

# Conducting Targeted Water Monitoring Studies to Measure Water Quality Success

Steve Hopkins, Nonpoint Source Coordinator  
Iowa Department of Natural Resources  
National NPS Training Workshop  
November 8, 2018



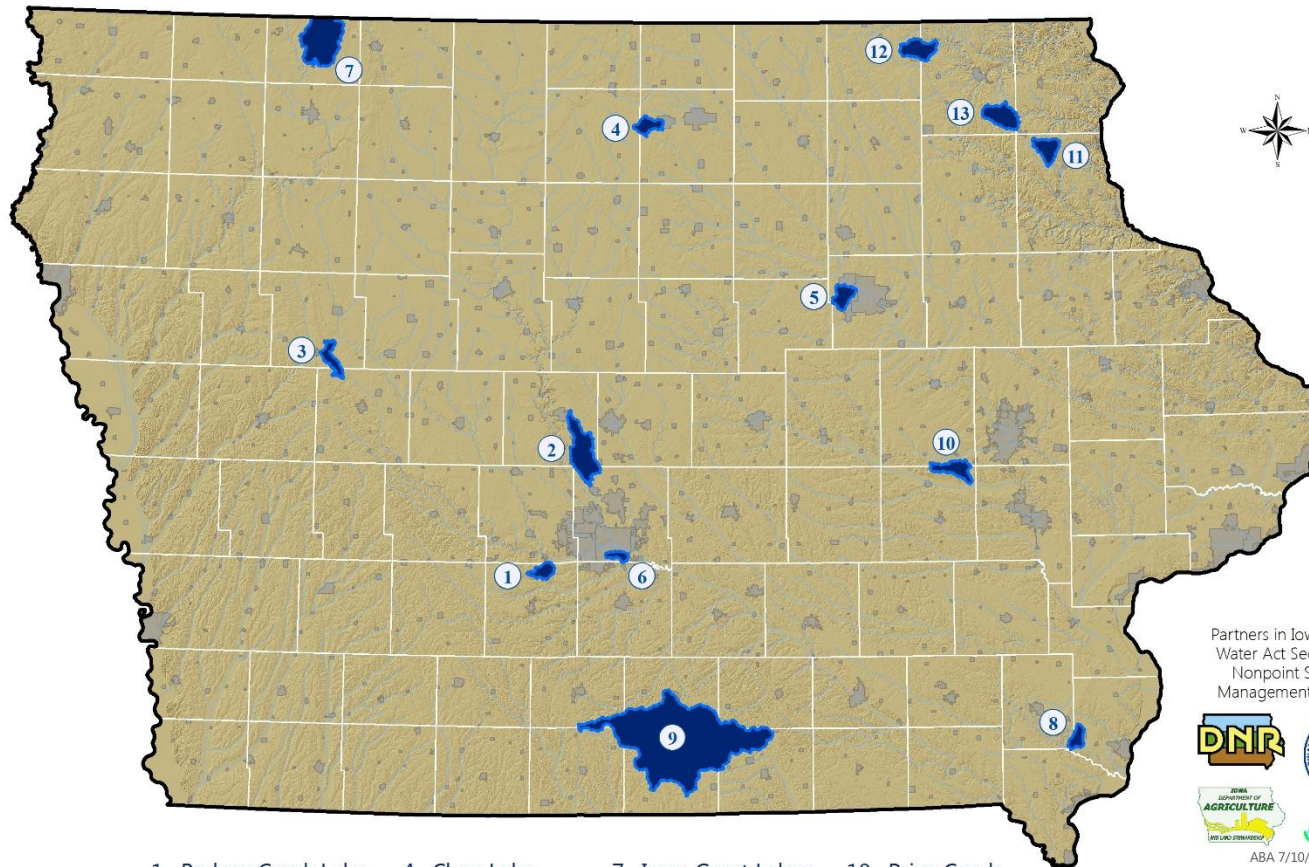
# Why Water Monitoring Studies?

- Is water quality actually improving?
- Are we targeting the right pollutant?
- Are we targeting the right areas?
- Is the waterbody still impaired?
- Is the watershed the problem?



# 319 Project Monitoring

## SECTION 319 WATERSHED PROJECTS, FFY2019



- |                      |                  |                     |                             |
|----------------------|------------------|---------------------|-----------------------------|
| 1. Badger Creek Lake | 4. Clear Lake    | 7. Iowa Great Lakes | 10. Price Creek             |
| 2. Big Creek Lake    | 5. Dry Run Creek | 8. Lake Geode       | 11. Silver Creek (Clayton)  |
| 3. Black Hawk Lake   | 6. Easter Lake   | 9. Lake Rathbun     | 12. Silver Creek (Howard)   |
|                      |                  |                     | 13. Yellow River Headwaters |

Partners in Iowa's Clean  
Water Act Section 319  
Nonpoint Source  
Management Projects



ABA 7/10/2018

# 319 Project Monitoring

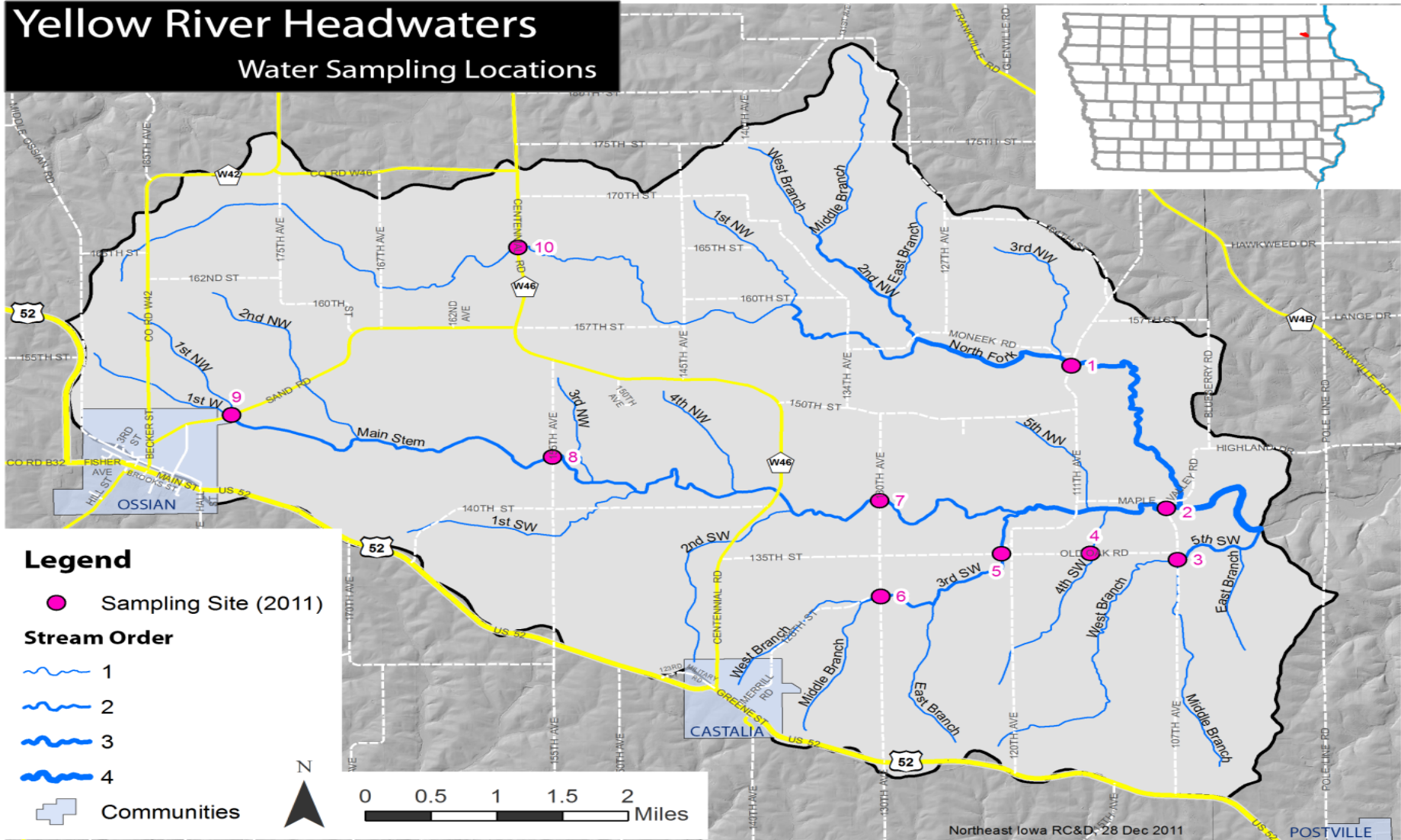
- Monitor for WQ 10a or SP 12 measure
- Sample the pollutant linked to the impairment
- Sample different stream segments or tributaries
- Sample different subwatersheds



