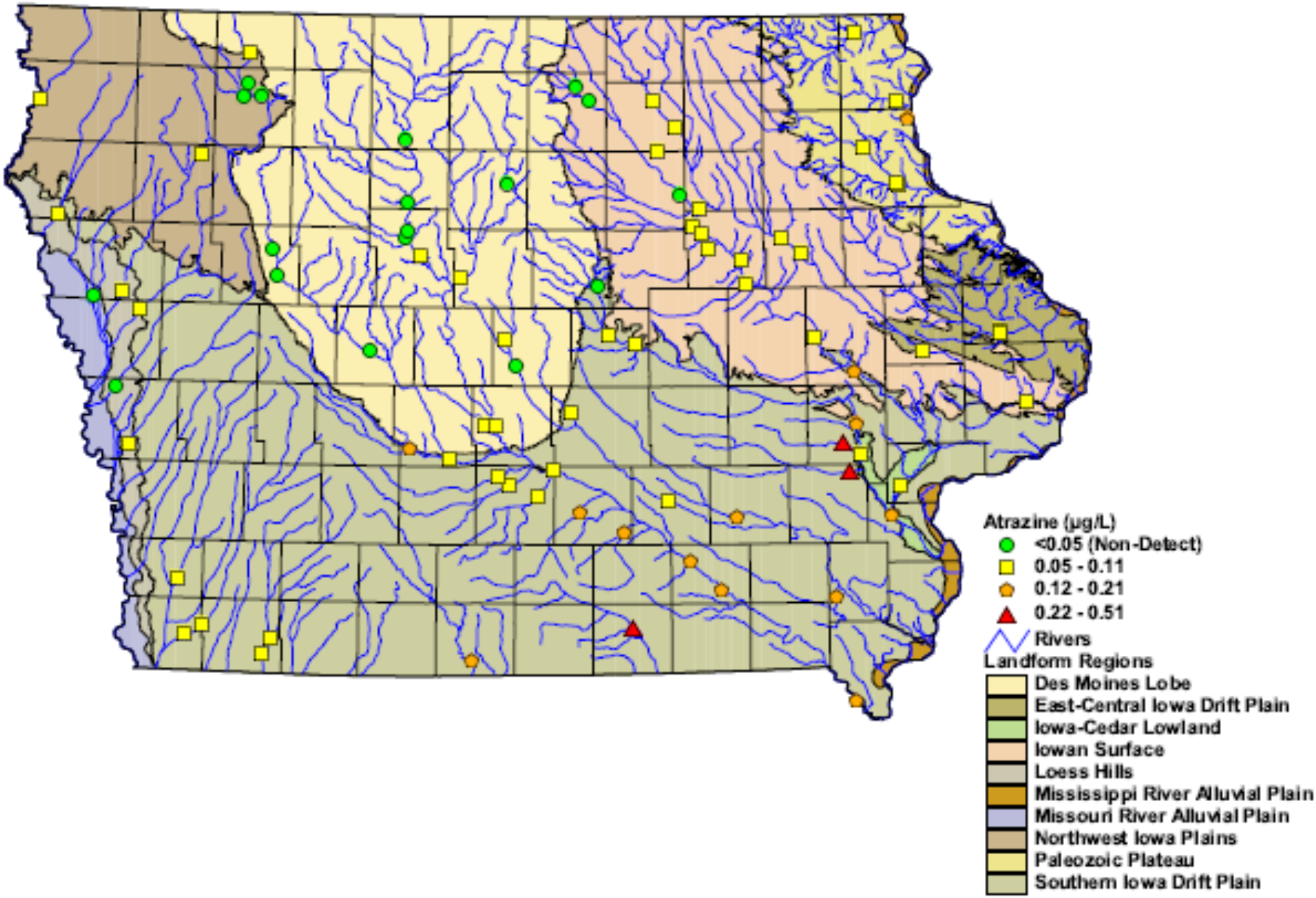

Mean Total P Loads 2000-2011
Total P Loads
lbs/ac
Not assessed
0.01 - 0.25
0.26 - 0.50
0.51 - 1.00
1.01 - 1.50
1.51 - 2.30
0 12.5 25 50 75 100
Miles
N
W
E
S
DNR

