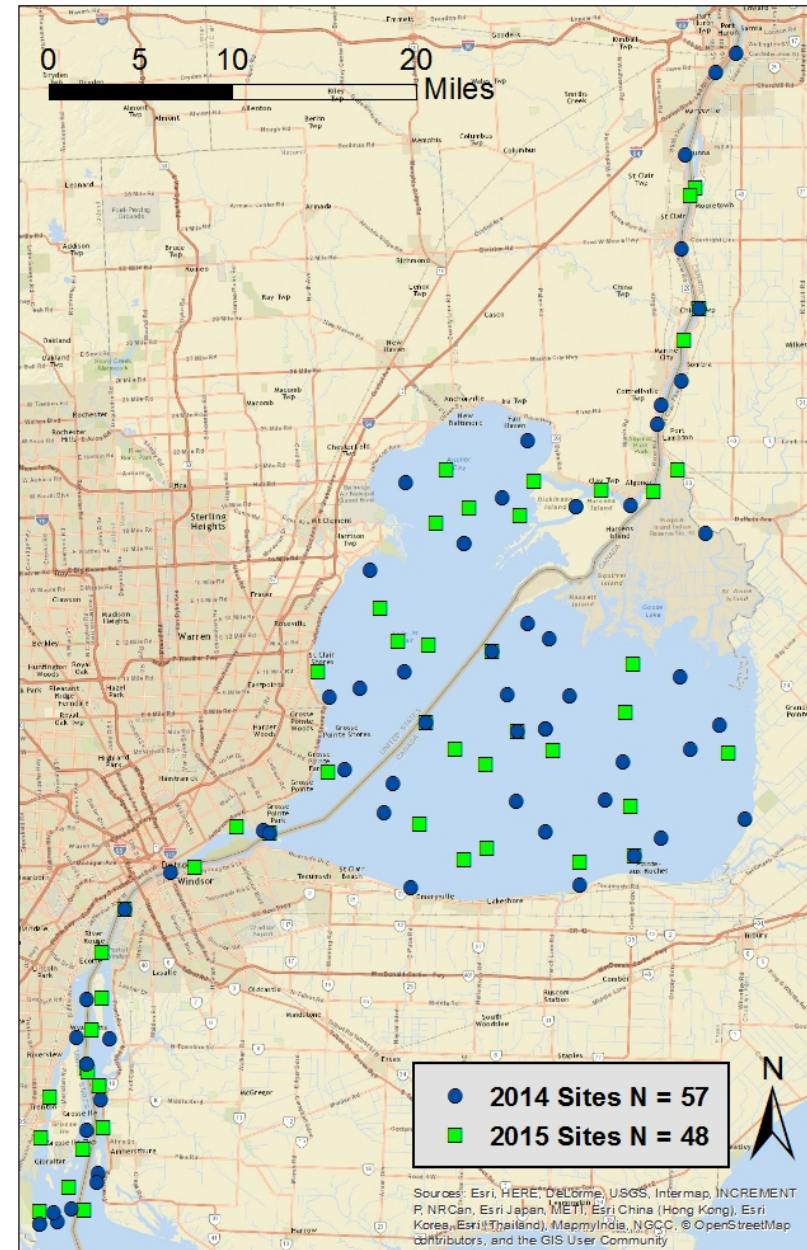


NCCA Connecting Channels Pilot Project

- CWA 305b – Assessing current conditions
- Probability-based sampling: Sites represent known fraction of area within a region → statistically-valid estimates of condition
- Sampled HEC in **2014 & 2015**
- Sampled St Marys River in 2015 & 2016

Parameters Collected:

- Conductivity, T, pH, DO, secchi
- DIN, DIP, TN, TP
- Chl *a*
- Algal toxins
- Enterococci
- Phytoplankton
- Benthic video
- Cations
- TOC
- Grain Size
- Sediment Chemistry
- Toxicity
- Benthos
- Fish – 2015 whole fish tissue



Outline

Preliminary Results for HEC 2014 for:

- Water Quality Index
- Benthic Quality Index
- Sediment Quality Index
 - Focus on Detroit River

Summary & Next Steps





Water Quality Index - Indicators & Thresholds

Lake/Basin	Chlorophyll a (ug/L)		Total Phosphorus (ug/L)		Dissolved Oxygen (mg/L)		Secchi Depth (m)	
	Good/Fair	Fair/Poor	Good/Fair	Fair/Poor	Good/Fair	Fair/Poor	Good/Fair	Fair/Poor
Huron	1.3	2.6	5	10	5	2	8.0	5.3
Western Erie	3.6	6.0	15	32	5	2	3.9	2.1

Thresholds from: IJC, 1979 and PMSTF, 1980

	Good	Fair	Poor
Water Quality Index	No component indicators are rated poor, and a maximum of one is rated fair.	One component indicator is rated poor, or two or more component indicators are rated fair.	Two or more component indicators are rated poor.