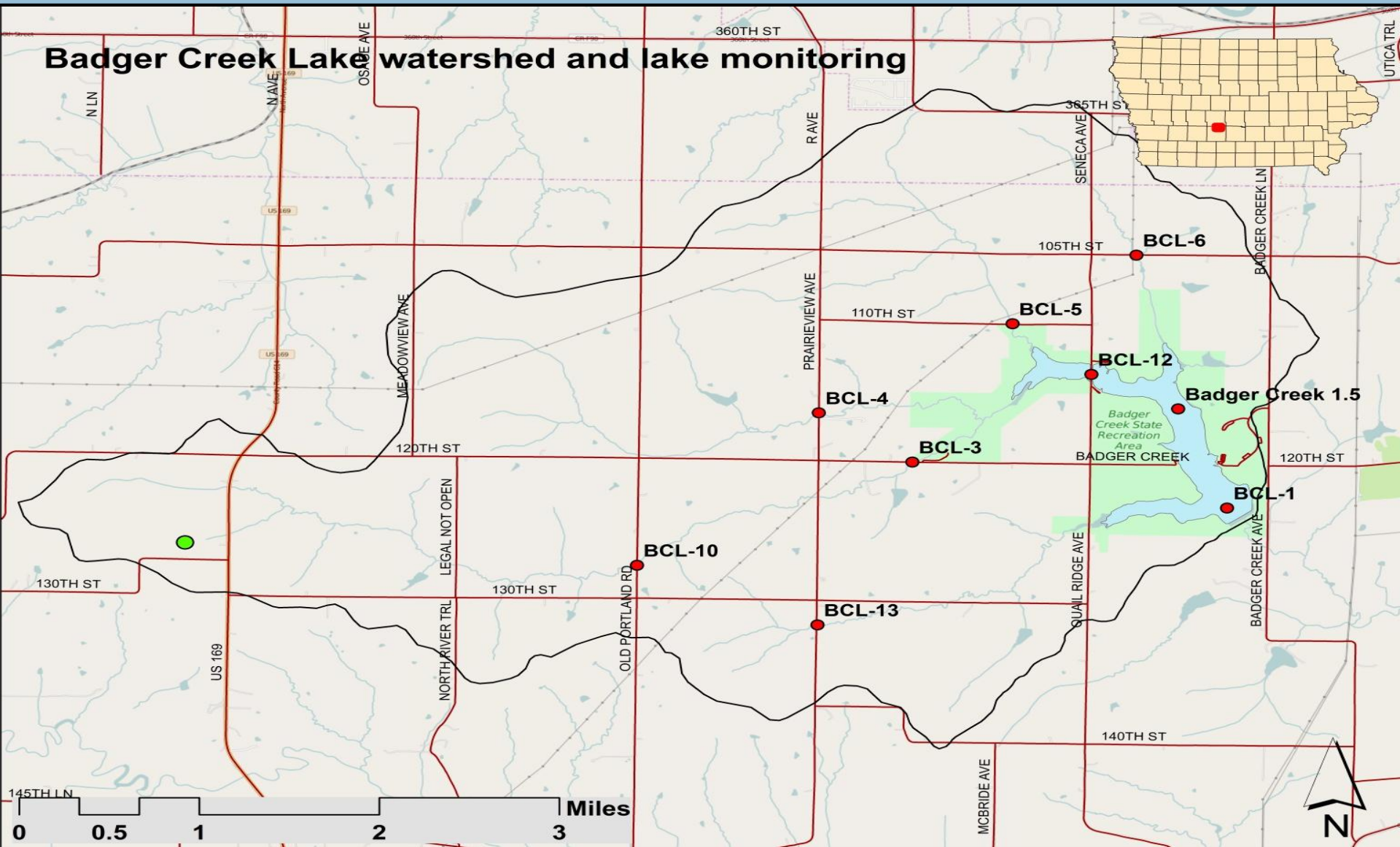


# River & Stream 319 Monitoring

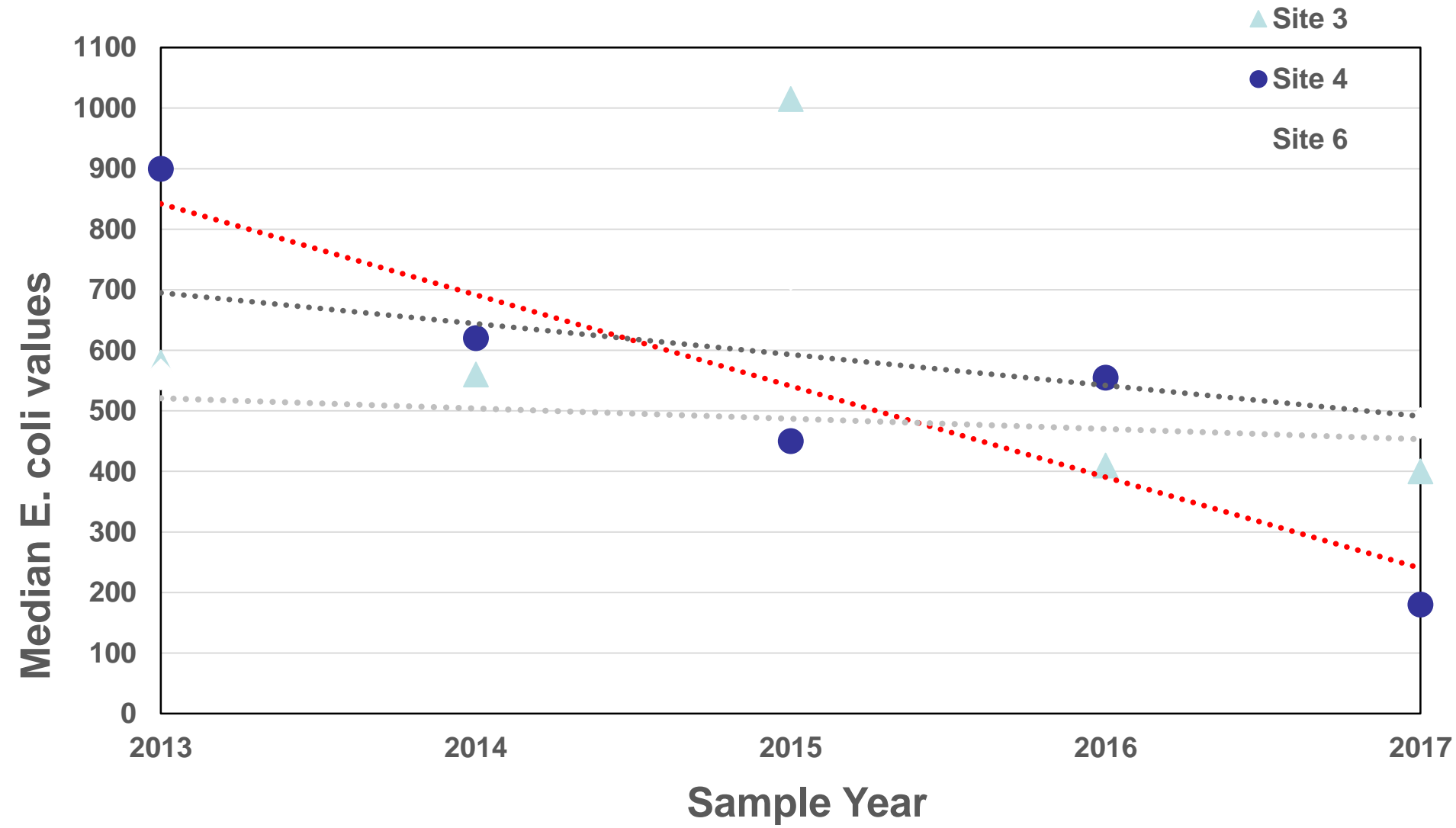
## Yellow River Headwaters Water Sampling Locations



