



IOWA DEPARTMENT OF NATURAL RESOURCES

LEADING IOWANS IN CARING FOR OUR NATURAL RESOURCES

Water Quality Standard for Metals

Connie Dou

3rd Annual Iowa Environmental Conference
October 27, 2017

Topics to Discuss

- Metals Standard
 - Aquatic Life
 - Human Health
- Impact on NPDES
- Compliance Solutions
- Current Rule Making
 - Total Metal vs Dissolved Metal
 - Aluminum Standard Change
 - Next Steps for Rule Making

Metals Standard

Aquatic Life

- Metals Standard for Aquatic Life
 - Adopted in 2007 as total recoverable
 - Common metals:
 - Cadmium, Chromium (VI), Copper, Lead, Nickel, Silver, Zinc
 - Major dischargers require effluent scans
 - Detection Limit

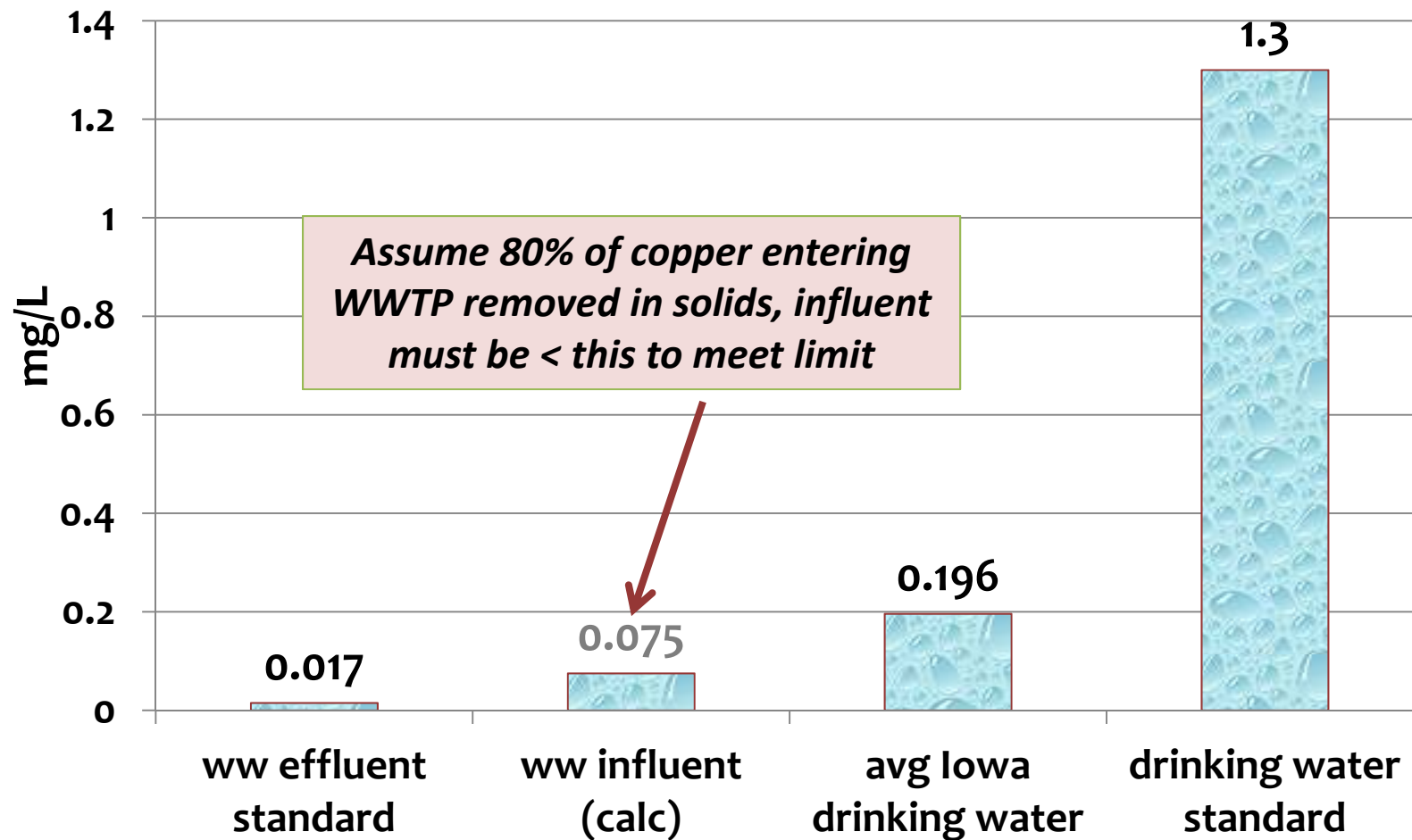
Impacts on NPDES Permits

- Facilities on small streams – End of Pipe Limits



- Copper:
 - Monthly average = 17 ug/l
 - Daily Max = 27 ug/l

Copper concentrations (from Winnie Gleason – Fox Engineering)



Metals Standard

Copper

- Added Biotic Ligand Model Criteria option in 2017
- Retain the existing standard (hardness based)
- Need 10 input parameter plus copper to run the model
- Applied on a case by case
- Dissolved copper
- Need 2 years monthly sampling (24 data points)
- DNR developed sampling guidance
- Talk to DNR staff before sampling

Parameters to run BLM

1. Temperature
2. pH
3. Dissolved organic carbon
4. Potassium
5. Calcium
6. Magnesium
7. Sodium
8. Sulfate
9. Chloride
10. Alkalinity
11. Copper - dissolved

