

Beaver Lake Ecological Surveys

Waukesha County, WI; 2021



WISCONSIN
LUTHERAN COLLEGE

Highlights

Fish surveys:

- First forage base survey
- 12 species sampled; others via scuba
- Indicator species: Rainbow darter

First scuba videography conducted

Vegetation surveys

- Possible expansion of *Chara*
- Very sporadic Eurasian water milfoil

First Zooplankton collections on the lake

Fish Survey Locations



Key:

★ Fyke Net

■ Seine Net

Fish Surveys: Seining for forage fish



Forage Fish Captured:

Sand shiners
Bluntnose minnows
Brook silversides
Rainbow darters
Johnny darters

Seine Net Results

	Station 1	Station 2	Station 3	Average per haul	Average per meter effort
Sand shiner	117	164	18	99.7	3.3
Brook Silverside	10	4	126	46.7	1.6
Bluntnose Minnow	57	184	142	127.7	4.3
Smallmouth Bass	0	3	0	1.0	0.0
Largemouth Bass	0	0	4	1.3	0.0
Rainbow Darter	0	1	0	0.3	0.0
Johnny Darter	0	1	0	0.3	0.0
			Totals	277.0	9.2

Seine Summary

1. Baseline survey of forage base collected
2. Indicator species: rainbow darter



Rainbow darter

Photo: Andrew Bogott

<https://commons.wikimedia.org/wiki/File:Rainbowdartermale.jpg>

Fish Surveys: Fyke nets for game and rough fish



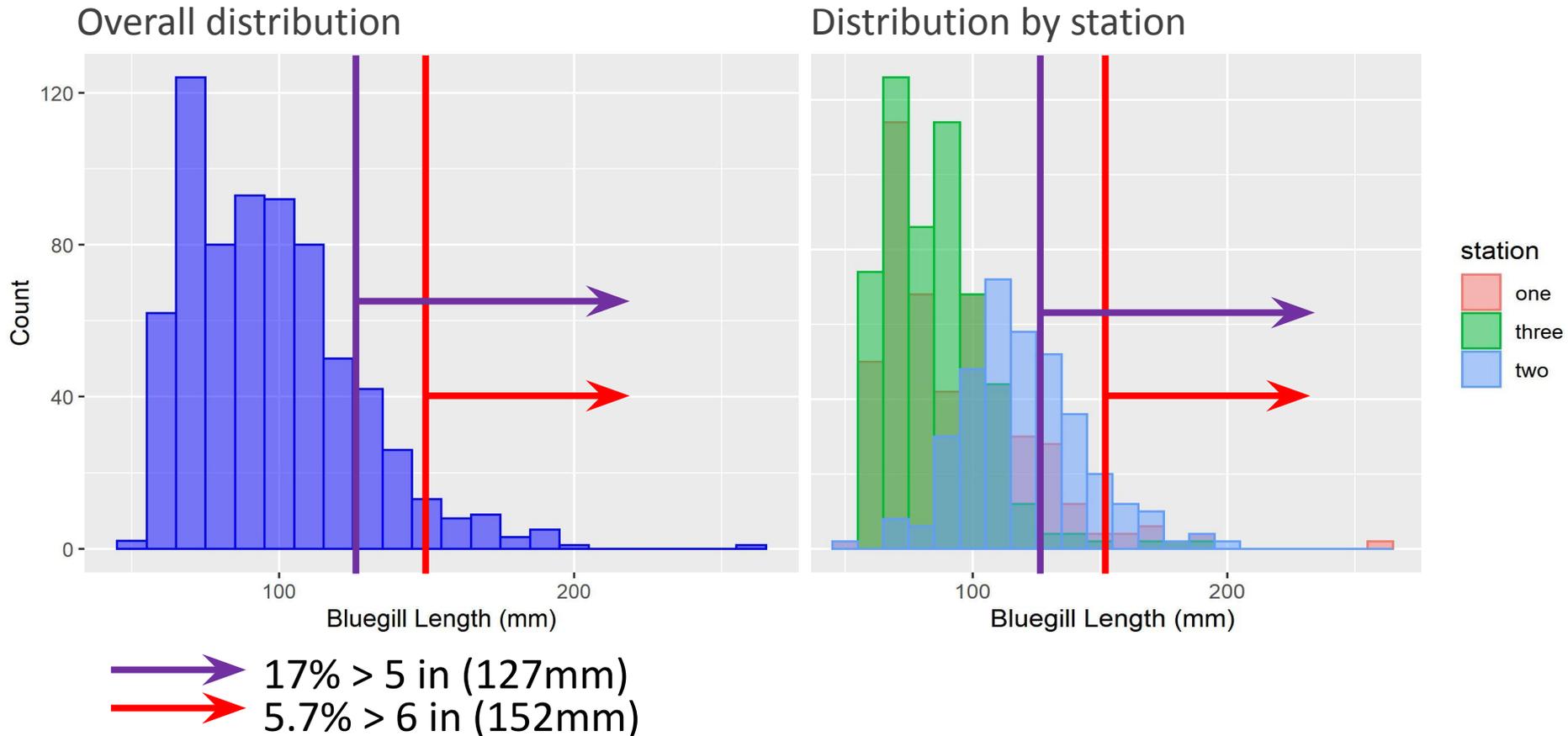
Captured Species:

Bluegill
Largemouth bass
Smallmouth bass
Longnose gar
Rock bass
Green sunfish
Pumpkinseed sunfish

Fyke Net Results

	Station 1		Station 2		Station 3		Average per trap*night
	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2	
Bluegill	107	133	59	122	138	132	115.2
Largemouth Bass	5	4	3	1	15	3	5.2
Smallmouth Bass	0	0	0	0	13	0	2.2
Longnose Gar	2	1	4	1	6	1	2.5
Rock Bass	0	2	2	3	0	8	2.5
Green Sunfish	5	5	1	1	0	1	2.2
Pumpkinseed	0	0	0	1	0	0	0.2
Totals	119	145	69	129	172	145	

Captured bluegills reflect small size distribution





Longnose Gar



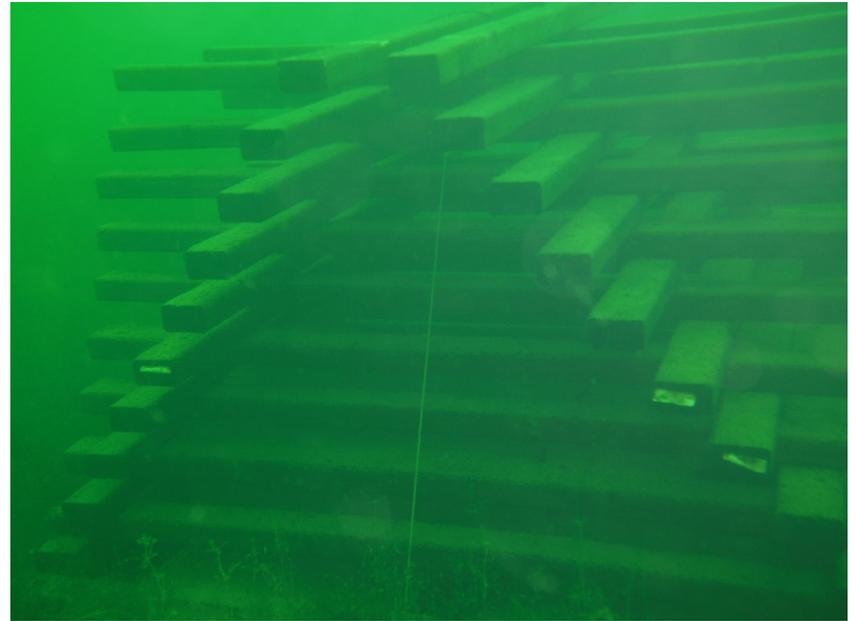
One “memorable” Bluegill

Fyke Net Summary

- Bluegills most abundant fish sampled, with small size distribution
- 15 longnose gar sampled
- Walleye, northern pike, yellow perch absent *in this survey*
- WLC surveys complement 2017 survey's by Cason and Associates. Differences may reflect:
 - Sampling method (e.g., we could not electroshock large fish)
 - Time of year
 - Possibly changes to fish community



Scuba surveys



Fish cribs located—thank you Paul Raab and Cody Lincoln!