DNR Beach Monitoring

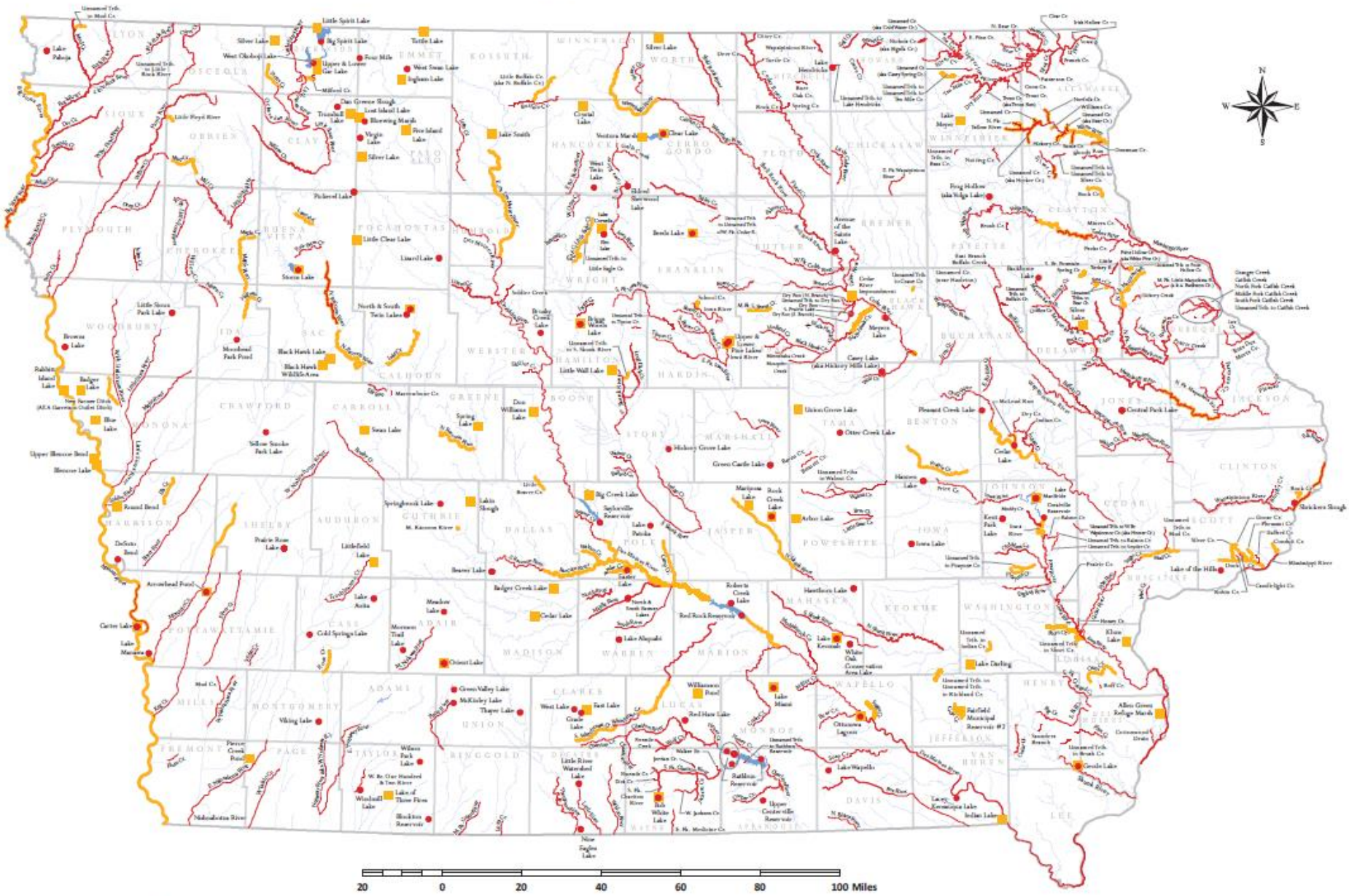
Maximum Concentration (ug/L Microcystin) - Concentrated Scum Samples