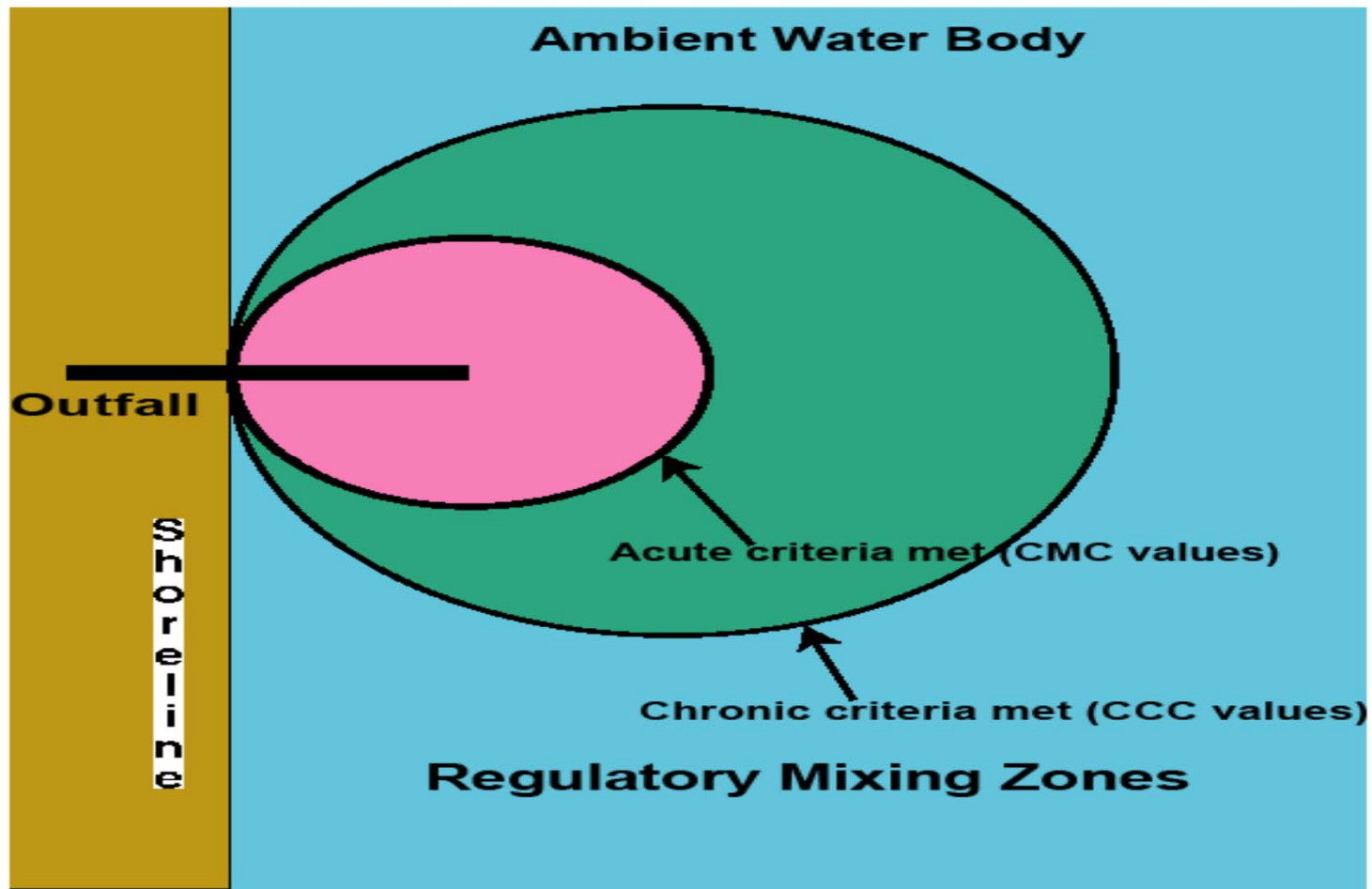
Metals Standard

Metals	Aquatic Life	Human Health (Fish only)	Human Health (Fish + Water)
Antimony		Yes	Yes
Arsenic(III)	Yes	Yes	Yes
Barium			Yes
Cadmium	Yes	Yes	
Chromium VI	Yes	Yes	
Copper	Yes	Yes	Yes
Lead	Yes		
Mercury(II)	Yes	Yes	
Nickel	Yes	Yes	Yes
Selenium	Yes	Yes	Yes
Silver	Yes		
Thallium		Yes	Yes
Zinc	Yes	Yes	Yes
Iron	Narrative Criteria		

Compliance Solutions

- Do not PANIC!
- Source Reduction – Drinking water pipe corrosion
- Send to another facility
- Collect Site-specific Information
 - Mixing Zone Studies & Diffusers
 - Site-Specific Hardness Data
 - ✓ Cadmium, Copper, Lead, Nickel and Zinc
- Relocation of outfalls
- Other options

Mixing Zone Studies & Diffuser



Mixing Zone Study



Mixing Zone Study

- Need DNR Authorization to Use Dye
- Inform DNR Field Office at least 48 Hours
- Develop a work plan before the study
- Contact DNR for Guidance Documents

DNR Current Rule Making

- Convert metal standard from total to dissolved
 - Bioavailable: dissolved metal (except aluminum)
 - EPA developed conversion factors (0.85 -1)
 - Criteria lower but easier to achieve compliance
 - Permittees monitor dissolved metal

- Developing new aluminum standard
 - EPA released draft Al criteria in July 2017
 - Varies with pH, DOC and hardness

Aluminum Aquatic Life Criteria

➤ Background on Aluminum

- Most abundant metal in Earth's Crust
- In soil and rocks
- Sources:
 - Runoff, mining, industrial process, water & wastewater treated with alum
- Toxicity:
 - Ion Regulation and breathing
 - Both dissolved and solid phase (colloidal)