# Lake 319 Monitoring



# Is the water improving?

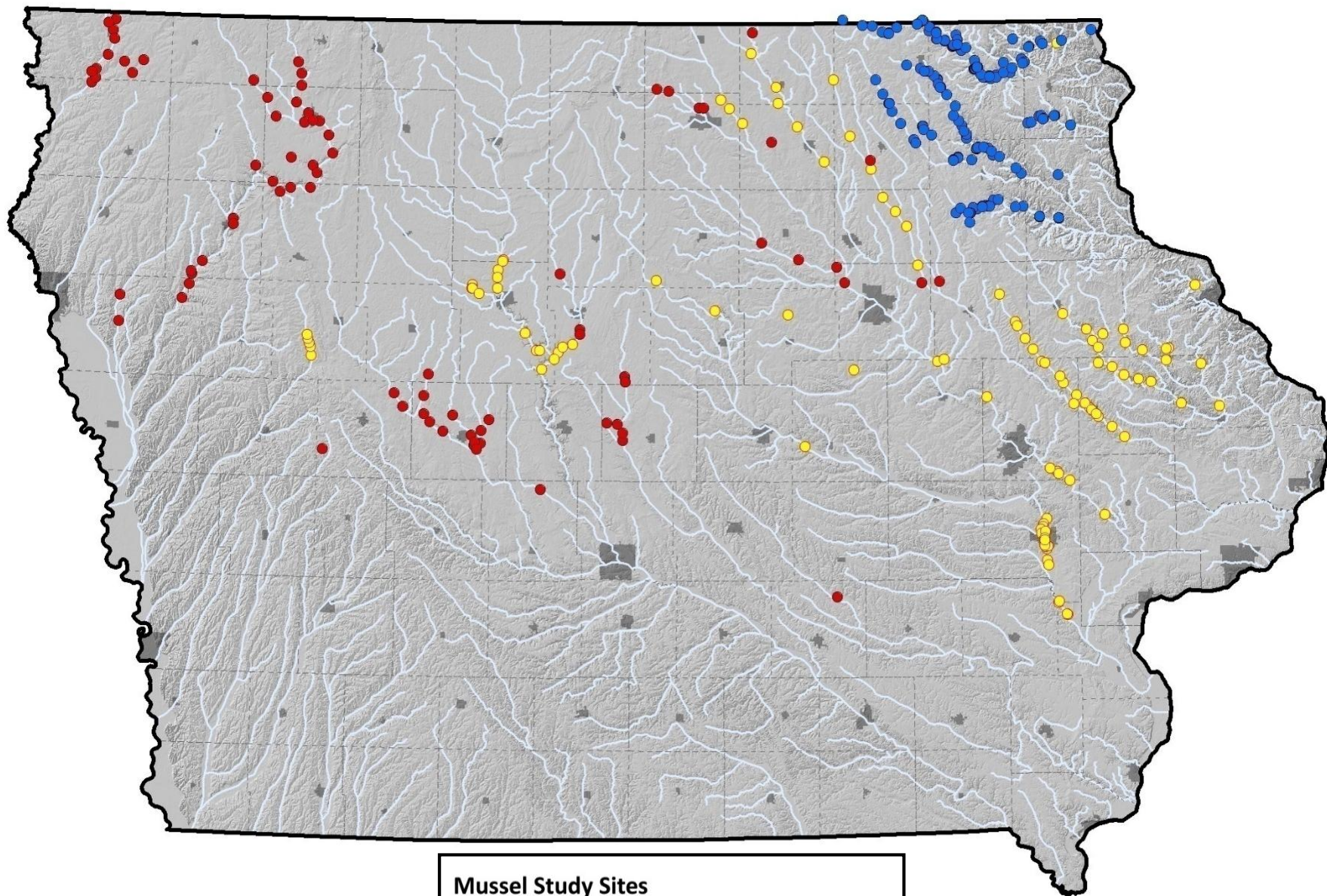


# Statewide Mussel Survey

- Native Mussels: indicate biological health of rivers & streams
- Resampled old study sites
- Added new study sites
- 7-Year Study: 2011-2017





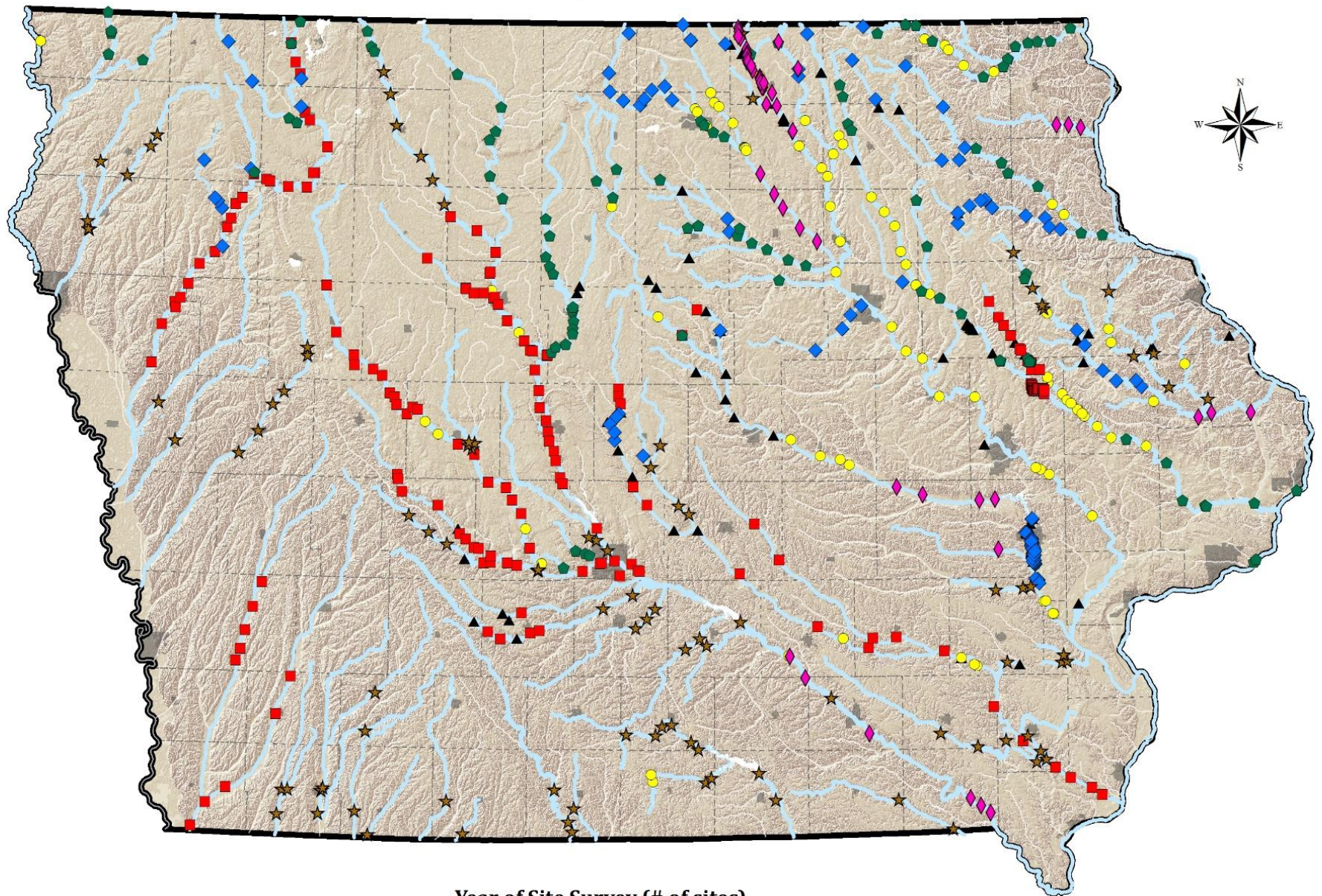


#### Mussel Study Sites

- Frest in 1984, ISU in 1998 (117 sites)
- ISU in 1999 (82 sites)
- Luther College in 1999-2000 (181 sites)