Huron-Erie Corridor - Huron

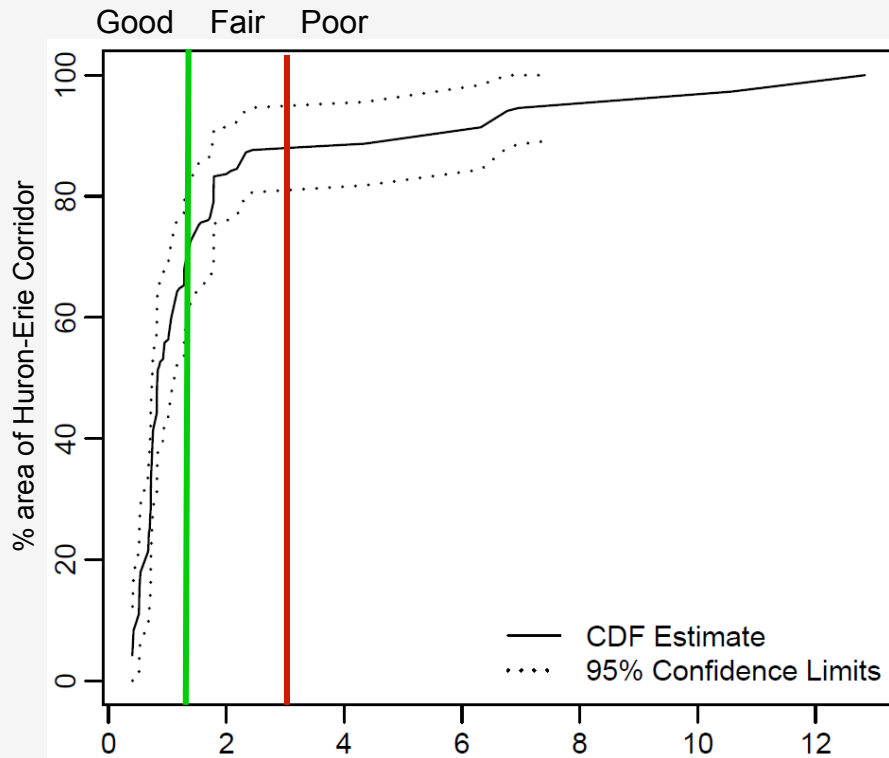
Thresholds

Chlorophyll a

Using NCCA Huron Threshold

Good < 1.3 µg/L

Poor > 2.6 µg/L



Chl a (µg/L)

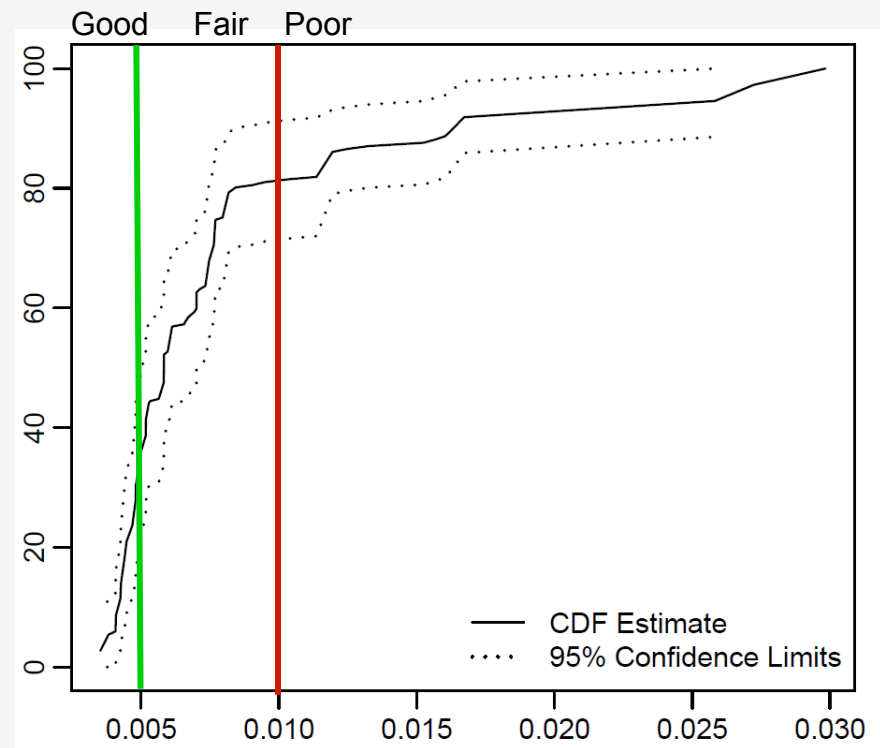
66% Good

Total Phosphorus

Using NCCA Huron Threshold

Good < 5 µg/L

Poor > 10 µg/L



Total P (mg/L)