Aluminum Aquatic Life Criteria

➤ Iowa Current Criteria

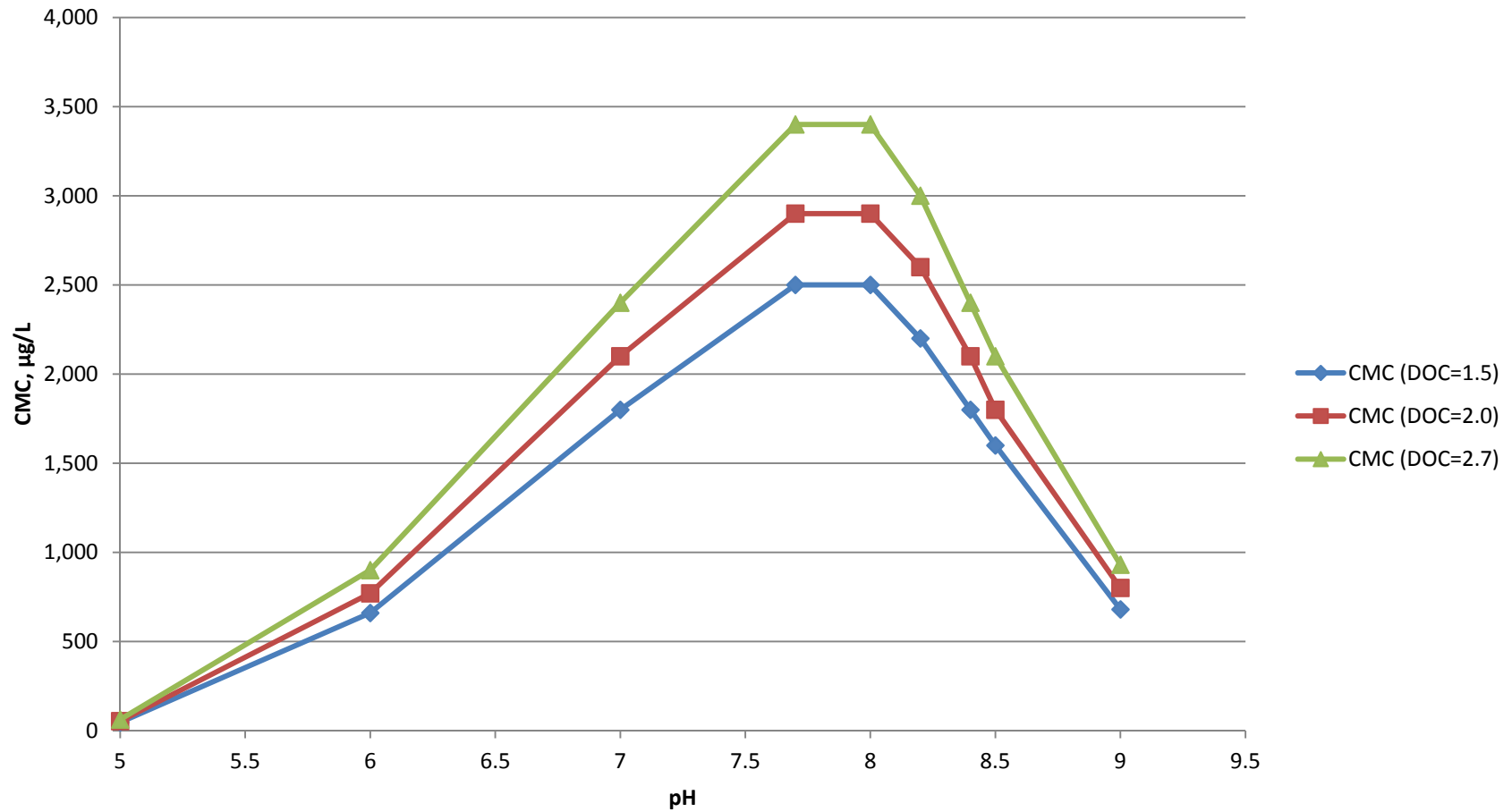
- Based on EPA 1988 criteria
- Acute = 750 $\mu\text{g/L}$, chronic = 87 $\mu\text{g/L}$ for warm water streams
- Total recoverable
- Outdated, fixed values
- Based on conditions different than Iowa waters
- Criteria below background levels