# Mussel Survey Sites, 2011 - 2017



## Year of Site Survey (# of sites)

- |                           |                           |                           |                          |
|---------------------------|---------------------------|---------------------------|--------------------------|
| ▲ 2011 Survey Sites (121) | ■ 2013 Survey Sites (185) | ■ 2015 Survey Sites (109) | ◆ 2017 Survey Sites (49) |
| ● 2012 Survey Sites (98)  | ◆ 2014 Survey Sites (151) | ★ 2016 Survey Sites (100) | ~ Rivers Sampled         |



# Survey Results

Year	# of sites	# of new sites	# of mussels found	# of species found
2011	121	99	10,398	34
2012	98	50	6,232	31
2013	185	141	4,398	30
2014	151	121	4,060	29
2015	109	98	5,178	36
2016	100	94	1,154	22
2017	49	46	3,615	27
Totals	813	649	35,035	39

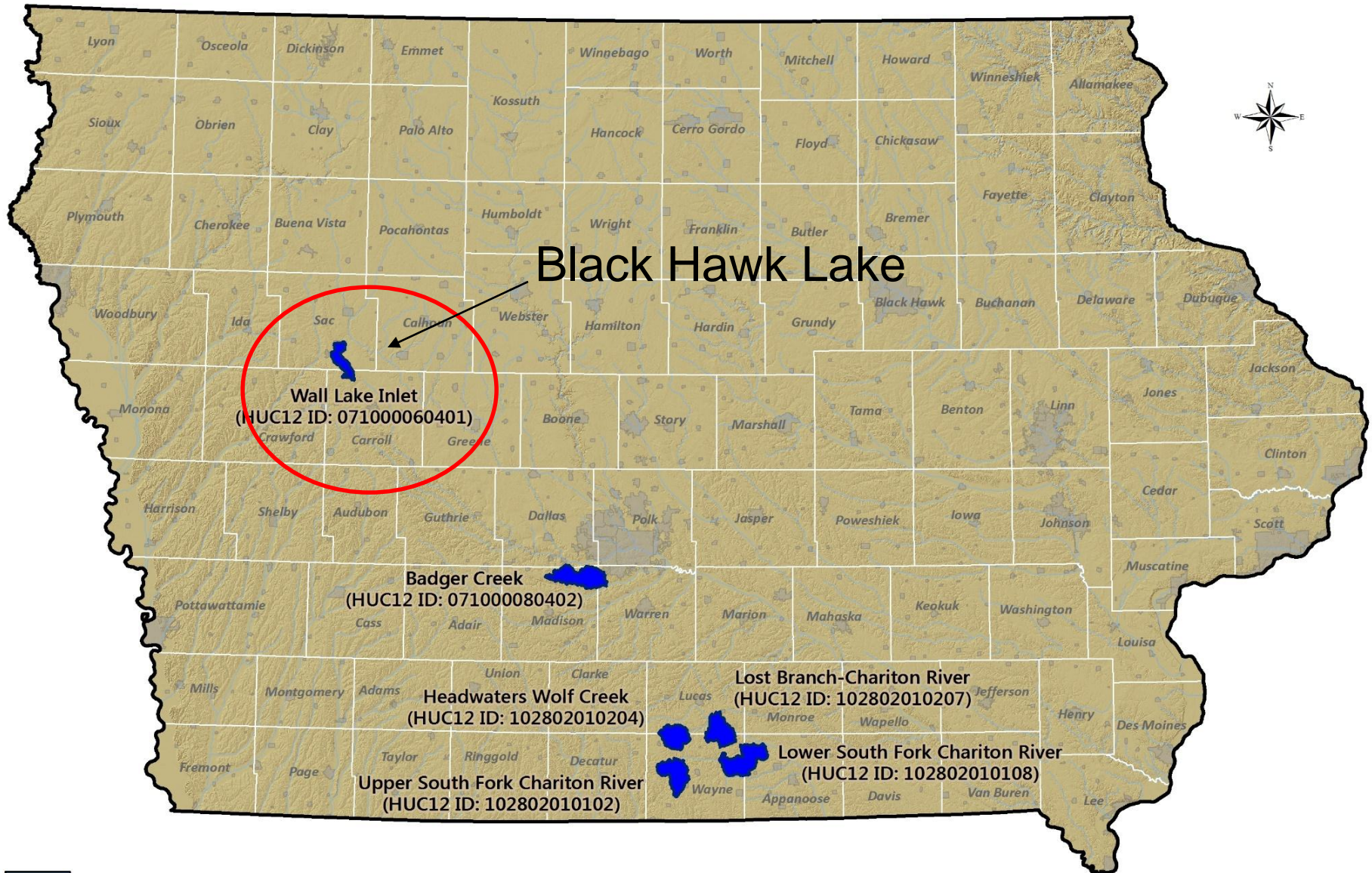


# Program Results

- Delisted 12 impaired river and creek segments
- Confirmed impairments at 11 sites
- New Mussel Biotic Index
- Two NPS Success Stories (so far):
  - Buffalo Creek
  - Lime Creek
- New Field Guide to Iowa Mussels



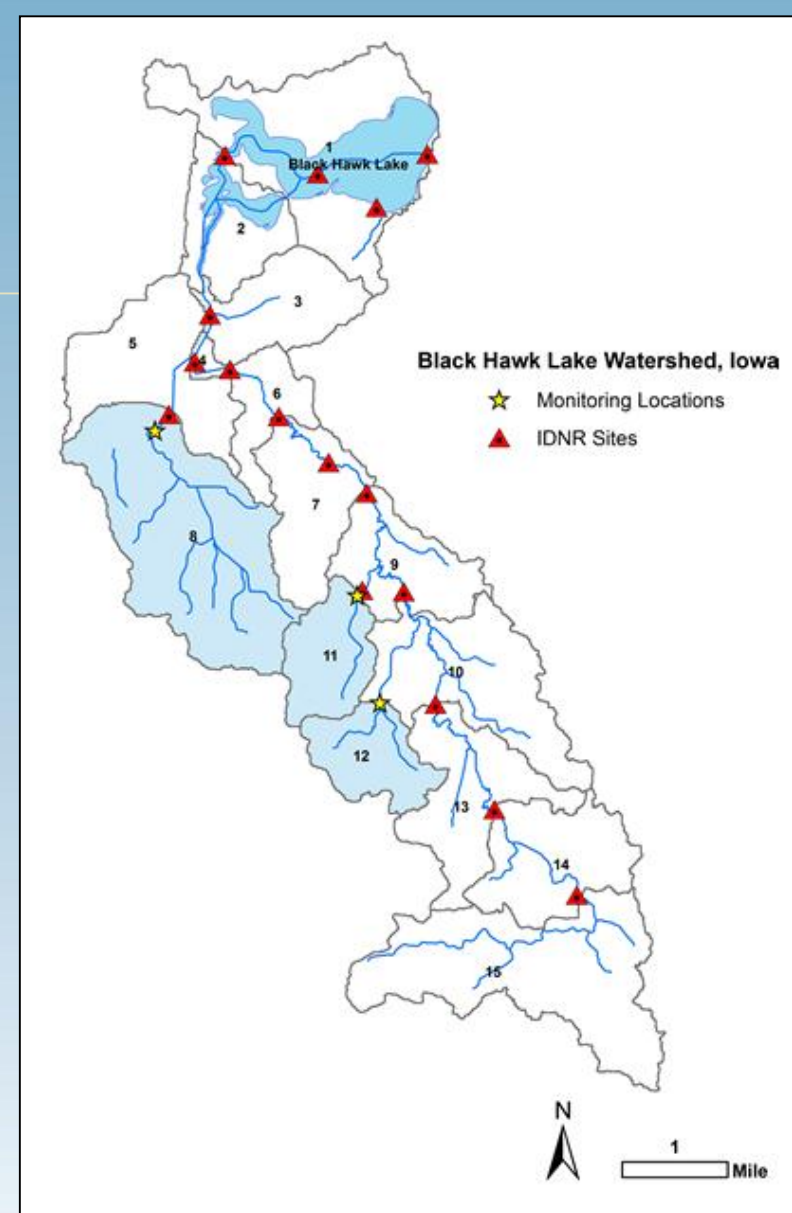
# NWQI PROJECT AREAS





# Background: NWQI Monitoring Project

5-year project (2015-2019) to analyze water quality and quantity trends in three subwatersheds within the Black Hawk Lake watershed.



