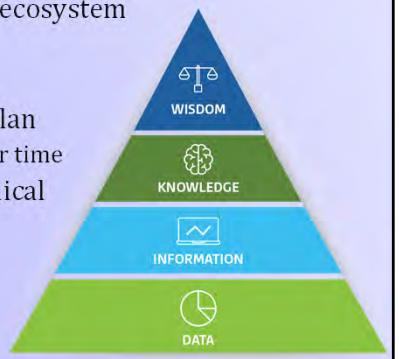
A

APPENDIX A

Public Participation Materials

Management Planning Project Overview

- Foster holistic understanding of ecosystem
- Collect & analyze data
  - Technical & sociological
- Construct long-term & useable plan
  - Living plan subject to revision over time
- Onterra's role is to provide technical direction
  - Not really recommendations



Onterra LLC Lake Management Planning

Management Planning Project Overview

Collect and compile information

Includes both environmental & sociological
Historical & current information
Past management actions

Planning Meeting I
Data Sections

Create a realistic and implementable management plan

Challenges facing lakes and lake groups
Create goals that will address challenges
Develop actions that will meet goals
Assign timeframes & facilitators

Planning Meeting II
Implementation Plan

Comprehensive Management Plan Outline

- 1.0 Introduction
- 2.0 Stakeholder Participation
- 3.0 Study Results
  - 3.1 Water Quality
  - 3.2 Watershed
  - 3.3 Shoreland Condition
  - 3.4 Aquatic Plants
  - 3.5 AIS
  - 3.6 Fishery
- 4.0 Summary & Conclusions
- 5.0 Implementation Plan
- 6.0 Methods
- 7.0 Literature Cited
- 8.0 Individual Lake Sections
  - 8.X.0 Introduction
  - 8.X.1 Water Quality
  - 8.X.2 Aquatic Vegetation

Onterra LLC Lake Management Planning

Comprehensive Management Plan Outline

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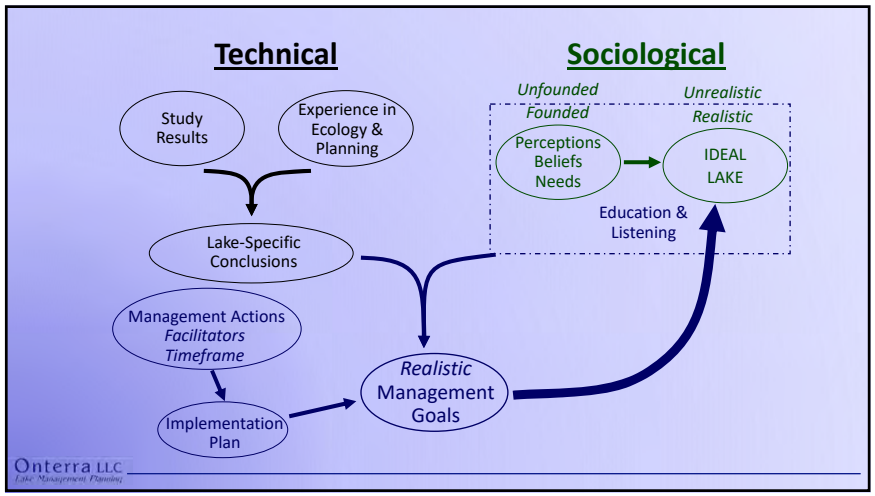
Plan Mtg I

Plan Mtg I

Planning Meeting II

Onterra LLC Lake Management Planning



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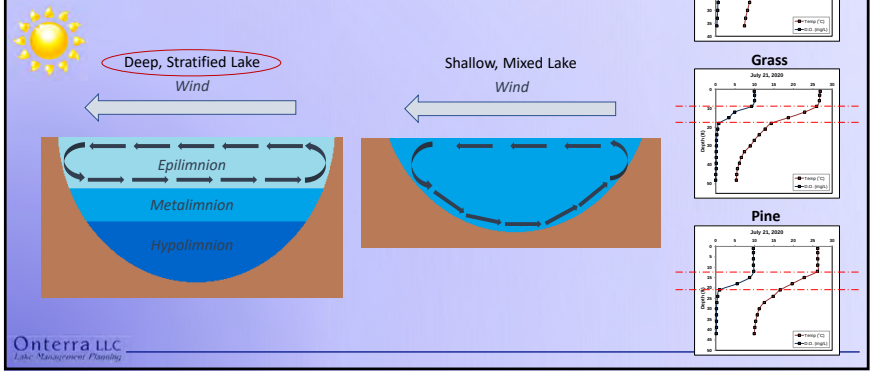
Plan Mtg I

Plan Mtg I

Planning Meeting II

Wisconsin Lakes Classification



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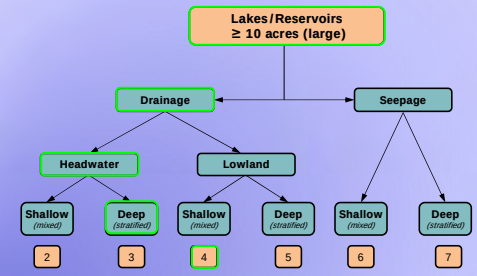
Natural Community Types

Categorization of lakes with similar features that influence water quality



Ecoregions

An area containing similar geology, physiography, hydrology, climate, and soils. As well as common terrestrial and aquatic fauna.

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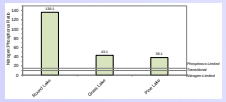
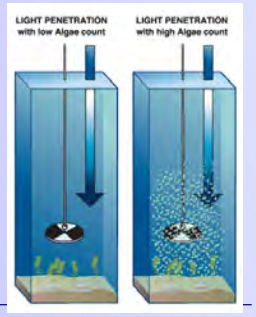
Introduction to Lake Water Quality

Phosphorus
Naturally occurring & essential for all life
Regulates phytoplankton biomass in **most** WI lakes
Most often 'limiting plant nutrient' (shortest supply)
Human activity often increases P delivery to lakes

Chlorophyll-*a*
Pigment used in photosynthesis
Used as surrogate for phytoplankton biomass

Secchi Disk Transparency
Measure of water clarity
Measured using a Secchi disk





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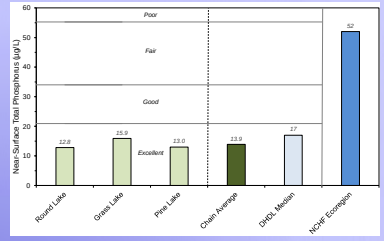
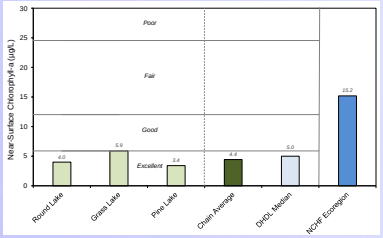
Cloverleaf Lakes Water Quality

Near-Surface Total Phosphorus



- ***Excellent*** **for Deep Headwater Drainage Lakes**
- **Much lower than the Ecoregion Median**
- ***Marl*** **binds with TP and settles out of water column**

Chlorophyll-a



- ***Excellent*** **for Deep Headwater Drainage Lakes**
- **Much lower than the Ecoregion Median**

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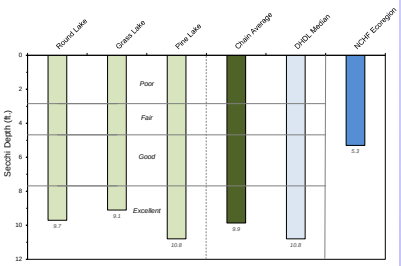
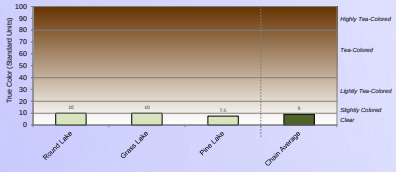
Cloverleaf Lakes Water Quality

Secchi Disk Transparency





- ***Excellent*** **for Deep Headwater Drainage Lakes**
- **Much lower than the Ecoregion Median**
- **Minimally impacted by tanins**

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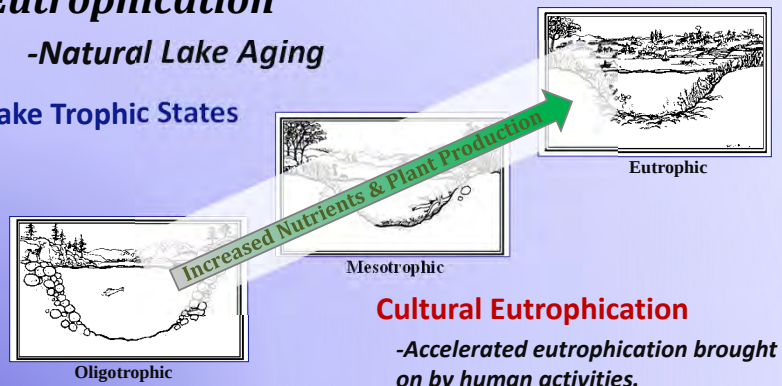
Eutrophication

-Natural Lake Aging

Lake Trophic States



Cultural Eutrophication

-Accelerated eutrophication brought on by human activities.

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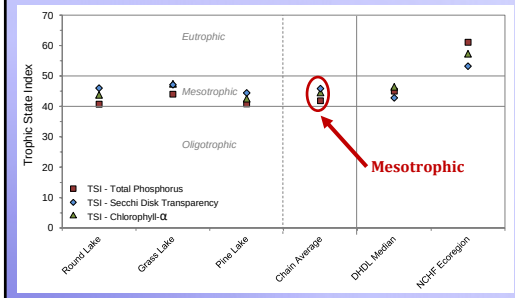
Cloverleaf Lakes Water Quality



Trophic State Index

A method to relate the trophic parameters – phosphorus, chlorophyll-a, and Secchi transparency, and understand the trophic lake of a lake.

- **Calcium Carbonate influenced**
- **Increasing trends on all lakes**

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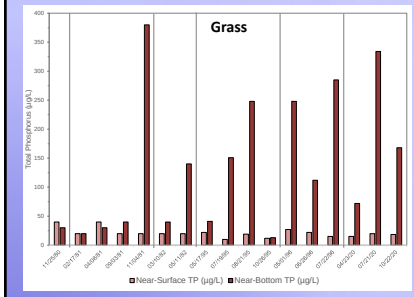
Cloverleaf Lakes Water Quality
Internal Phosphorus Loading



What is internal loading?

- Release of P from anoxic sediments
- Iron binds P with oxygen and releases it (dissolves) when no oxygen is present (anoxic).
- P is then made available to algae following turnover event
- Occurring on all lakes, particularly Grass

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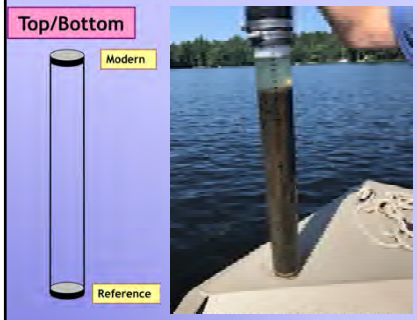
Cloverleaf Lakes Paleocology



Sediment core

Top-Bottom Sediment Core Results

- Pine had the best "core."
- Grass likely has unusually high sedimentation rates.
- Prior to European settlement, chain had slightly lower phosphorus.
- Likely greatest increase in TP in Round > Grass > Pine
- Plant community largely similar to pre-European times.

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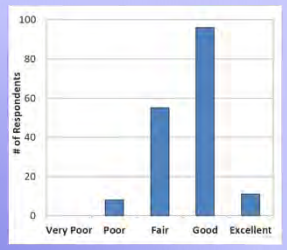
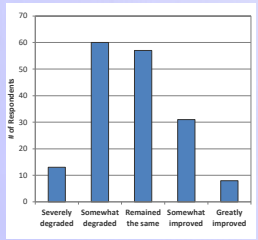
Stakeholder Perceptions of Water Quality

42% Response Rate

How would you describe the current water quality of Cloverleaf Lakes?



How has water quality changed in Cloverleaf Lakes since you first visited?



~50% of stakeholder survey respondents indicated that *water clarity (clearness of water)* is the single most important aspect when considering water quality, whereas aquatic plant growth was most important to ~26% of respondents

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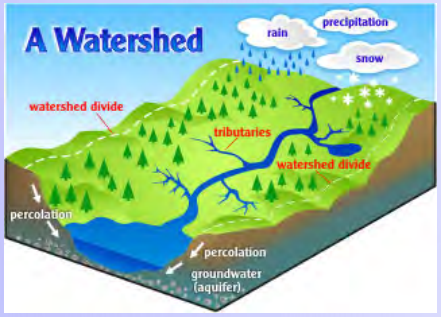
Watershed

Wolf River Watershed



Geographic area within which all water drains to a common point

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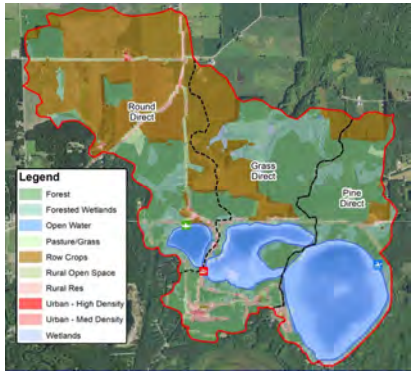
Cloverleaf Lakes Watershed

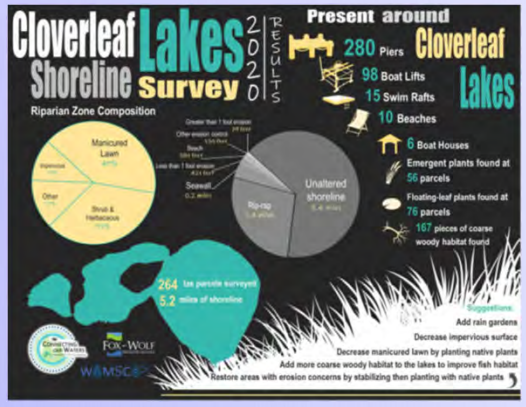


~1,800 acres
WS:LA = 7:1
Residence Time: ~1 year

- Controlled by dam on Pine Lake, potentially influenced by Auld Rohr Dam (at Pine Manor)
- Sanitary district in place

Shoreland Assessment

- Shoreland area is important for buffering runoff and provides valuable habitat for aquatic and terrestrial wildlife.
- EPA National Lakes Assessment results indicate shoreland development has greatest negative impact to health of our nation's lakes.
- Surveys conducted by Fox-Wolf Watershed Alliance, with support from WAMSCO in 2020



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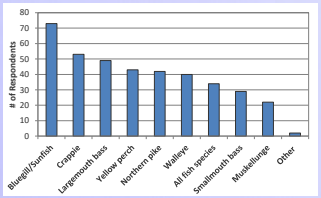
Lake Management Planning

Stakeholder Perceptions of Fisheries

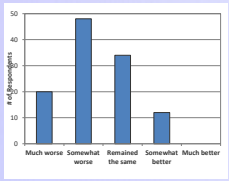
42% Response Rate

What species of fish do you like to catch on Cloverleaf Lakes?



How would you describe the current quality of fishing on Cloverleaf Lakes?

How has the quality of fishing changed on Cloverleaf Lakes since you started fishing the lake?