Aluminum Aquatic Life Criteria

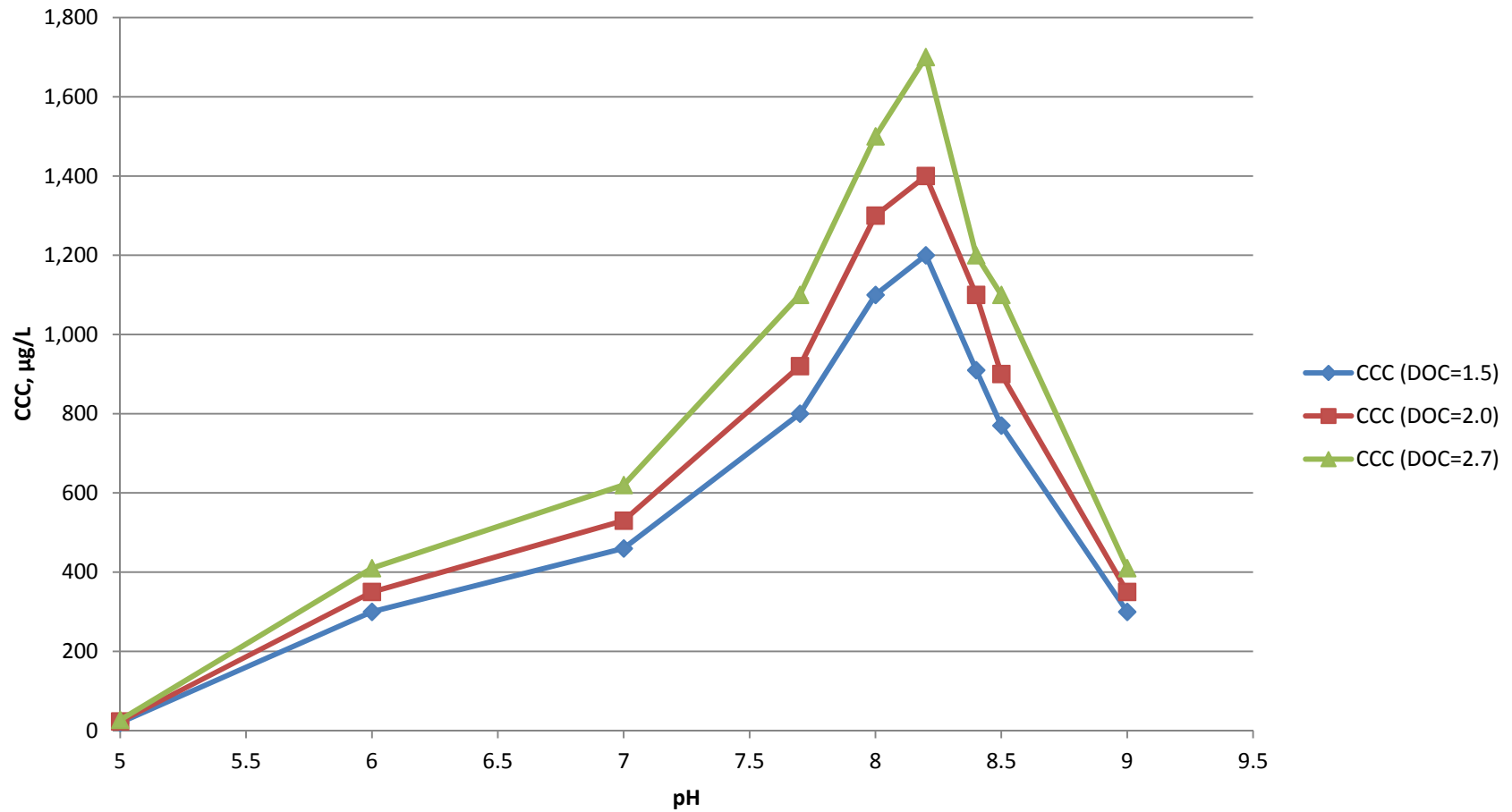
➤ EPA 2017 Draft Criteria

- Function of pH, dissolved organic carbon (DOC) and hardness
- Multilinear Regression (MLR)
- Most up-to-date toxicity
- Acute criterion: 20 species
- Chronic criterion: 11 species
- pH = 5.0 to 9.0, DOC = 0.0 to 5 mg/L,
Hardness = 0 - 150 mg/L as CaCO₃

pH Effect on Acute Aluminum Criteria



pH Effect on Chronic Aluminum Criteria



Aluminum Criteria Update: Options

Option #1: Adopt EPA draft criteria

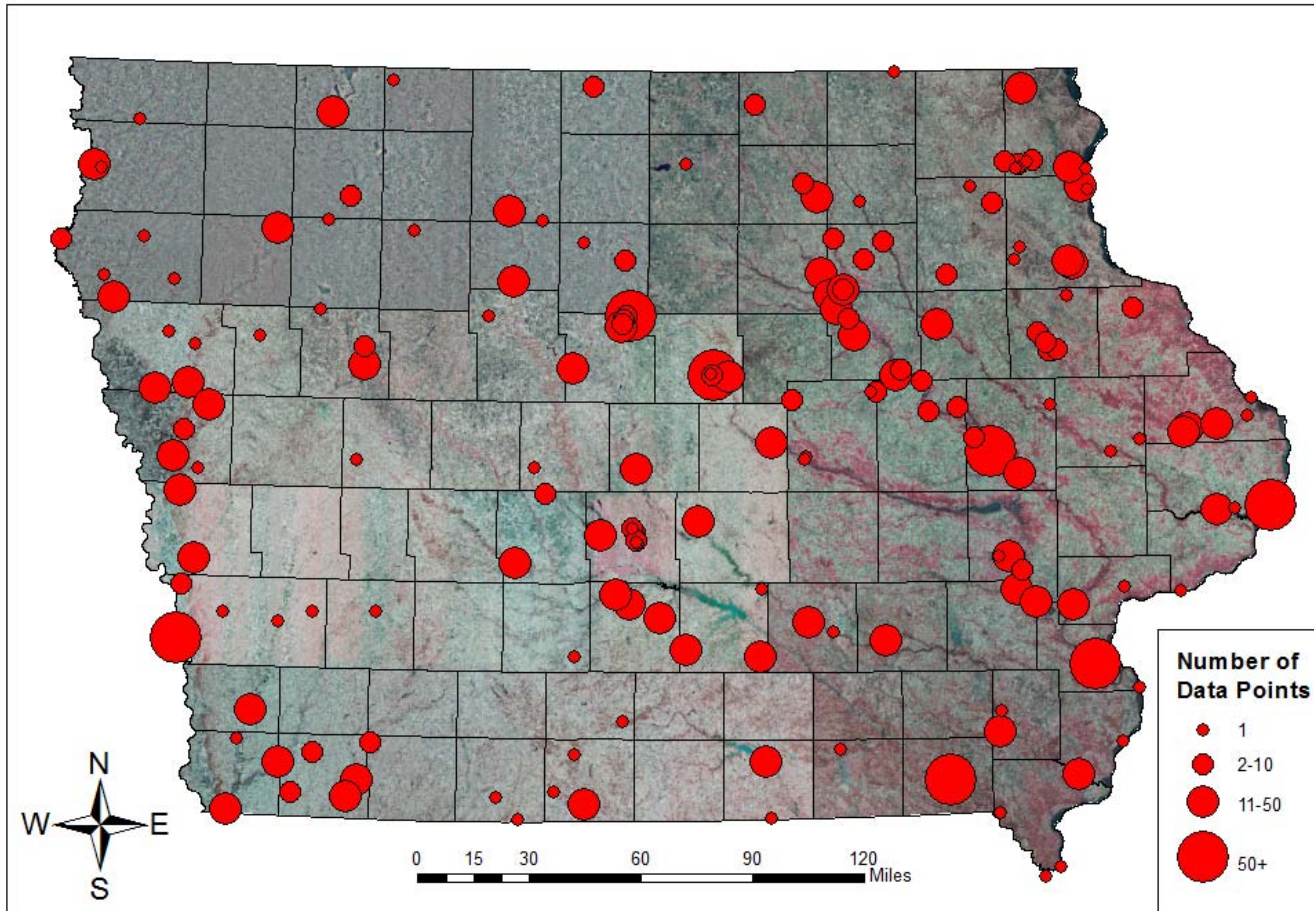
- Develop Default Criteria Specific to Iowa
(Regional vs Statewide)
- Testing method