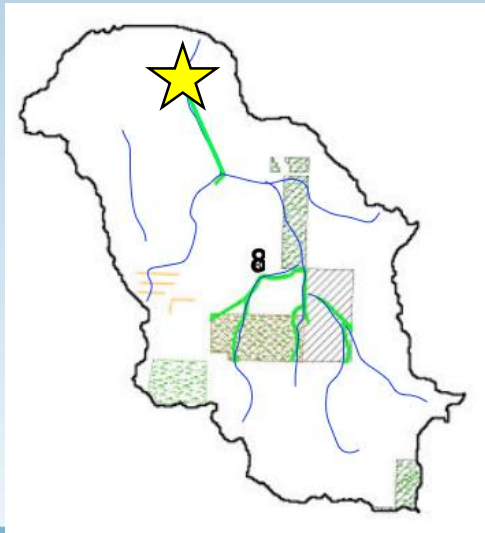
14



# Materials and Methods: Monitoring locations

## Subwatershed 8:

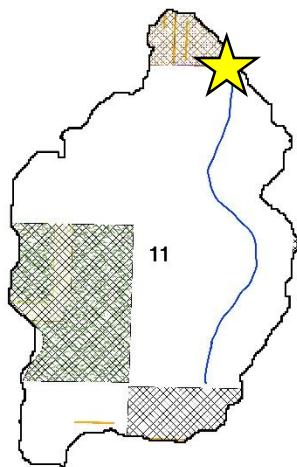
- Size: 1,988 acres
- Relatively few BMPs (22.5% of area)
  - Grass waterways, nutrient management, terraces, cover crops.
- 2 Monitoring Locations:
  - 36" tile (site T8)
  - Surface runoff from grass waterway (site S8)



# Materials and Methods: Monitoring locations

## Subwatershed 11: Low BMPs

- Size: 567 acres.
- Likely tile fed, but access is not possible.
- Some BMP implementation (30% of area), but not near the stream
  - No-till, nutrient management, cover crops.
- 1 Monitoring Location: 1<sup>st</sup> order stream (site S11). CREP wetland is just downstream.

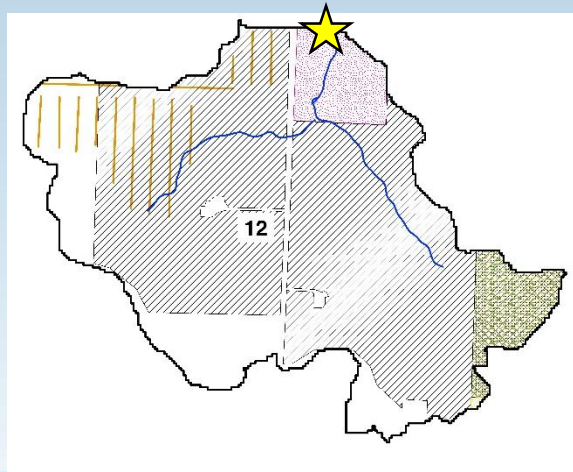




# Materials and Methods: Monitoring locations

## Subwatershed 12: High BMPs

- Size: 547 acres
- BMP implementation over majority of area (87.5%)
  - Terraces, no-till, nutrient monitoring plans, CRP at surface monitoring point.
- 2 Monitoring Locations:
  - One 15" tile (site T12),
  - One 1<sup>st</sup> order stream (site S12).



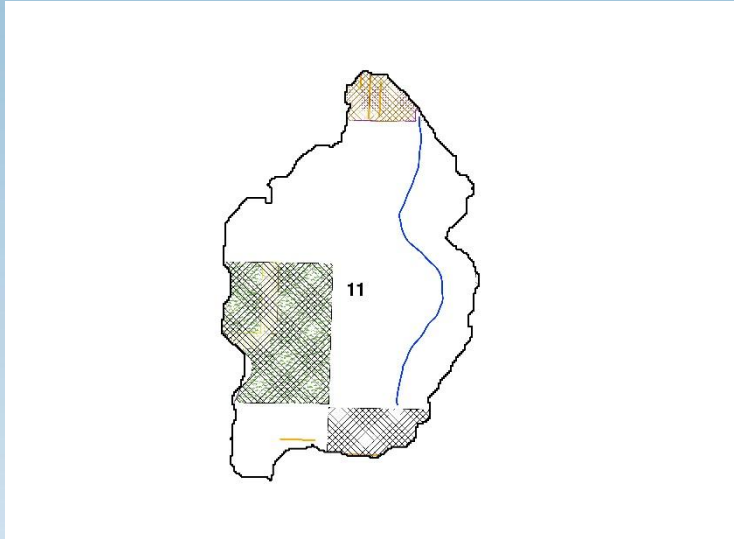
# Materials and Methods: Analytical Methods

- Samples analyzed for:
  - Nitrate+nitrite ( $\text{NO}_x\text{-N}$ )
  - Ammonia ( $\text{NH}_4\text{-N}$ )
  - Total nitrogen (TN)
  - Total phosphorus (TP)
  - Dissolved reactive phosphorus (DRP)
  - Total suspended solids (TSS)
  - Volatile suspended solids (VSS)



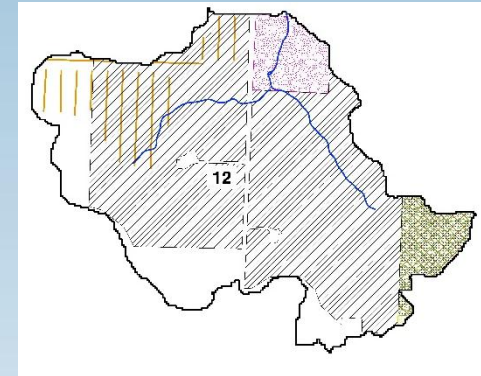
# Conclusions: Subwatershed comparisons

## Subwatershed 11: Low BMP



- Nitrate loss = 279 kg/ha
- TP loss = 3.6 kg/ha
- TSS (Soil loss) = 3,877 kg/ha

## Subwatershed 12: High BMP



- Nitrate loss = 180 kg/ha **(36% less)**
- TP loss = 2.2 kg/ha **(39% less)**
- TSS (Soil loss) = 193 kg/ha **(95% less)**