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Fisheries Data

Walleye	Put-Grow-Take fishery Low density	
Muskellunge	Class B – good fishing, but less than prime waters	Currently at 0.25 fish/acre, within target population
Northern Pike	Low size and abundance	
Bass	Largemouth are common	Managed for large population go keep panfish populations in check
Panfish	Bluegill, black crappie, and pumpkin seed are common, yellow perch are present.	Special panfish regs in 2016 imposed to increase size structure

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Aquatic Plant Surveys

- Determine changes in plant community from past surveys
- Assess both native and non-native populations
- Numerous surveys used in assessment
  - Early-Season AIS Survey (CLP, EWM, PYI)
  - Whole-Lake Point-Intercept Surveys
  - Late-Season AIS Survey (EWM)
  - Emergent/Floating-Leaf Community Mapping Survey (PL)

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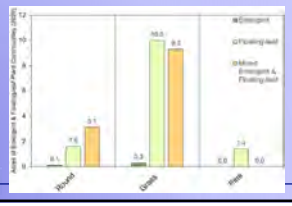
Highlights of Aquatic Plant Surveys

- **44 Species in 2020**
  - Eurasian watermilfoil (EWM)
  - Curly-leaf pondweed (CLP)
  - Pale-yellow iris (PYI)
  - Purple loosestrife (PL)
  - Phragmites (aka giant reed)
  - Starry stonewort in 2021 (SSW)
- **Community Mapping Surveys**



Scientific Name	Common Name	Status in Wisconsin	Coefficient of Conservatism	Growth Form	Round 2020	Grass 2020	Pine 2020
Acorus calamus	Sweetflag	Non-Native - Naturalized	N/A	E	I		
Brasenia schreberi	Watershield	Native	7	FL	I	X	I
Carex aquatilis	Long-bracted tussock sedge	Native	7	E	I	I	
Ceratophyllum demersum	Coontail	Native	3	S	X	X	X
Chara spp.	Muskgrasses	Native	7	S	X	X	X
Decodon verticillatus	Water-willow	Native	7	E		I	
Eleocharis palustris	Creeping spikerush	Native	6	E	I		
Elodea canadensis	Common waterweed	Native	3	S	X	X	X
Iris pseudacorus	Pale-yellow iris	Non-Native - Invasive	N/A	E	I	I	I
Lemna minor	Lesser duckweed	Native	5	FF	X		
Lemna trisulca	Forked duckweed	Native	6	FF		X	
Lemna turionifera	Turion duckweed	Native	2	FF	X		
Lythrum salicaria	Purple loosestrife	Non-Native - Invasive	N/A	E	I	I	
Myriophyllum sibiricum	Northern watermilfoil	Native	7	S			X
Myriophyllum spicatum	Eurasian watermilfoil	Non-Native - Invasive	N/A	S	X	X	X
Najas flexilis	Slender naiad	Native	6	S	X	X	X
Najas guadalupensis	Southern naiad	Native	7	S		X	X
Nasturtium officinale	Watercress	Non-Native - Invasive	N/A	S/E	X		
Nitella spp.	Stoneworts	Native	7	S	X		X
Nuphar variegata	Spatterdock	Native	6	FL	X	X	I
Nymphaea odorata	White water lily	Native	6	FL	X	X	I
Phragmites australis subsp. *australis*	Giant reed	Non-Native - Invasive	N/A	E	I	I	
Pontederia cordata	Pickerelweed	Native	9	E	I	I	
Potamogeton amplifolius	Large-leaf pondweed	Native	7	S	X	X	
Potamogeton berchtoldii	Slender pondweed	Native	7	S	X		
Potamogeton crispus	Curly-leaf pondweed	Non-Native - Invasive	N/A	S	X	I	X
Potamogeton friesii	Fries' pondweed	Native	8	S			X
Potamogeton gramineus	Variable-leaf pondweed	Native	7	S		X	X
Potamogeton illinoensis	Illinois pondweed	Native	6	S	X	X	X
Potamogeton natans	Floating-leaf pondweed	Native	5	S		X	
Potamogeton pusillus	Small pondweed	Native	7	S		X	
Potamogeton richardsonii	Clasping-leaf pondweed	Native	5	S	X	X	X
Potamogeton strictifolius	Stiff pondweed	Native	8	S	X		
Potamogeton zosteriformis	Flat-stem pondweed	Native	6	S	X	X	X
Ranunculus aquatilis	White water crowfoot	Native	8	S	X		
Sagittaria latifolia	Common arrowhead	Native	3	E	I		
Schoenoplectus acutus	Hardstem bulrush	Native	5	E	X	X	I
Schoenoplectus tabernaemontani	Softstem bulrush	Native	4	E	I	I	
Sparganium spp.	Bur-reeds	Native	5	FF	X	X	
Stuckenia pectinata	Sago pondweed	Native	3	S	X	X	X
Typha spp.	Cattail spp.	N/A	N/A	E	I	I	
Utricularia vulgaris	Common bladderwort	Native	7	S		X	X
Vallisneria americana	Wild celery	Native	6	S	X	X	X
Wolffia spp.	Watermeal spp.	Native	N/A	FF	X		

X = Located on rake during point-intercept survey; I = Incidental Species
E = Emergent; FF = Free-floating; FL = Floating-leaf; S = Submergent; S/E = Submergent/Emergent

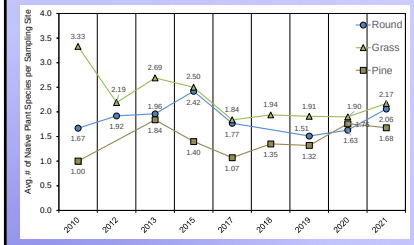
Factors that Impact Aquatic Plants on Cloverleaf Lakes

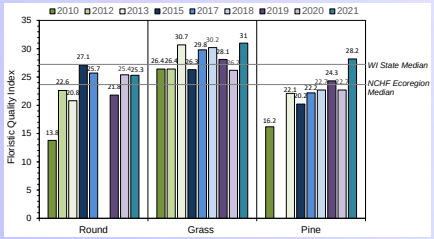
- **Natural Environmental Changes**
  - Natural population dynamics
  - Climactic conditions
- **Aquatic Plant Management**
  - Herbicide Treatments

	Round	Grass	Pine	Grass & Round Treated for CLP
2004	68.0			
2005	41 acres treated/ 2 acres hand-harvested			
2006	20.0			X
2007	19.5			X
2008	5.9			X
2009	4.2		2.1	
2010	9.2			5 acres
2011	11.85			
2012	4.6	24.5	2.48	
2013		6.5	65.7	
2014				
2015	1.9		1.5	
2016	3.96	32.0	77.1	
2017				
2018	4.6	0.27		
2019		1.2	0.6	
2020	1202 lbs.			
2021		6.8		

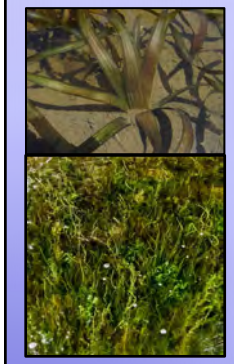
2,4-D Whole-lake Herbicide Treatment
2,4-D Herbicide Spot-Treatment
Fluridone Whole-lake Herbicide Treatment
DASH/Hand-Harvesting
Combination of Herbicides for CLP Spot-Treatment
ProcellaCOR Spot-Treatment with Whole-Lake Potential

Vegetation Trend Analysis

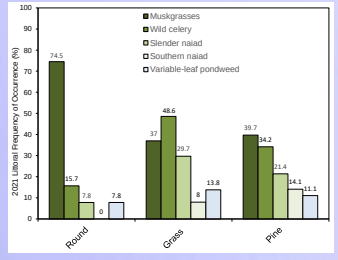




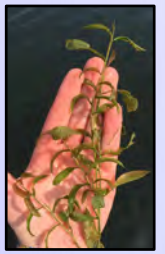
Frequent Species



Wild Celery



Muskgrasses

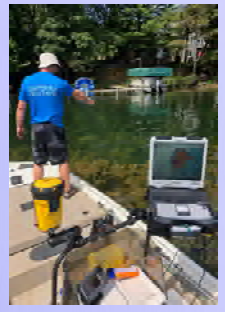


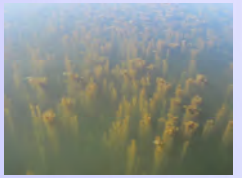
Variable-leaf Pondweed

Slender Naiad

Southern Naiad

Professional AIS Mapping





Point-Based Mapping

- Single or Few Plants
- Clumps of Plants
- Small Plant Colony

Polygon-Based Mapping

- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting

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Non-Native Emergent Aquatic Plants

Pale Yellow Iris

Purple Loosestrife

Phragmites (Giant Reed)

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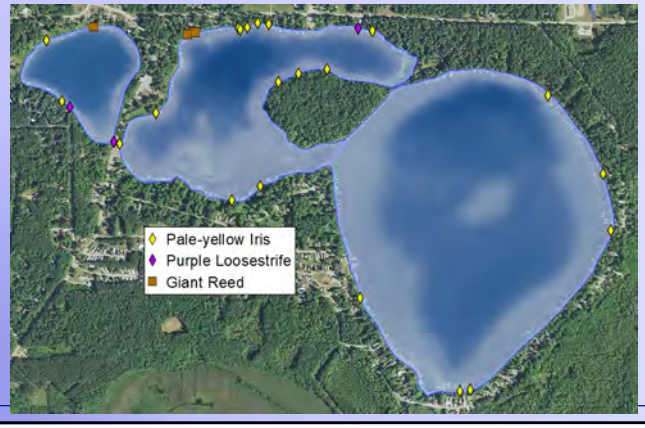
Non-Native Emergent Aquatic Plants



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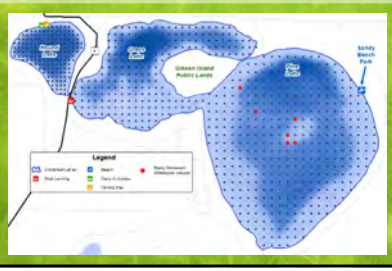
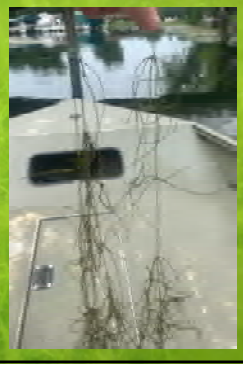
Non-Native Aquatic Plants
Starry Stonewort

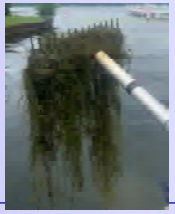
- **Suspicious specimens in 2019, identification could not be confirmed**
- **Located at 6 PI locations in 2021**





Biology of Starry Stonewort

- Starry stonewort (*Nitellopsis obtusa*) is a macroalgae (non vascular)
- Native to Europe & Asia; rare in portions of its range.
- First documented in St. Lawrence River in 1970s; likely transported to U.S. via international ballast water.
- North American clones are all male; spread by fragmentation & bulbils



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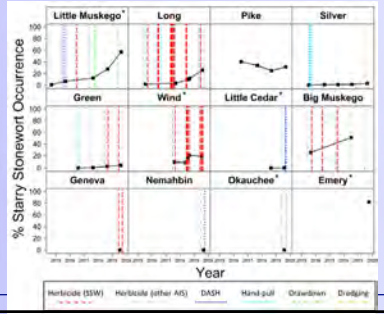
Management of Starry Stonewort

- Preventing spread to new waterbodies
- Current control methods have not shown a measurable impact
  - Algaecides (limno-curtains)
  - Hand-Harvest/DASH
  - Dredging
  - Winter drawdown



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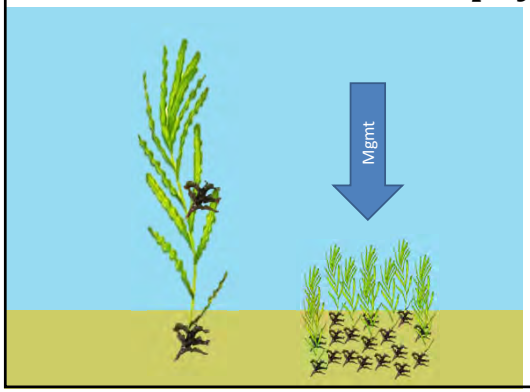
Non-Native Aquatic Plants
Curly-Leaf Pondweed

- **First officially documented from system in 1992**
- **Need to rely on mapping data, as CLP senescence occurs before point-intercept surveys**

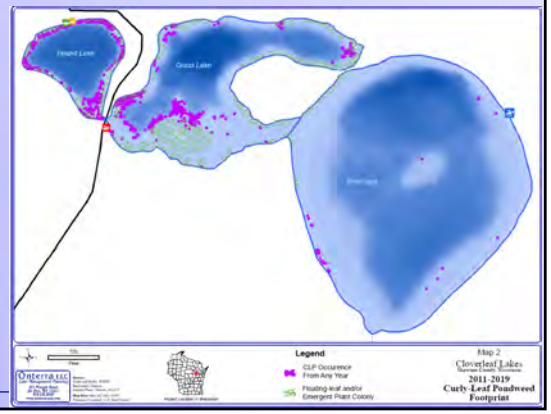
CLP Life-Cycle & Control Strategy Philosophy



- Established populations typically have 5-10 years of viable turions in sediment
- Unless documented ecological impacts, established populations not targeted for lake-wide management
- Dies off around July 4th

CLP Population

- Some herbicide treatment in mid-2000s to 2010
- 2011-2021 has been only low-density occurrences
- Onterra is hesitant on recommending active management



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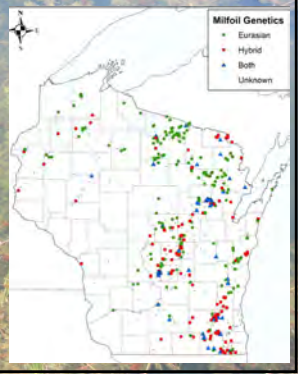
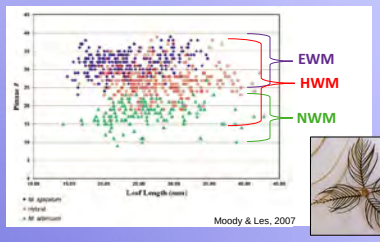
Non-Native Aquatic Plants

Eurasian Watermilfoil

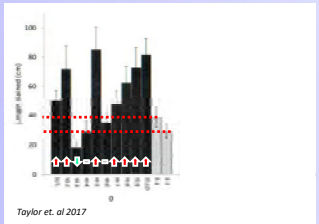
- First "officially" documented in 1992
- Handful of samples sent in for DNA (2012, 2015) have all been HWM



Science on Invasive Watermilfoil Hybridity



Moody & Les, 2007



Taylor et. al 2017

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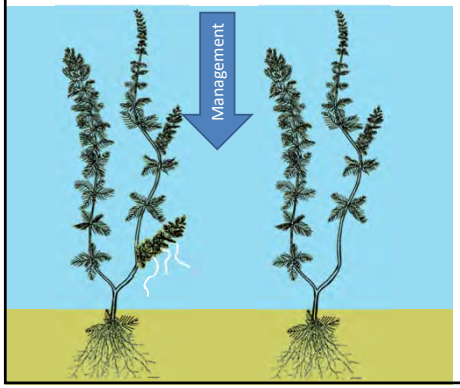
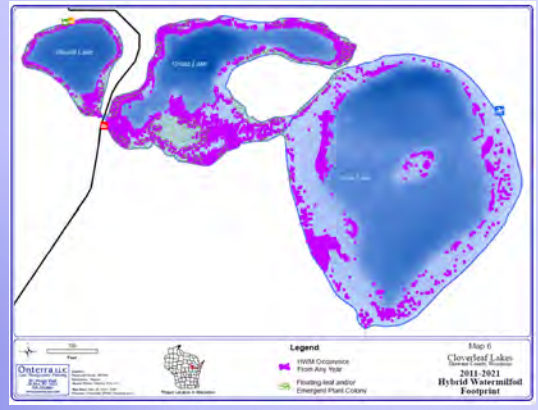
EWM Life-Cycle & Control Strategy Philosophy



- Strategy is straight-forward compared to CLP management
- Herbicide needs to translocate to root crown (*hard to kill with herbicides*)
- Hand-harvesting is analogous to single treatment (*extremely time intensive)*
- Winter drawdown can be effective if completely de-water and desiccate/freeze roots.

2011-2021 EWM Population



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Best Management Practices (BMPs)

- **A "placeholder" term to represent the management option that is currently supported by that latest science and policy**
- **Definition evolves over time**
  - Pre 2010 - small spot treatments with granular products
  - Early 2010s - larger spot treatments with liquid products
  - Mid 2010s – whole-lake treatments, spot treatments with herbicide combos, hand-harvesting/DASH
  - Current– whole-lake/basin approaches, nuisance maintenance vs population management, mechanical harvesting, increasing human tolerance, new herbicides

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Integrated Pest Management Strategies (IPM)

- **Using a combination of methods that are more effective when applied collectively as part of defined strategy than when conducted separately**
  - Prevention
  - Biological control
  - Biomanipulation
  - Nutrient management
  - Habitat manipulation
  - Substantial modification of cultural practices
  - Pesticide application
  - Water level manipulation
  - Mechanical removal
  - Feasibility planning
  - Population monitoring

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Hand-Harvesting

- **Removal of entire root material required for EWM/HWM**
- **Removal of reproductive structures for CLP/SSW**
- **Scale limitations, not for large or dense areas**
- **Diver-Assisted Suction Harvest (DASH) can increase efficacy**
- **Limitations**
  - –Density of EWM & native plants
  - –Clarity of water
  - –Sediment type
  - –Obstructions

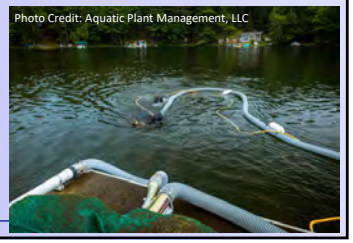
Photo Credit: Aquatic Plant Management, LLC

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Herbicide Treatment

- **Introduces greater need for risk assessment discussion**
  - Known impacts of herbicides
  - Unknown impacts of herbicides
  - Public sentiment
- **How they work**
  - Concentration & Exposure Time (CET)
  - Herbicide dissipation
  - Spot vs whole-lake (whole-basin)
  - Herbicide formulation


Photo Credit: Schmidt's Aquatic, LLC

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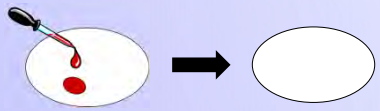
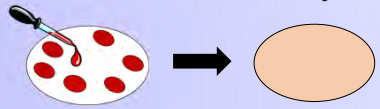
Ecological Definitions of Herbicide Treatment

Spot Treatment: Herbicide applied at a scale where dissipation will not result in significant lake wide concentrations; impacts are anticipated to be localized to in/around application area.