35% Good

N = 55

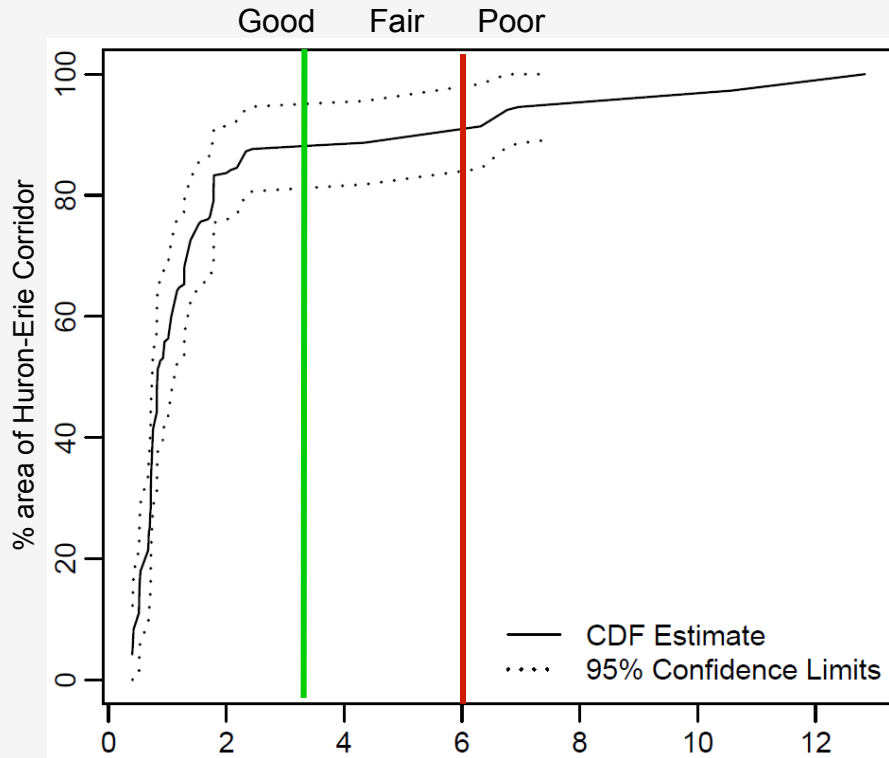
Huron-Erie Corridor - Western Erie

Chlorophyll a

Using NCCA Western Erie Threshold

Good < 3.6 µg/L

Poor > 6 µg/L



Chl a (µg/L)
66% Good (CDF)
85% Good

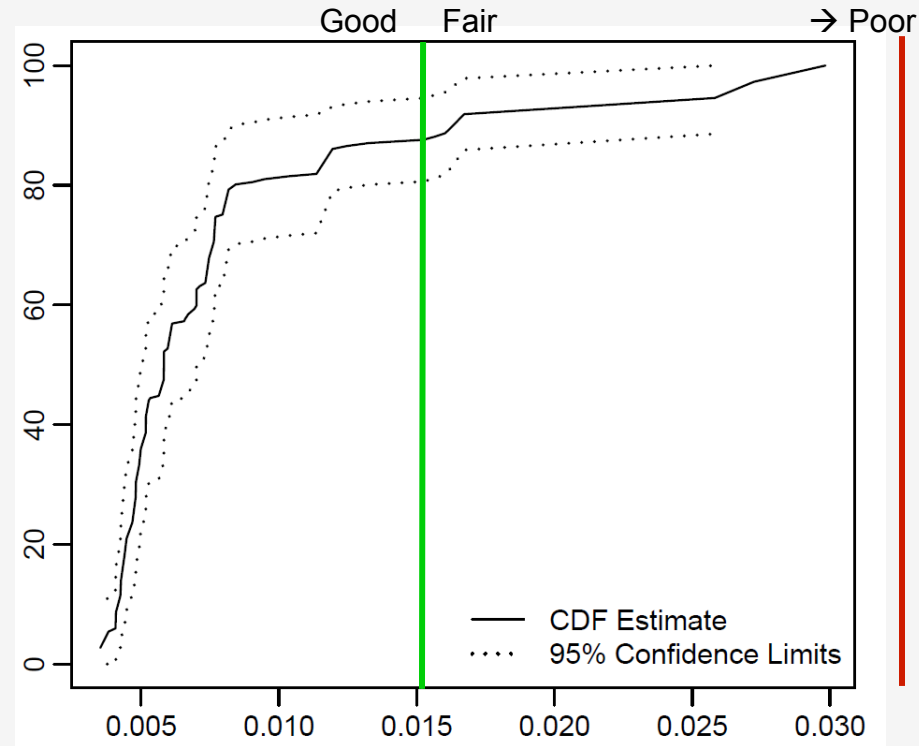
N = 55

Total Phosphorus

Using NCCA Western Erie Threshold

Good < 15 µg/L

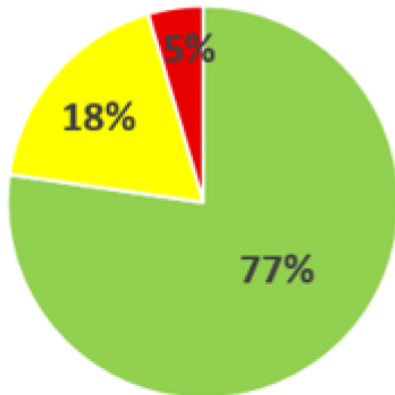
Poor > 32 µg/L



Total P (mg/L)
35% Good (CDF)
84% Good

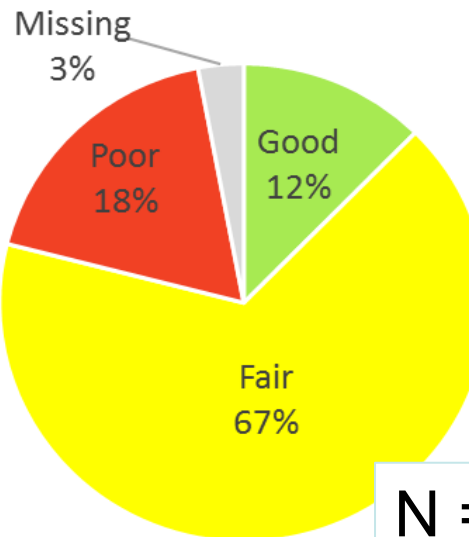
Water Quality Index

**2010
Lake Huron**



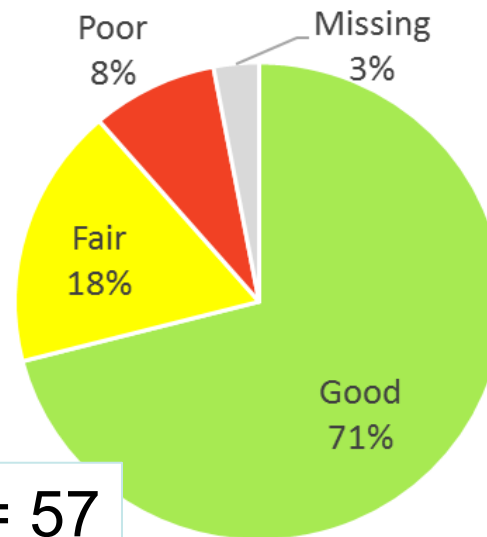
N = 67

**2014 HEC
Huron Thresholds**

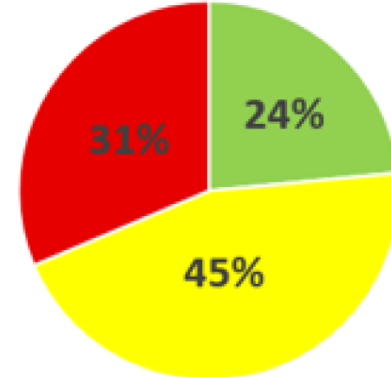


N = 57

**2014 HEC
Western Lake Erie
Thresholds**



**2010
Lake Erie**