Option #2: Simplified Biotic Ligand Model

Option #3: Develop Full Biotic Ligand Model

Aluminum Criteria: Data Analysis

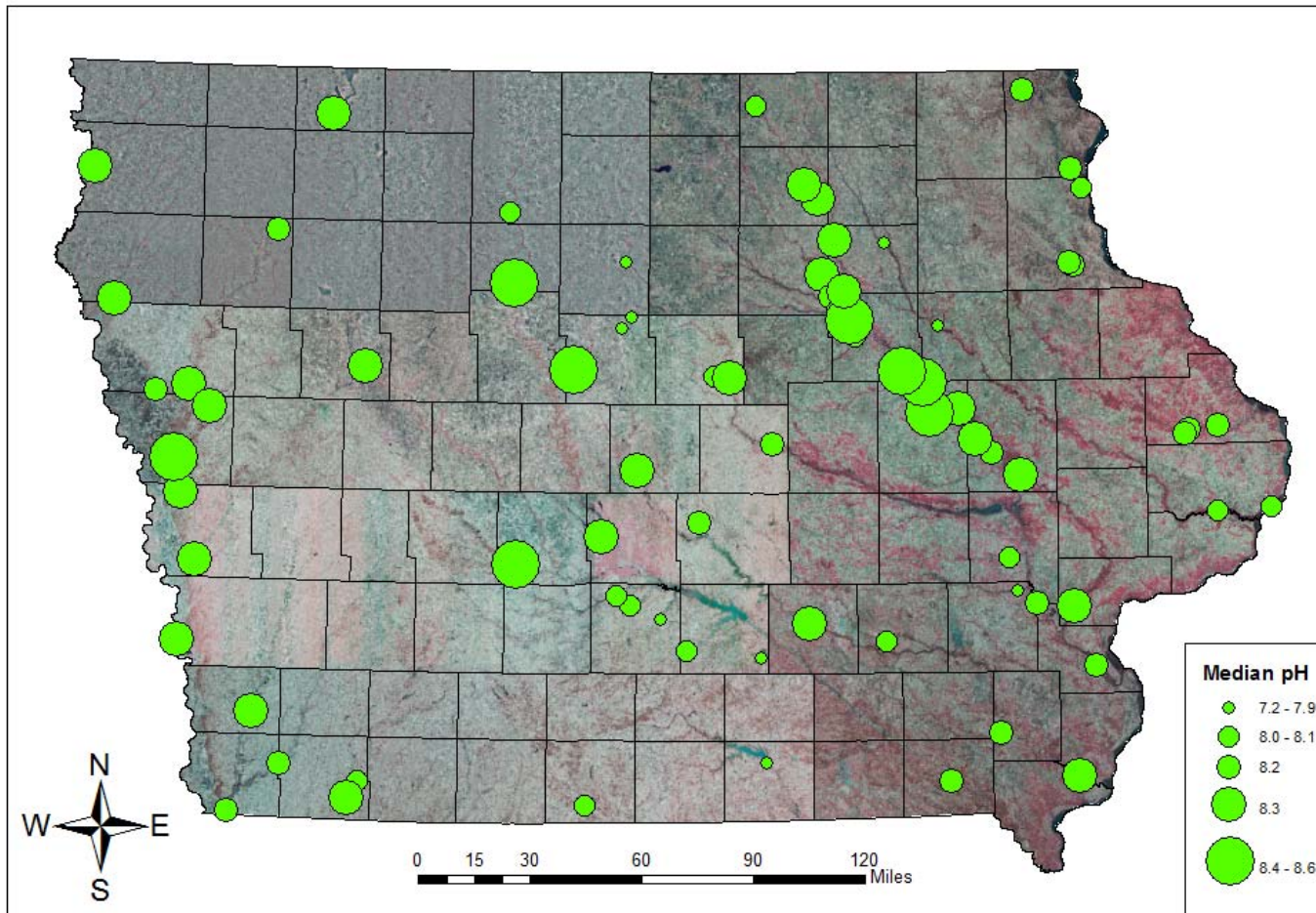
DOC, Hardness, & pH paired data availability (2,399)



