

# Investigating lake sturgeon habitat use, feeding ecology and benthic resource availability in the lower Niagara River

Funded through the Ecological Greenway Fund

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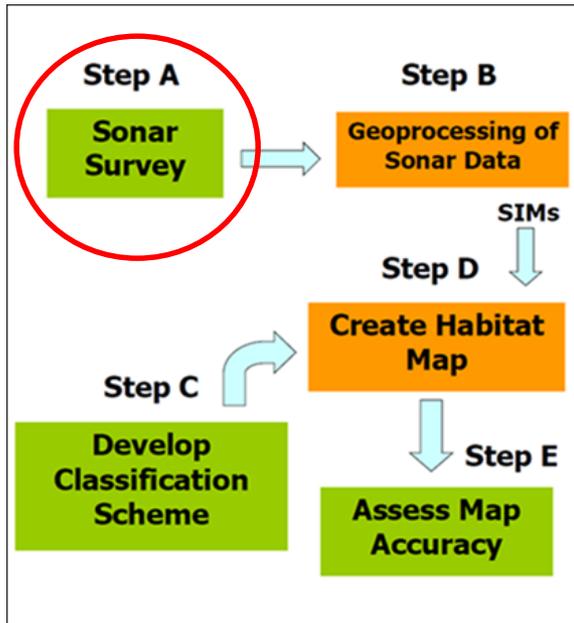
Knut Mehler – Great Lakes Center

Eric Bruestle – Great Lakes Center

# Objectives

1. *Use bathymetric and habitat data obtained from USFWS's side-scan sonar project on the lower Niagara River to **create benthic habitat maps**. Using the habitat maps, **assess diversity and community structure of benthic invertebrates** in the lower Niagara River.*
2. ***Document habitat use, movements, and diet** of lake sturgeon in the lower Niagara River.*

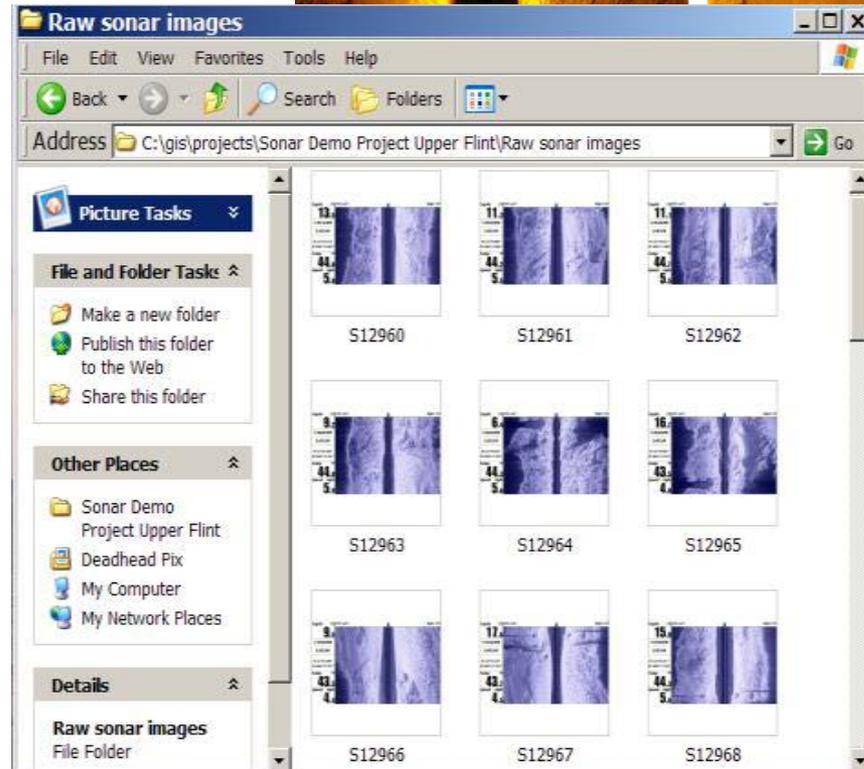
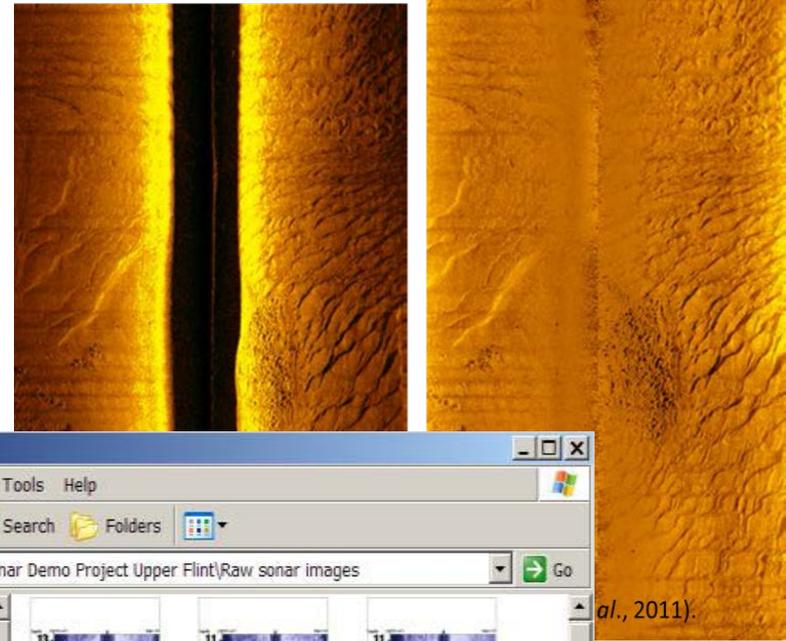
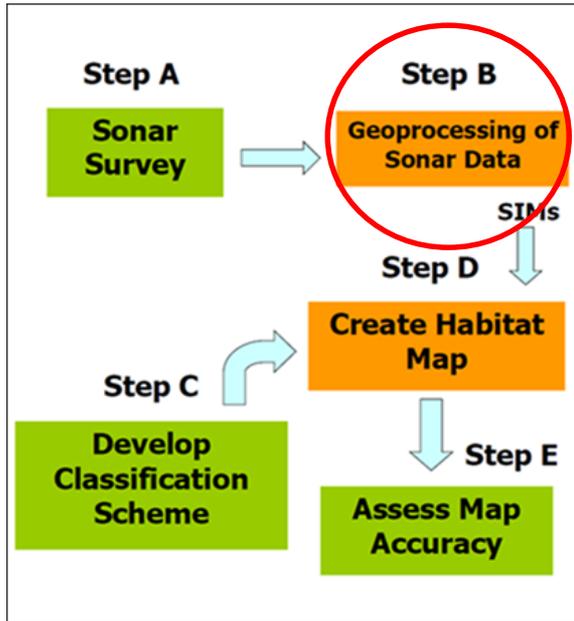
# Create substrate map