N = 69

Rank	Good	Fair	Poor
Water Quality Index	No component indicators are rated poor, and a maximum of one is rated fair.	One component indicator is rated poor, or two or more component indicators are rated fair.	Two or more component indicators are rated poor.

Benthic Quality Index



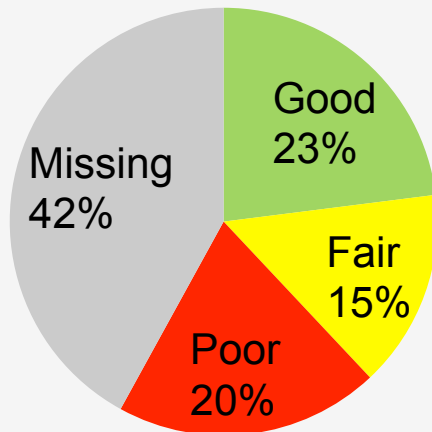
- Oligochaete Trophic Index:
$$OTI = \frac{c.5 \sum n \downarrow 0 + \sum n \downarrow 1 + 2 \sum n \downarrow 2 + 3 \sum n \downarrow 3}{\sum n \downarrow 0 + \sum n \downarrow 1 + \sum n \downarrow 2 + \sum n \downarrow 3}$$
 - Based on oligochaete abundance and tolerance to organic pollution
 - Each taxa assigned to tolerance group
 - New Great Lakes index in development for NCCA