Scuba Videography

<https://www.youtube.com/watch?v=kwHrG8bnC0s>



<https://www.youtube.com/watch?v=kwHrG8bnC0s>

Vegetation Point Surveys

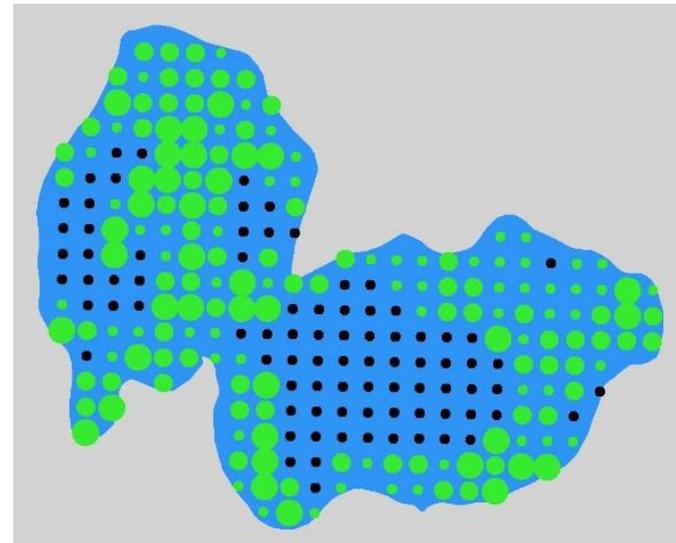
255-coordinate system using defined points allows comparison from year-to-year

2021 survey compared to 2015 survey

9 species of plant or macroalgae identified and mapped according to density

Species identified:

- *Chara*
- Spiny naiad
- Slender naiad
- Illinois pondweed
- Flatstem pondweed
- Variable pondweed
- Sago pondweed
- Eelgrass
- Filamentous algae



Key:

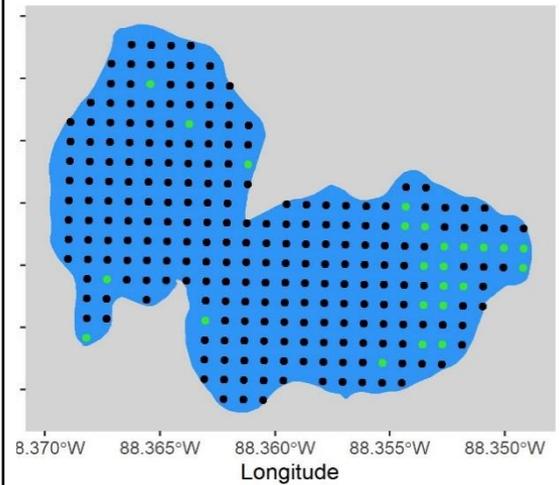
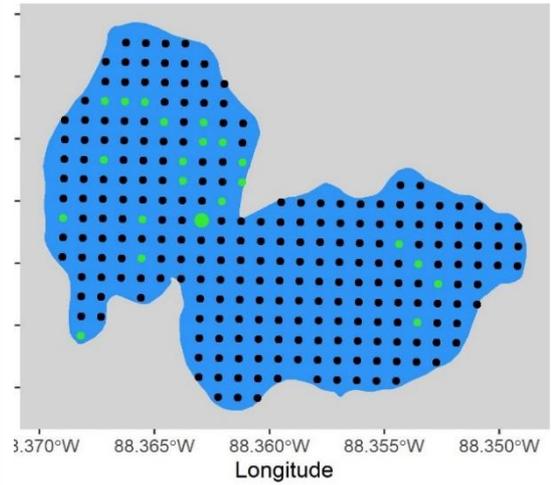
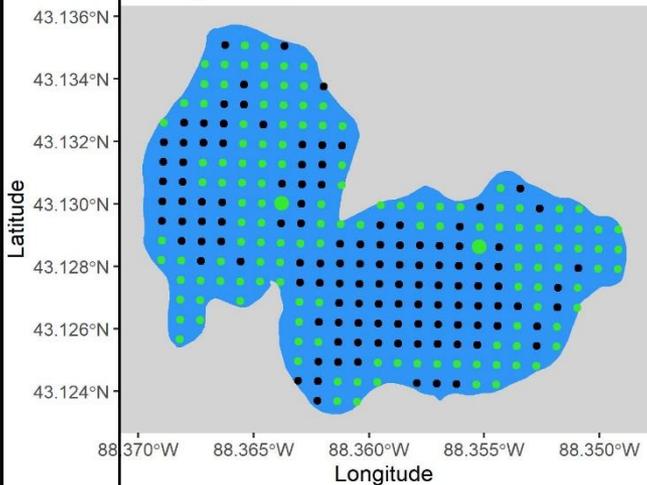
- None of that species present
- Species present
- ½ of rake full
- Full rake