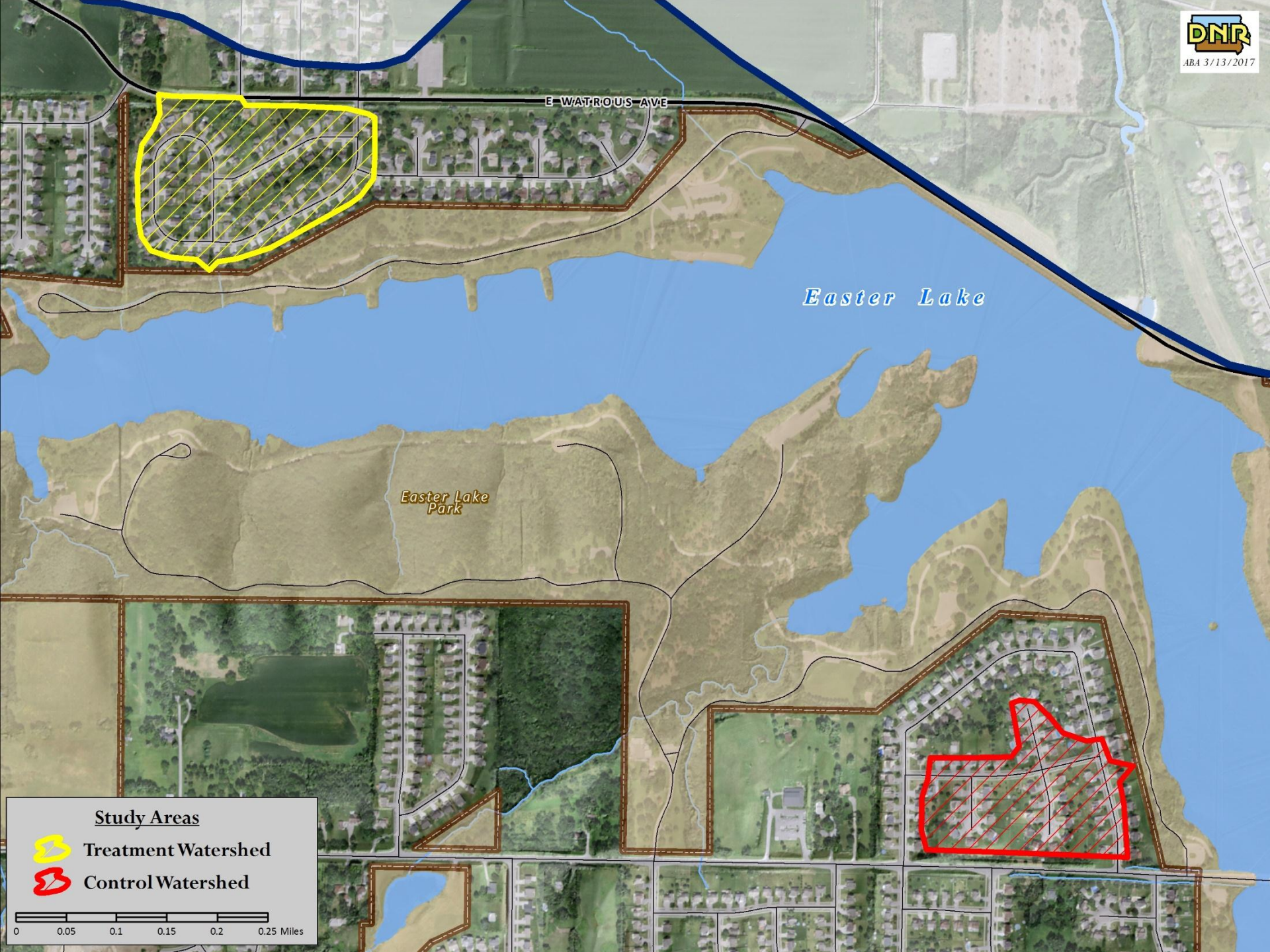


# Urban Paired Watershed Study: Easter Lake

## Easter Lake Watershed (City of Des Moines)

- Treatment Subwatershed: Targeted BMPs
- Control Subwatershed: No BMPs





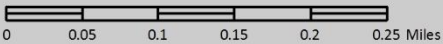
**Study Areas**



**Treatment Watershed**



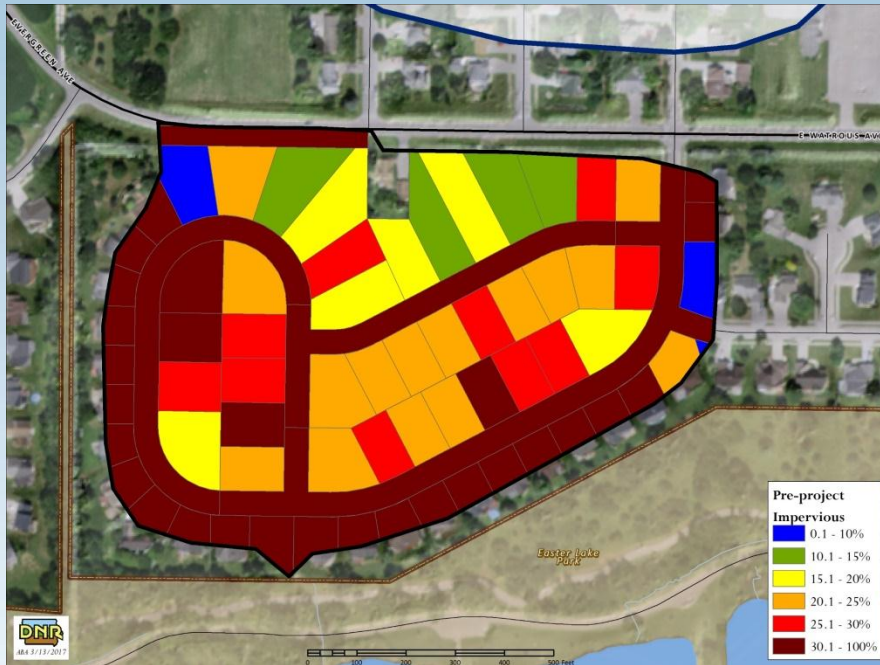
**Control Watershed**



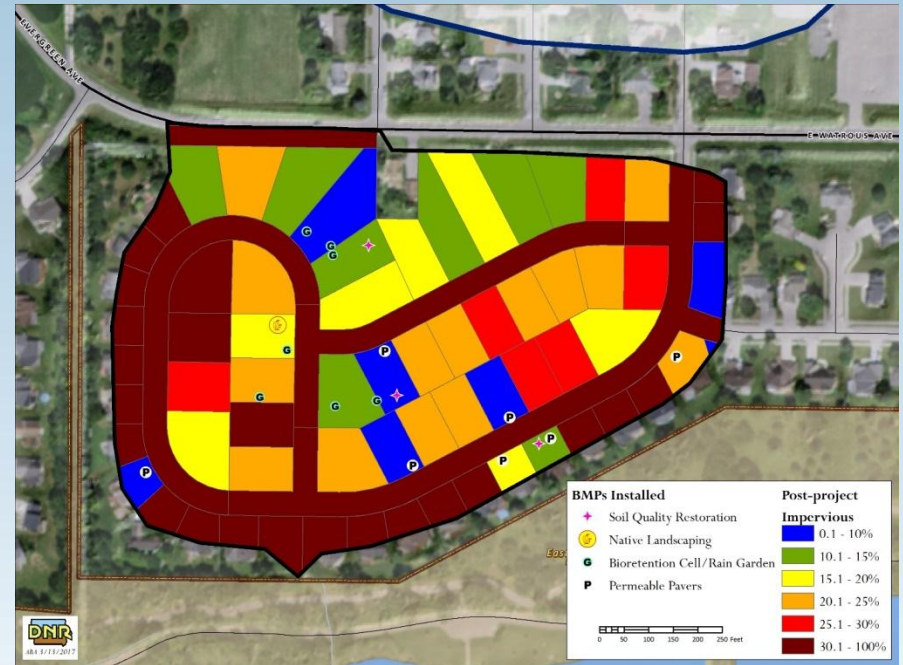


# Treatment Subwatershed

## Pre-Project



## Mid-Project



# Treatment vs. Control

## Treatment Subwatershed:

27% less runoff



# Beach Sand Study

Tracking *E. coli* problems and Identifying solutions



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**Jason Palmer**  
**Watershed Improvement Section**  
Iowa DNR