Good - Oligotrophic	Fair - Mesotrophic	Poor - Eutrophic
OTI score < 0.6	OTI score between 0.6 and 1.0	OTI score > 1.0

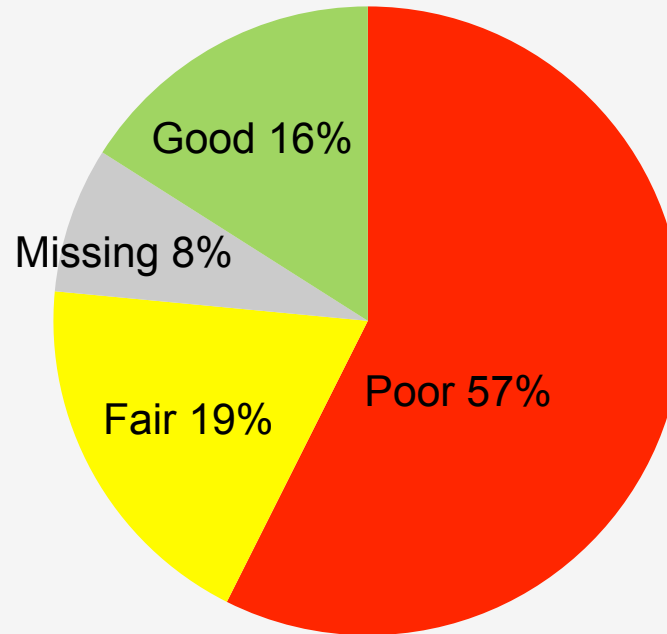
Oligochaete Trophic Index (OTI)

2014 - HEC

2010 - Lake Huron

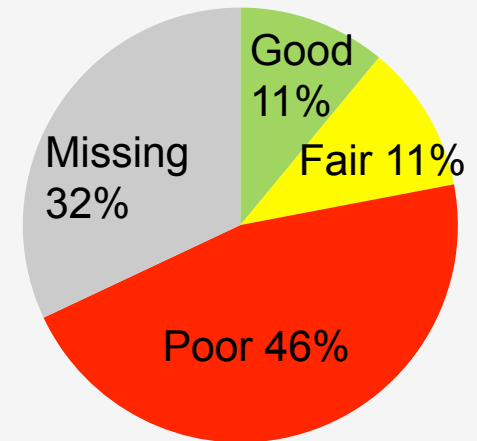


N = 67



N = 57

2010 - Lake Erie



N = 69

**Good -
Oligotrophic**

OTI score < 0.6

**Fair -
Mesotrophic**

OTI score between
0.6 and 1.0

**Poor -
Eutrophic**

OTI score > 1.0

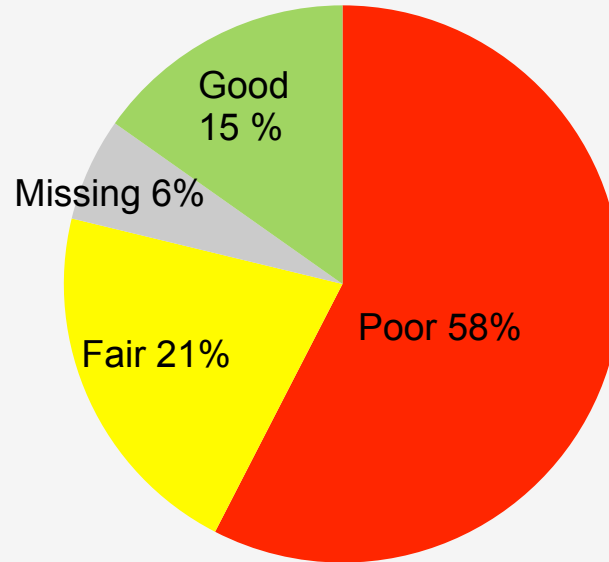
2014 OTI by HEC Subpopulation

St. Clair River
N = 12



N = 12

Lake St. Clair
N = 29



N = 29

Detroit River
N = 16



N = 16

**Good -
Oligotrophic**

OTI score < 0.6

**Fair -
Mesotrophic**

OTI score between
0.6 and 1.0

**Poor -
Eutrophic**

OTI score > 1.0



Sediment Quality Index

Rank	1. Sediment Chemistry	2. Sediment Toxicity	Sediment Quality Index
Good	$mPEC-Q \leq 0.1$	$\geq 90\%$ control-adjusted survival	Both indicators rated good
Fair	$0.1 < mPEC-Q < 0.6$	$\geq 75\%$ control-adjusted survival	At least one indicator rated fair and none rated poor
Poor	$mPEC-Q \geq 0.6$	$< 75\%$ control-adjusted survival	At least one indicator is rated poor

