# Inventory of Minnesota River Backwater Fish Communities



## Introduction

- $\succ$  Floodplains are an important component of large rivers, serving a vital role in ecosystem function.
- > Backwater habitats provide critical spawning and rearing habitat, refuge from high-flow conditions, and plankton rich foraging areas for many fish species.
- > Despite their importance, relatively little is known about fish communities inhabiting the hundreds of Minnesota River backwater habitats.

# **Objectives**

- Develop protocols for assessing Minnesota River backwater fish communities.
- > Characterize fish communities in at least 12 Minnesota River backwaters.
- Compile historical Minnesota River backwater fish community survey data.

### Methods

- Identify and assess backwaters representative of the diversity of Minnesota River backwater habitats.
- > Assess fish communities with seines, boat electrofishing, gill nets, and fyke nets. Determine sampling effort based on backwater surface area (Table 1).
- $\succ$  Quantify physical habitat characteristics (e.g., size, connectivity, macrophyte cover) of backwaters and surrounding land.
- > Utilize Non-metric multidimensional scaling (NMDS) ordinations to identify patterns and relationships among fish communities and habitat characteristics.

# Results

- Eight backwater habitats were assessed during 2016 and 2017 (Figure 1).
- > Backwaters varied in size from 5 to 100 acres, with fish species richness varying from 14 to 30, for a total of 48 unique species.
- $\succ$  Ordinations indicate that fish communities in the eight assessed backwaters may be influenced ( $P \le 0.2$ ) by river mile and connectivity (Figure 2). For example, Beckendorf lake rarely connects with the main channel, while the Franklin oxbow and New Ulm oxbow (NUox) almost always connect with the main channel.
- Fish communities in Minnesota River backwaters evaluated by Schmidt and Polomis (2007) generally differed from backwaters sampled during this study and were often larger in size and further downstream (Figure 3).

# Michael Vaske, Michael Wolf, and Anthony Sindt Minnesota Department of Natural Resources

#### **Table 1.** Sampling effort based on backwater surface area. 15-100 ac Sampling gear < 15 acres Four 20 mir Entire Boat electrofishing shoreline (10 runs (or en shoreline minute runs) Standard gill net Large mesh gill net 3/4" fyke net 3/8" fyke net 1/8" fyke net Seine Backwater Lakes Legend Backwaters to sample Backwaters sampled Gifford Lake Louisville Swamp Montevideo Oxbow Beckendorf Lake Long Lake Long Slough Sulfur Lake Belle Plaine Oxbow -Mack Lake Anderson Lake New Ulm Oxbow 12.5 25 50 Figure 1. Locations of Minnesota River backwaters identified for this study. Ω O Beckendorf Rivermile Magk NMDS2 0.0 NUG **Monte**<sub>Ox</sub> SPO Franklir 0.5 SAF Connectivity -0.5 0.0 0.5

### NMDS1

**Figure 2.** NMDS ordination for eight backwaters included in this study. Backwaters (black) farther away in ordination space are more dissimilar than those that are close to each other. Fish species (red) closest to backwater sites are associated with higher catch rates in those backwaters.

res	>100 acres
nute tire e)	Four 20 minute runs
	6
	2
	4
	4
	4
	8



GIS	
	BP
	205
	BQhn
EM6	BSAR
EMS	BAR
EMS	BAR
EMS	BSAR
EMS	BSAR
EMS	B
EMS	B
EMS	B



**Figure 3.** NMDS ordination including eight backwaters sampled during this study (black) and 20 backwaters (purple) evaluated by Schmidt and Polomis (2007).

# Conclusions

- > Fish communities differ among Minnesota River backwater habitats and are likely influenced by river mile and connectivity with the main channel.
- $\succ$  Although differences exist among fish communities, many fish species are commonly found in backwater habitats throughout the Minnesota River floodplain (e.g., Black Crappie, Bluegill, Common Carp)
- Non-metric multidimensional scaling is a useful method for examining complex relationships among fish communities and habitat characteristics of Minnesota River backwaters.
- $\succ$  Outcomes from this and future studies will increase our understanding of the importance of backwater habitats for fish communities and help identify and prioritize habitats for conservation, restoration, and protection efforts.

# References

1. Schmidt, K., and T. Polomis. 2007. Fish Communities of Minnesota River Flood Plain Lakes. MNDNR. Available: files.dnr.state.mn.us/areas/fisheries/westmetro/2006mnriver-floodplain-survey.pdf (January 2018).





