



# Chicago Area Waterway System As An Invasion Pathway for Crustaceans

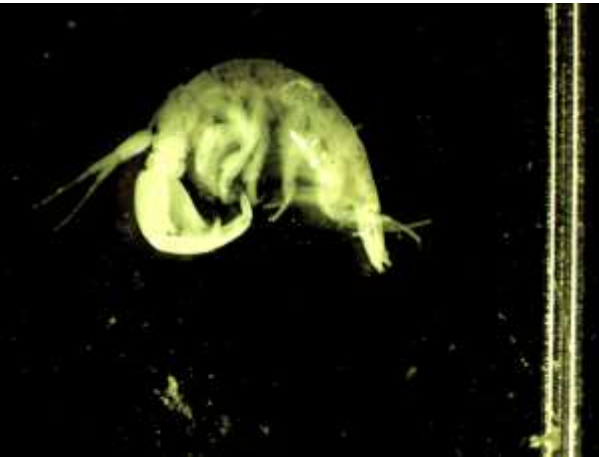
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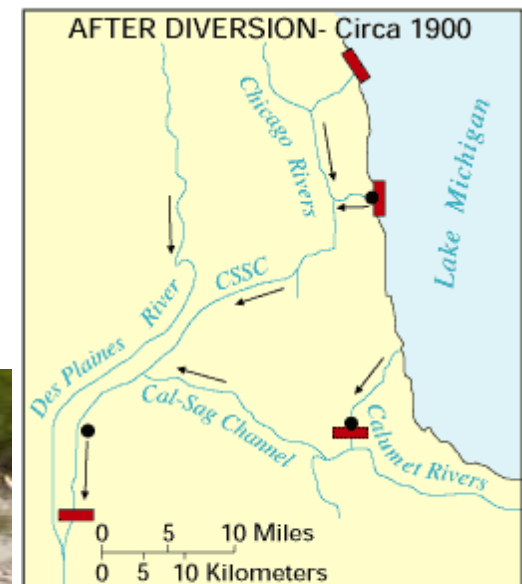
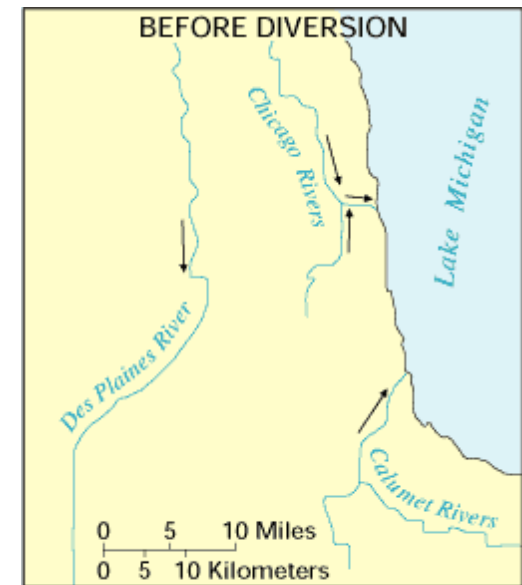
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# CAWS Is An Invasion Corridor

- Lake Michigan and Illinois River connected by *Chicago Sanitary and Ship Canal*
- Important AIS connection at continental scale
- Asian carp is current focus
- Little recent sampling for 'non-fish' taxa



## EXPLANATION

- ← Direction of Flow
- Control structure



# Scud (*Apocorophium lacustre*)

- Native to Atlantic, mostly estuaries
- Spread to Gulf of Mexico, and then into Mississippi (1988), Ohio (1996), and Illinois (2003) Rivers
- Last sampled Dresden Pool (just downstream of CAWS) in 2005
- Declared GLMRIS “Species of Concern” for spread into Great Lakes



# Crayfish

- Rusty crayfish (*Orconectes rusticus*) well known from Lake Michigan and CAWS
- Reports of red swamp crayfish (*Procambarus clarkii*), but nothing confirmed
- Recent discovery of red swamp crayfish in Wisconsin lead to a multi-year eradication effort
- No systematic sampling of crayfish in CAWS for (at least) decades