Density of *Chara*

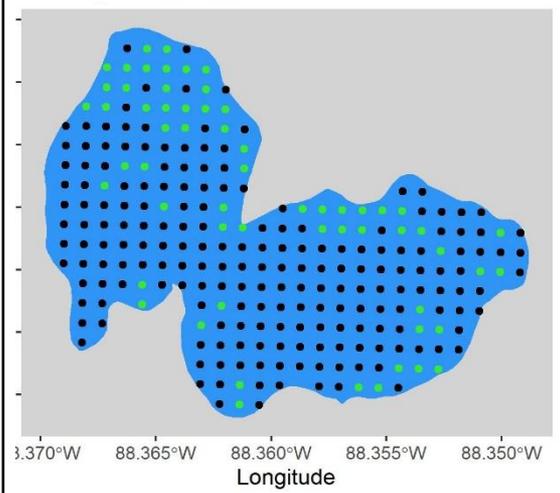
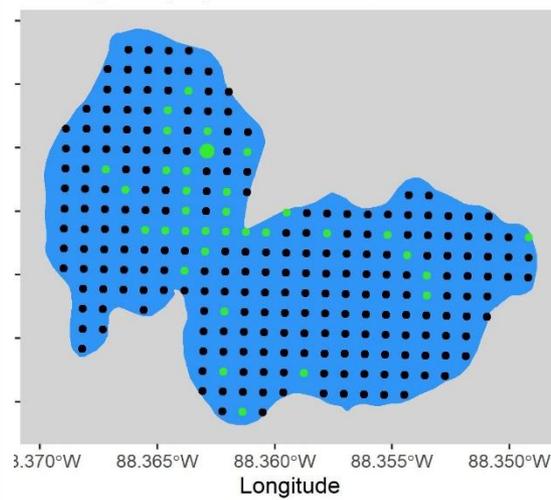
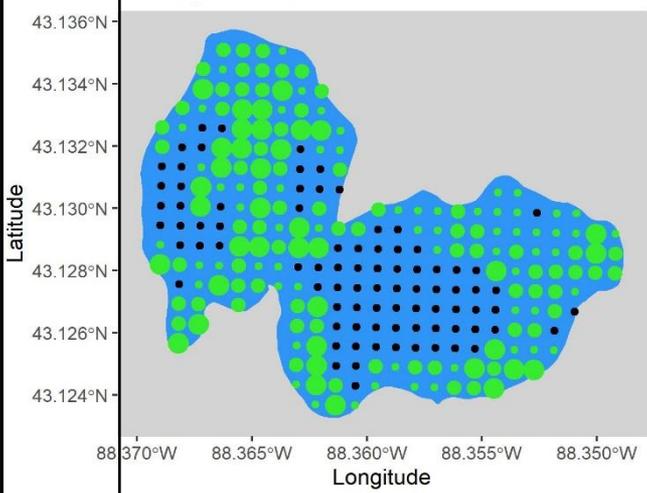
Density of Spiny Naiad

Density of Slender Naiad

2015



2021



Vegetation Point Survey Summary

Lots of *Chara*!