Whole-Lake (basin-wide) Treatment: Herbicide applied at a scale where dissipation will result in significant lake wide concentrations; impacts are anticipated to be on a lake wide scale.



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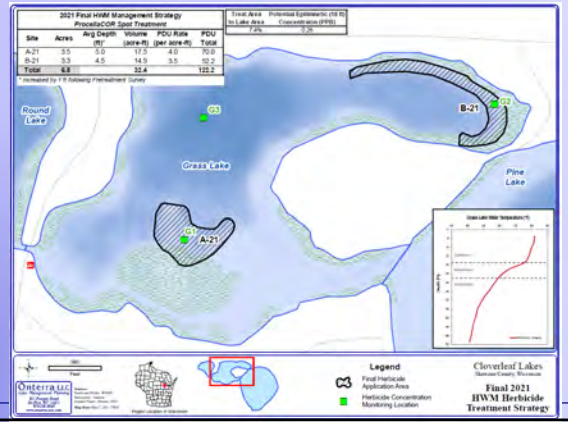
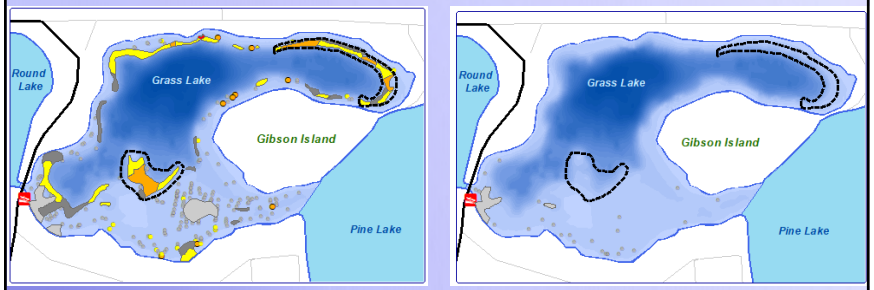
2021 HWM Management Strategy



2021 HWM Management Strategy

ProcellaCOR



Potential whole-lake: 0.26 ppb

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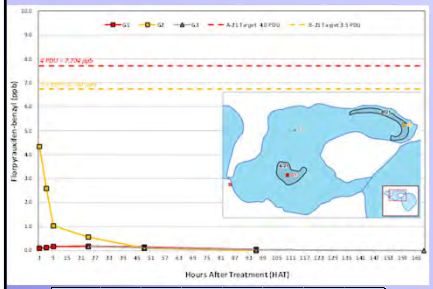
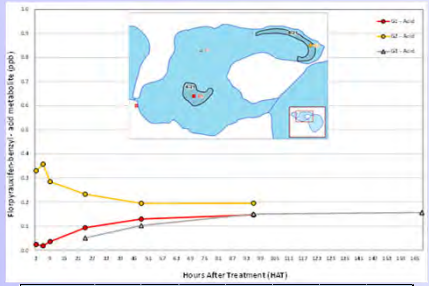
2021 HWM Management Strategy





Florpyrauxifen-benzyl (SX-1552) HAT (ppb)							
	3	6	9	24	48	96	168
G1	0.096	0.124	0.167	0.180	0.146	0.042	
G2	4.340	2.588	1.031	0.564	0.099	0.000	
G3				0.174	0.118	0.035	0.000

Florpyrauxifen-benzyl - Acid (SX-1552-A) HAT (ppb)							
	3	6	9	24	48	96	168
G1 - Acid	0.023	0.018	0.035	0.093	0.129	0.146	
G2 - Acid	0.330	0.357	0.284	0.232	0.194	0.195	
G3 - Acid				0.050	0.102	0.150	0.156

Potential whole-lake: 0.26 ppb

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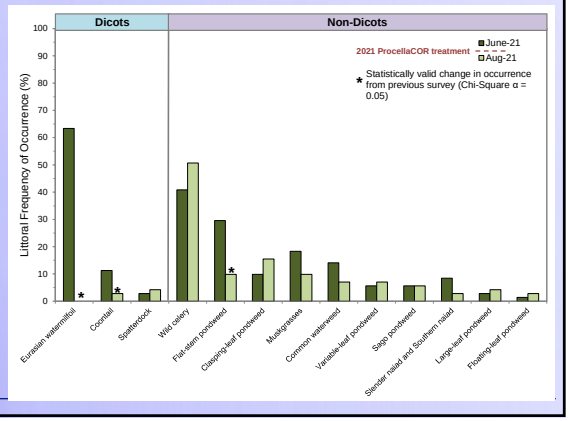
2021 HWM Management Strategy

Sub-Sample PI



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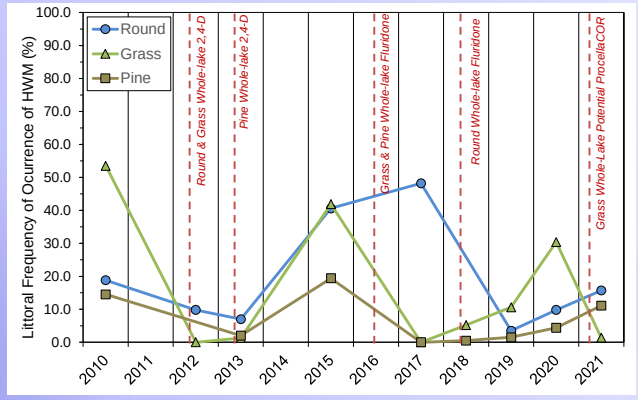
2021 HWM Population

Whole-Lake PI



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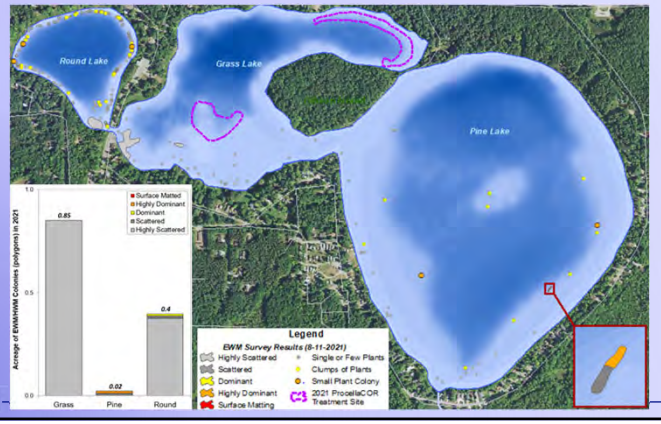
2021 HWM Population



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AIS Management Perspectives

1. **No Coordinated Active Management (Let Nature Take its Course)**
   - Focus on education of manual removal by property owners
2. **Reduce AIS Population on a lake-wide level (Population Management)**
   - Would likely rely on herbicide treatment (risk assessment)
   - Will not "eradicate" AIS
   - Set triggers (thresholds) of implementation and tolerance
3. **Minimize navigation and recreation impediment (Nuisance Control)**
   - May be accomplished through herbicide treatment, hand-harvesting, or mechanical harvesting

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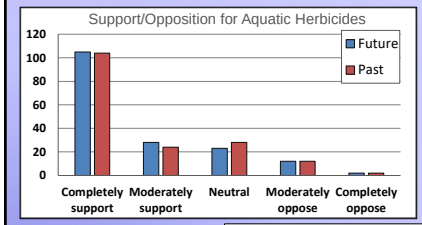
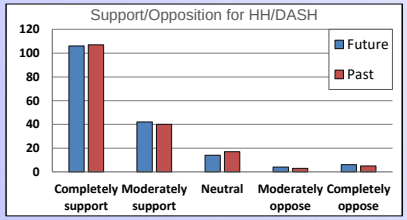
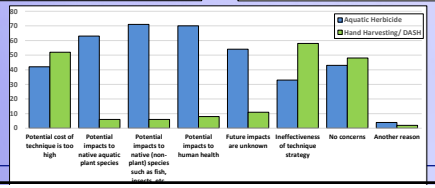
Stakeholder Perceptions of HWM Management

42% Response Rate







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4.0 Conclusions

Water Quality

- Overall "excellent" for Deep Headwater Drainage System
- Marl is dominant driver of water quality
- Internal nutrient loading is occuring
- Evidence exists that the water quality of the chain has decreased in recent decades & since European colonization
- Impacts of zebra mussels is unclear

Watershed

- Relatively small watershed, but large proportion in row crop agriculture
- Sanitary district is good for lake, but also can foster sense of complacency
- Shoreland protection and enhancement important to long-term health

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4.0 Conclusions

Aquatic Plants

- Changes in native plant metrics have been observed, largely responding to herbicide management of HWM
- Stable and high water having negative impact on emergent species, particularly on the "grassy island"
- Development of AIS monitoring & management plans is necessary
  - Emergent AIS (PL, PYI, Phrag)
  - Curly-leaf Pondweed
  - Hybrid Watermilfoil
  - Starry Stonewort

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Planning Meeting II

Primary Objective: Create implementation plan framework

Steps to Achieve Objective:

1. Discuss challenges facing lakes and lake groups
2. Convert challenges to management goals
3. Create management actions to meet management goals
4. Determine timeframes and facilitators to carry out actions

Assignment for Planning Meeting II

1. Create list of challenges facing lake and lake group (keep to yourself)
2. Review stakeholder survey results
3. Send potential report section edits and questions to Onterra

Onterra LLC Lake Management Planning

B

APPENDIX B

Stakeholder Survey Response Charts and Comments

Cloverleaf Chain of Lakes - Anonymous Stakeholder Survey

Surveys Distributed: *413*
Surveys Returned: *173*
Response Rate: *41.9%*

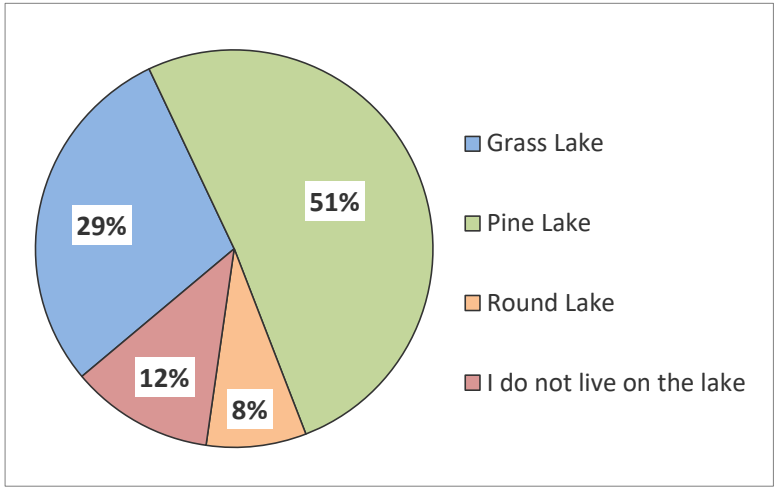
Cloverleaf Lakes Property

1. Is your property on the lake or off the lake?

Answer Options	Response Percent	Response Count
On the lake	84.4%	146
Off the lake	15.6%	27
answered question		**173**
skipped question		**0**

2. On which lake is your Cloverleaf Lakes property located?

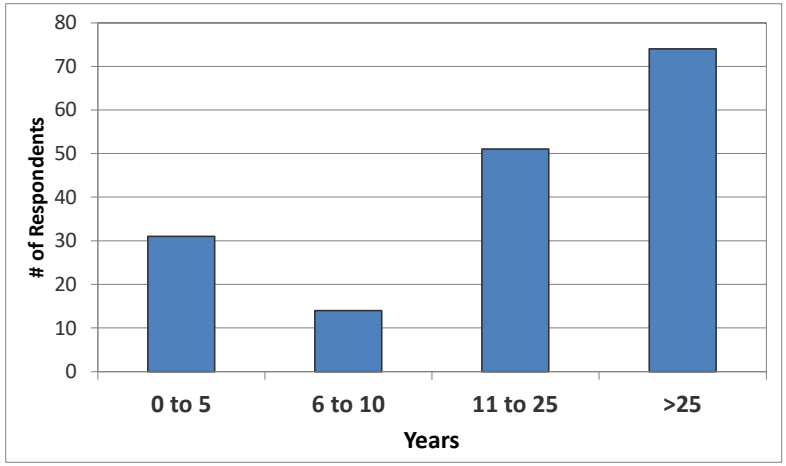
Answer Options	Response Percent	Response Count
Grass Lake	29.1%	50
Pine Lake	51.2%	88
Round Lake	8.1%	14
I do not live on the lake	11.6%	20
answered question		**172**
skipped question		**1**



3. How many years have you owned or rented your property on or near the Cloverleaf Lakes?

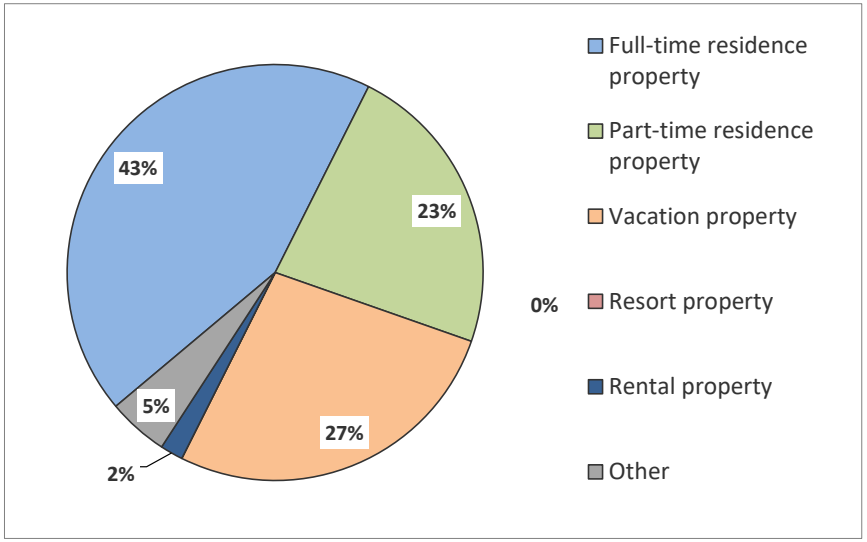
Answer Options	Answer Options	Response Count
		170
	answered question	170
	skipped question	3

Category (# of years)	Responses	% Response
0 to 5	31	18%
6 to 10	14	8%
11 to 25	51	30%
>25	74	44%



4. How is your property on or near the Cloverleaf Lakes used?

Answer Options	Response Percent	Response Count
Full-time residence property	43.5%	74
Part-time residence property	22.9%	39
Vacation property	27.1%	46
Resort property	0.0%	0
Rental property	1.8%	3
Other	4.7%	8
answered question		170
skipped question		3

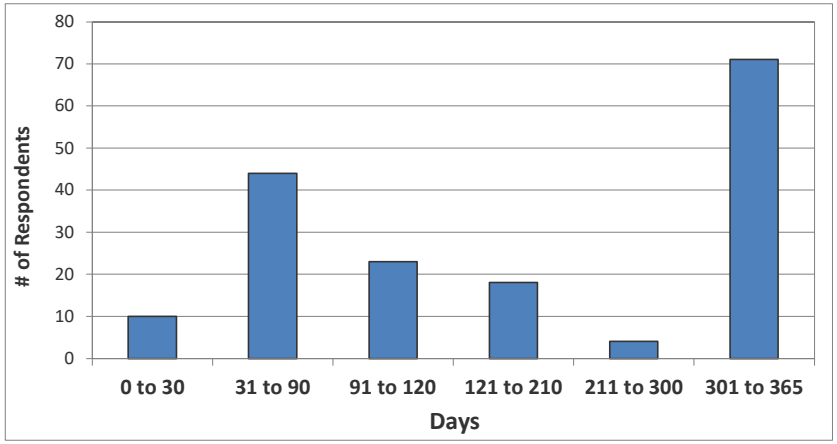


Number	Other
1	Supper Club
2	Cottage used all year
3	Managed forest land/recreation
4	as of last July 2020 full time residence
5	Lot with garage.
6	The Pandemic has greatly reduced our use of the property which effects answers to this and the next questions
7	More full-time than part-time
8	Two properties - full time residency and seasonal cottage

5. Considering the past three years, how many days each year is your property used by you or others?

	Response Count
answered question	170
skipped question	3

Category (# of days)	Responses	%
0 to 30	10	6%
31 to 90	44	26%
91 to 120	23	14%
121 to 210	18	11%
211 to 300	4	2%
301 to 365	71	42%