# Objectives, Methods

**Scud:** Assess current distribution of scud in CAWS and Lake Michigan harbors

- Hester Dendy samplers, Ponar, kick-nets, at 25 sites in CAWS and Lake Michigan harbors

**Crayfish:** Assess crayfish community composition in CAWS and Lake Michigan harbors

- Minnow traps at 18 sites (12-20/site) in CAWS and Lake Michigan harbors





# Distribution of Scud

- Found at a single site in the Dresden Pool
- Large numbers of macroinvertebrate crustaceans found elsewhere, giving some confidence in our methods



After Diversion



# What Does This Mean?

- After spreading rapidly to Dresden Pool, scud have (apparently) not spread in last decade
- No obvious water quality changes from Dresden Pool into CAWS, and lots of boat traffic

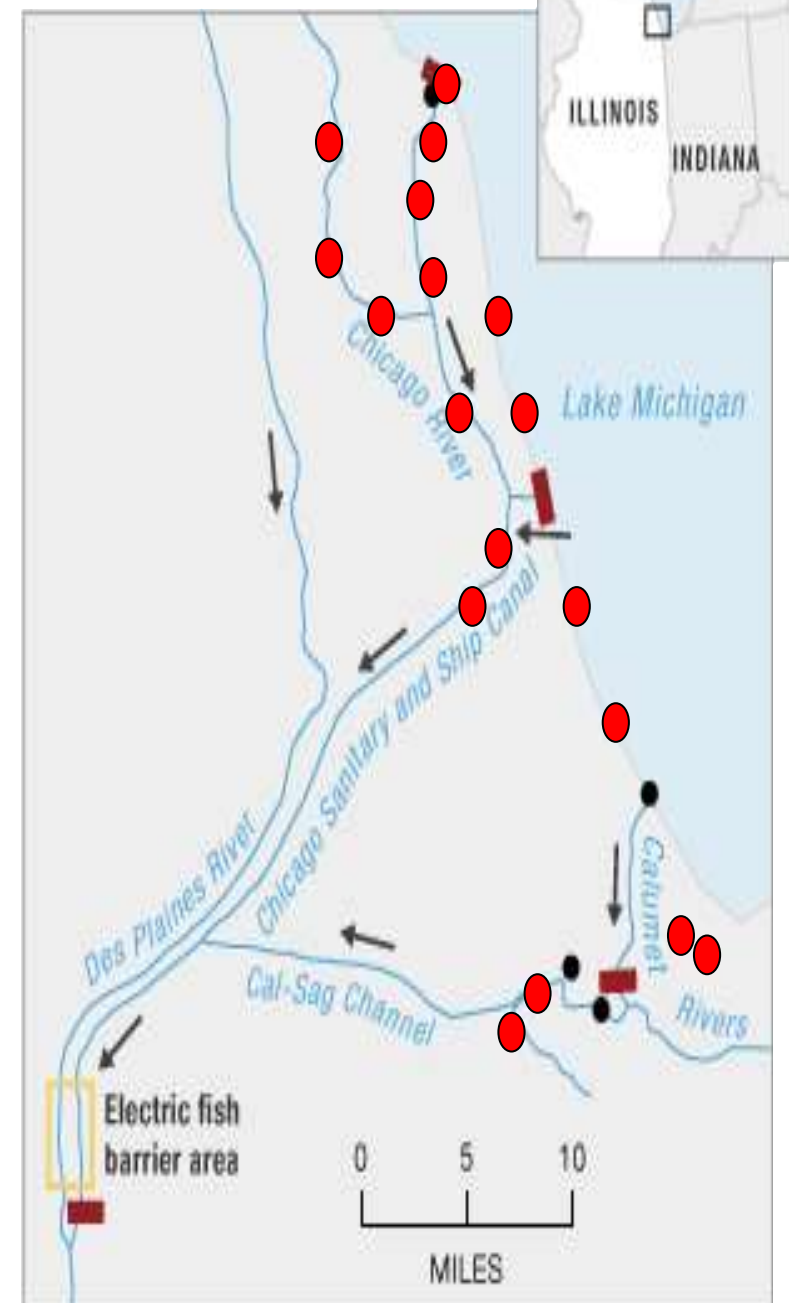
# What Does This Mean?