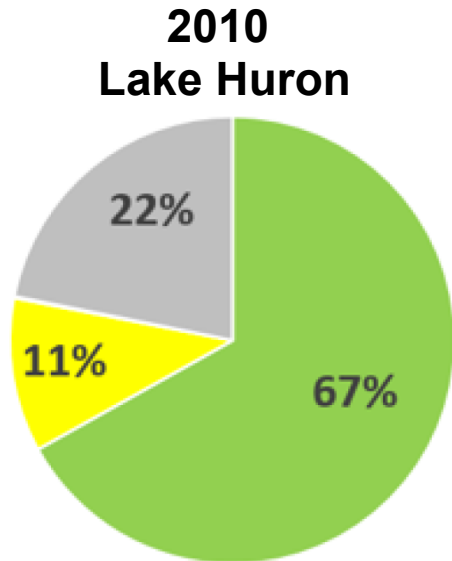
Sediment Chemistry Index based on Probable Effects Coefficients - Quotients (PEC-Qs)

$$Mean\ PEC-Q = \frac{Mean\ PEC-Q_{metals} + PEC-Q_{total\ PAHs} + PEC-Q_{total\ PCBs}}{n}$$

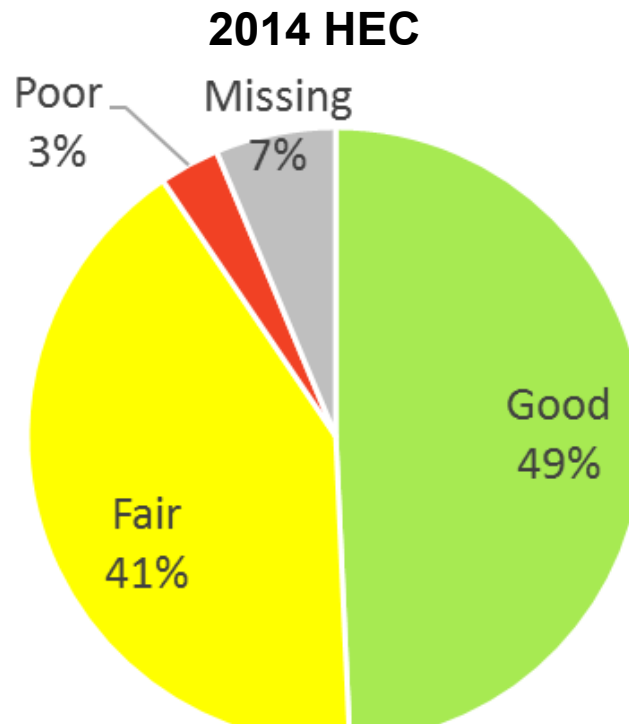
Sediment Toxicity – % survival *Hyalella azteca*

- Thresholds defined in literature (Ingersoll et al., 2001, USEPA, 2004)
- Methods → 2010 NCCA Great Lakes Technical Memo

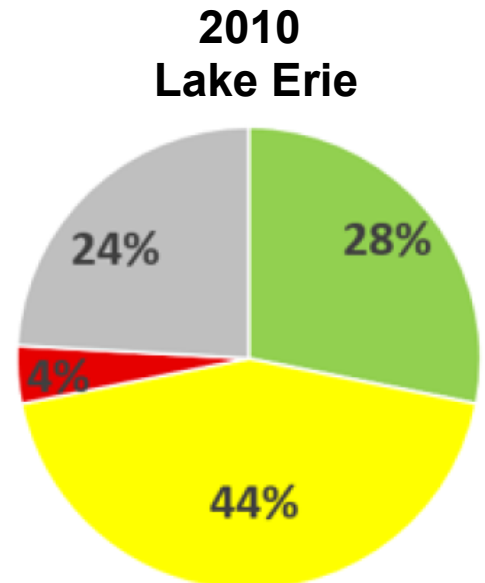
Sediment Quality Index – Comparison to Lakes