<1 | 1.00 - 4.99 | 5.00 - 19.99 | >20

Ambient Monthly Stream Monitoring Sites 2000 - 2009 (Median)



List of Iowa's Impaired Waterbodies (2012)



Impaired Lakes (141 Lakes/234 Impairments)

- Category 5 Impairment - TMDL Required (93 Lakes/161 Impairments)
- Category 4 Impairment - TMDL Not Needed (66 Lakes/73 Impairments)

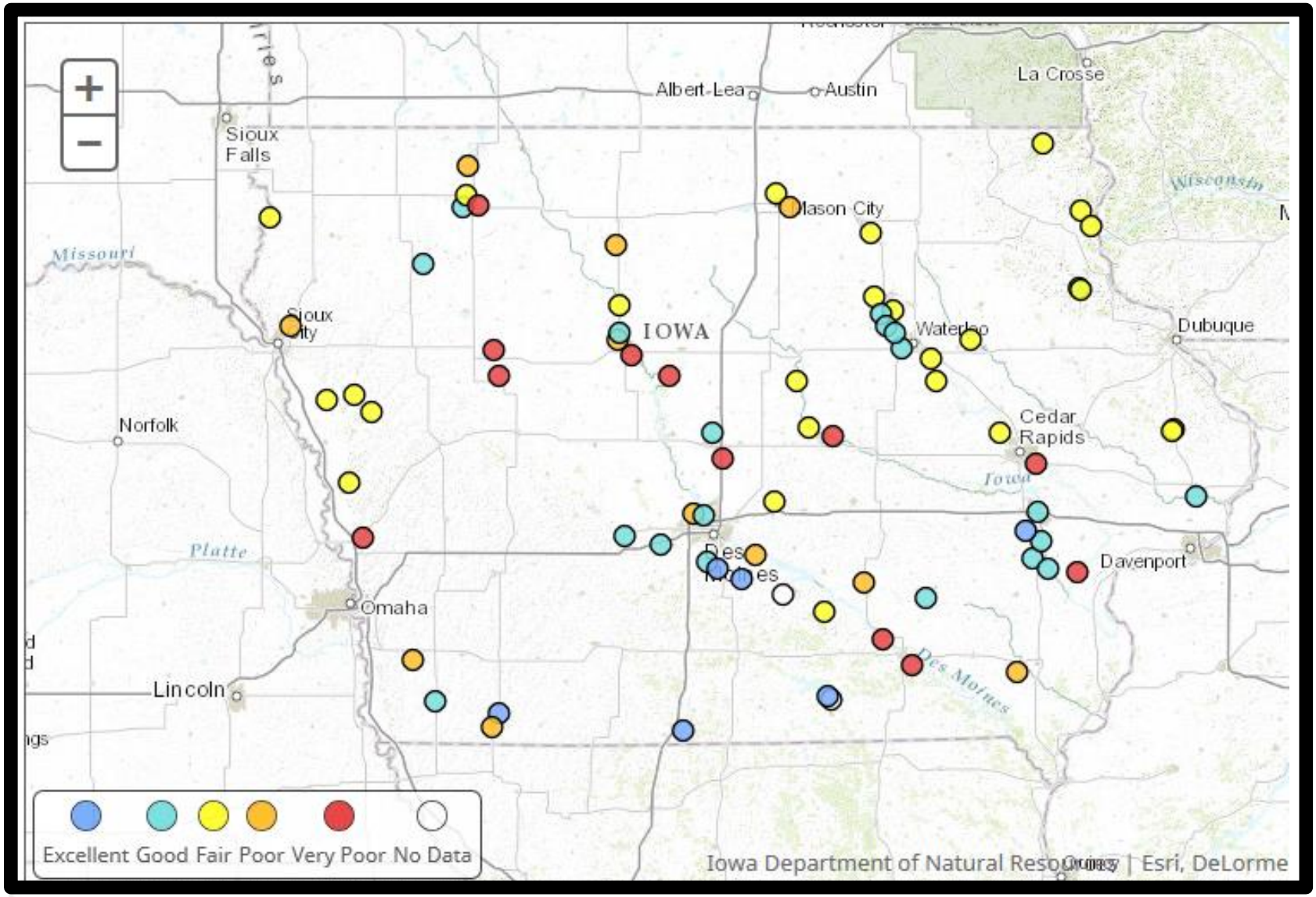
Impaired Stream Segments (480 Segments/599 Impairments)