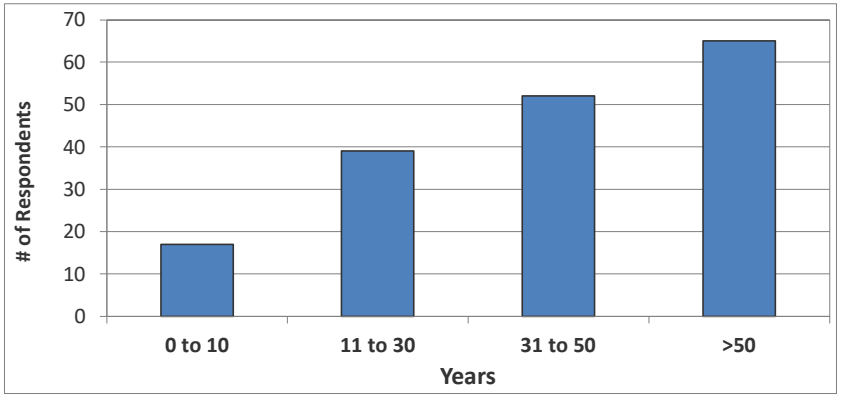


Recreational Activity on Cloverleaf Lakes

6. How many years ago did you first visit the Cloverleaf Lakes?

Answer Options	Response Count
answered question	173
skipped question	0

Category (# of years)	Response Percent	Response Count
0 to 10	9.8%	17
11 to 30	22.5%	39
31 to 50	30.1%	52
>50	37.6%	65

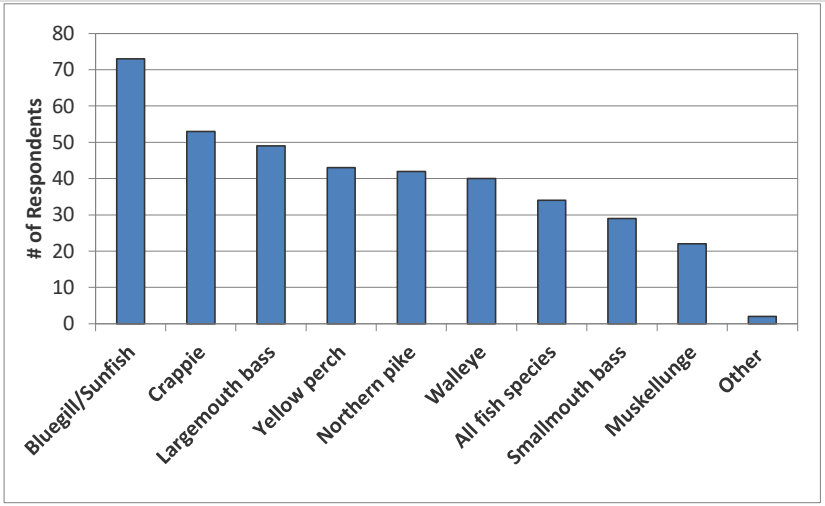


7. Have you personally fished on the Cloverleaf Lakes in the past three years?

Answer Options	Response Percent	Response Count
Yes	65.3%	113
No	34.7%	60
answered question		173
skipped question		0

8. What species of fish do you like to catch on the Cloverleaf Lakes?

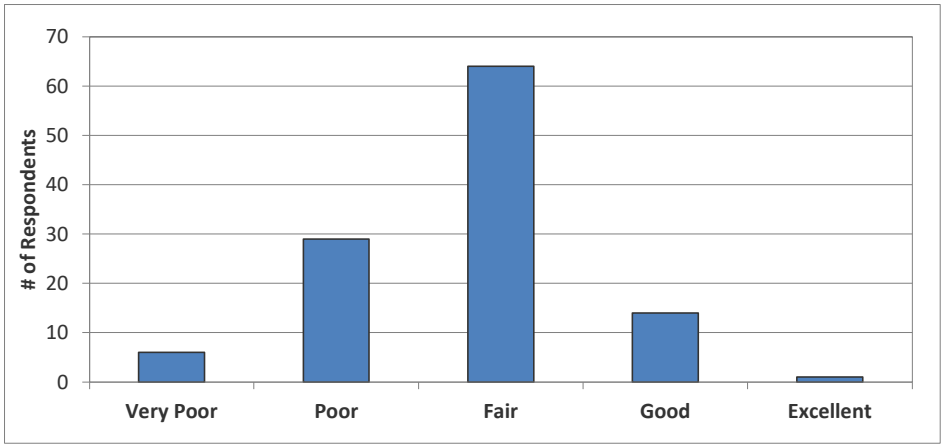
Answer Options	Response Percent	Response Count
Bluegill/Sunfish	64.6%	73
Crappie	46.9%	53
Largemouth bass	43.4%	49
Yellow perch	38.1%	43
Northern pike	37.2%	42
Walleye	35.4%	40
All fish species	30.1%	34
Smallmouth bass	25.7%	29
Muskellunge	19.5%	22
Other	1.8%	2
answered question		113
skipped question		60



Number	Other
1	Have never seen a walleye here
2	mostly weeds

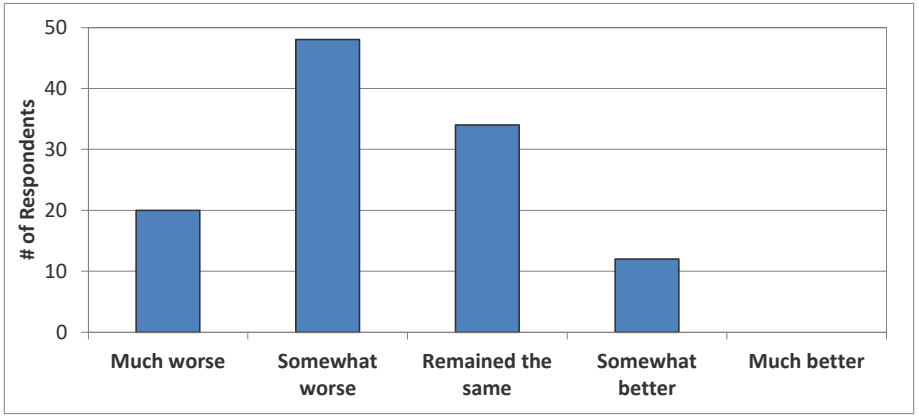
9. How would you describe the current quality of fishing on the Cloverleaf Lakes?

Answer Options	Very Poor	Poor	Fair	Good	Excellent	Response Count
	6	29	64	14	1	114
					answered question	**114**
					skipped question	**59**



10. How has the quality of fishing changed on the Cloverleaf Lakes since you have started fishing the lake?

Answer Options	Much worse	Somewhat worse	Remained the same	Somewhat better	Much better	Response Count
	20	48	34	12	0	114
					answered question	**114**
					skipped question	**59**

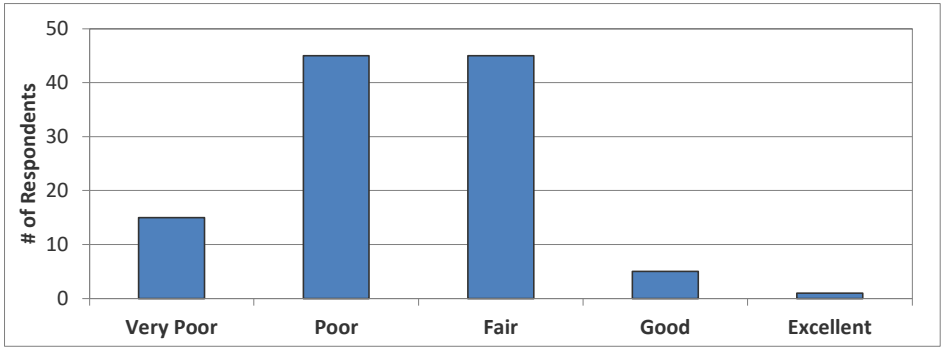


11. New bag limits took effect on the Cloverleaf Lakes in 2016 restricting harvest of large bluegill and sunfish (over 7 inches) to five per day, per angler, to address size structure concerns. Were you aware of these special regulations?

Answer Options	Response Percent	Response Count
Yes	72.6%	82
No	27.4%	31
answered question		**113**
skipped question		**60**

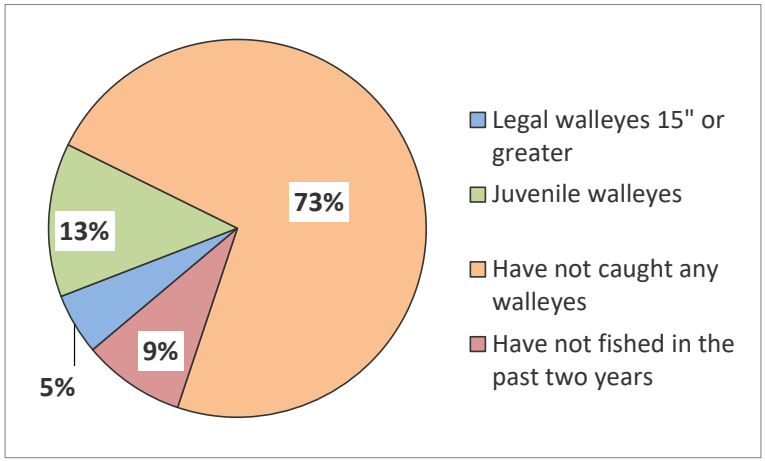
12. How would you describe the current population of keeper-size bluegill and sunfish (over 7 inches)?

Answer Options	Very Poor	Poor	Fair	Good	Excellent	Response Count
	15	45	45	5	1	111
answered question						**111**
skipped question						**62**



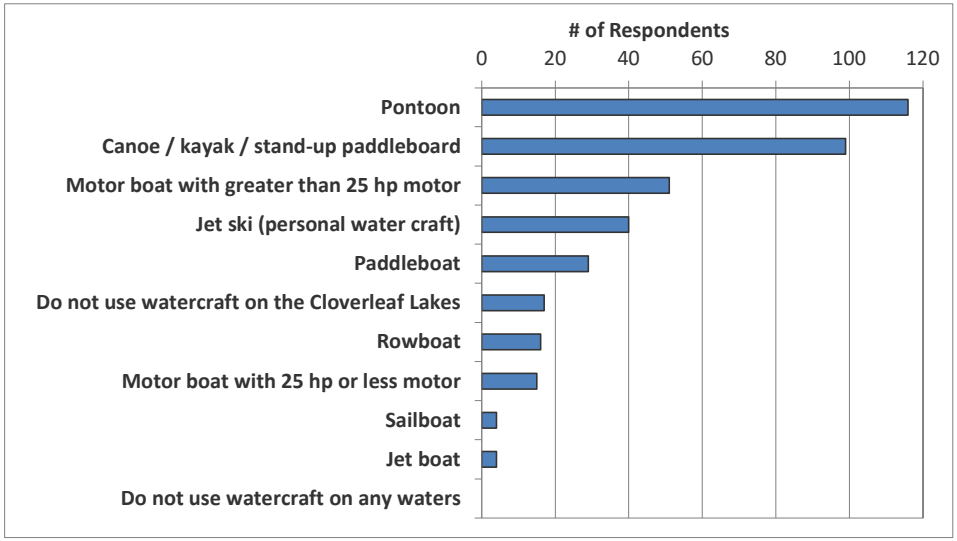
13. Walleye have been stocked intermittently on the Cloverleaf Lakes due to no evidence of natural reproduction and relatively low abundance found in recent WDNR fishery surveys. If you have fished the lakes in the past TWO YEARS, please select all you have caught.

Answer Options	Response Percent	Response Count
Legal walleyes 15" or greater	5.4%	6
Juvenile walleyes	13.5%	15
Have not caught any walleyes	74.8%	83
Have not fished in the past two years	9.0%	10
answered question		111
skipped question		62



14. What types of watercraft do you currently use on the Cloverleaf Lakes?

Answer Options	Response Percent	Response Count
Pontoon	67.8%	116
Canoe / kayak / stand-up paddleboard	57.9%	99
Motor boat with greater than 25 hp motor	29.8%	51
Jet ski (personal water craft)	23.4%	40
Paddleboat	17.0%	29
Do not use watercraft on the Cloverleaf Lakes	9.9%	17
Rowboat	9.4%	16
Motor boat with 25 hp or less motor	8.8%	15
Sailboat	2.3%	4
Jet boat	2.3%	4
Do not use watercraft on any waters	0.0%	0
answered question		171
skipped question		2



15. Do you use your watercraft on waters other than the Cloverleaf Lakes?

Answer Options	Response Percent	Response Count
Yes	12.8%	21
No	87.2%	143
answered question		**164**
skipped question		**9**

16. What is your typical cleaning routine after using your watercraft on waters other than the Cloverleaf Lakes?

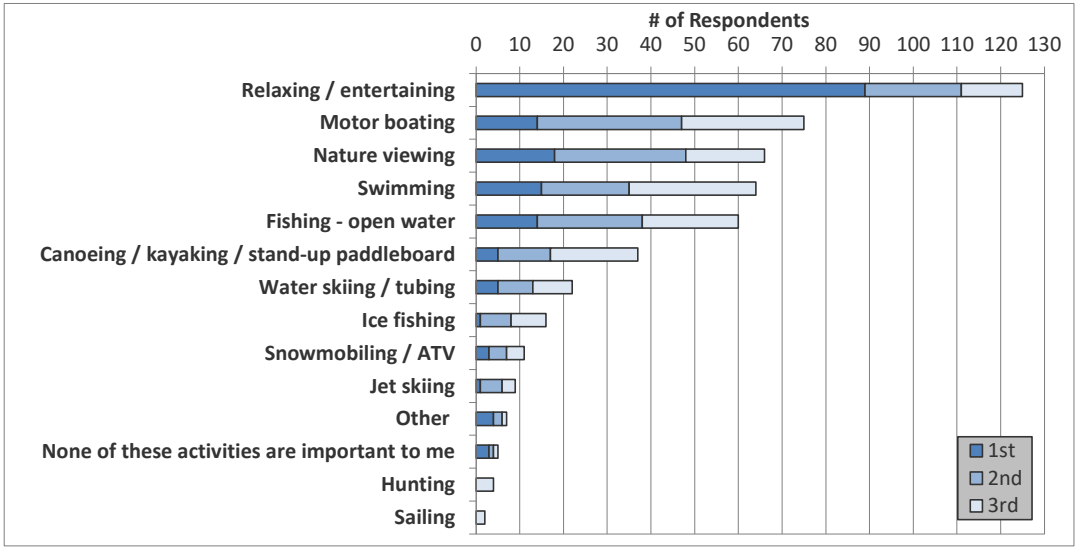
Answer Options	Response Percent	Response Count
Remove aquatic hitch-hikers (ex. - plant material, clams, mussels)	65.2%	15
Drain bilge	30.4%	7
Rinse boat	39.1%	9
Power wash boat	17.4%	4
Apply bleach	4.4%	1
Air dry boat for 5 or more days	65.2%	15
Do not clean boat	13.0%	3
Other		5
answered question		**23**
skipped question		**150**

Number	"Other" responses
1	stays in until put away for winter
2	don't go to other lakes
3	Only use the boat on the lake
4	Boats dont go on other lakes
5	do not go to any other lake

17. Please rank up to three activities that are important reasons for owning your property on or near the Cloverleaf Lakes, with the 1st being most important.