Side scan sonar (SSS) survey by the USFWS in 2011



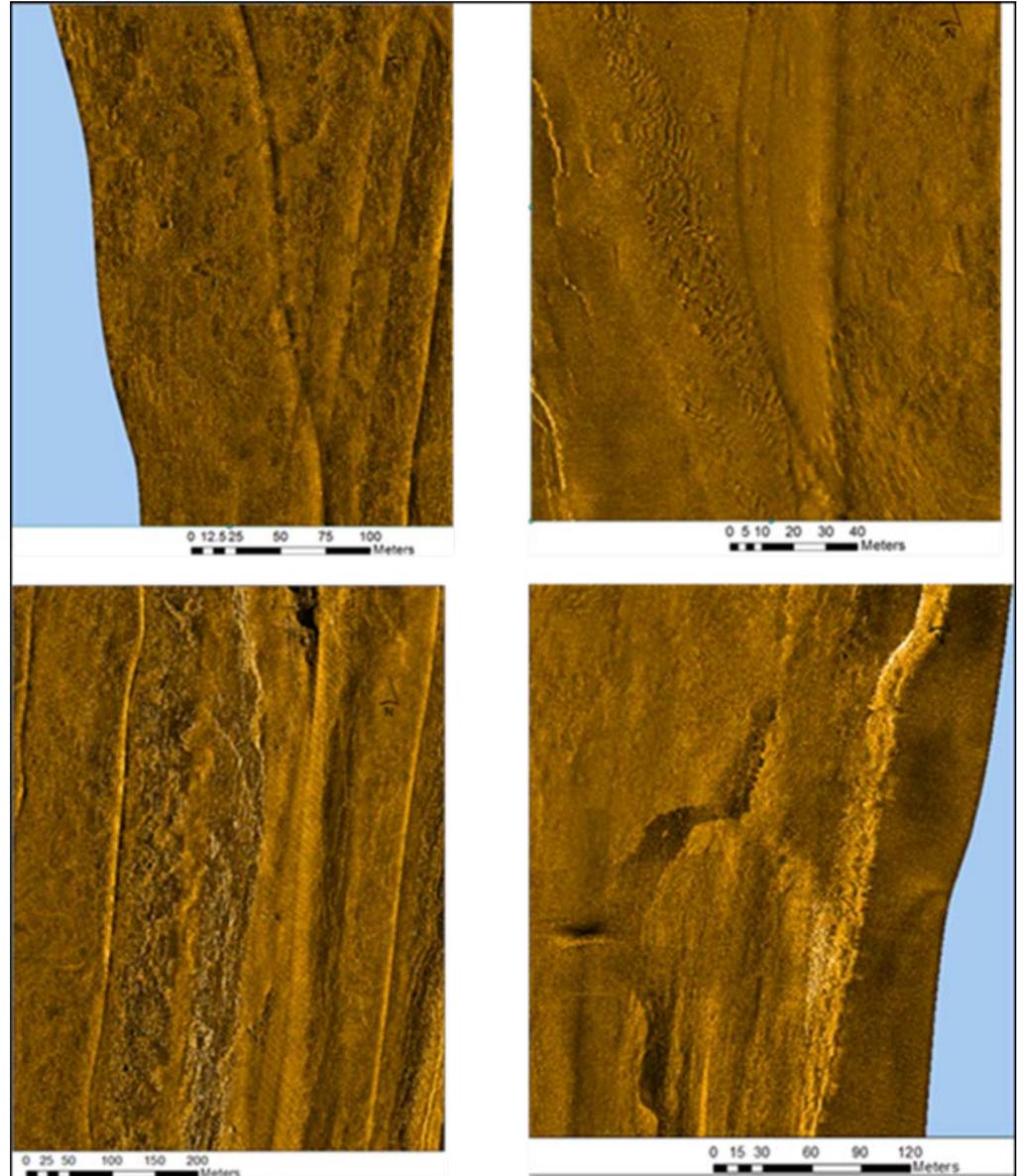
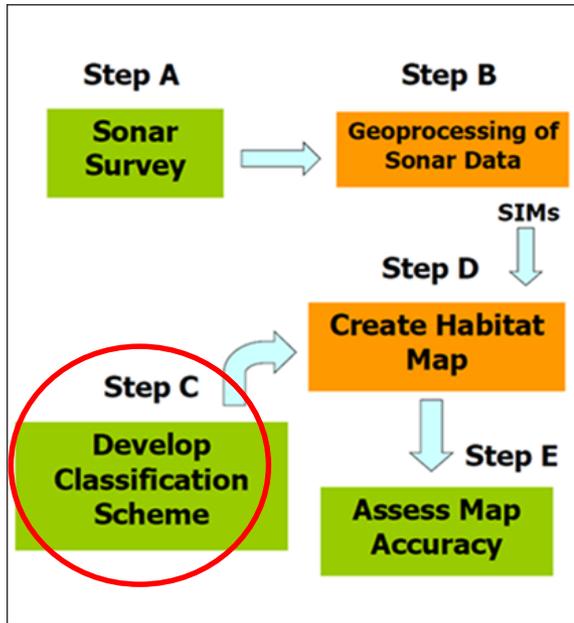
# Create substrate map



Transfer raw sonar data into usable images (remove water column), beam angle corrections, assemble images)  
Import data into ArcGIS 10

al., 2011).