Possible expansion of *Chara*

No EWM in 255-point survey (but some present in shoreline survey)

Used same methods as survey in 2015 (but different samplers may introduce bias)



Meandering Boat Survey

Shoreline survey conducted in August 2021, with primary objective to identify Eurasian water milfoil

Eurasian water milfoil identified at 5 locations

- *Very* sparse (usually individual plants present)
- Survey limited to shallow water along shorelines due to clarity

Additional species identified:

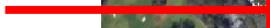
- Yellow pond lily
- White pond lily



EWM manually pulled in Sept 2021



Pulled
3 – 6
plants



Water
too
choppy
to see
clearly



Pulled
10 – 20
plants



Pulled
1 – 2
plants



Did not
locate
any
milfoil



EWM Experiment

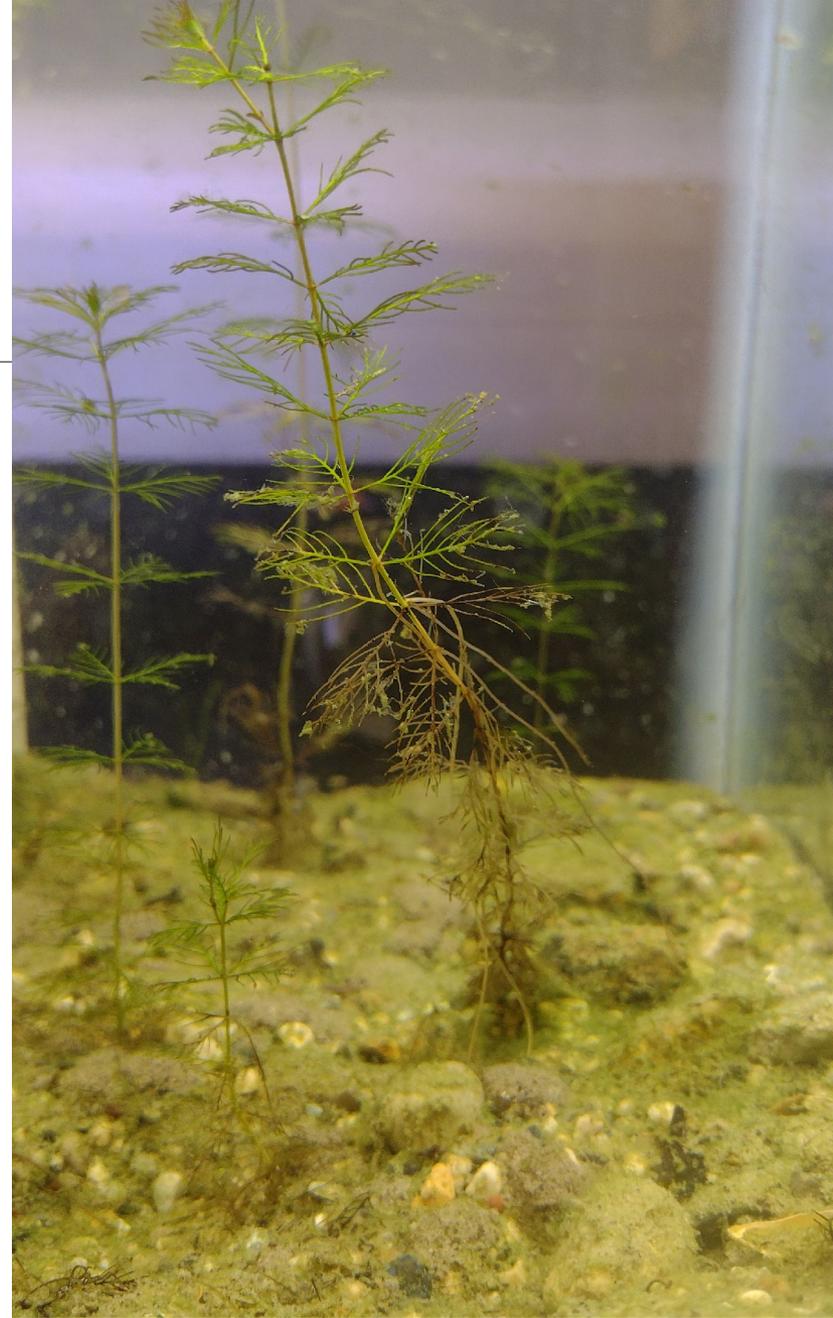
What size milfoil fragment can grow into a new plant?