Statewide pH values

Median pH Levels

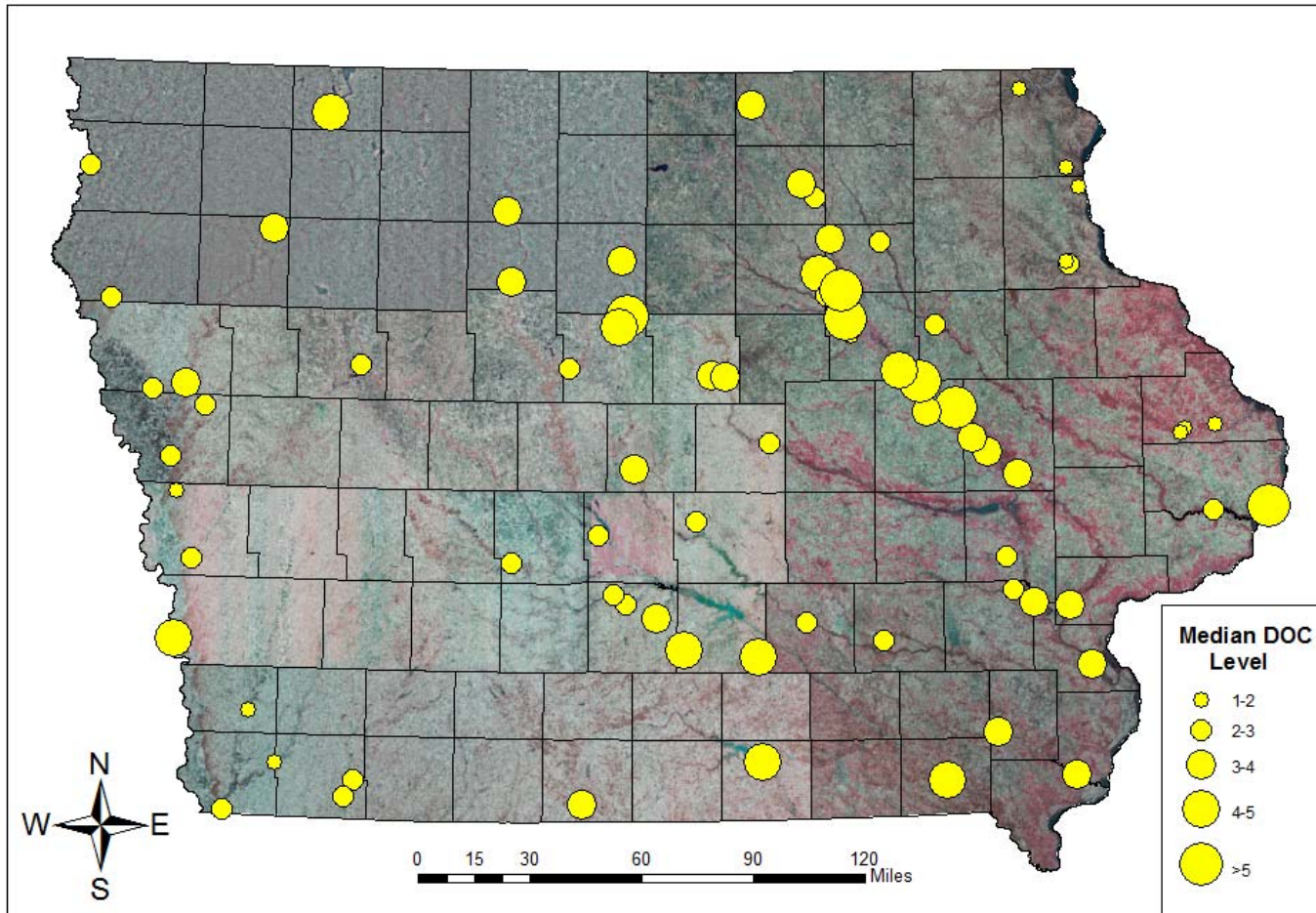
(Including sites with 5 or more data points)



Statewide DOC values

Median DOC levels

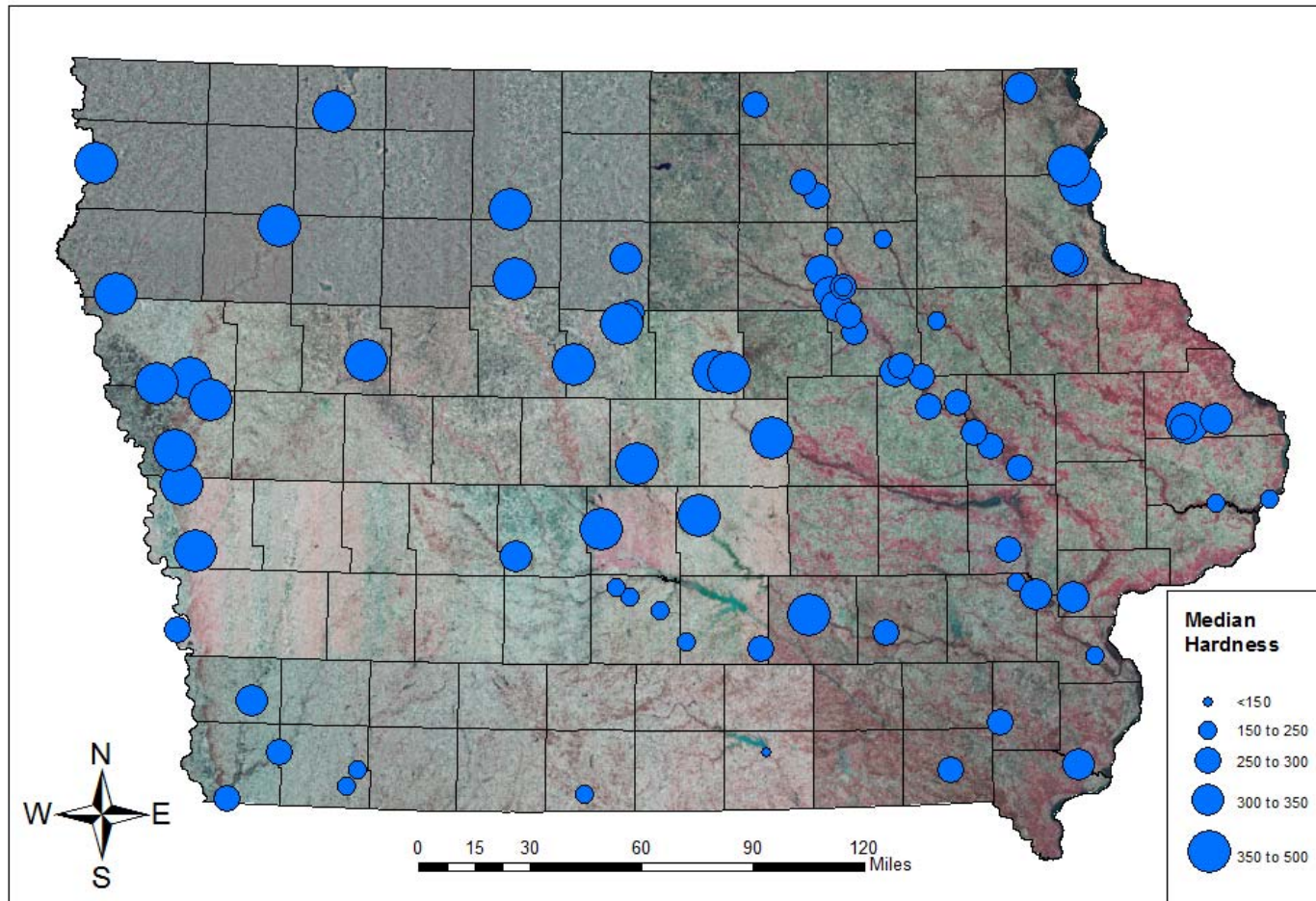
(Including sites with 5 or more data points)