- After spreading rapidly to Dresden Pool, scud have (apparently) not spread in last decade
- No obvious water quality changes from Dresden Pool into CAWS, and lots of boat traffic
- 25 sites in a very large system is only 25 sites.....
- Development of sampling methods is required
- Scud remain one of the most imminent non-native species threats to the Great Lakes



# Crayfish Distributions

After Diversion

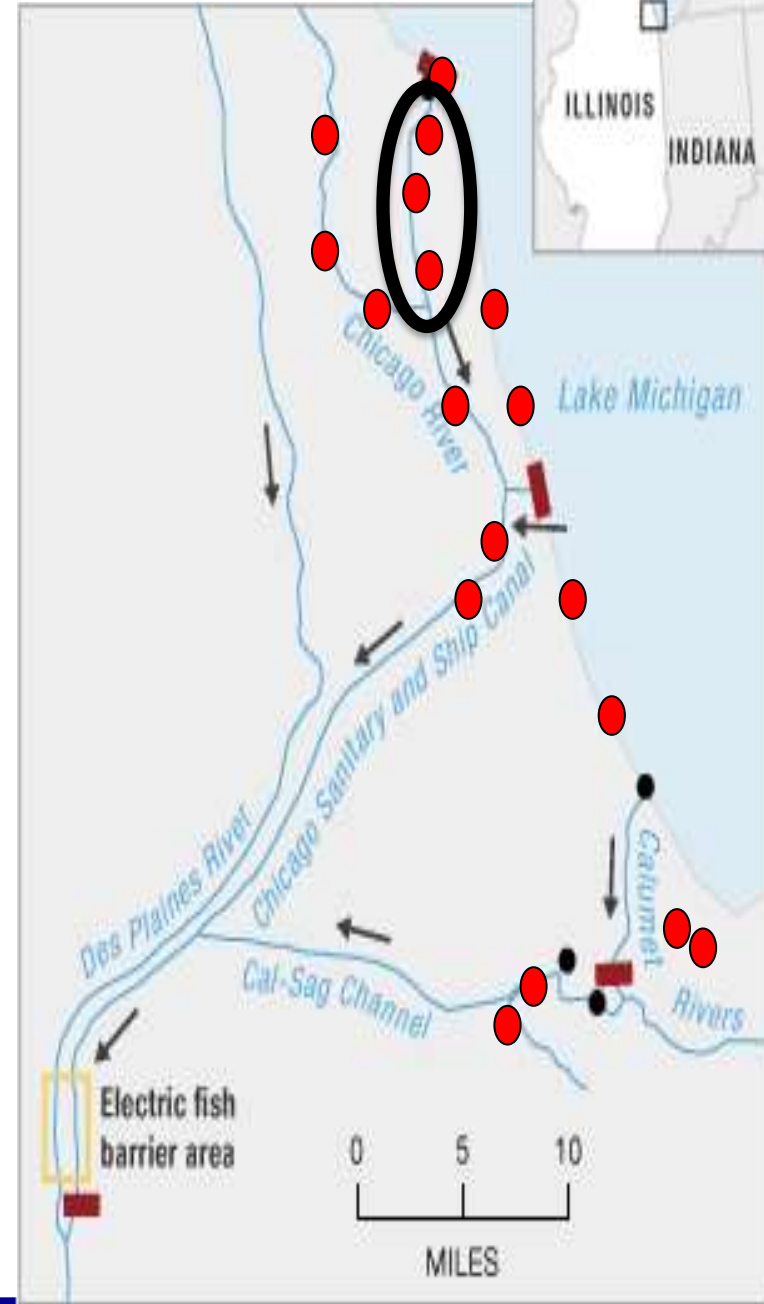


# Crayfish Distributions

- Red swamp crayfish well established in North Shore Canal



After Diversion



# Crayfish Distributions

- Red swamp crayfish well established in North Shore Canal
- Rusty crayfish widespread, and dominant in all harbors