N = 67



N = 57



N = 69

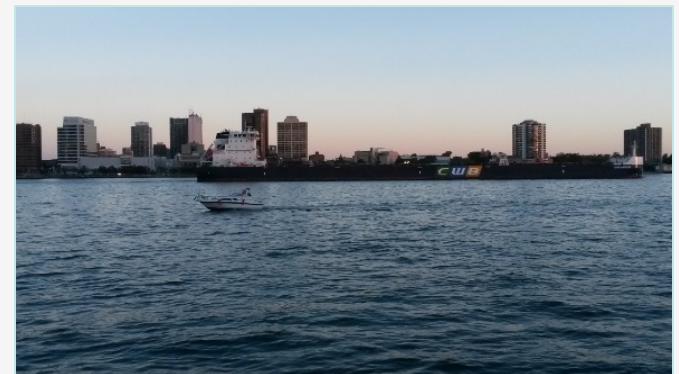
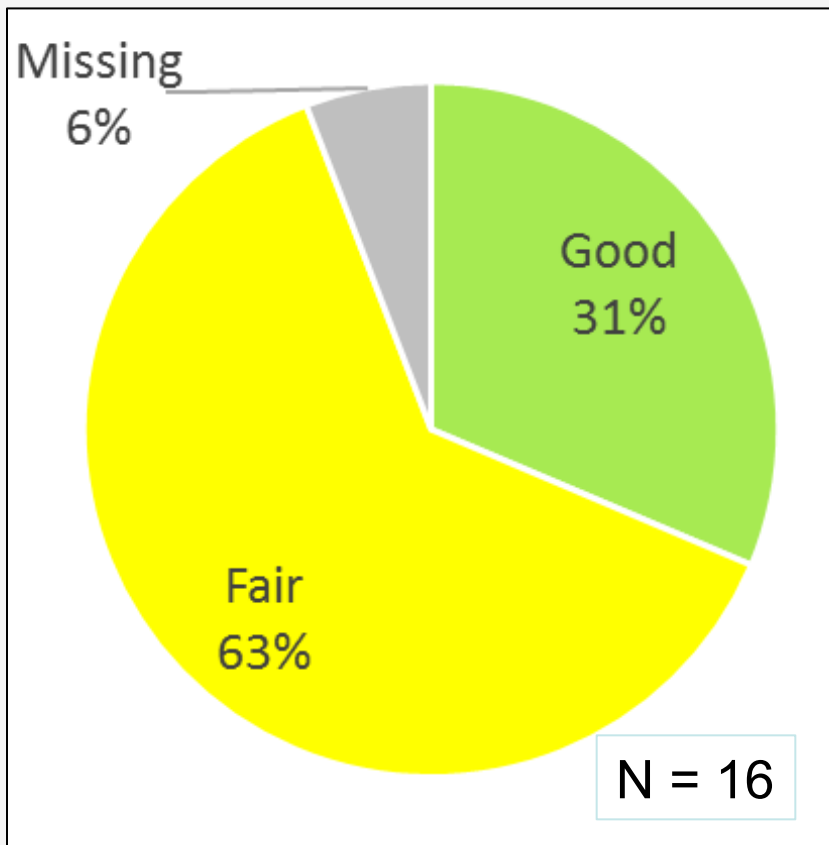
Rank	Sediment Quality Index
Good	Both indicators rated good
Fair	At least one indicator rated fair and none rated poor
Poor	At least one indicator is rated poor

Detroit River Focus

- Detroit River
 - Urbanized region
 - Listed as Area of Concern (AOC)
- Compared **Sed Chem Index** point data from:
 - NCCA - probability study - 104 sq km of Detroit River
 - Targeted sediment characterization sampling - 5 areas (excludes Trenton Channel)