- Category 5 Impairment - TMDL Required (391 Segments/488 Impairments)
- Category 4 Impairment - TMDL Not Needed (107 Segments/111 Impairments)

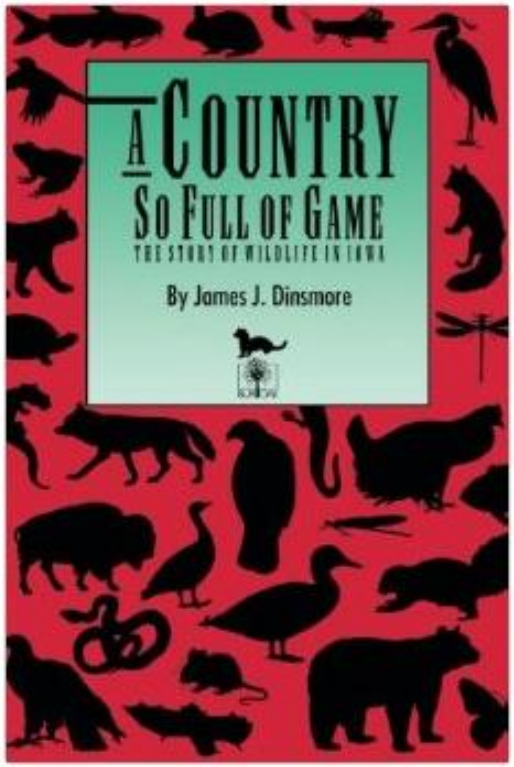
DNR

ABA 5/29/2013

Water Quality Index February 2014



Historical Accounts of Iowa's Wildlife Diversity

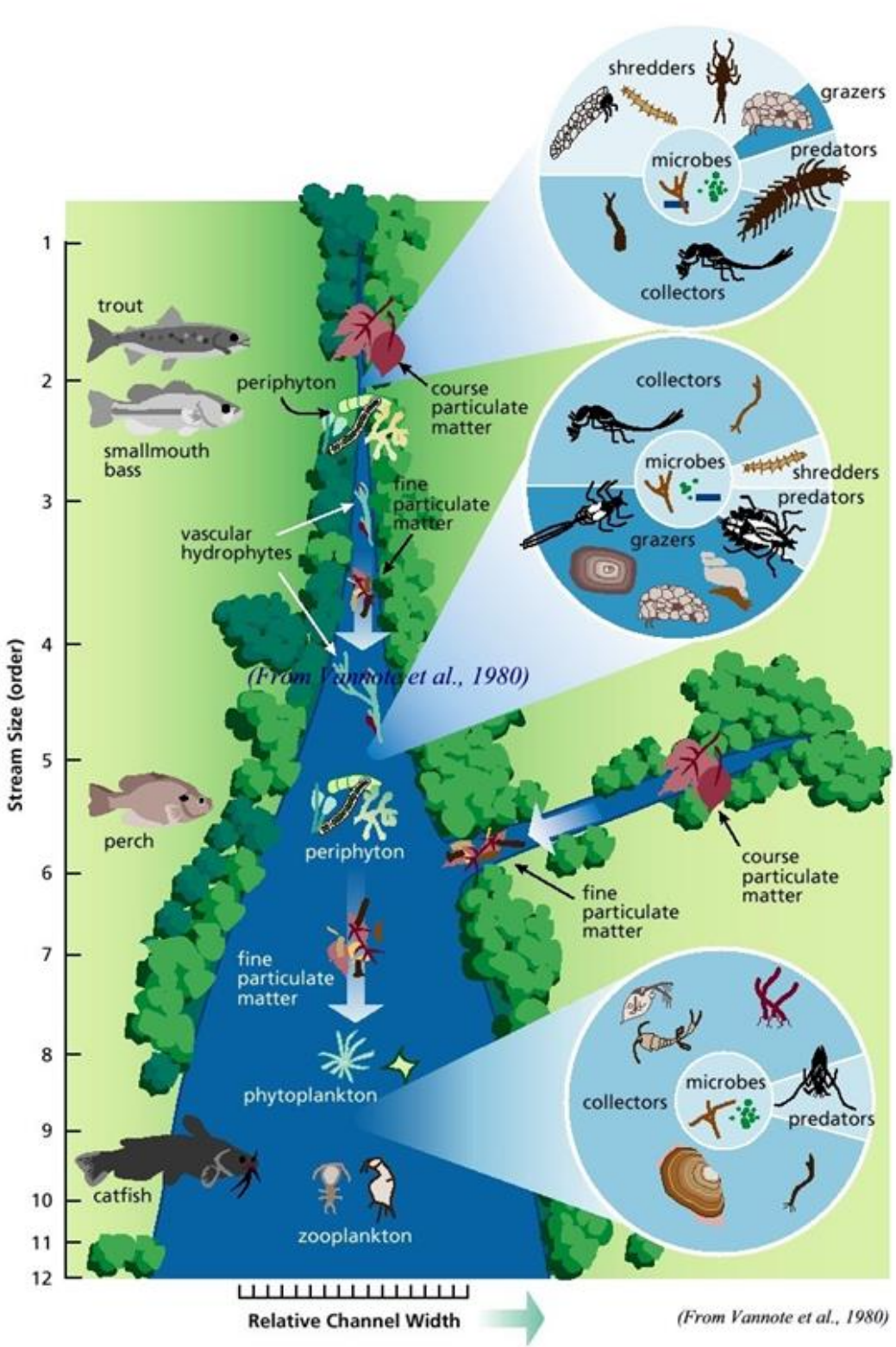