After Diversion

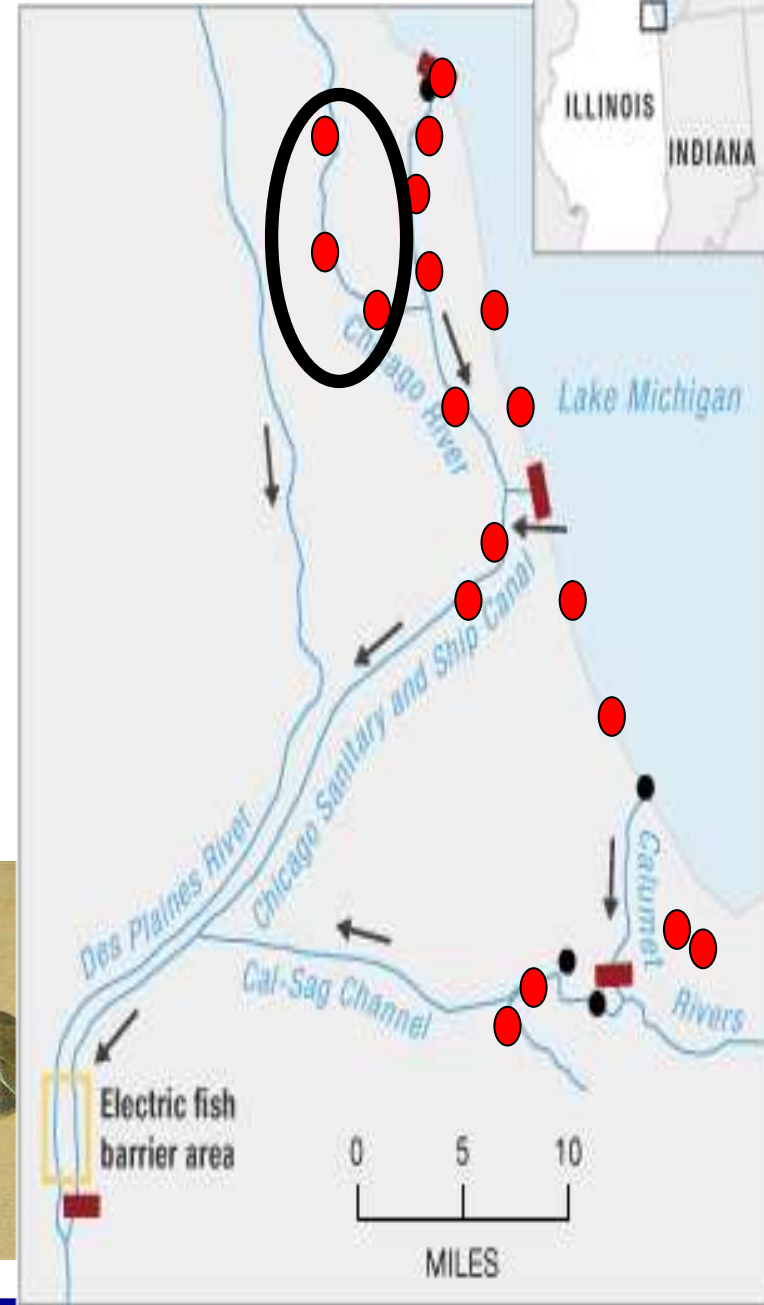


# Crayfish Distributions

- Red swamp crayfish is well established in North Shore Canal
- Rusty crayfish widespread, and dominant in all harbors
- Native species found only in relatively undisturbed section of North Branch



After Diversion



# What Does This Mean?

- Red swamp crayfish well established, unknown for how long
- Rustys and red swamp nearby to each other, but little overlap – competitive interactions?
- 18 sites in a large system is only 18 sites