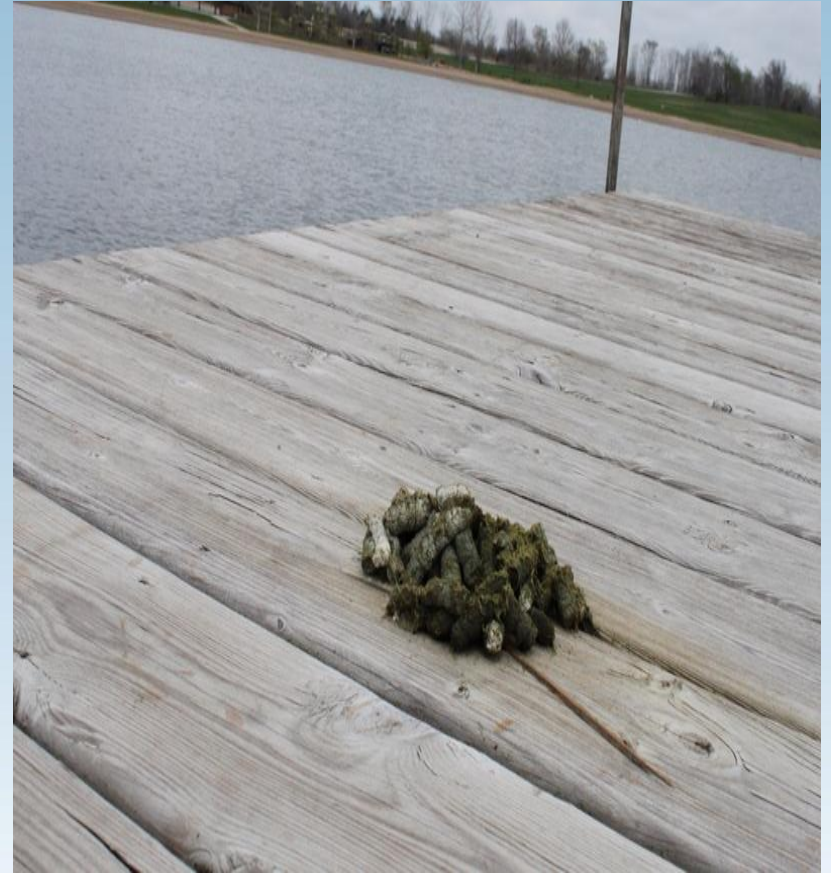


clean water  
*starts with you.*  
IOWA DNR WATERSHED IMPROVEMENT



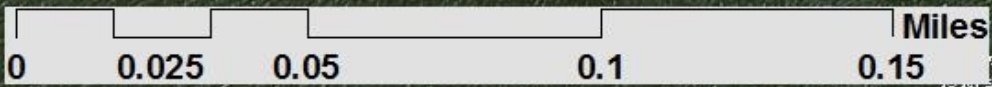


“It’s the geese, stupid!”  
Or, is it the sand?





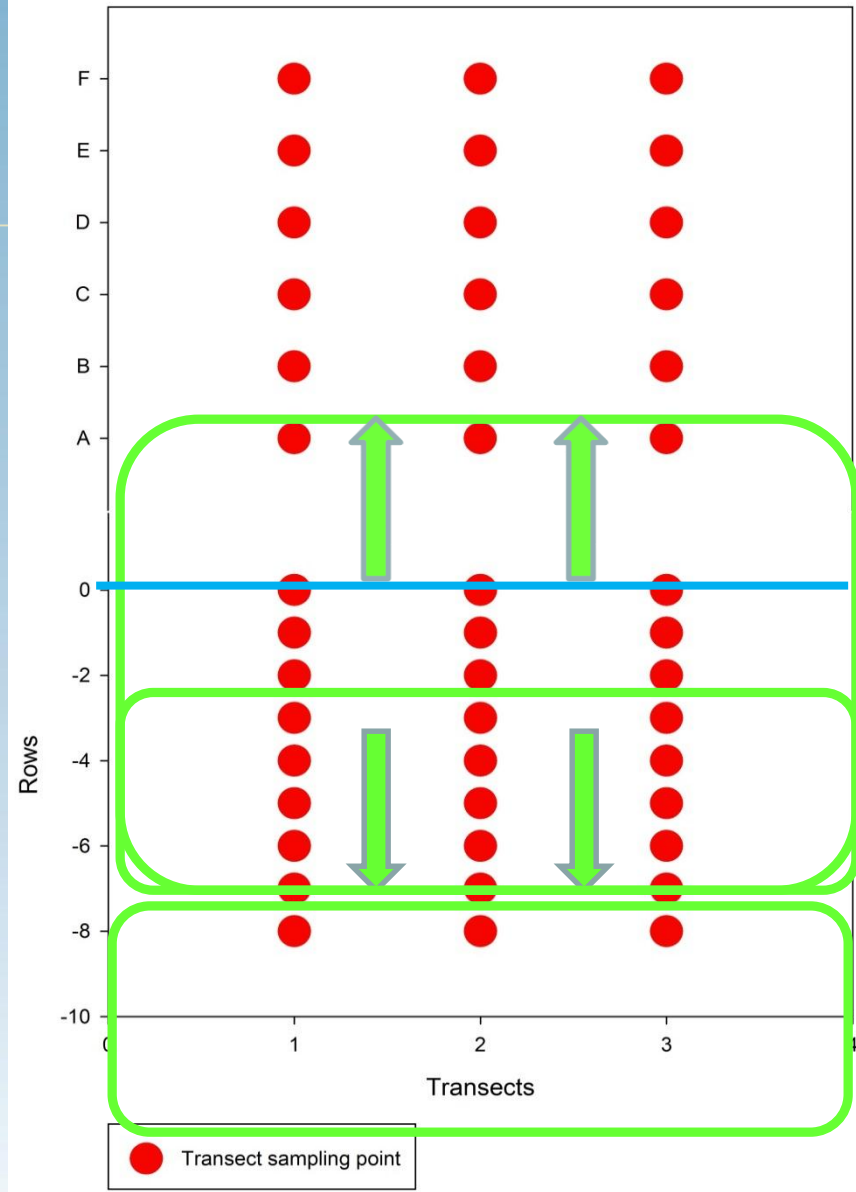
# Big Creek Lake Beach Monitoring



Map data: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

# Goals/Design

- Gradient near to far shore sand?
- Gradient near to far shore water?
- Association between sand and water conc?
- Diff. between swim zone and open lake?