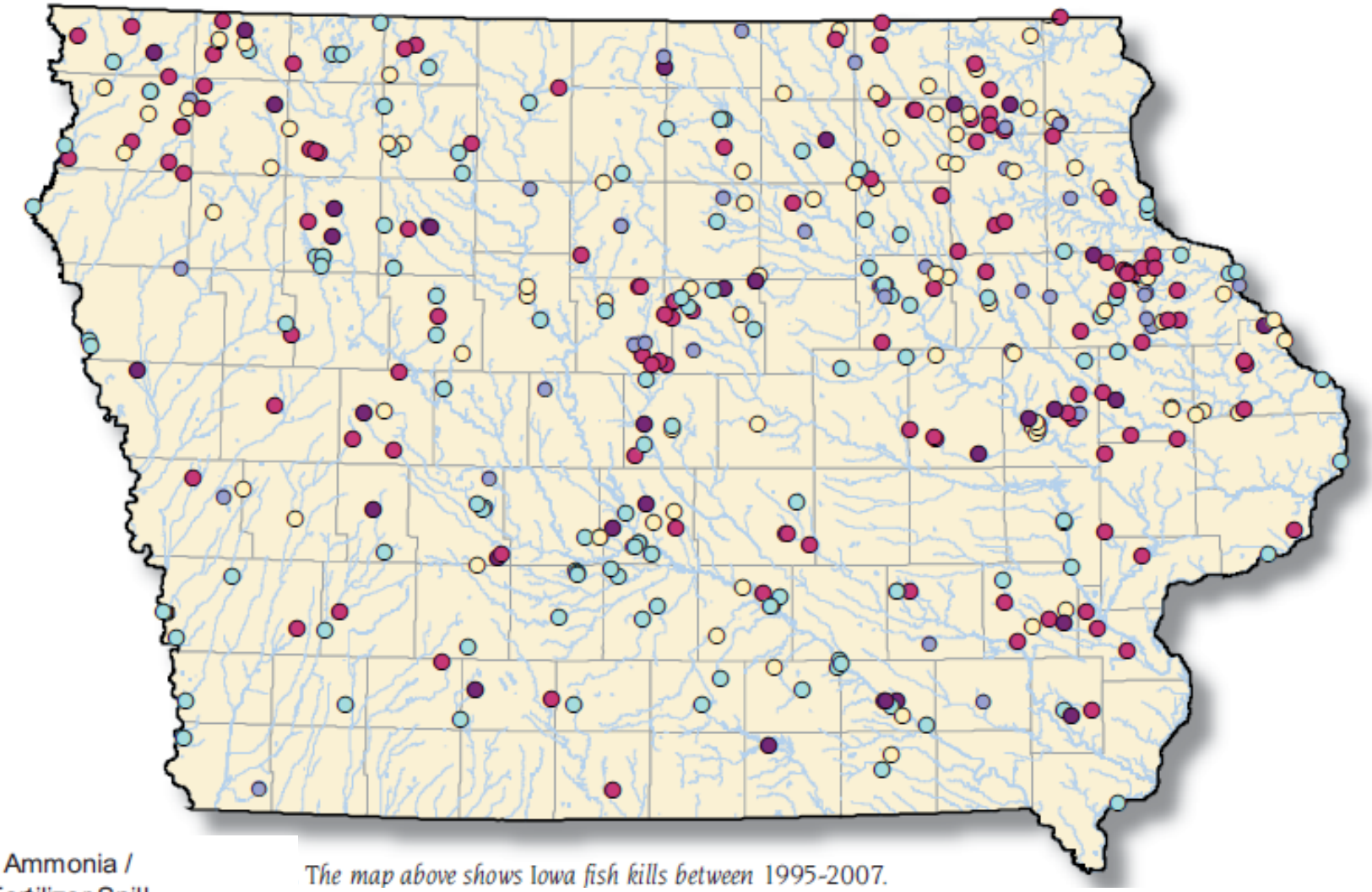
"Indian agent Joseph Street said it well in 1833 when he described his trip across Iowa: '*I had never rode through a country so full of game.*' In the early 1800s Iowa's deep soil, free-flowing rivers and streams, and favorable climate had combined to produce the welcoming habitats that supported a surprising variety of animals."