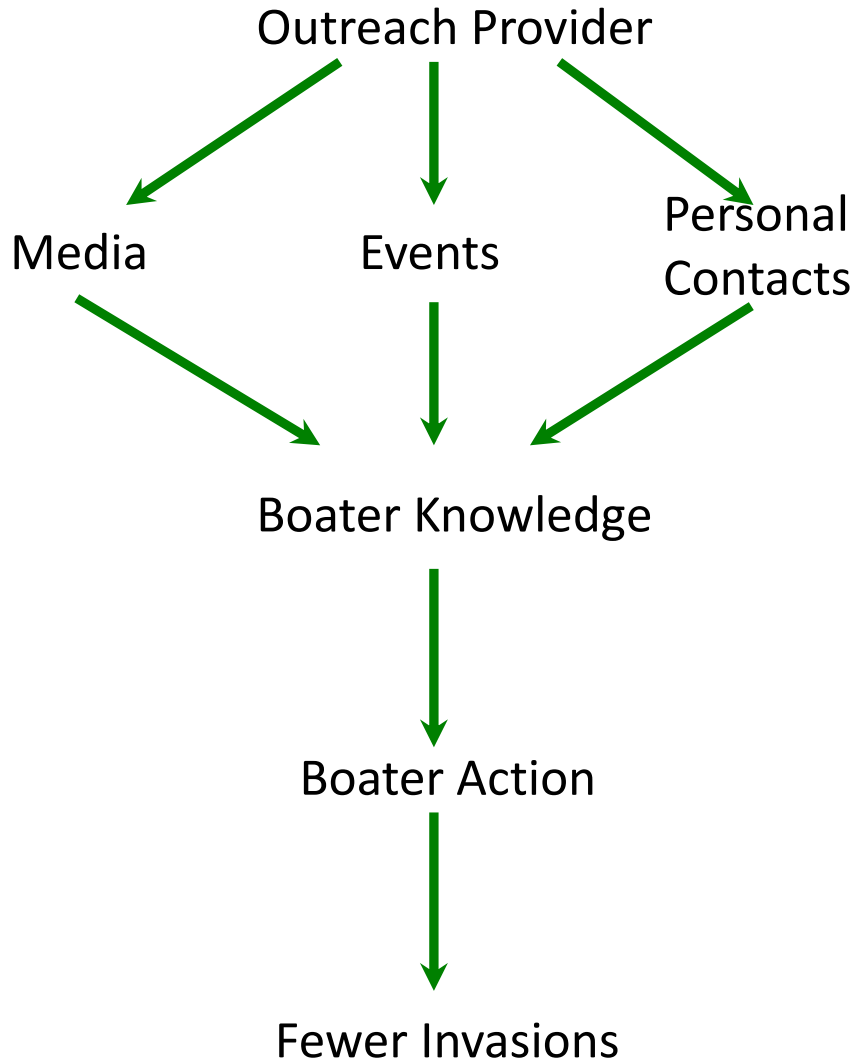


# Conclusions

- CAWS remains an active pathway for spread of non-native aquatic species
- Almost all recent sampling and AIS management in the CAWS has focused on Asian carp, but the threat is much wider
- Management to prevent spread of scud, and to prevent spread of red swamp crayfish, could reduce future AIS problems