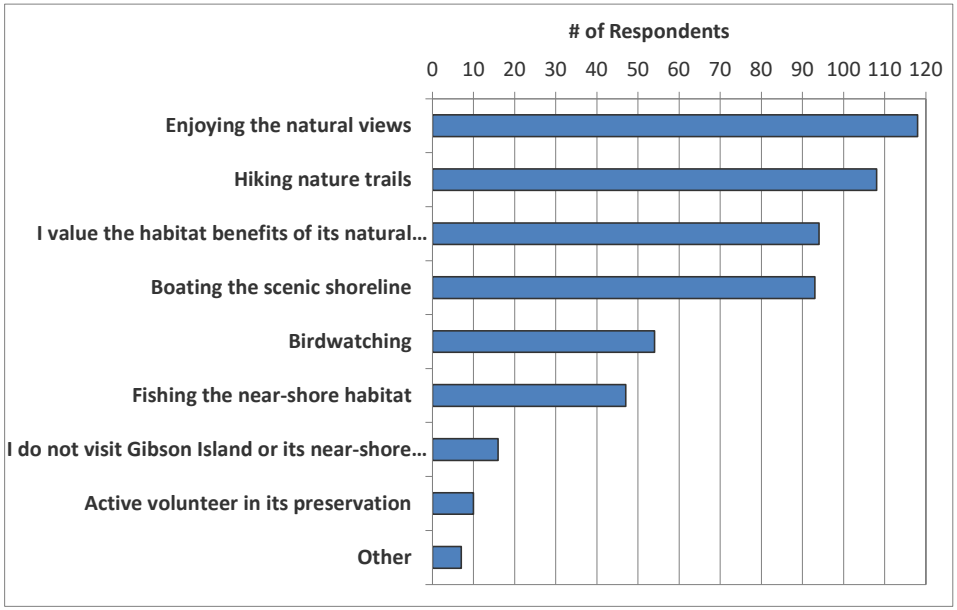
Answer Options	1st	2nd	3rd	Rating Average	Response Count
Relaxing / entertaining	89	22	14	1.4	125
Motor boating	14	33	28	2.19	75
Nature viewing	18	30	18	2	66
Swimming	15	20	29	2.22	64
Fishing - open water	14	24	22	2.13	60
Canoeing / kayaking / stand-up paddleboard	5	12	20	2.41	37
Water skiing / tubing	5	8	9	2.18	22
Ice fishing	1	7	8	2.44	16
Snowmobiling / ATV	3	4	4	2.09	11
Jet skiing	1	5	3	2.22	9
Other	4	2	1	1.57	7
None of these activities are important to me	3	1	1	1.6	5
Hunting	0	0	4	3	4
Sailing	0	0	2	3	2
			answered question		**173**
			skipped question		**0**

Number	"Other" responses
1	Business
2	Use as a 2nd residence
3	Pontoon rides
4	Been in my family for more than 100 yrs
5	We love the woods and the beauty of the lake.
6	pontoon boating around pine and grass lakes
7	Storage business



18. Gibson Island is a 25-acre nature reserve at the heart of the Cloverleaf Lakes. This important ecologic resource with more than one mile of undeveloped shoreline was purchased for the town in 2006 through a combination of state grants, neighbor-to-neighbor fundraising and local government contributions. What best describes your use, if any, of Gibson Island?

Answer Options	Response Percent	Response Count
Enjoying the natural views	68.6%	118
Hiking nature trails	62.8%	108
I value the habitat benefits of its natural shorelines	54.7%	94
Boating the scenic shoreline	54.1%	93
Birdwatching	31.4%	54
Fishing the near-shore habitat	27.3%	47
I do not visit Gibson Island or its near-shore areas	9.3%	16
Active volunteer in its preservation (member of invasive-removal and/or native-plantings team)	5.8%	10
Other	4.1%	7
answered question		**171**
skipped question		**1**



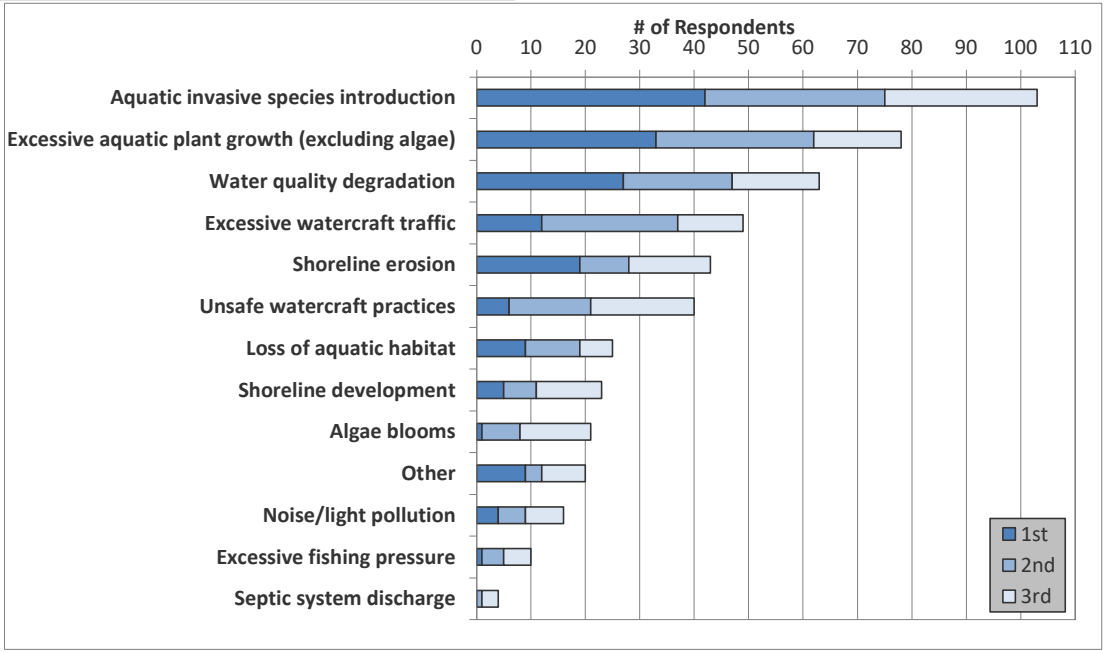
Number	"Other" responses
1	Ok
2	I was opposed to the purchase of the island and was a driving reason for not being a member of this organization for over 10 years. The value of it being a "natural" habitat is overstated and residents likely would have been better served with development of the island and increased tax base that it could provide
3	Think a swim area by the island should be built.
4	The CLPA should look at ways to duplicate the Gibson Island project.
5	needs to be cleaned up, down trees
6	Reflecting on the history of the island
7	I love sitting on my kayak on the sandbar's around the island to take pictures of the loons and eagles and the great blue herons

Cloverleaf Lakes Current and Historic Condition, Health and Management

19. From the list below, please rank your top three concerns regarding the Cloverleaf Lakes, with the 1st being your top concern.

Answer Options	1st	2nd	3rd	Response Count
Aquatic invasive species introduction	42	33	28	103
Excessive aquatic plant growth (excluding algae)	33	29	16	78
Water quality degradation	27	20	16	63
Excessive watercraft traffic	12	25	12	49
Shoreline erosion	19	9	15	43
Unsafe watercraft practices	6	15	19	40
Loss of aquatic habitat	9	10	6	25
Shoreline development	5	6	12	23
Algae blooms	1	7	13	21
Other	9	3	8	20
Noise/light pollution	4	5	7	16
Excessive fishing pressure	1	4	5	10
Septic system discharge	0	1	3	4
			answered question	**168**
			skipped question	**5**

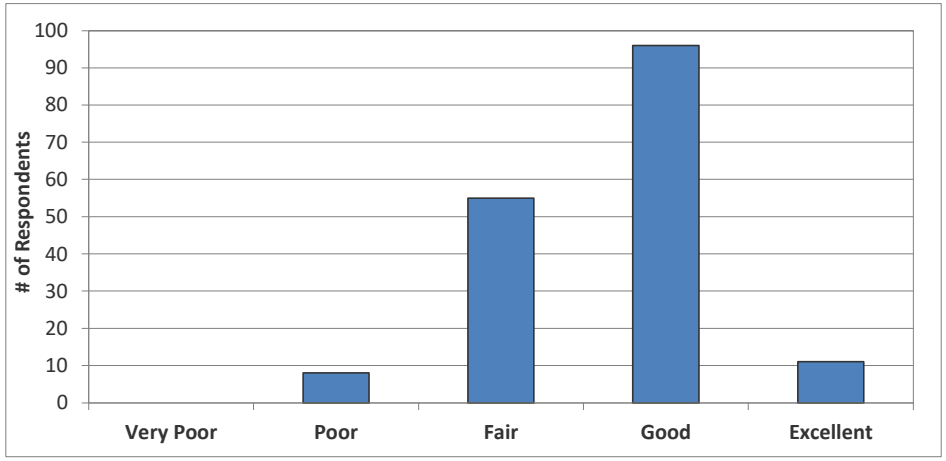
Number	"Other" responses
1	Poor fishing.
2	Manure run off
3	Muck
4	Muck/slit build-up
5	inconsiderate behavior of people near properties the sandbar on Pine lake. There are times we can't enjoy our property due to loud music and foul language from some of these people. I realize we don't own the water, but many of these folks live elsewhere on the Cloverleaf and I'm sure they would appreciate this going on in front of their property.
6	undersized fish(musky,bass) r being kept should cat and release
7	Water level too high- not consistent
8	Low water level
9	They use too motors that are too large on the lake, ripping up all the aquatic plants.



10	Excessive sediment/muck accumulation
11	muck build up and weed control
12	folks feeding the mallards and geese are a big problem in that these two species are not afraid of anyone and they leave "messes" all over the docks, lakefront, and the shoreline
13	The CLPA should host welcoming community events. Especially fun things to do for families including but not limited to lake property owners.
14	muck on the shore line cant be used for swiming
15	Increasing muck along the south shore of Grass Lake
16	water being replaced by Muck
17	sediment infiltration "muck" slowly wrecking the lakes
18	Excessive kept fish. Must have more restrictions with larger size limits and less bag limits.
19	boat landing access is poorly engineered
20	Large watercraft operated without regard to the wake produced, affecting other boaters, dock moorage and shorelines.
21	Mucky areas
22	Weeds are getting to thick along south shore, no more fish!
23	Disregard of property owners by non-property owners and disregard for wake times.
24	Construction permitted against DNR recommendations
25	letting grass lake alley along adams beach to fill in.

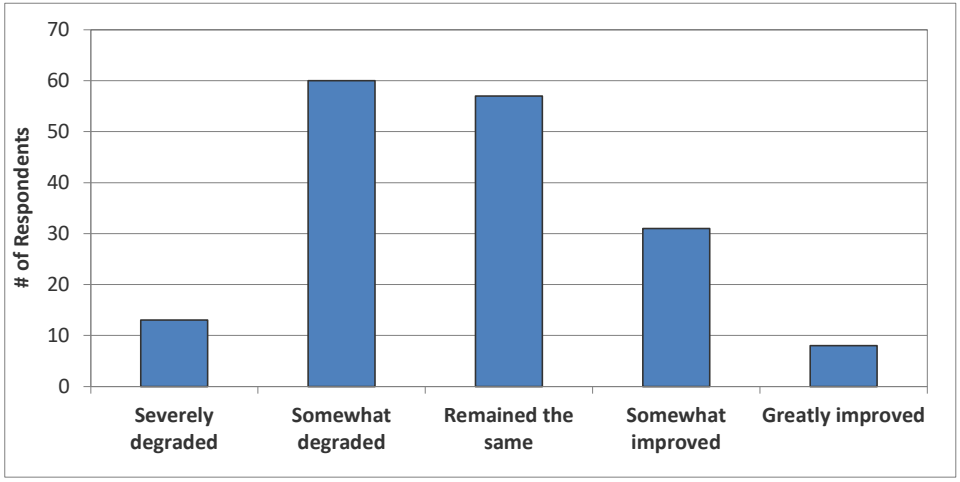
20. How would you describe the overall current water quality of the Cloverleaf Lakes?

Answer Options	Very Poor	Poor	Fair	Good	Excellent	Response Count
	0	8	55	96	11	170
					answered question	**170**
					skipped question	**3**



21. How has the overall water quality changed in the Cloverleaf Lakes since you first visited the lake?

Answer Options	Severely degraded	Somewhat degraded	Remained the same	Somewhat improved	Greatly improved	Response Count
	13	60	57	31	8	169
					answered question	**169**
					skipped question	**4**



22. Which of the following would you say is the single most important aspect when considering water quality?

Answer Options	Response Percent	Response Count
Water clarity (clearness of water)	49.7%	85
Water color	1.8%	3
Aquatic plant growth (not including algae blooms)	26.3%	45
Algae blooms	4.1%	7
Smell	1.2%	2
Water level	9.4%	16
Fish kills	1.8%	3
Other	5.9%	10
answered question		171
skipped question		2

Number	"Other" responses
1	Milfoil
2	temperature, oxygen levels can contribute to algae blooms and fish kills
3	Invasive species
4	good plants give oxygen, invasives hamper use of waterway
5	excess fertility, such as nitrogen
6	Shoreline is caving in from the high water.
7	Invasive aquatic species
8	water being replaced by Muck & silt.
9	areas of the lake are slowly filling in with muck
10	Most of thyese go hamd in hand but excessivepleasure boat traffic on these small lakes has deteriorated the water quality by contributing to some of the items above

23. Before reading the statement above, had you ever heard of aquatic invasive species?

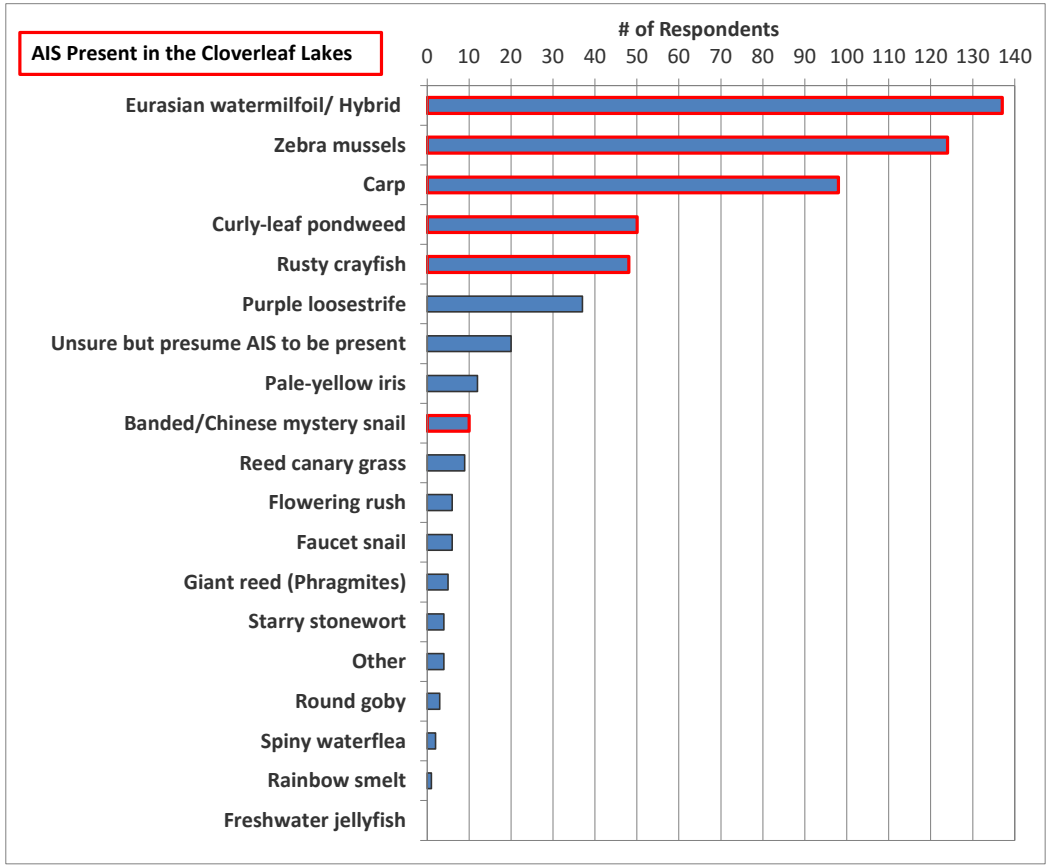
Answer Options	Response Percent	Response Count
Yes	97.1%	167
No	2.9%	5
answered question		172
skipped question		1

24. Do you believe aquatic invasive species are present within the Cloverleaf Lakes?

Answer Options	Response Percent	Response Count
Yes	86.6%	142
I think so but am not certain	12.2%	20
No	1.2%	2
answered question		164
skipped question		9

25. Which aquatic invasive species do you believe are in the Cloverleaf Lakes?

Answer Options	Response Percent	Response Count
Eurasian watermilfoil/ Hybrid Eurasian watermilfoil	84.1%	137
Zebra mussels	76.1%	124
Carp	60.1%	98
Curly-leaf pondweed	30.7%	50
Rusty crayfish	29.5%	48
Purple loosestrife	22.7%	37
Unsure but presume AIS to be present	12.3%	20
Pale-yellow iris	7.4%	12
Banded/Chinese mystery snail	6.1%	10
Reed canary grass	5.5%	9
Flowering rush	3.7%	6
Faucet snail	3.7%	6
Giant reed (Phragmites)	3.1%	5
Starry stonewort	2.5%	4
Other	2.5%	4
Round goby	1.8%	3
Spiny waterflea	1.2%	2
Rainbow smelt	0.6%	1
Freshwater jellyfish	0.0%	0
answered question		**163**
skipped question		**10**



Number	"Other" responses
1	Quaga(sp) mussel
2	There have been Carp and crayfish in these lakes for over 50 years, -now I can't say if they are "Rusty" crayfish, but it appears that after this time they should be considered part of the natural ecosystem
3	knotweed/bamboo, garlic mustard, black locust, buckthorn, mullein, oriental bittersweet, dames rocket
4	not sure

26. Before the present year, aquatic herbicides have been used to manage Eurasian watermilfoil on the Cloverleaf Lakes. Professional monitoring of the aquatic plant community has also occurred during this time. Prior to reading this information, did you know that aquatic herbicides were being applied in the Cloverleaf Lakes to manage Eurasian watermilfoil?