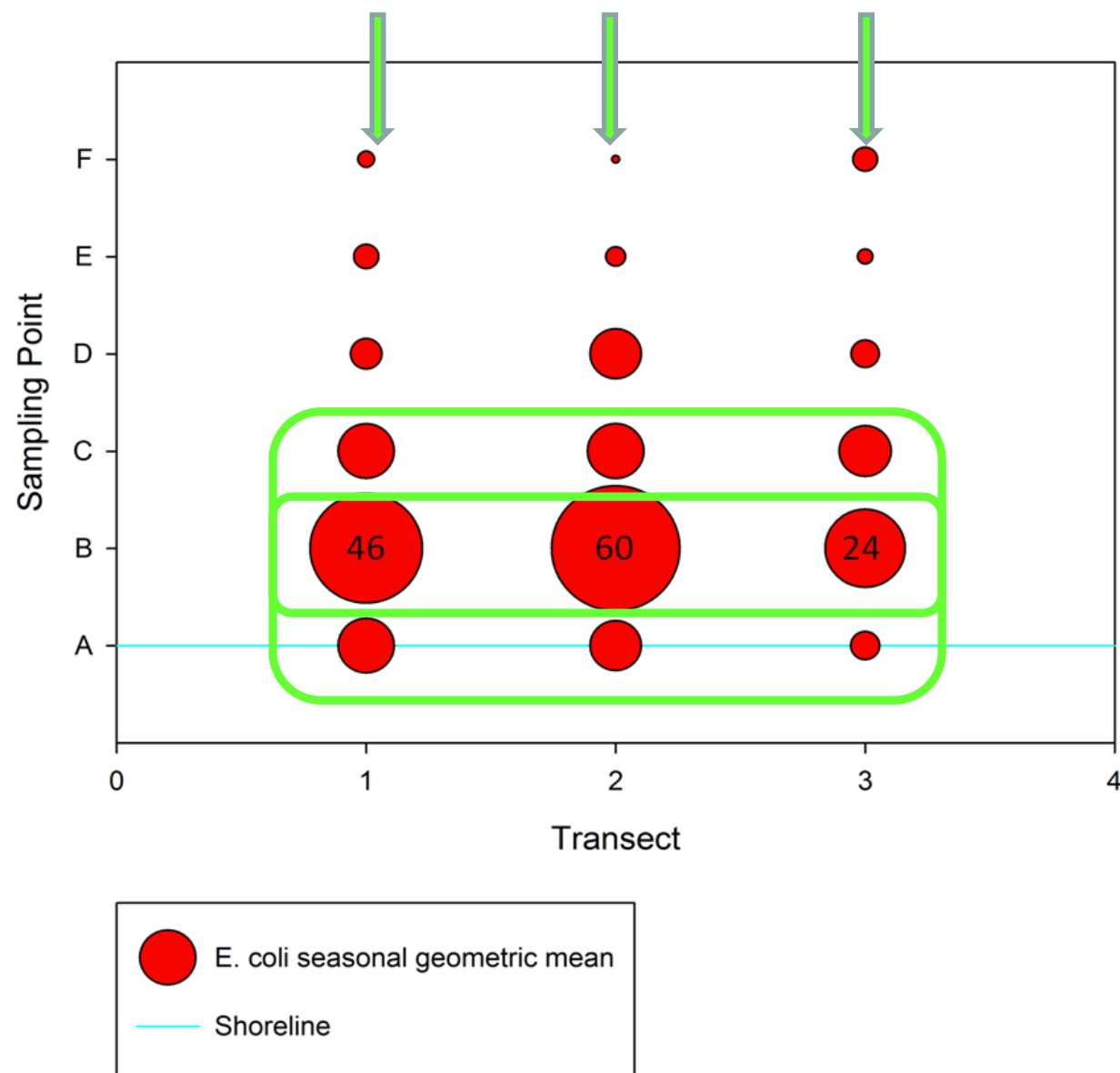


# Sample Collection



Shoreline  
gradient  
Moisture  
E. coli  
100's to  
1,000's  
times  
higher in  
sand than  
water

Big Creek Beach Sand 2015 Season E. coli Grid





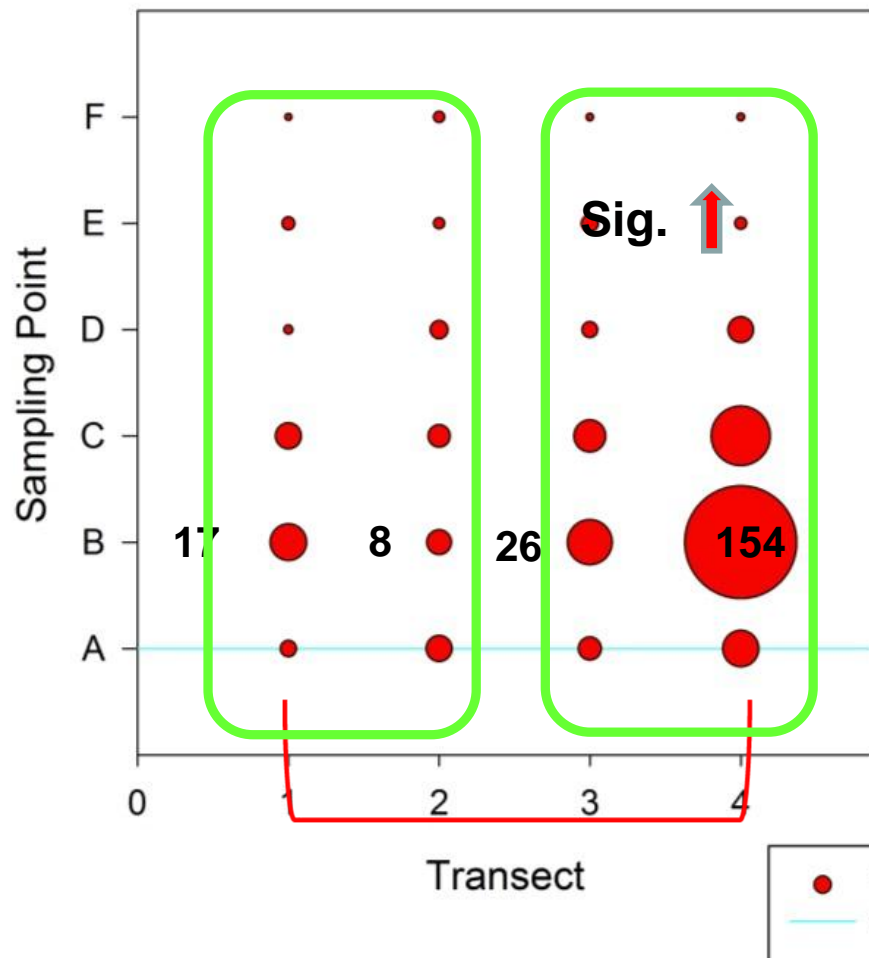




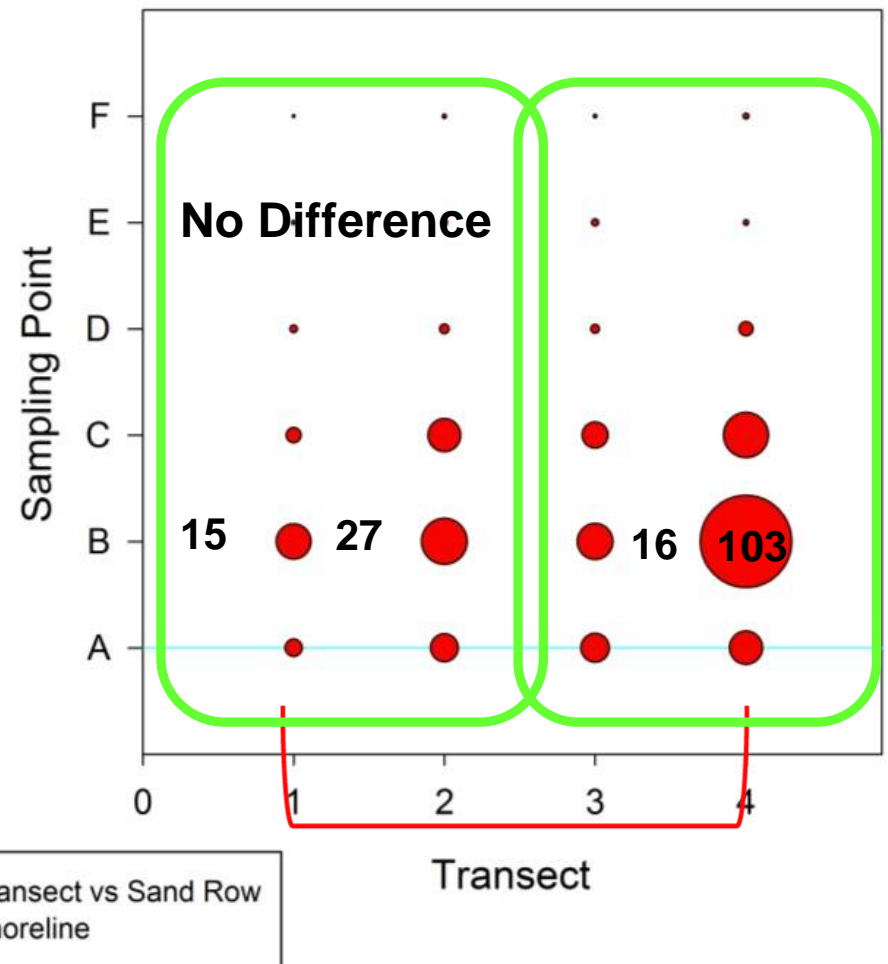
# Paired Beach Groomer Study



## 2016 Season E. coli Grid



## 2017 Season E. coli Grid







# Questions?

Steve Hopkins, NPS Coordinator, Iowa DNR

[Stephen.hopkins@dnr.iowa.gov](mailto:Stephen.hopkins@dnr.iowa.gov)