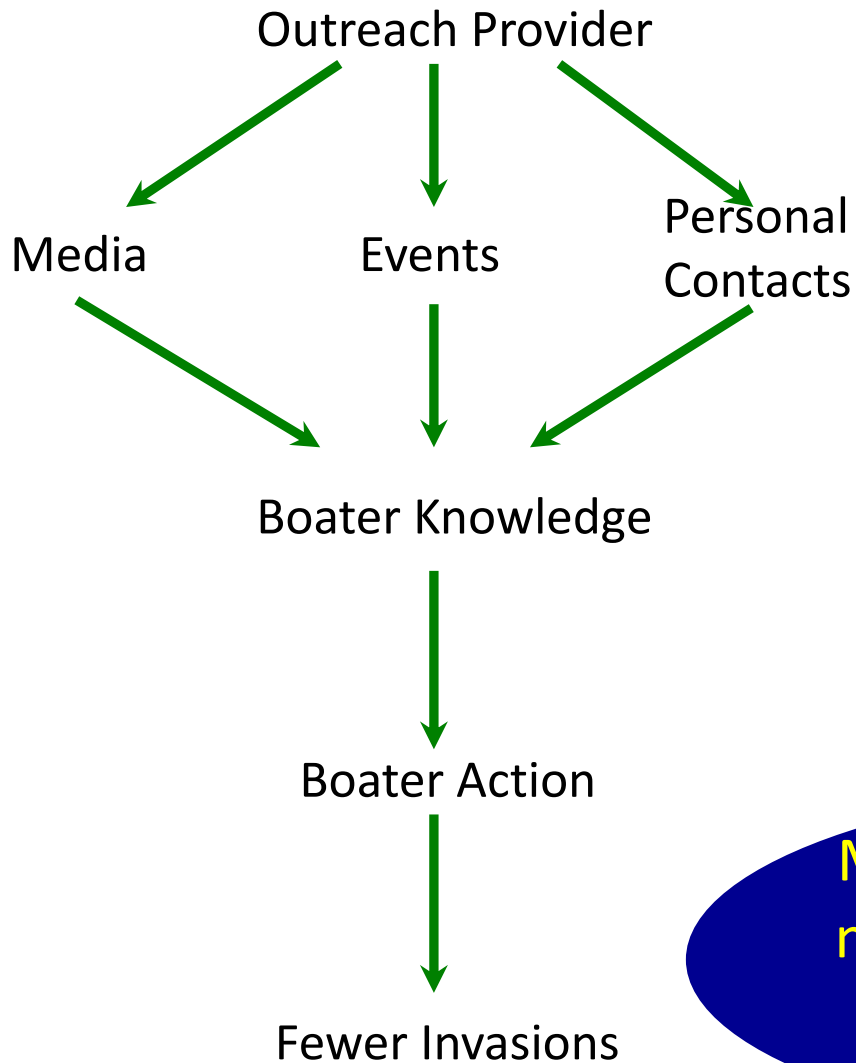


# Outreach... with Kelly Garbach & Ellen Cole



- Outreach is a large part of AIS management
- Assumes that knowledge of AIS issues and how to prevent spread will lead to 'good' behaviors
- Common message is to clean hull between waterbodies
- Little work to assess whether outreach is effective

# Does Outreach to Better Behavior?



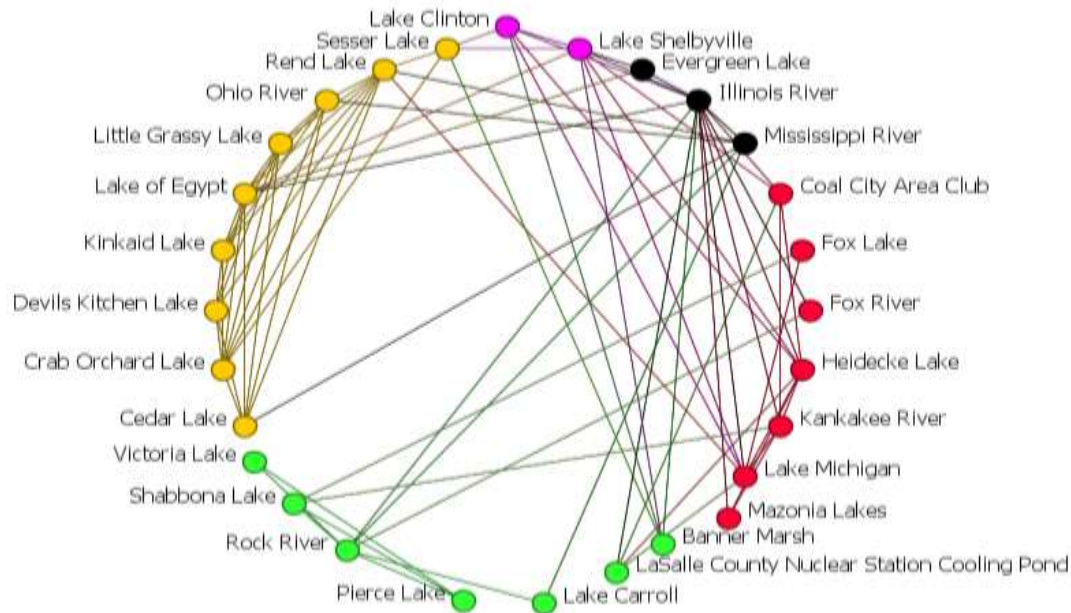
Metrics of outreach success are number of contacts with public, number of brochures/posters distributed, etc.