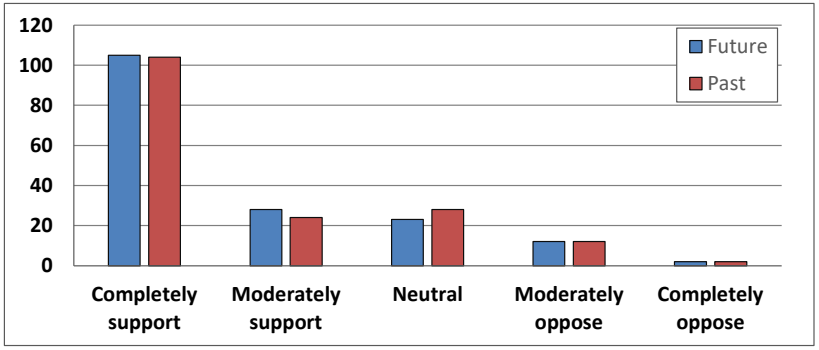
Answer Options	Response Percent	Response Count
Yes	88.4%	152
I think so but can't say for certain	7.0%	12
No	4.7%	8
answered question		**172**
skipped question		**1**

27. What is your level of support or opposition for the past use of herbicides to treat Eurasian watermilfoil in previous years?

Answer Options	Completely support	Moderately support	Neutral	Moderately oppose	Completely oppose	Rating Average	Response Count
	104	24	28	12	2	1.73	170
answered question							**170**
skipped question							**3**

28. What is your level of support or opposition for future aquatic herbicide use to target Eurasian watermilfoil in the Cloverleaf Lakes?

Answer Options	Completely support	Moderately support	Neutral	Moderately oppose	Completely oppose	Rating Average	Response Count
	105	28	23	12	2	1.69	170
answered question							**170**
skipped question							**3**



29. Before the present year, hand harvesting and DASH (Diver Assisted Suction Harvesting) have been used to manage Eurasian watermilfoil on the Cloverleaf Lakes. Professional monitoring of the aquatic plant community has also occurred during this time. Prior to reading this information, did you know hand harvesting and DASH (Diver Assisted Suction Harvesting) were being done in the Cloverleaf Lakes to manage Eurasian watermilfoil?

Answer Options	Response Percent	Response Count
Yes	87.3%	151
I think so but can't say for certain	4.1%	7
No	8.7%	15
answered question		**173**
skipped question		**0**

30. What is your level of support or opposition for the past use of hand harvesting and DASH to target Eurasian watermilfoil in previous years?

Answer Options	Completely support	Moderately support	Neutral	Moderately oppose	Completely oppose	Rating Average	Response Count
	107	40	17	3	5	1.6	172
answered question							**172**
skipped question							**1**

31. What is your level of support or opposition for future hand harvesting and DASH use to target Eurasian watermilfoil in the Cloverleaf Lakes?

Answer Options	Completely support	Moderately support	Neutral	Moderately oppose	Completely oppose	Rating Average	Response Count
	106	42	14	4	6	1.62	172
answered question							**172**
skipped question							**1**

32. What concerns, if any, do you have for the future use of aquatic herbicides and hand harvesting/ DASH to target Eurasian watermilfoil in the Cloverleaf Lakes?

Answer Options	Aquatic Herbicide	Hand Harvesting/ DASH
Potential cost of technique is too high	42	52
Potential impacts to native aquatic plant species	63	6
Potential impacts to native (non-plant) species such as fish, insects, etc.	71	6
Potential impacts to human health	70	8
Future impacts are unknown	54	11
Ineffectiveness of technique strategy	33	58
No concerns	43	48
Another reason	4	2
answered question		**165**
skipped question		**8**

Number	"Other" responses
1	Too many weeds floating to my shore after they pick them-need a better way
2	I personally hand harvested a lot of milfoil for years, it was absolutely not effective compared to herbicides. Please use herbicides.
3	hand harvesting waste of monet
4	Be aggressive and get rid of invasive species.
5	I have no major concerns with use of aquatic herbicides, but expect that they safe for contact with Humans. With many shallow surface wells in the area it might be good to have a monitoring program to understand if they might get into the drinking water.
6	Using proper chemicals should not have a great impact on fish,human health.
7	Weeds are much worse and weed beds have grown.
8	removing the sediment building up in the lakes would be a better use of funds than trying to eliminate the plants growing in the muck.
9	I assume herbicides would be used responsibly.

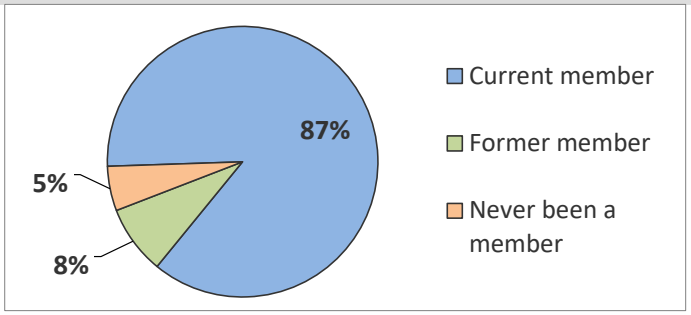
Cloverleaf Lakes Protective Association (CLPA)

33. Before receiving this mailing, had you ever heard of the Cloverleaf Lakes Protective Association (CLPA)?

Answer Options	Response Percent	Response Count
Yes	98.3%	169
No	1.7%	3
answered question		**172**
skipped question		**1**

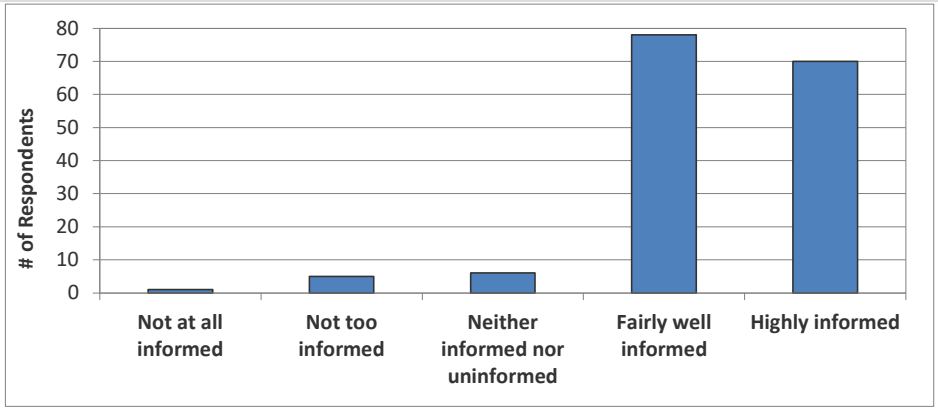
34. What is your membership status with the CLPA?

Answer Options	Response Percent	Response Count
Current member	86.5%	147
Former member	8.2%	14
Never been a member	5.3%	9
answered question		170
skipped question		3



35. How informed has (or had) the CLPA kept you regarding issues with the Cloverleaf Lakes and its management?

Answer Options	Not at all informed	Not too informed	Neither informed nor uninformed	Fairly well informed	Highly informed	Response Count
	1	5	6	78	70	160
answered question						160
skipped question						13



36. Annual dues have remained at a nominal $25 per household (higher for businesses) for many years. The CLPA applies member dues and donations to keeping the lakes healthy, primarily by fighting invasive species through the boat-launch monitor program and milfoil-control efforts. Would you be in favor of raising annual dues to $35?

Answer Options	Response Percent	Response Count
Yes	82.5%	132
No	17.5%	28
answered question		160
skipped question		13

37. Some members have said they would appreciate the resumption of a Cloverleaf Lakes directory listing for those who live on or near the lakes. Would you find such a directory useful?

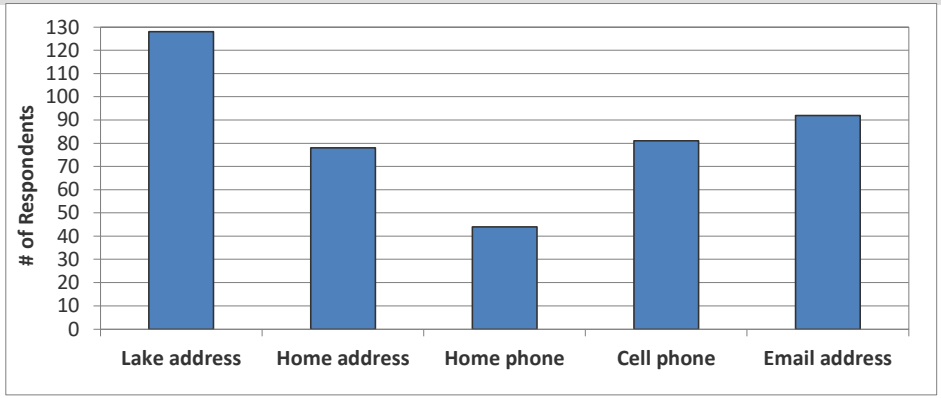
Answer Options	Response Percent	Response Count
Yes	82.6%	133
No	17.4%	28
answered question		161
skipped question		12

38. If yes, which format for the directory would you prefer?

Answer Options	Response Percent	Response Count
Print	57.9%	77
Online	42.1%	56
answered question		133
skipped question		40

39. What would you like to see in terms of a directory listing?

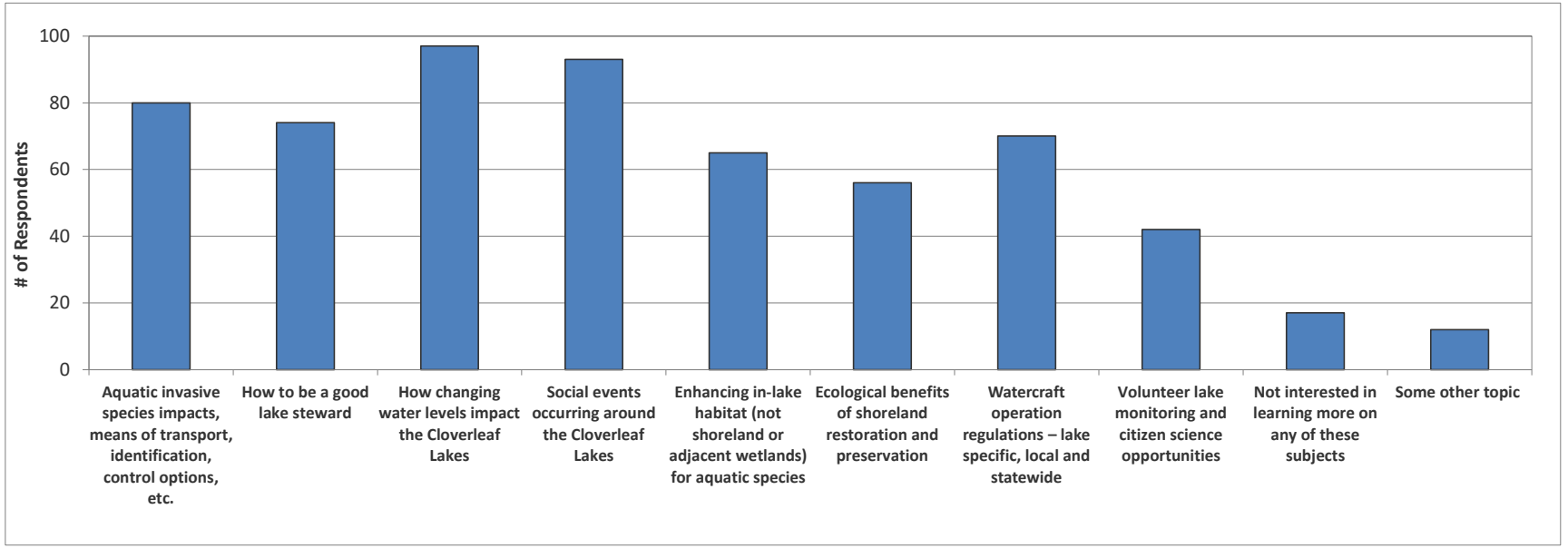
Answer Options	Response Percent	Response Count
Lake address	95.5%	128
Home address	58.2%	78
Home phone	32.8%	44
Cell phone	60.5%	81
Email address	68.7%	92
answered question		134
skipped question		39



40. Stakeholder education is an important component of every lake management planning effort. Which of these subjects would you like to learn more about?

Answer Options	Response Percent	Response Count
Aquatic invasive species impacts, means of transport, identification, control options, etc.	46.5%	80
How to be a good lake steward	43.0%	74
How changing water levels impact the Cloverleaf Lakes	56.4%	97
Social events occurring around the Cloverleaf Lakes	54.1%	93
Enhancing in-lake habitat (not shoreland or adjacent wetlands) for aquatic species	37.8%	65
Ecological benefits of shoreland restoration and preservation	32.6%	56
Watercraft operation regulations – lake specific, local and statewide	40.7%	70
Volunteer lake monitoring and citizen science opportunities	24.4%	42
Not interested in learning more on any of these subjects	9.9%	17
Some other topic	7.0%	12
	answered question	**172**
	skipped question	**1**

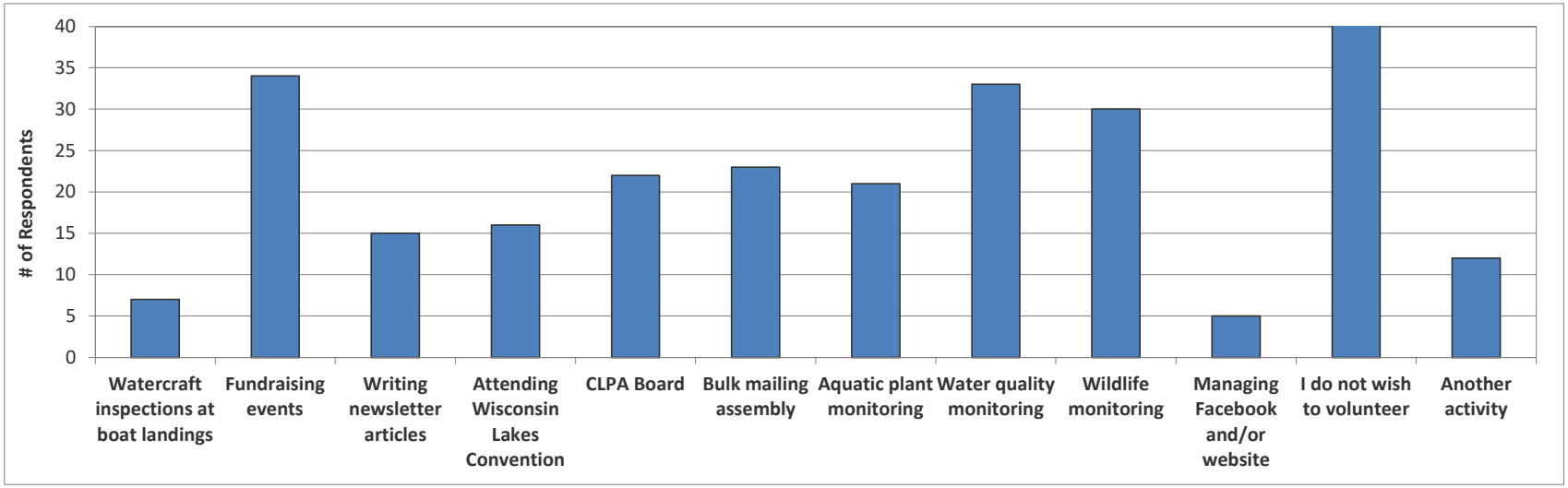
Number	Some other topic responses
1	How to make summer residents better neighbors + good lake stewards with less ski jets, huge boat motors ect on such small lakes
2	raise boat launch fees, eliminate sandbar piss hole, overfishing, noise
3	taxes more recreational events besides fireworks
4	I enjoy getting information on all of these subjects, I feel fairly well informed, but want to stay up to date on current thinking.
5	People using lawn care products that run off into the lakes, salt on roads around lakes, farm run off
6	The relationship among the lakes and other neighboring water ways.
7	Shoreline Erosion
8	Fun activities for all families in the area. Not educational only it fun
9	removing the Muck to replace with water. Fish live in water.
10	please stress to the Big City Idiots that a bright green lawn means a nice greenish brown lake by mid summer.
11	Willing to assist
12	Ancd



41. The effective management of the Cloverleaf Lakes will require the cooperative efforts of numerous volunteers. Please select the activities you would be willing to participate in if the CLPA requires additional assistance.