# Create substrate map

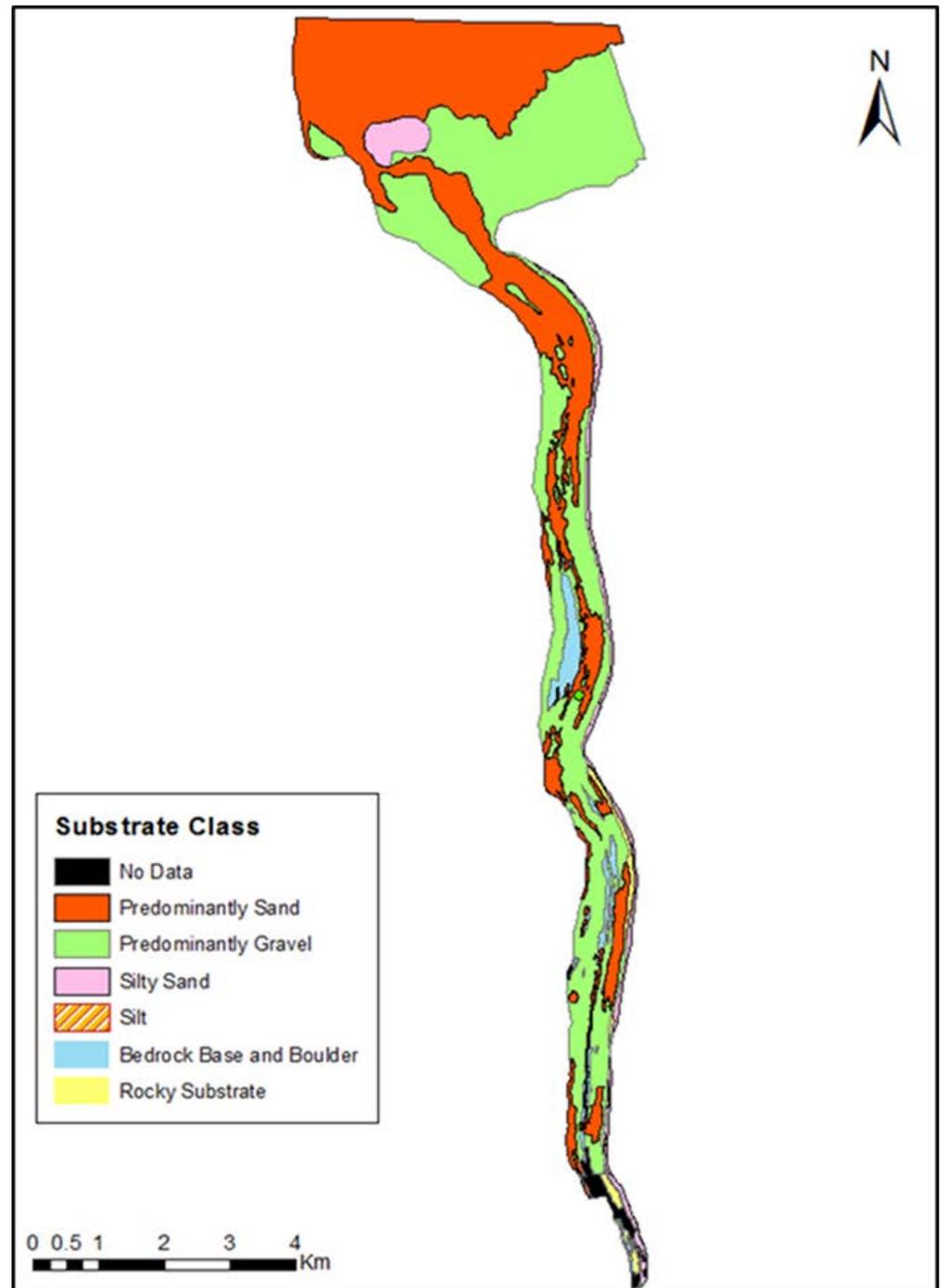
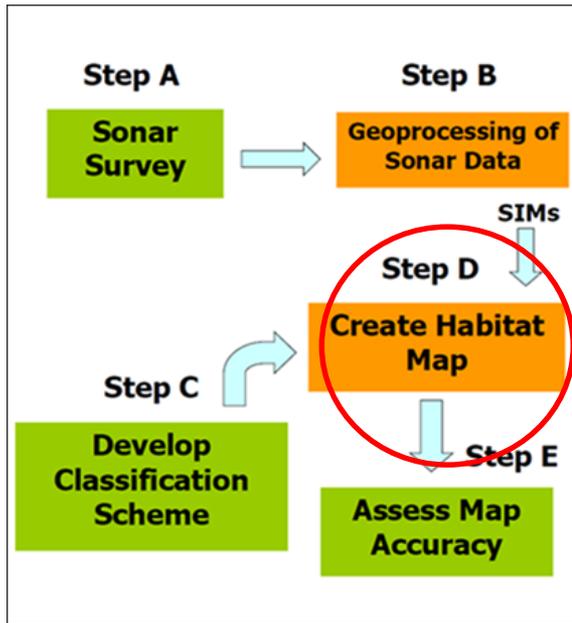


What will the map show?

How many substrate classes?