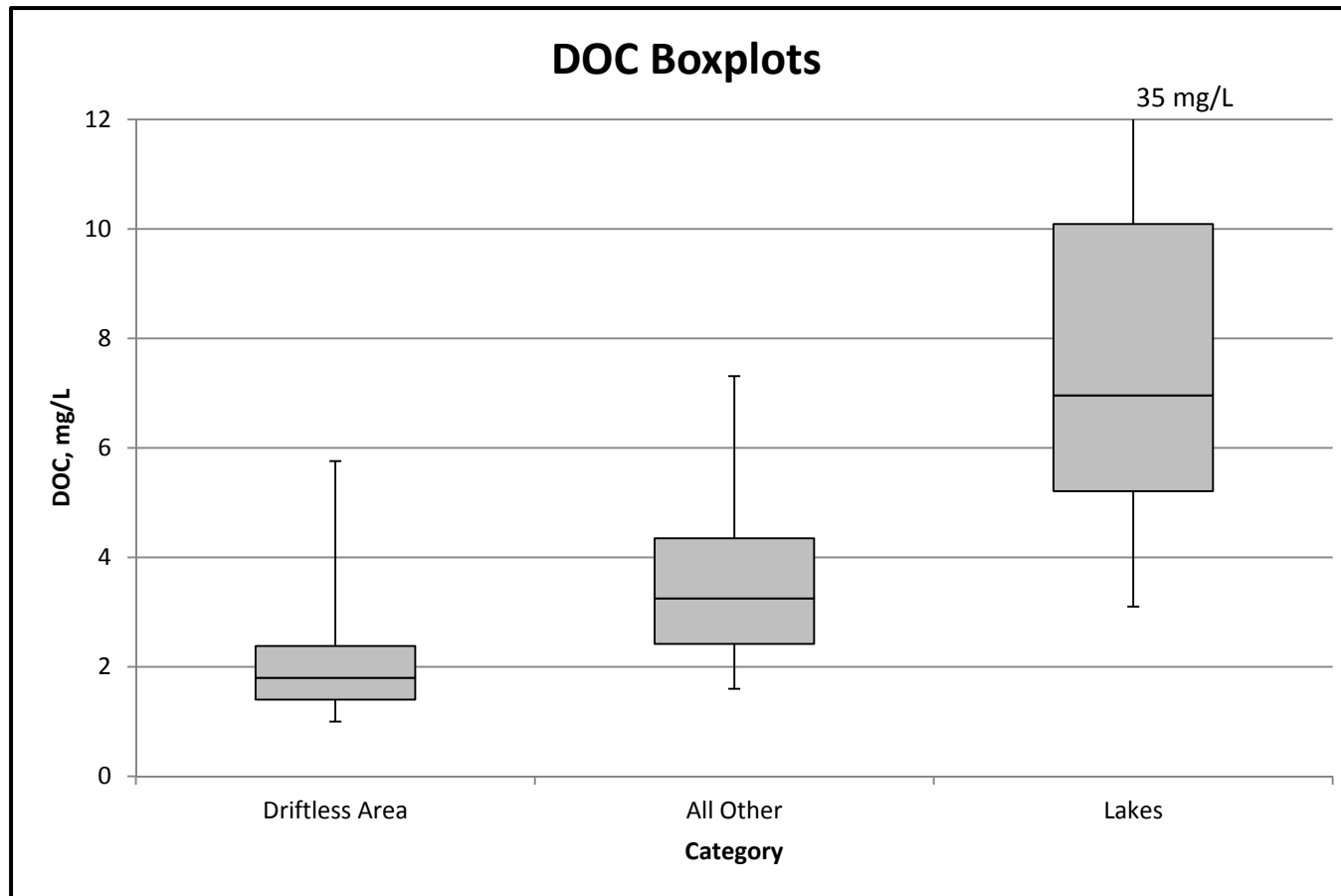
Statewide Hardness values

Median Hardness Levels

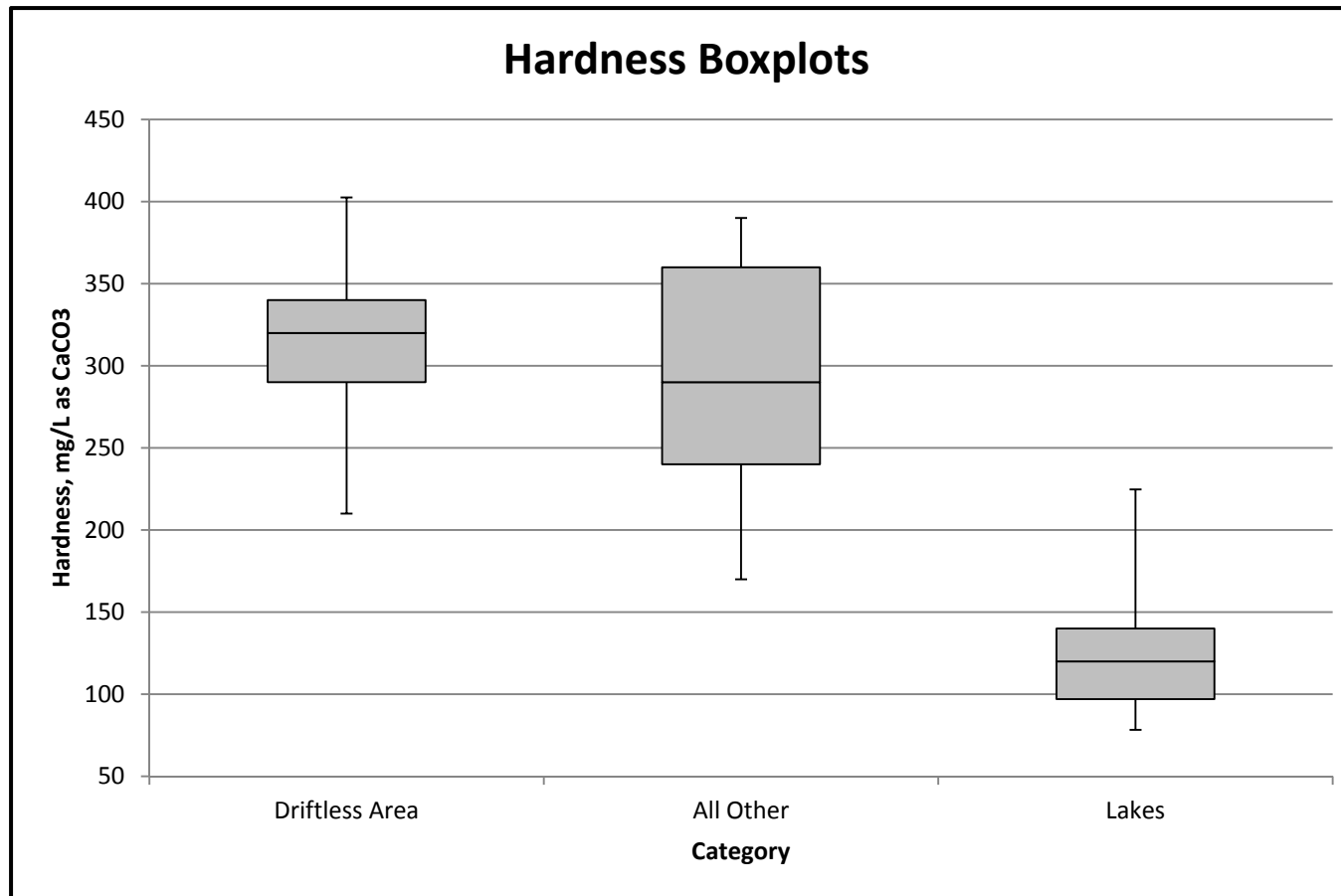
(Including sites with 5 or more data points)