Answer Options	Response Percent	Response Count
Watercraft inspections at boat landings	4.4%	7
Fundraising events	21.1%	34
Writing newsletter articles	9.3%	15
Attending Wisconsin Lakes Convention	9.9%	16
CLPA Board	13.7%	22
Bulk mailing assembly	14.3%	23
Aquatic plant monitoring	13.0%	21
Water quality monitoring	20.5%	33
Wildlife monitoring	18.6%	30
Managing Facebook and/or website	3.1%	5
I do not wish to volunteer	42.9%	69
Another activity	7.5%	12
answered question		**161**
skipped question		**12**

Number	Another Activity responses
1	Island
2	not up there enough
3	less on weeds and more focus value of property &fun activities
4	my full time residence is not close and would be difficult to volunteer for any of these
5	At this time I do not want to commit, but may help partime.
6	care for Gibson Island
7	Not sure at this time. Thank you.
8	The boat monitor is a waste of money, as so many boats use the landing when no monitor is present.
9	I will donate to CLPA but I cannot volunteer due to health concerns.
10	will help to remove Muck
11	Loon alert! Keeping the baby loons safe! Keeping people and boaters clear of the nest and the young.
12	Abcd



42. Please feel free to provide written comments concerning LakeName, its current and/or historic condition and its management.

Answer Options	Response Count
	91
answered question	**91**
skipped question	**82**

Number	Response Text
1	The water level has been checked on the Cloverleaf Lakes the middle of November. The water level is 8" above the high limit mark. I would like to know the lake with the lake being 8" above the high limit mark, why the person controlling the pine manner outlet dam can legally block 1/2 of the dam off. He is interfering with the natural flow of the waterway, would you consider responding back please.
2	There must be some way to have the summer weekenders respect the full timers peace, property lines ect (like pick up after their pets)
3	When we bought our cottage many years ago on Grass Lake, we could swim and fish in front of our place. No more-too much water milfoil to swim or fish and sometimes even get our boat out.Hope the future will see more attention given to Grass Lake.
4	There seems to be no oversite on building around the lakes. Too big of houses on too small of lots, too much paved services. Too big of boats for size of lake. Ice fisherman should pay a launch fee just like boaters who use the landing.
5	Improve fishing. More monitoring of watercraft operations, unsafe watercraft practices (deinking and noise)I appreciate the efforts that have been done. Thank you
6	I do have concerns as well about the annual fireworks show on the lake and wish they would stop. Debris litters the lake and surrounding land and I worry especially about the disturbances it causes to the eagles nesting on and near Gibson Island in addition to other wildlife. Towns close by offer firework shows that folks could easily attend. I would much rather there be a fundraising event (i.e. tee shirt sales) that would support the integrity of the Cloverleaf Lakes as opposed to it being used to buy fireworks. Thank you.

7	People don't observe the no wake rules and timesShould charge $ at boat launch for non residents Ban jet skis!
8	We enjoy the annual July 4th activities and fireworks. We hope these continue for years to come. We appreciate the volunteers who make this possible.
9	Would like to see a project that would remove the muck on Grass Lake, mainly along the shore of Adams beach. The DNR did this at the 156 boat landing on the Wolf river a number of years ago, so it can be done. They pumped the muck into a very large bladder that must have been emptied in some way.
10	Over the years, we have seen the quality of fishing go from good to bad to worse to terrible. It certainly begs the question if the CLPA and all of their projects involving pouring chemicals into the lakes have done more harm to the natural inhabitants of the lake (fish) than helped.
11	The water quality of the lake has deteriorated significantly over the past 50 years. The weeds are ever moving to the shore reducing our wonderful sandy swim area. Weeds cover the water surface on busy boating days. Definitely not going to remain a property owner much longer. It's heartbreaking. We've been property owners for 55 years and were renters prior to ownership.
12	Have the date when you paid dues on address label please.
13	You are doing a great job, thank you.
14	More walkways on Cloverleaf Lake Rd. Before it got all built up homes & garages. Widen roads
15	very happy the fireworks have returned
16	Need more stocking of walleye & yellow perch! There are way to many water skiers, tubers & jet skis that are not following boating laws safe distances -from other boats and distance from shore. The so called WakeSetter boats should not be allowed to make the huge waves on Grass Lake as they are disturbing the shore line and damaging boats and piers where boats are tied to piers!!!!!! Grass Lake is way to small for such boats.. Boaters & jet skiers that come from the landing need also more informed boating regulations .. There are also lake residence that boat after sun down with boat light on or lights that don't work properly.
17	Throughout the years the lakes has evolved into consisting of two types of people; those that care and those that do not. You either have the extreme end of people trying to maintain the quality and in some cases being over the top with things and then you have those who could care less and use and abuse the lakes. We appreciate what people are doing to help preserve the quality of the lakes but it seems null in void when you have people coming in on the weekends and abusing the lakes with way too much boat traffic and things of that nature. It's such a small chain of lakes and the boat traffic during the summer months is out of control. The other part that contradicts what the Association is trying to do is the fireworks. You are trying to preserve the quality of nature in and around the lakes but then put on this huge fireworks show that draws in hundreds of people who are not from the area and litter, party, and trash the area. And that's not including what the debris of the fireworks does to the water and natural habit either. We do appreciate the efforts of Gibson Island.
18	Thank you to all volunteers of CLPA!!
19	We enjoy our time at the lake and want to ensure that it remains a great lake system for further years to come.
20	In the early 1960s in the spring of the year water covered the road on the South West corner of Pine lake.I felt this was a natural cleaning of the lake as water was filtered back through the sand.Most lake fronts had natural sand.Today with all the rock being used for shorelines the lake is not able to self filer itself. Lake shore restoration is a joke.Good excuse not to have a nice sand shoreline. John
21	shoreland erosion is significant with the advent of numerous wakeboats and previous shoreland preservation with "plants" is not effective in controlling erosion. Rocks are effective in controlling erosion.
22	as an example fireworks is most popular event but is not part of association .It seems like cla spends all of their energy on environmental instead of homeowners enjoyment of the lakes.It seems as if the focus is on reyturning the area to the way the lakes were 100 yrs ago instead of creating a more enjoyable home
23	Clpa doing a great job! Thank you
24	The lake water level is an issue. There is not much consistency to the level. Often times it's too high for too long and other times it's too low. We would appreciate regulated water levels on Pine Lake. Visitors to the lake must be given the lake rules and it needs to be posted better at the boat launch. NO WAKE from 6pm to 10am needs to be enforced better.

25	We continue to loose our yard due to shoreline erosion. The muskrats are awful and a big contributor I am sure.
26	I am a long term resident have either lived or recreated on the lakes for over 60 years. I could write a book on many of the topics here. Watercraft rules have become too restrictive and counter productive--ie no wake thru the channel... also should use state laws on slow no wake rules. Slow at 6pm too restrictive--agree with no towing after 6pm. Water quality has remained fairly constant in my view over the years I have been here. Fishing has always been a hit or miss thing. There seems to be a lot of overfishing of panfish in the spring where a few folks are taking many of the large panfish out of the lakes. Would be good to put some larger culverts in on the island access road to get flow from that side. It feels like invasive plants are the largest concern for the lakes and the positive response of the association is the major driver for me becoming a member once again. This should remain the focus area. Other "conservation" efforts while appearing laudable are really low impact items in the long term. Example : Inhabited shorelines have been mostly cleared as that is what the owners wanted from a practical matter. Long grass etc on the shore lines is a breeding ground for mosquitos & counter to desired use of recreation. especially on shorelines with hard sand bottoms and beaches
27	Many people have been working hard to manage the lakes for a very long time.
28	was there an opening between Grass lake and Pine lake where you walk to the island. Does this effect various fish reproduction in the lakes
29	It would be great to catch fish when we go fishing on cloverleaf lakes.
30	Very little has been done to increase family fishing, i.e. panfish. Stop planting walleye, waste of time and money. Get interested in families and stop catering to sportsmen who only want muskies.
31	I have spoken to numerous people and understand that bringing water level up could help with weed issues
32	We have lived here more than 25 years and it has become more congested and not as quiet and relaxing of an atmosphere as it used to be. We have a little gem and a small piece of up north. But as people have cut more and more trees and squeeze more buildings into tiny lots this makes it more like a city than the lakes.
33	I think we need to do a better job of making sure that the folks that live on the and near the lakes keep their property in decent condition. I see they are cleaning up the Cloverleaf Lakes trailer park, which is refreshing. However that old bar on the corner of hwy 22 and "Y" is terrible. That mess needs to cleaned up. That is the access to our beautiful lakes from the North, and it is a real eyesore. And it seems to get worse every year. It is basically a visible junkyard.
34	Now that the survey of the shoreline has been done, and the properties have been identified, will the information be made public, and will affected homeowners of the shoreline be independently informed?
35	We would like to see a horse power motor limit enforced. Our lakes are too small for these great big water skiing boats. When my husband was a boat monitor , he saw engines as big as 250 horse power.

36	Good job!
37	The CLPA has done a great job of managing lake priorities of invasive species, water quality and lake safety.
38	The CLPA has and will do a great job in protecting the Lakes. I thank you for the fine job you all do.
39	Suggestion: check into the ability to have "no wake" designations during periods of high water in order to save the shorelines. Since the marshlands are maintained at a higher water level, our spring high water marks sometimes have docks under water
40	Our family has owned vacation property on Pine Lake since 1945 and it is a sacred place for us. We have enthusiastically supported CLPA and all its important stewardship initiatives to preserve the fragile qualities and character of the lakes. We recognize there are competing interests in how the lakes are used and enjoyed by a large and varied profile of folks. A major concern to our family is the increasing number of very large and very loud speed boats which are really too big for the Cloverleaf Lakes. In addition to the roaring engines, some boats also employ speakers to blare music. Even inside the cottage with doors and windows closed it is very audible. It really is noise pollution and an assault on the senses. It impacts and hijacks OUR ability to relax and enjoy our time at the lake cottage. Can we control the size of the motors allowed on the lakes? Is there a noise ordinance which governs the loud music? Can we put this on the table for CLPA to discuss? Thank you for all the good work you do!
41	Very appreciative of the efforts made by CLPA
42	I think it's critical that we take care of the lake. I have been coming to the lake for over 50 years (I'm 57) and 8 years ago my wife and I purchased one of the homes. My grandfather built his place in the 1930's. My family spends the entire summer on the lake and I plan on retiring there.
43	Things are going well. I appreciate the efforts of all involved.
44	Weed control is biggest issue facing lake owners who want to enjoy the water (the primary reason to live on the water). This must be managed. I do not know if the Lake Association pays for Sheriff to patrol lakes, but if we do, this money should fund weed control vs. petty intrusions by impolite officers. Residents do not see value in Sheriff patrols.
45	Continued management of aquatic plant invasive species is necessary!!
46	We appreciate all of the efforts of the CLPA to keep the lakes healthy and enjoyable.
47	wish we had a plan for the muck problem that seems to be getting worse, we should also not allow weed cutting if they don't remove from lake, people are cutting weeds all year and just letting them in the water, they should be removed dried and burned.
48	Should expand the weekend hours for skiing / tubing to 6:30. Almost every weekend the 6pm stop time was ignored. I no longer have a ski boat, but I understand the desire to maximize sunlight
49	Prior owner. No longer live in Wisconsin, but support CLPA and Pine Lake from over 50 years of being involved with that area.
50	Over 52 years my shoreline has eroded about five feet. This is an accurate measurement. Step to the pier has caved in along with many trees. SERIOUS!
51	Weekend usage and crowding on the lakes, especially on weekends and holidays, has increased a lot over the last 20-30 years.
52	Too many boats with very large engines on Grass Lake going through the narrow channel. Their wake is eroding the Islands shores and the trees are starting to fall into the lake. Milfoil is rampant, and zebra mussels are getting worse.
53	I love spending time on the lakes and I think CPLA tries to do a good job. Unfortunately the weed situation has gotten worse, the fishing is poor, and on the weekends there is so much boat traffic that is takes until the middle of the week for the water to settle down and become clear again.
54	Over Building on the shoreline of the lake has reduced the quality of being there. Additional public spaces open to everyone like Gibson Island and Sandy Beach could improve the lake experience.
55	Good Luck, my hubby was involved when everything was first started.
56	It would be really nice if everyone followed the state and local boating regulations. Really do not enjoy watching people tubing at 7:30pm on a Friday night.

57	Considering all the development I've seen over 50 years, fishing success and water quality have remained very good. I also like that with the early and late "quiet" hours during the summer, it's the sort of lake that both power boaters and kayakers can enjoy equally. I think we do a good job of balancing competing interests.
58	Boat traffic has increased and the size of the boats have greatly increased. These larger boats (not about horsepower) most of them are ski/inboard/wakeboard boats. They create very large waves that impact shoreline erosion, boating/skiing/tubing, and fishing. Jet skis -- there are aLOT of jetskis on the lake. These jetskis produce a lot of noise pollution and unfortunately most of these jetski operators do not follow rules of operation. Lastly, the jetskis produce a powerful jet that extends well below the waterline and destroys fish beds.
59	We very much appreciate the people who donate their skills and time to this work.
60	The lakes used to be great fishing for panfish until someone decided to make them trophy musky lakes. now the fishing is poor to support the 88 muskies we have in the lakes.
61	We would like to see the CLPA share a more detailed financial statement each year including expenditures and funds on hand. The CLPA has done an excellent job over the years. We enjoy the newsletter. Any emphasis on lake levels is a waste of time since nothing can be done to increase/decrease the levels.
62	I would like more enforcement of regulation when people feed deer and ducks on their property, which leads to neighbors' properties being negatively affected due to excessive wildlife traffic for feeding, and resultant excrement, etc.
63	Please clean the dead trees off the island
64	CLPA is very well organized and managed.
65	I have real concern that the south shore of Grass lake and the channel into Pine lake will continue to worsen with muck making recreation impossible. I would like to see this problem addressed
66	concern that non residents of the lakes know and obey regulations and respect people's shorelines
67	Thanks for soliciting input! Great idea! Concerns I didn't comment on above are light and noise pollution. I was concerned about the ATVs ramping up noise levels after their use was approved on local roads, and I was right. Not all ... but way too many ATV vehicles are not equipped, like cars, with adequate noise suppression. I'm happy for the ATV owners, but please equip your vehicle with adequate noise suppression! I'm also concerned about light pollution around the lake. Gone are the nights of spectacular star-gazing on the dock. There's just too much ambient light around the lake after dark these days. It's hard to understand the purpose of dockside or lake facing lights left on after dark, or even all night long. If thieves or vandals are a concern (which is minimal on the lakes vs. living in a city), lights can nowadays be set for motion. Thanks for listening!
68	Ask any 3rd grader: do fish live in water, silt, or Muck, what do you think the answer will be.?
69	Some of the docks are over sized for lot size, becoming a lake issue.
70	We are very fortunate to have the beautiful trees, wildlife, and the access to the three lakes. Our quaint community is very comforting safe feeling and relaxing!
71	thanks for all you do for the betterment of the lakes
72	Too much is controlled by too few; meetings seem strategically scheduled to exclude non-residents; nepotism exists/persists
73	#1 issue that needs attention on the chain is try to clean up the sediment that is slowly wrecking the lakes.
74	Invasive weeds require immediate action
75	The CLPA Board is doing a good job.