➔ How detailed

# Preliminary Substrate Map

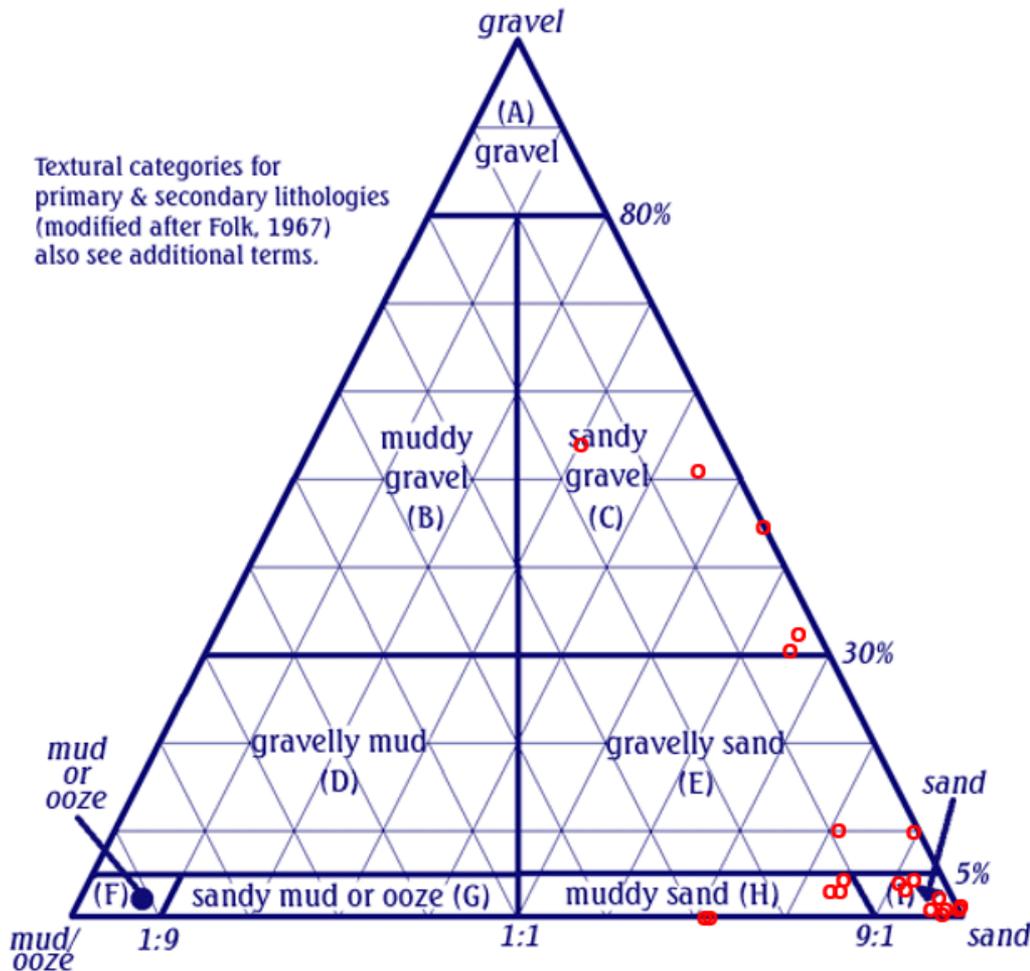


# Assessing Map Accuracy

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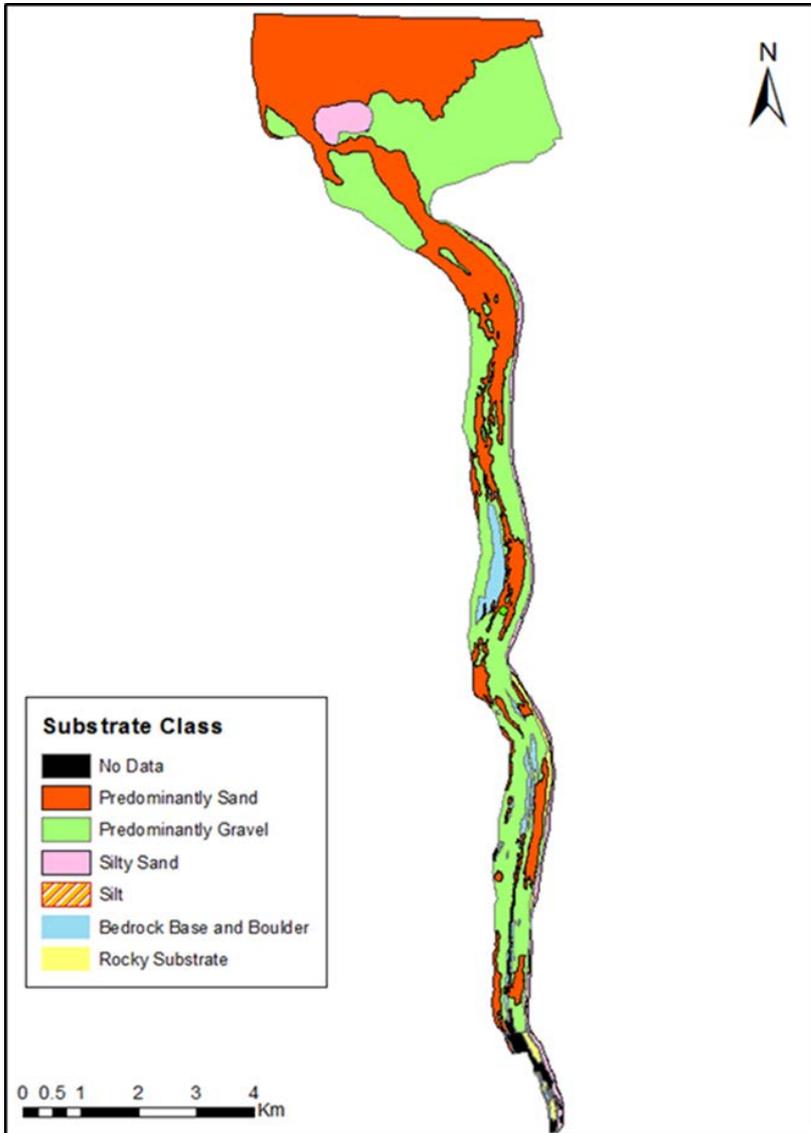
# Map Accuracy: Sieve Analysis



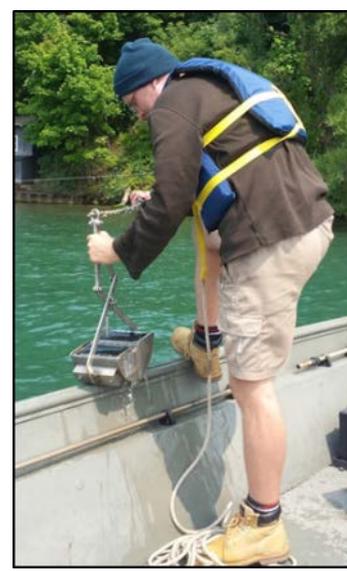
Ternary diagram to discriminate between the sub-ordinate substrate type as those have different characteristics, such as density, shear stress stability, and organic matter content

Results from video images and sieve analyses proved very good accuracy (75%) of substrate map based on side scan sonar, esp. for larger grain size.

Using the habitat maps, **assess diversity and community structure of benthic invertebrates** in the lower Niagara River



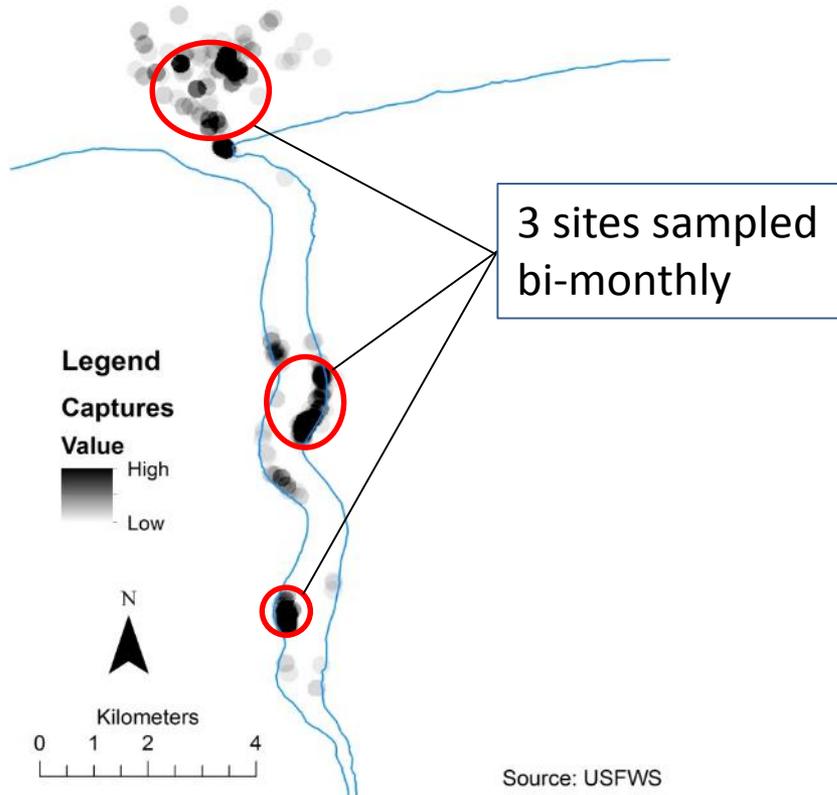
	Area (km <sup>2</sup> )	Area (%)	# Samples by area	# Samples taken
Sand	11.8	43.1	43	41
Gravel	12.4	45.3	45	48
Silty Sand	1.4	5.0	5	14
Silt	0.01	0.04	1	15
Bedrock Base	1.4	5.0	5	14
Rocky Substrate	0.2	0.6	1	15
No Data	0.3	1.2	n/a	n/a
<b>Total</b>	<b>27.5</b>	<b>100</b>	<b>100</b>	<b>147</b>



147 benthic samples were collected and are currently being processed

*Using the habitat maps, assess diversity and community structure of benthic invertebrates in the lower Niagara River*

Lower Niagara River Sturgeon Capture Points



**estimate** spatiotemporal changes in the **food availability** for Lake Sturgeon over an **entire year** (April 2014- 2015)