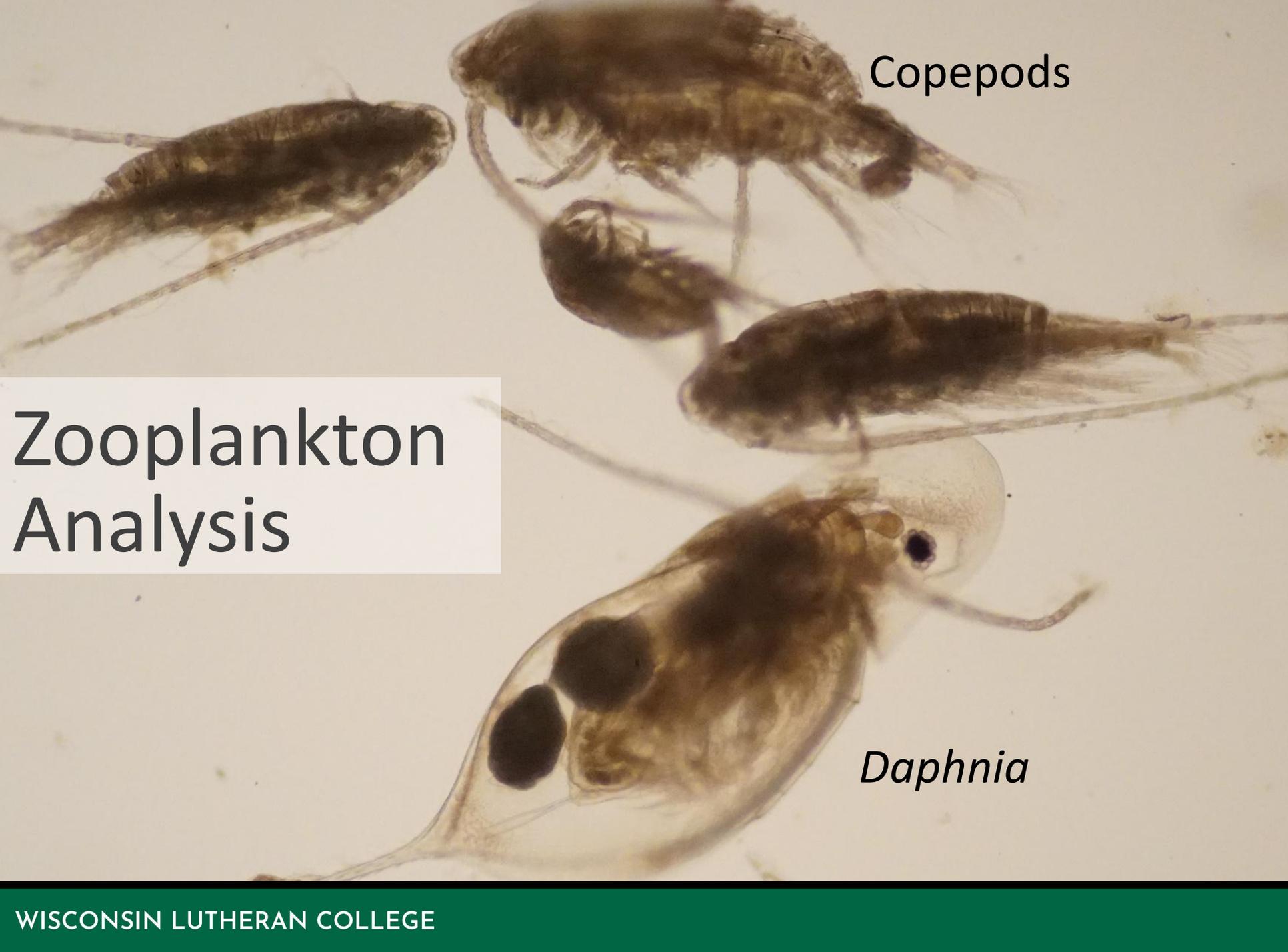
Milfoil Fragment Size	Survival
0.5"	0 / 25
1"	2 / 25
1.5"	4 / 25
2"	3 / 25
2.5"	7 / 25