Based on hundreds of primary sources: chronicles of military expeditions, field reports by early naturalists, first-person accounts by fur traders and hunters to up-to-date county checklists.

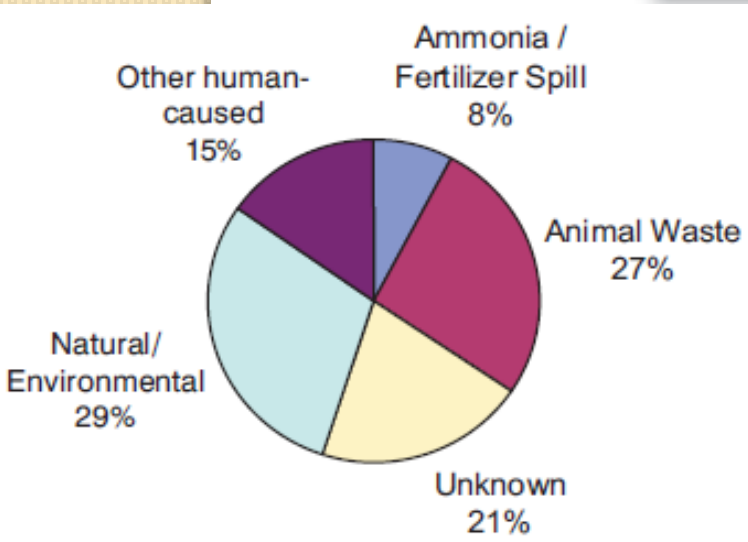
Loss of River and Floodplain Function

Nishnabotna River


shredders
grazers
microbes
predators
collectors
trout
periphyton
course particulate matter
smallmouth bass
collectors
microbes
shredders
predators
grazers
fine particulate matter
vascular hydrophytes
(From Vannote et al., 1980)
perch
periphyton
course particulate matter
fine particulate matter
fine particulate matter
phytoplankton
collectors
microbes
predators
catfish
zooplankton
Stream Size (order)
1
2
3
4
5
6
7
8
9
10
11
12
Relative Channel Width
(From Vannote et al., 1980)



The map above shows Iowa fish kills between 1995-2007.



Fish Kills in Iowa Streams 1995-2007