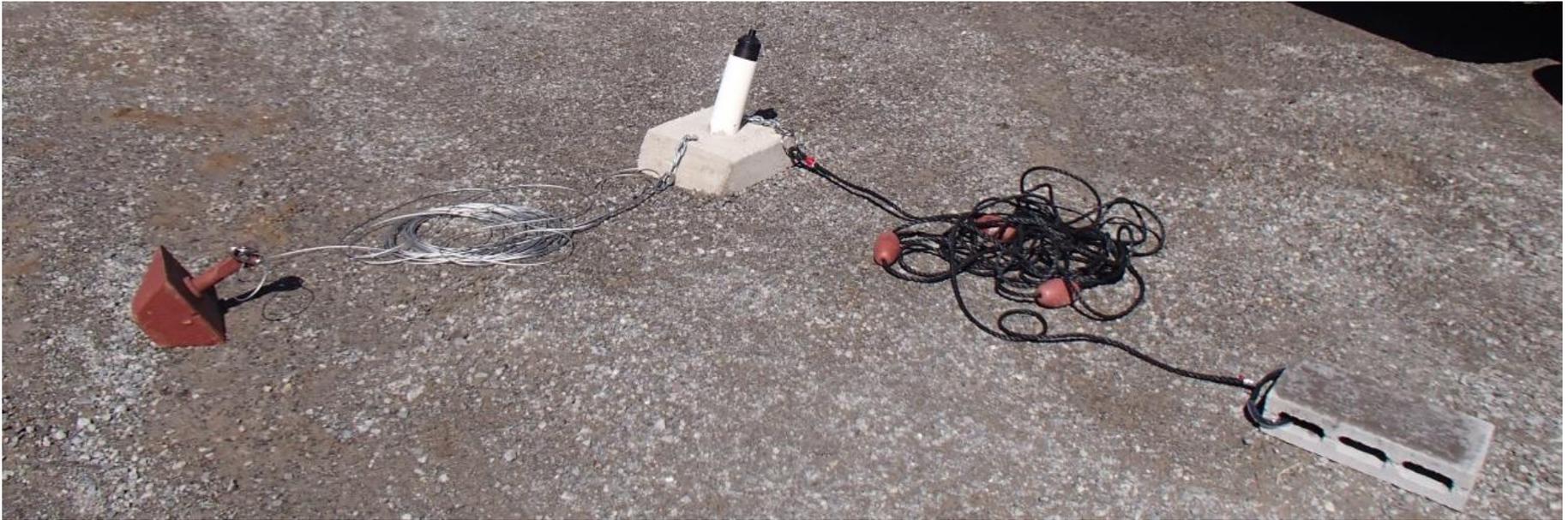
**108 benthic samples** have been obtained and are currently being processed

# Preliminary results on benthos



- Bedrock and rocky substrate dominated by Dreissena mussels and amphipods throughout entire lower Niagara and Niagara bar
- Inverse relationship between Oligochaeta and Chironomid biomass and substrate size
- Hexagenia mayflies found – Indicators of good water and sediment quality!