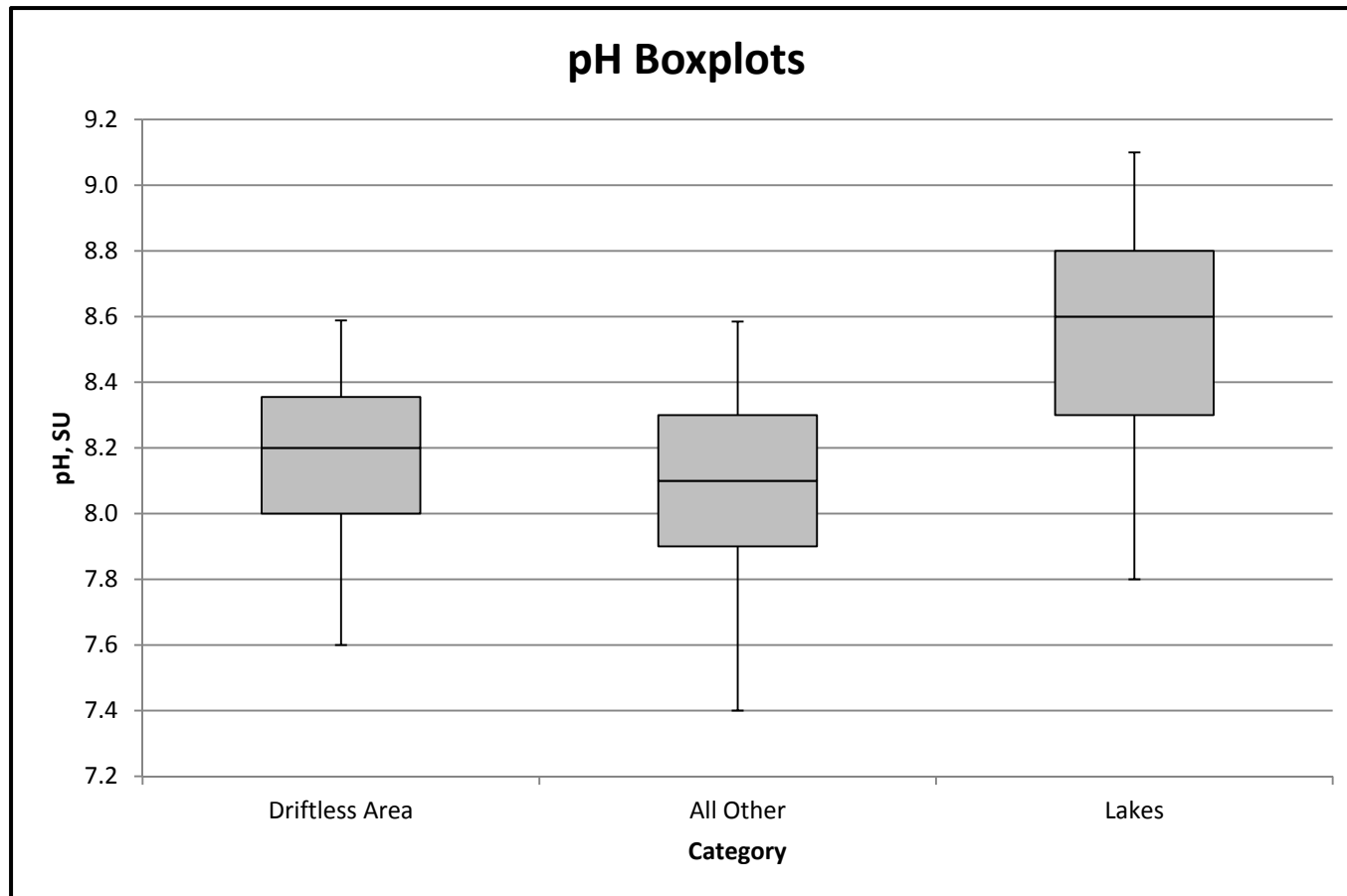
Aluminum: Regional Data Analysis



Aluminum: Regional Data Analysis



Aluminum: Regional Data Analysis



Aluminum & Metal Criteria: Next Steps

- Technical Advisory Committee
- EO71 process (draft rule and FIS and JIS)
- Another Stakeholder meeting
- Governor's office pre-clearance
- Working with EPA at the same time

Q & A

➤ My contact information

Connie Dou😊

Telephone: 515-725-8400

Email: Connie.Dou@dnr.iowa.gov