Detroit River 2014 Sediment Chemistry Index

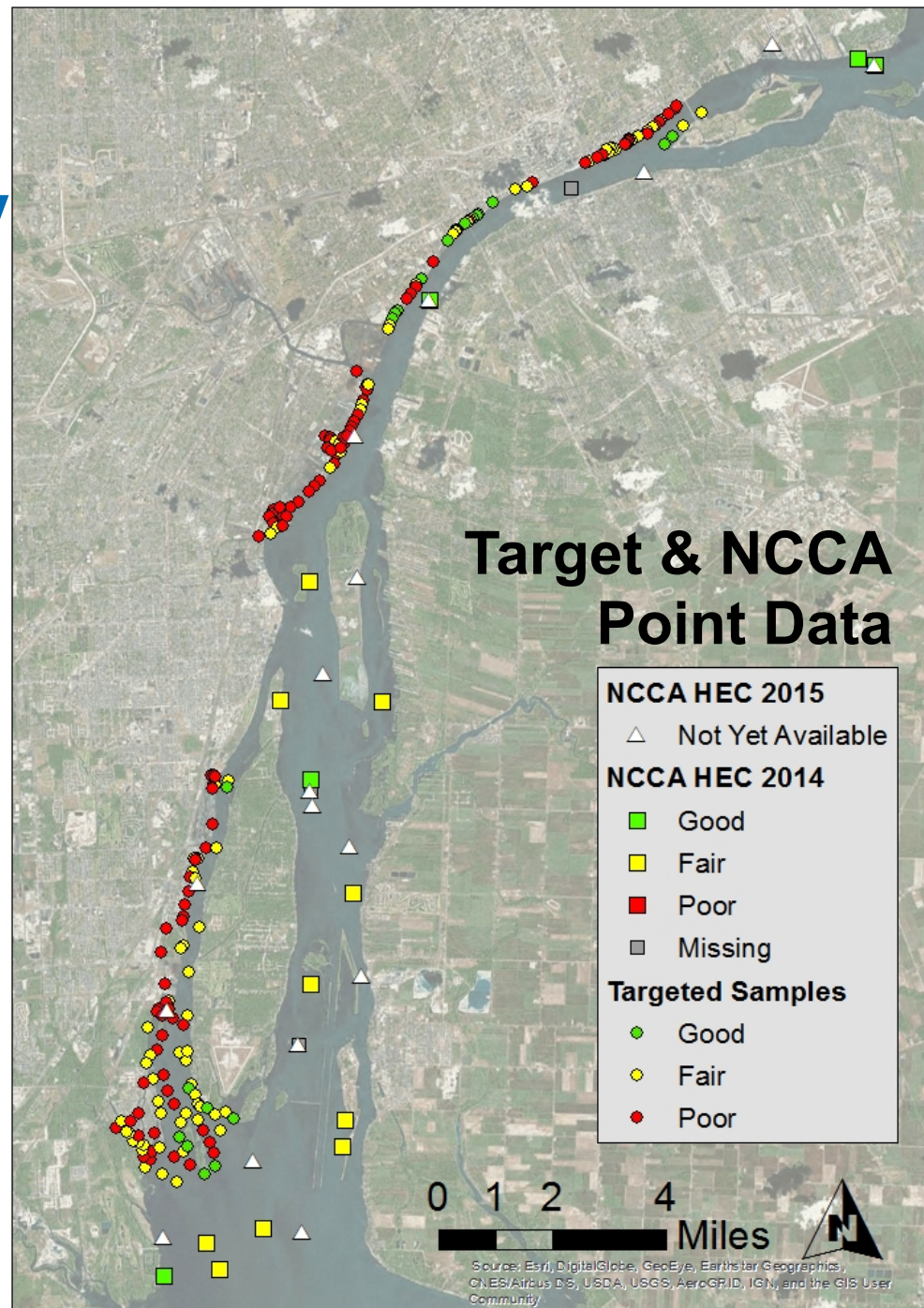
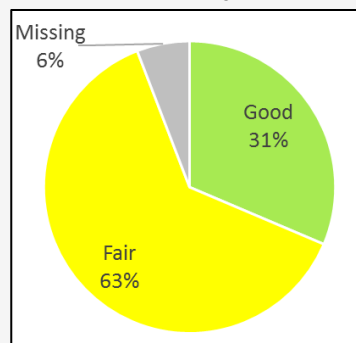


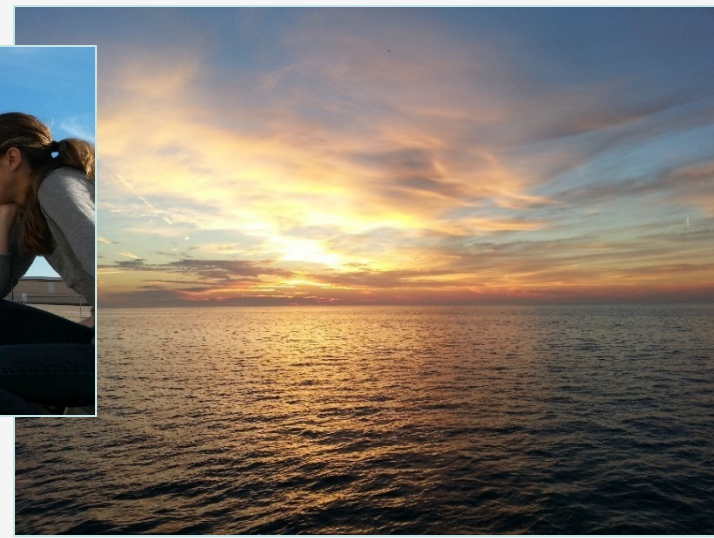
Rank	Sediment Chemistry
Good	$mPEC-Q \leq 0.1$
Fair	$0.1 < mPEC-Q < 0.6$
Poor	$mPEC-Q \geq 0.6$

Sediment Chemistry Index Detroit River Point Data Results

- Used surface only
- NCCA: Total PCB congeners
- Targeted: Total PCB aroclors

Detroit River 2014
Sediment Chemistry Index





Summary

- Cost-effective system-wide assessment
- Ongoing challenges:
 - Setting appropriate condition thresholds in connecting channels
 - Assess entire area – Missing data
 - Assessing small areas with extreme conditions
- Future Directions:
 - Complete Analyses of 2014-2015 Data
 - Include results in 2015 NCCA reports
 - Assess Niagara River

Questions?