Roots growing from stem



Left: pulled milfoil (~8 – 12 leaflet pairs)
Right: lab-grown milfoil (~8 or fewer leaflet pairs)





Copepods

Zooplankton Analysis

Daphnia

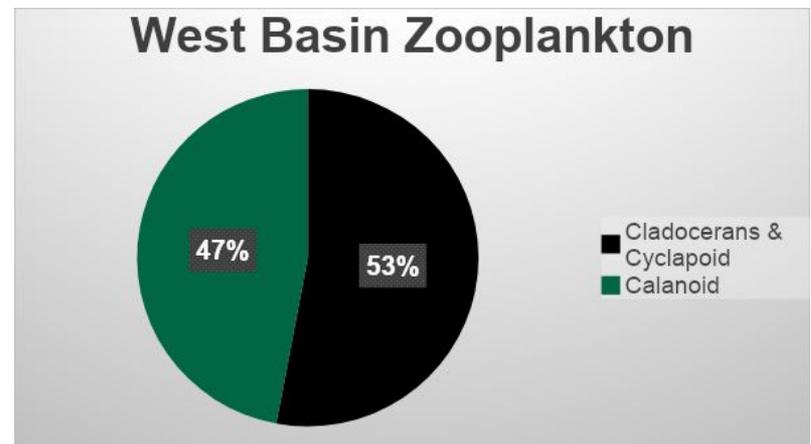
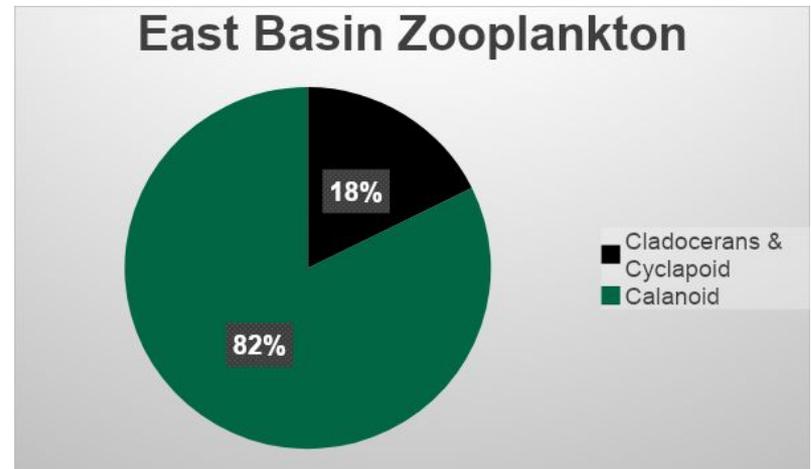
Zooplankton Analysis

Zooplankton provides base for future years' comparison

High proportion of calanoid copepods (green) correlates with lower nutrient levels

Substantial variation between East / West Basin

Pewaukee Lake: calanoids between 15% and 47% in last 21 years



Water Chemistry Observations

Dissolved oxygen, temperature, and conductivity measured in West and East basins in April, July, October

Thermocline established in summer; water well-mixed in April and October

Hypoxia recorded in West basin in July (not abnormal)