***Document habitat use and movements  
of lake sturgeon in the lower Niagara River.***



VR2W Receiver



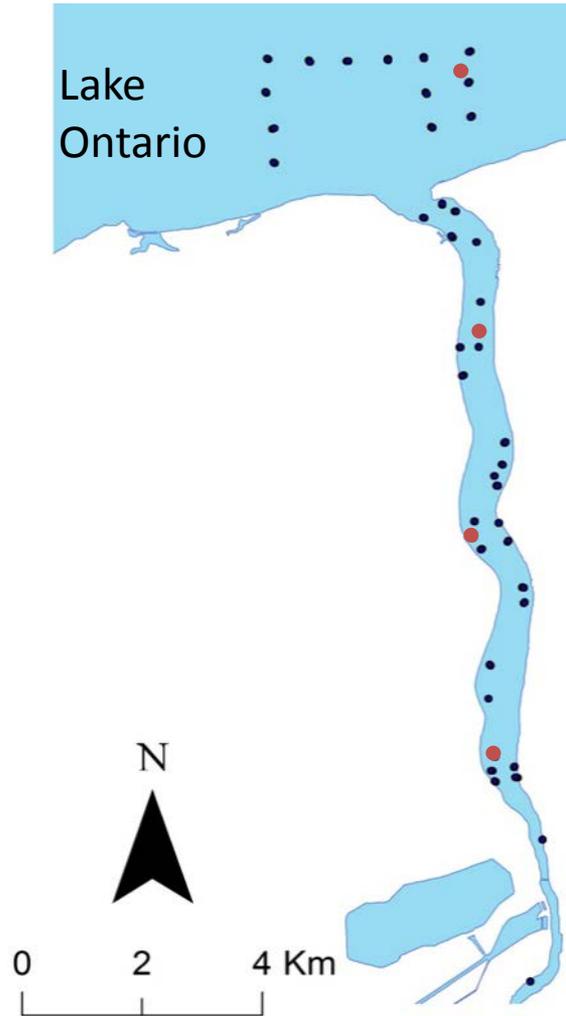
V16 Transmitter

# *Document habitat use and movements of lake sturgeon in the lower Niagara River.*

Deployed **39**  
acoustic receivers

Retrieved and  
downloaded data  
from **35** receivers

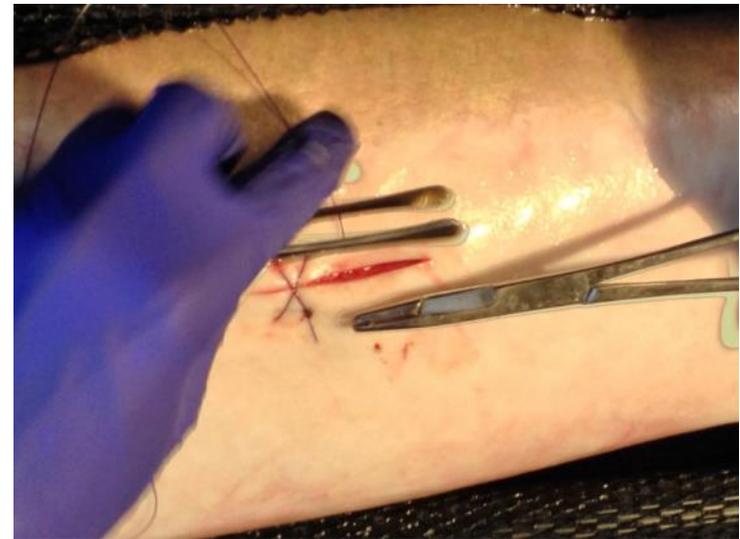
Set **4** sentinel tags



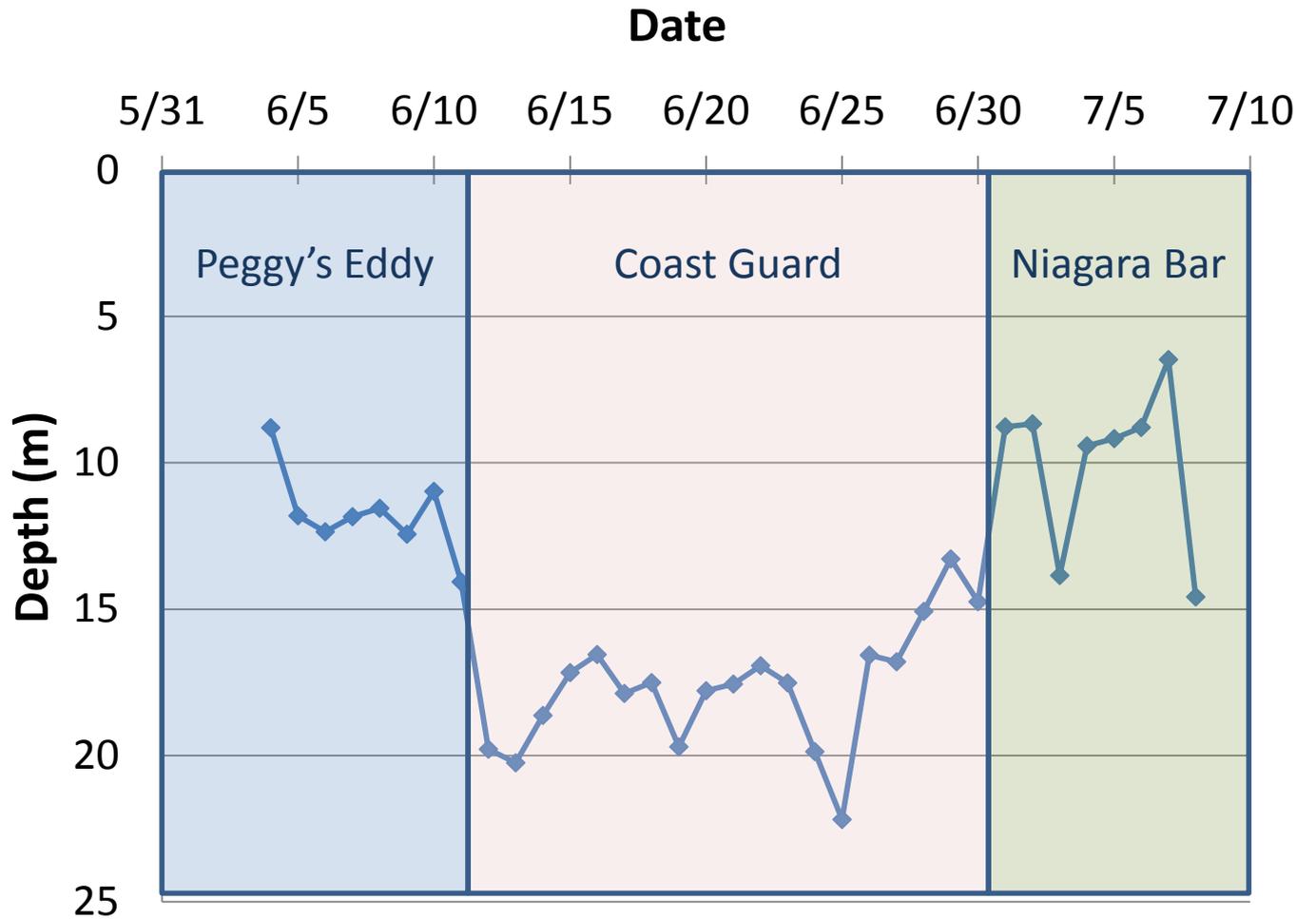
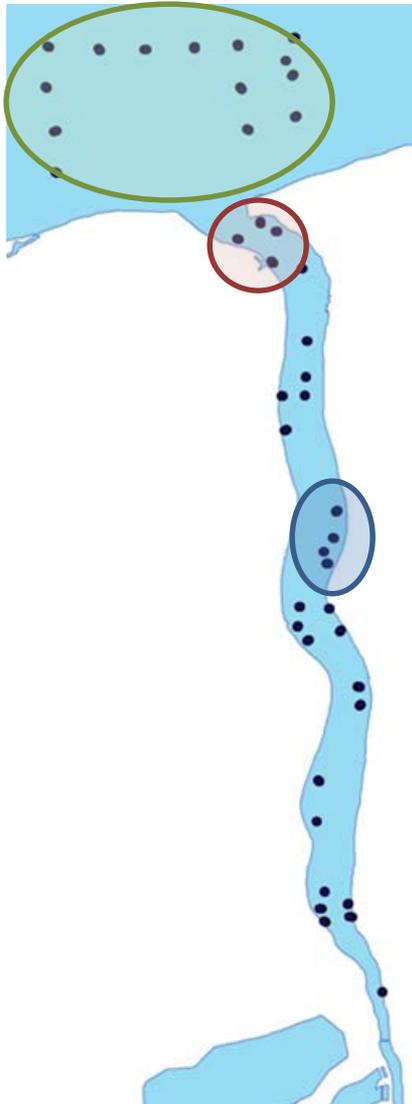
# Acoustic Tagging

**75** lake sturgeon captured this season

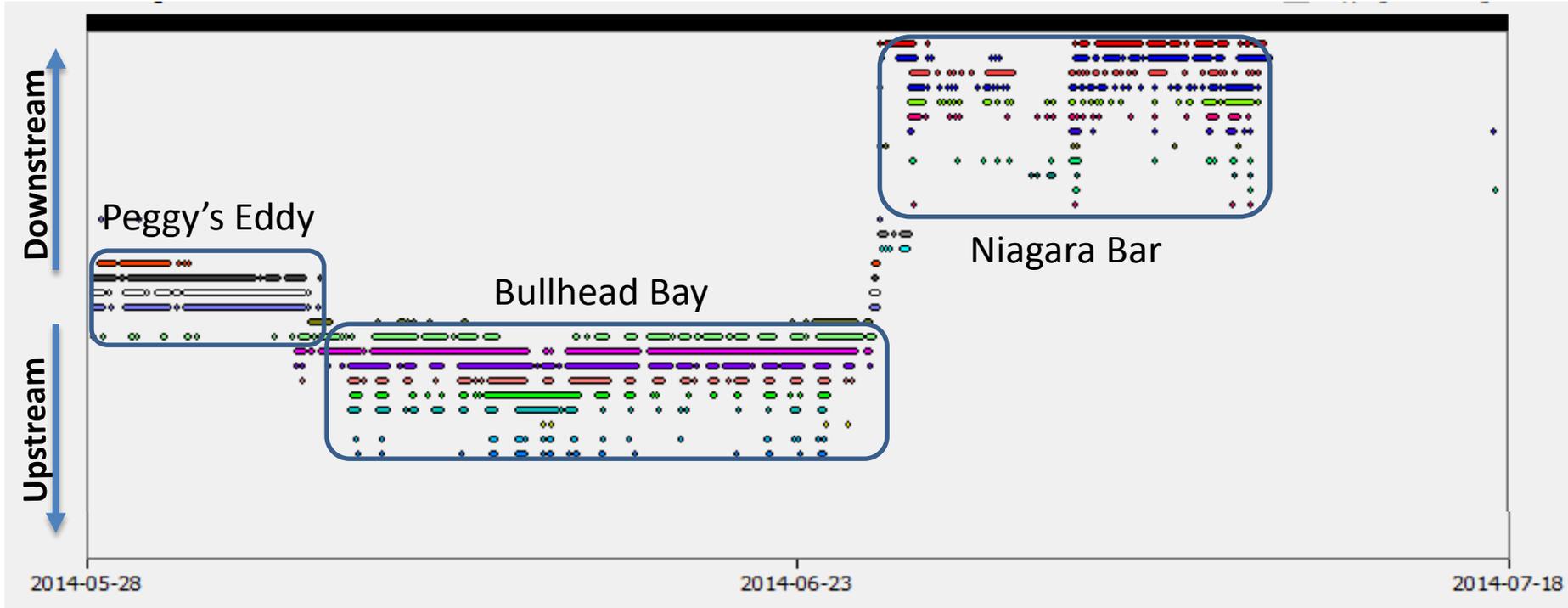
Surgically implanted **30** acoustic tags