# Networks of Waterbodies

- 6,000 surveys sent to Illinois boaters, 515 usable surveys returned
- Responses about travel patterns, combined with behaviors, allow us to construct networks of Illinois lakes



# Network of Boater Connections, $\geq 5$ visits



## ALL BOATERS

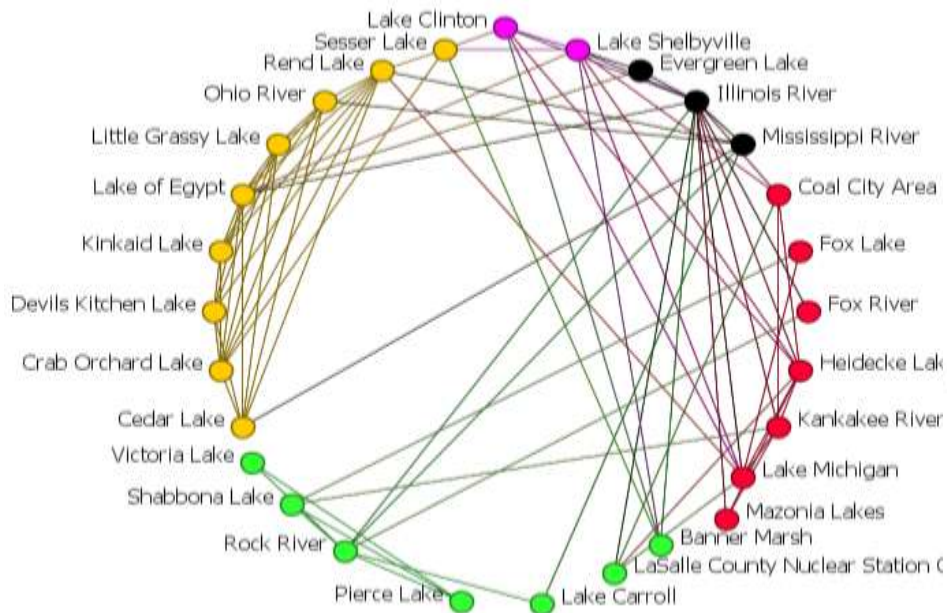
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Density = 0.217

Path length = 2.280

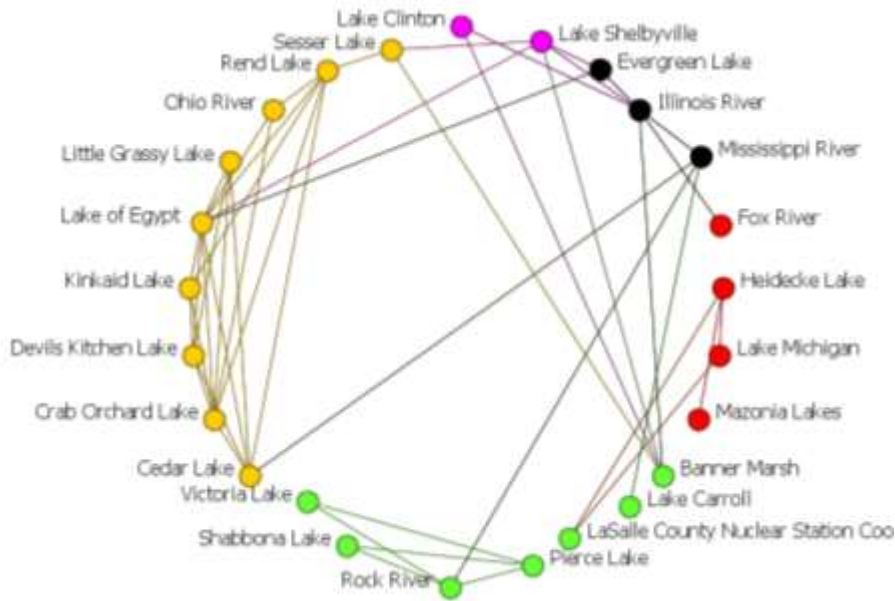


# Network of Boater Connections, $\geq 5$ visits



## ALL BOATERS

n = 28  
Density = 0.217  
Path length = 2.280



## 'BAD' ACTORS

n = 25  
Density = 0.153  
Path length = 2.612

# Questions?