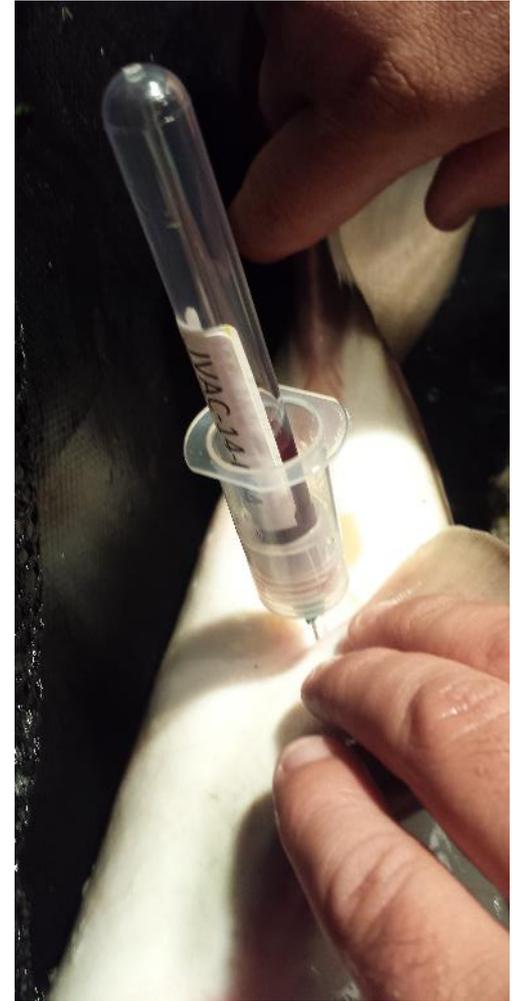
# Fish #13022



# Fish #13029



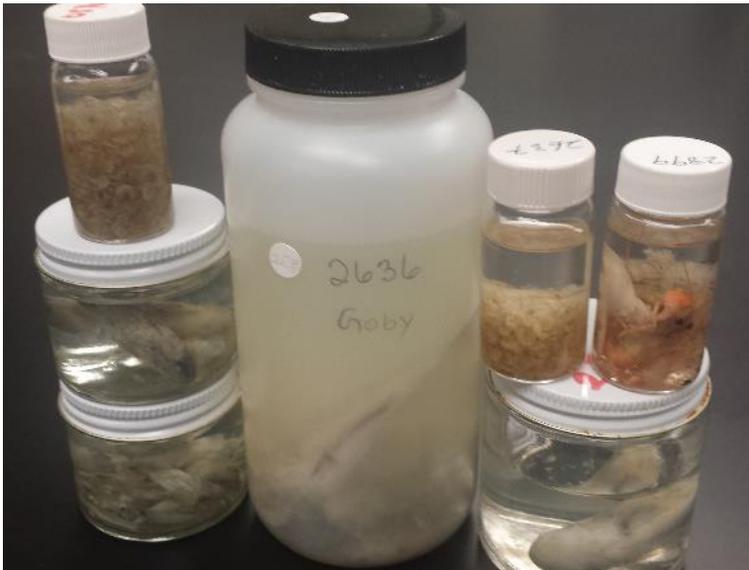
***Document diet of lake sturgeon in the lower Niagara River.***



# Diet Analyses

## Stomach Content Analysis

- Snapshot
- High taxonomic precision
- 33 samples collected
- All samples wet-weighted and identified



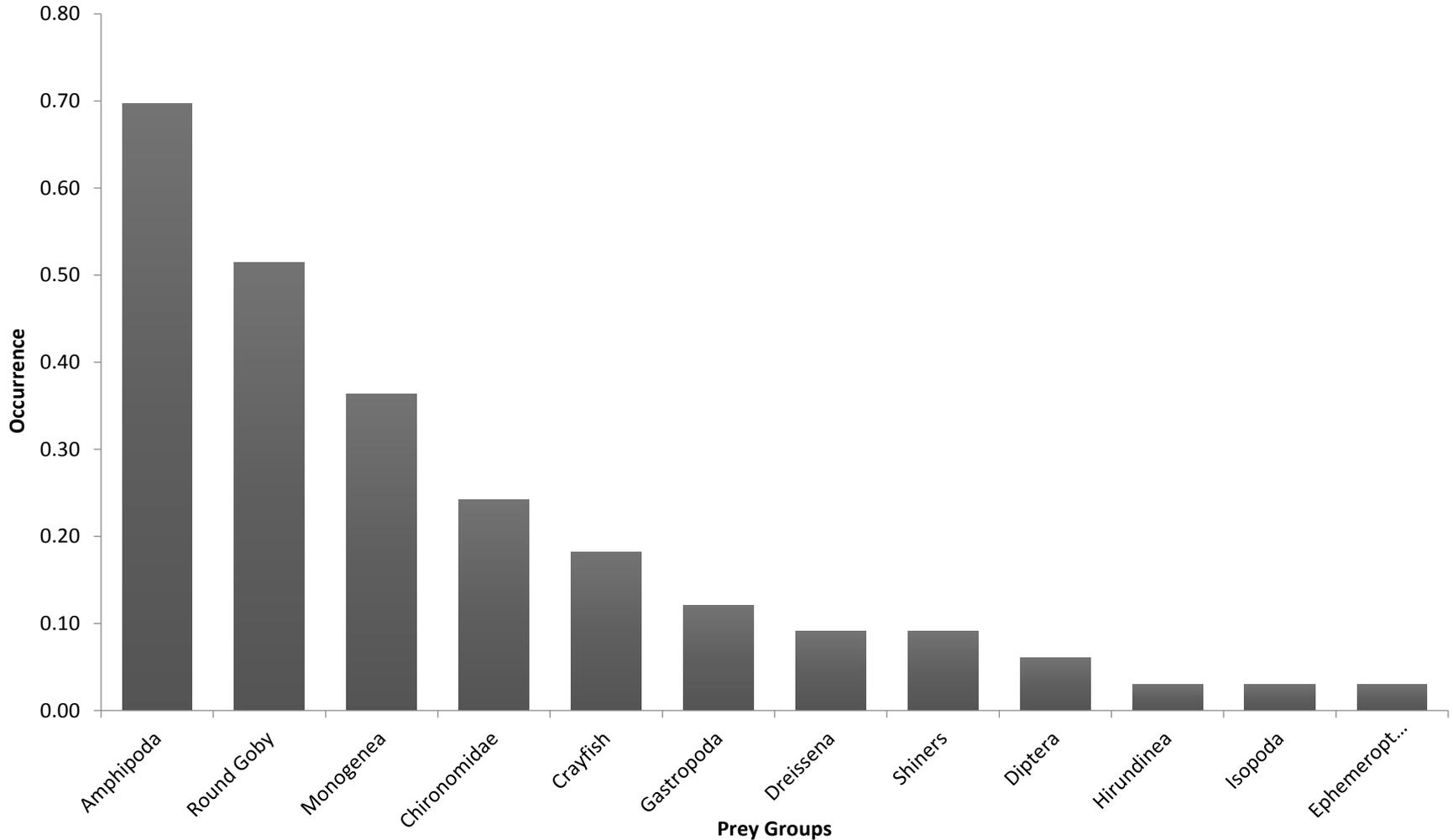
## Stable Isotope Analysis

- Long term diet history
- Carbon sources
- Trophic position
- Over 100 samples collected
- 150 samples sent for analysis

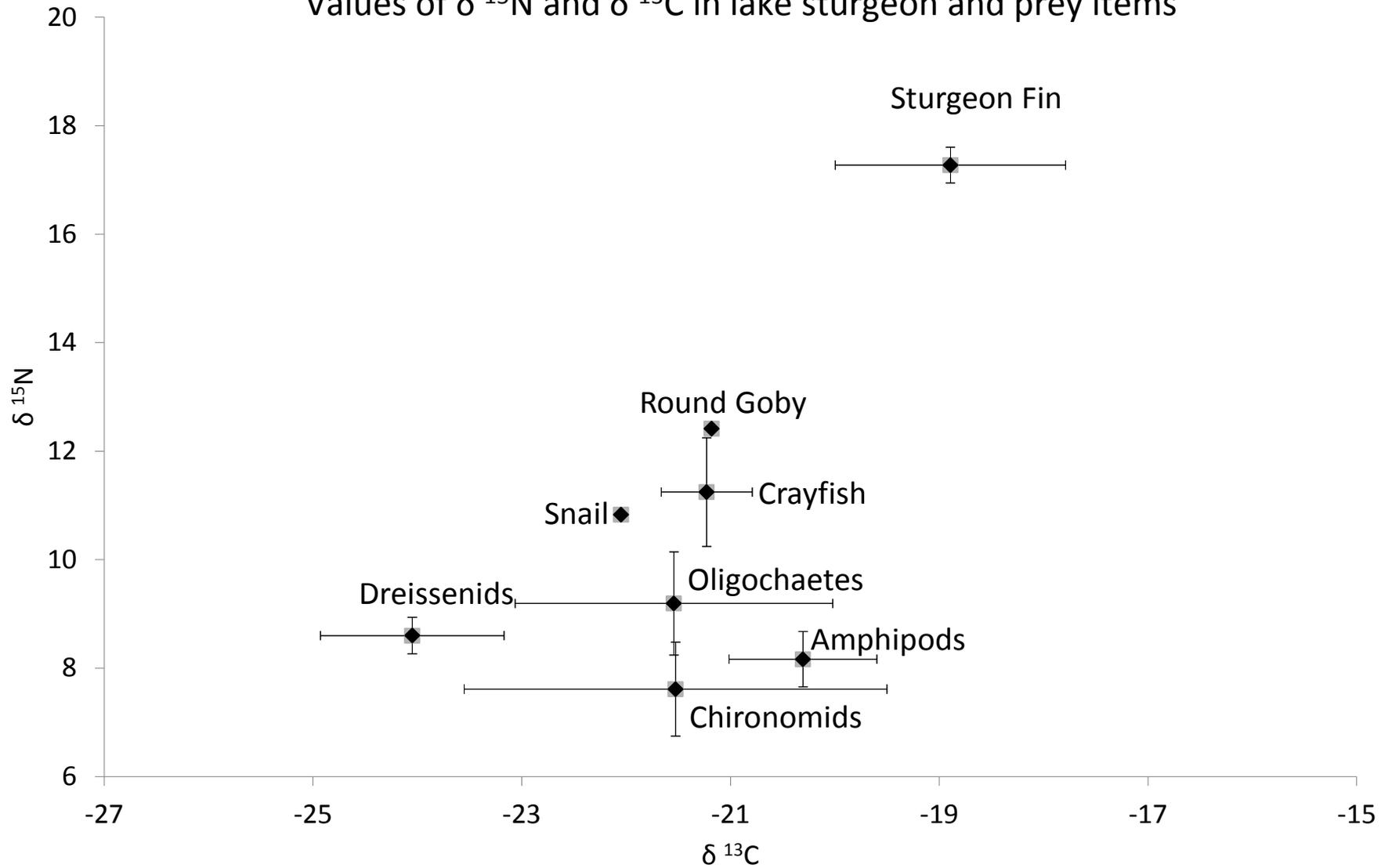


# Diet Analysis

Frequency of occurrence of prey groups



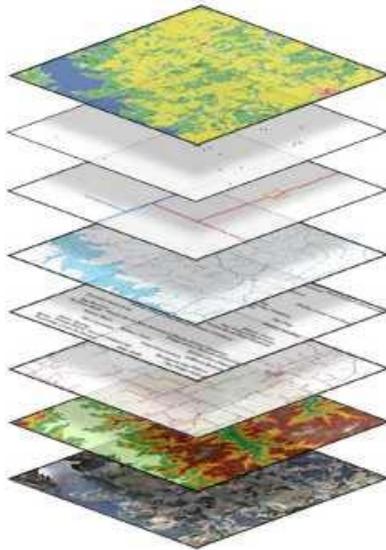
# Values of $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ in lake sturgeon and prey items



# Future Tasks: Objective 1

## Benthic Habitat Map

- Revise the substrate map
- Finish sieve and organic matter content analyses
- Add biotic and abiotic data layers to substrate map



## Assess diversity and community structure of benthic invertebrates

- Finish taxonomic identification
- Using benthic community biological indices to prioritize habitats for conservation
- Compare current with historical data on benthic communities
- Analyze spatiotemporal changes in food availability at 3 sites
- Identify habitat of importance as feeding grounds for lake sturgeon

# Future Tasks: Objective 2

## Telemetry

- Recover and download receivers
- Analyze detection data and generate home range estimates
- Deploy acoustic releases in Spring 2015
- Tag 30 more sturgeon

## Diet Analysis

- Collect more stomach samples in Spring
- Continue sampling benthic food resources
- Interpret stable isotope data
- Send more samples for analysis