76	Our property has been in our family since 1929. In the 65 years I have been going to Cloverleaf Lakes it has become so built up with large houses and garages, and the lakes filled with so many large noisy boats and jet skis that the lakes are no longer the peaceful refuge they once were. These lakes are much too small to handle the enormous watercraft that would be at home on Lake Michigan, and it is only a matter of time before one of them is involved in a fatal accident. These boats also introduce pollution into the lakes and damage shorelines. I know this is wishful thinking, but charging user fees to boat owners based on size and number (with the funds going toward lake and shoreline restoration) would be the fair thing to do: people should pay for what they use (and damage)!
77	management has been outstanding
78	I feel the CLPA board, and it's partnership with local government has been beneficial. I appreciate the information in the newsletter and the attempts to educate and involve both the lake and local communities. Keep up the good work! I think your efforts to keep us informed and involved are very helpful.
79	Maintaining water level is very important. Several homeowners pump out lake water to irrigate their grass and other uses. Additionally the dam is not properly managed during periods of limited rain such as this past summer. I would like to evaluate dredging the channel and other shoreland areas where depth is minimal
80	While this does not affect the lake, I am concerned with major violations of the 25mph speed limit on Rustic Drive and Cloverleaf Lake Road. It has created an unsafe environment and needs to be monitored and enforced. I understand this is probably a Town of Belle Plaine issue, but I wanted to note it. Thank you for this survey. I look forward to the results and doing my part to protect and improve the quality of our beautiful lakes which have been in my family for nearly 100 years.
81	What are the possibilities of opening the trail to the island with a large culvert to provide boat traffic through therre. Why was a culvert to Round lake not made larger to facilitate pontoon traffic?
82	CLPA and its leaders are fantastic!
83	Need to enhance boat and jet ski supervision.
84	None
85	Would like to see better management of people's behavior at the sandbar. Would also like boaters, jetskiers & fisherman to respect a reasonable distance from piers.
86	I think the well water quality around the lakes needs more addressing. Yes, we had water testing and meetings but that is not enough. We live on round lake and have extremely high nitrate levels and we need to buy bottled water.
87	We love coming up to our seasonal every year. I think the CLPA is making improvements every year.
88	boats getting to large and powerfull for this lake
89	I have lived on Round Lake for just under 20 years. I used to enjoy swimming off of our dock, now it is completely surrounded by weeds. It seems like all of the attention has been on the more populated areas to the neglect of the areas that are less used. I view the lake as a complete system and each part/feature reacts and responds to the rest of the environment. If one area is neglected, it will subtly impact the remaining portion over time. Residents have taken it upon themselves to create dock areas or swimming areas that suit their needs (sometimes) at the expense or consequence of the rest of the system. My personal example is that my neighbor moved in around 10 years ago and removed 90-95% of his trees on his property right down to the shoreline. While I have no issue if he had the right to do this - I completely expect that 100% of his lawn fertilizer runs into Round Lake. My dock is now essentially inaccessible for swimming and only accessible for non-motorized boats due to that extensive weeds. I used to fish off the dock, now I basically de-weed the lake when I fish so I have stopped. I do know his boat dock is clear of adjacent weeds and he enjoys swimming at his dock. He certainly might have the conditions that are more favorable for swimming and I have better conditions to support a full carpet of weeds, Either way, I no longer swim, fish, or boat from my dock on Round Lake. I love the natural area, the quietness, and don't support the fireworks because I do enjoy the loons. I think people have ample opportunity for fireworks in Shawano or Clintonville for those activities. I think the loons will no longer stay if their environment is too adverse for them to stay. We all enjoy the eagles. It appears we spend a disproportionate amount of resources to support fishing and boating to the detriment of other wildlife that has less social value. I don't expect this setting to be a wilderness preserve. But I do see too much pressure on recreation and fishing to the exclusion (or extinction) of all other legitimate features. Since I was asked if I would be open to give more money to support activities that barely meet my needs, I thought I would offer my thoughts. Given that level of activity on the Cloverleaf Lakes area in general, I am certain my thoughts are in the minority.
90	I am extremely pleased to have such an active and conscientious community concerned with the viability and health of our lakes.

91	Lake level to high because people with large motors want it higher Also there should be a no wake zone on grass lake from island to heading east this would do a lot for shoreline erosion.

C

APPENDIX C

Water Quality Data

Round Lake

	Secchi (feet)				Chlorophyll-*a* (µg/L)				Total Phosphorus (µg/L)			
	Growing Season		Summer		Growing Season		Summer		Growing Season		Summer	
Year	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean
1980					0		0		0		0.0	
1981	0		0		1	5.0	0		2	20.0	0.0	
1987	9	9.7	6	9.6	0		0		0		0.0	
1988	9	12.2	5	12.4	0		0		0		0.0	
1989	9	10.4	7	10.6	0		0		0		0.0	
1990	11	10.2	6	8.9	0		0		0		0.0	
1991	9	15.3	6	14.9	0		0		0		0.0	
1992	11	10.3	8	9.8	0		0		0		0.0	
1993	4	8.9	3	7.8	0		0		0		0.0	
1994	5	11.6	3	11.3	0		0		0		0.0	
1995	12	13.5	8	16.5	0		0		0		0.0	
1996	10	9.8	5	11.0	0		0		0		0.0	
1997	13	12.6	8	9.8	0		0		0		0.0	
1998	22	12.1	11	8.5	0		0		0		0.0	
1999	2	6.5	0		0		0		0		0.0	
2000	7	9.7	6	8.7	0		0		1	10.0	1.0	10.0
2001	11	6.9	6	5.0	0		0		0		0.0	
2002	9	7.6	4	6.8	0		0		0		0.0	
2003	5	9.4	3	9.0	0		0		0		0.0	
2004	5	9.8	3	8.0	0		0		0		0.0	
2005	6	9.3	3	9.3	1	6.1	0		1	16.0	0.0	
2006	5	11.7	3	11.3	4	3.0	4	3.0	6	13.5	4.0	12.0
2007	4	11.5	1	9.8	2	3.0	2	3.0	2	10.0	2.0	10.0
2008	7	10.8	3	7.8	3	4.0	3	4.0	4	13.5	3.0	13.0
2009	5	9.1	3	8.0	4	3.9	3	4.1	6	13.2	3.0	13.3
2010	6	9.8	3	8.8	3	5.2	3	5.2	5	12.4	3.0	12.7
2011	4	9.3	3	9.3	3	4.1	3	4.1	4	13.5	3.0	11.0
2012	5	9.2	3	8.3	3	3.6	3	3.6	5	12.0	3.0	12.3
2013	3	9.0	2	8.0	3	4.4	3	4.4	4	13.4	3.0	12.0
2014	4	9.5	3	8.3	3	3.5	3	3.5	4	10.7	3.0	10.0
2015	5	8.6	3	9.0	3	3.4	3	3.4	4	13.9	3.0	13.3
2016	5	9.6	3	7.7	3	2.2	3	2.2	5	13.9	3.0	14.0
2017	6	8.3	2	8.5	3	2.9	2	2.5	4	16.7	2.0	15.5
2018	0		0		3	2.8	3	2.8	4	14.3	3.0	14.7
2019	4	11.3	3	8.3	3	6.3	3	6.3	4	14.3	3.0	14.3
2020	6	11.5	3	9.1	5	5.9	3	7.4	5	15.4	3.0	14.7
All Years (Weighted)		10.5		9.7		4.0		4.0		13.6		12.8
DHDL Median				10.8				5.0				17.0
NCHF Ecoregion Median				5.3				15.2				52.0

Grass Lake

	Secchi (feet)				Chlorophyll-*a* (µg/L)				Total Phosphorus (µg/L)			
	Growing Season		Summer		Growing Season		Summer		Growing Season		Summer	
Year	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean
1981	0		0		1	4.6	0		2	30.0	0.0	
1982	0		0		1	6.0	0		1	20.0	0.0	
1987	10	10.2	6	9.8	0		0		0		0.0	
1988	12	10.5	5	10.5	0		0		0		0.0	
1989	10	10.9	7	10.8	0		0		0		0.0	
1990	11	11.8	6	11.6	0		0		0		0.0	
1991	9	10.3	6	10.2	0		0		0		0.0	
1992	11	8.9	8	7.5	0		0		0		0.0	
1993	6	8.5	4	9.8	0		0		0		0.0	
1994	16	8.9	7	10.5	0		0		0		0.0	
1995	13	10.4	9	11.4	3	7.2	1	6.2	4	15.8	2.0	14.5
1996	15	8.5	9	8.5	4	9.0	3	5.7	4	19.0	3.0	16.3
1997	17	10.0	11	10.4	1	4.5	1	4.5	4	15.8	3.0	15.7
1998	9	9.6	6	9.8	1	3.1	1	3.1	4	16.5	3.0	11.7
1999	5	9.5	2	10.8	2	4.0	1	3.0	4	15.3	2.0	11.0
2000	10	9.5	7	9.4	3	5.0	2	5.5	4	19.5	2.0	19.5
2001	6	8.3	3	9.0	0		0		0		0.0	
2002	9	7.6	4	8.6	3	5.7	2	4.6	5	20.0	3.0	20.0
2003	4	7.5	3	8.0	3	6.2	3	6.2	3	17.7	3.0	17.7
2004	4	6.8	3	7.0	3	7.0	3	7.0	4	22.3	3.0	22.0
2005	1	8.0	0		1	2.2	0		1	19.0	0.0	
2006	4	9.6	2	10.5	4	4.9	3	4.5	5	15.2	3.0	14.3
2007	2	7.4	0		2	4.6	2	4.6	3	13.7	2.0	13.5
2008	6	7.5	3	6.3	3	4.3	3	4.3	4	16.3	3.0	15.7
2009	5	6.3	3	6.2	3	5.7	3	5.7	5	16.6	3.0	15.3
2010	6	7.8	3	6.8	3	6.8	3	6.8	5	15.2	3.0	14.3
2011	5	6.7	3	6.2	3	10.5	3	10.5	4	17.3	3.0	16.3
2012	5	9.6	3	8.7	3	7.2	3	7.2	5	17.0	3.0	16.3
2013	4	7.9	3	7.0	3	6.4	3	6.4	4	14.5	3.0	12.3
2014	4	7.5	3	7.7	4	5.5	4	5.5	4	13.8	3.0	13.3
2015	4	8.5	3	7.7	7	6.4	7	6.4	4	16.8	3.0	17.7
2016	5	7.8	3	7.0	4	5.7	4	5.7	5	15.4	3.0	18.7
2017	4	6.8	2	6.0	3	7.7	2	8.3	4	18.0	2.0	18.0
2018	1	11.0	0		3	4.7	3	4.7	4	14.3	3.0	14.0
2019	4	11.0	3	10.0	3	4.1	3	4.1	4	14.6	3.0	14.7
2020	7	8.6	3	6.4	5	5.2	3	6.3	6	16.6	3.0	17.4
All Years (Weighted)		9.1		9.1		6.0		5.9		16.6		15.9
DHDL Median				10.8				5.0				17.0
NCHF Ecoregion Median				5.3				15.2				52.0

Pine Lake

	Secchi (feet)				Chlorophyll-*a* (µg/L)				Total Phosphorus (µg/L)			
	Growing Season		Summer		Growing Season		Summer		Growing Season		Summer	
Year	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean
1981	0		0		1	6.2	0		3	23.3	0.0	
1982					1	5.0	0					
1987	9	12.8	6	11.4	0		0		0		0.0	
1988	10	10.3	5	10.2	0		0		0		0.0	
1989	9	10.8	7	10.6	0		0		0		0.0	
1990	14	10.8	7	11.9	0		0		3	15.7	1.0	20.0
1991	15	11.1	10	11.6	0		0		4	13.0	2.0	11.5
1992	13	10.7	10	10.7	0		0		3	11.3	2.0	10.5
1993	9	14.2	7	14.7	4	5.8	3	3.7	4	11.0	3.0	10.3
1994	10	13.9	6	11.9	5	4.1	3	3.8	6	12.5	3.0	10.0
1995	17	11.9	11	12.8	5	4.1	3	3.2	5	11.0	3.0	9.7
1996	17	12.5	9	12.7	5	4.4	3	3.9	5	11.8	3.0	10.0
1997	18	13.0	11	12.4	4	4.0	3	3.5	5	22.6	3.0	20.7
1998	21	12.2	10	11.2	4	3.9	3	3.1	5	15.0	3.0	13.3
1999	7	9.1	3	9.7	4	3.2	3	2.6	5	13.0	3.0	12.0
2000	11	10.5	9	9.9	4	2.8	3	2.1	6	13.5	4.0	13.3
2001	9	11.3	6	11.2	4	4.0	3	3.6	5	10.8	3.0	11.0
2002	8	8.4	4	8.5	4	3.4	3	2.5	4	15.3	3.0	13.3
2003	0		0		4	3.1	3	2.7	6	16.5	3.0	13.3
2004	5	10.4	3	9.0	3	4.1	3	4.1	4	14.5	3.0	15.7
2005	5	9.6	3	9.3	4	3.8	3	2.9	5	14.6	3.0	13.3
2006	5	10.3	3	9.2	3	4.2	2	4.1	3	13.3	2.0	15.5
2007	5	9.8	2	11.0	4	4.4	3	3.4	5	14.2	3.0	13.3
2008	4	8.6	3	7.2	3	3.3	3	3.3	4	15.5	3.0	15.3
2009	5	11.2	3	8.3	3	3.8	3	3.8	4	9.8	3.0	9.0
2010	6	10.4	3	10.0	4	3.5	3	3.0	6	13.0	3.0	13.7
2011	4	10.3	3	8.0	3	5.2	3	5.2	4	13.0	3.0	14.7
2012	5	11.8	3	10.3	3	3.2	3	3.2	5	11.8	3.0	12.7
2013	4	11.3	3	9.7	3	3.7	3	3.7	4	12.0	3.0	10.7
2014	4	9.8	3	9.0	3	3.2	3	3.2	4	10.5	3.0	10.7
2015	5	8.6	3	6.7	3	4.0	3	4.0	4	14.3	3.0	15.7
2016	5	10.6	3	6.7	3	3.1	3	3.1	5	12.6	3.0	14.7
2017	4	8.3	2	8.0	3	4.2	2	3.5	4	14.9	2.0	13.5
2018	1	12.0	0		3	4.7	3	4.7	4	13.0	3.0	14.7
2019	4	12.3	3	10.3	3	3.4	3	3.4	4	11.1	3.0	11.0
2020	7	10.5	3	8.3	5	3.1	3	3.0	5	14.0	3.0	13.3
All Years (Weighted)		11.2		10.8		3.9		3.4		13.6		13.0
DHDL Median				10.8				5.0				17.0
NCHF Ecoregion Median				5.3				15.2				52.0

D

APPENDIX D

FWWA/WAMSCO 2019 Shoreline Assessment Report

https://cloverleaflakes.com/wp-content/uploads/2021/01/Cloverleaf-Lakes-Shoreline-Survey-2020-for-website.pdf

Cloverleaf Lakes, Shawano County

Shoreline Assessment 2020

Introduction

The Fox-Wolf Watershed Alliance and Waterways Association of Menominee and Shawano Counties regional watershed coordinator for Shawano and Menominee Counties was tasked with the shoreline survey on the Cloverleaf Lakes Lake as part of Wisconsin Department of Natural Resources Grant LPE-570-18.

On June 22nd through June 24th, the shoreline survey was conducted on the Cloverleaf Lakes. Connecting Our Waters, a program of the Fox-Wolf Watershed Alliance and the Waterways Association of Menominee and Shawano Counties (WAMSCO), completed the survey with help from volunteers around the Cloverleaf Lakes.

The Wisconsin Department of Natural Resource Lake Shoreland & Shallows Habitat Monitoring Field Protocol was used to completed the Cloverleaf Lakes survey in 2020. This protocol has been used on other lakes within Shawano and Menominee Counties and more detail can be found under the survey methodology section.

Cloverleaf Lakes Shoreline Historically

The Cloverleaf Lakes Protective Association have a long history with the Wisconsin DNR Lake grant program. While a lake management plan completed in 1992 does not include a shoreline survey, it does discuss that the creation of 20-foot wide buffer strips can control wave erosion and trap soil eroded from the land above (IPS Environmental and Analytical Services 1992).

In 2008, the Cloverleaf Lakes Protective Association worked with NES Ecological Services to plan for and plant 11 native plant projects around the Cloverleaf Lakes. A thorough inventory was taken of the soil, sun exposure and moisture regime of the sites around the lake. The report created with this project has been included as Appendix D. It includes plant names and site designs for the projects installed in 2010.

2020 Cloverleaf Lakes Survey

From June 22 through June 24, 2020, Connecting Our Waters with help from a volunteer from Pine Lake, completed the Cloverleaf Lakes Shoreline survey. Emily Henrigillis completed the Round Lake shoreline survey and coarse woody debris survey on June 22nd. With help from Kristy Krueger, Pine Lake, Grass Lake was surveyed on June 23rd, and Pine Lake was surveyed on June 24th. The coarse woody debris survey was completed on Grass and Pine Lakes on July 30th.

The general observations from the survey were there was a large variety in shoreline practices around the Cloverleaf Lakes. The sandy soils around the lake also lead to a lack of floating-leaf and emergent plants around Pine Lake.

Survey Methodology

The Wisconsin Department of Natural Resource Lake Shoreland & Shallows Habitat Monitoring Field Protocol was used to complete the Cloverleaf Lakes shoreline survey in 2020. The methodology is described below but the full protocol can be found in Appendix A. Definitions can also be found in the full protocol.

Before heading out to the field, a map was created of the lakes and associated tax parcels that touch the lake. These type of maps can be loaded on to a GPS or smart phone. Maps were created in ArcGIS then exported as a georeferenced PDF to be loaded into Avenza maps. During the Cloverleaf Lakes survey Avenza maps was used to track our location on the lake, as well as the tax parcel number we were working on

The riparian zone, the area of interest, starts at the high water level and extends 35 feet inland. The high water mark is defined as the point on the bank or shore up to which the water, by its presence, wave action, or flow, leaves a distinct mark on the shore or bank[1]. Water levels were slightly lower than average during the survey but did not change the methods used during the Cloverleaf Lakes survey.

While completing the survey, multiple variables are assessed. The canopy cover is assessed on trees greater than 16 feet tall and in 5% increments. The trees that are providing the canopy cover may or may not fall within the riparian zone.

Next the ground layer of the riparian buffer zone is analyzed. There are five options for the ground layer cover and their percent cover needs to equal 100%. Similar to canopy cover, this is broken down in 5% increments:

1. Shrubs and herbaceous plants: Shrubs refer to woody plants that are less than 16 feet tall. Herbaceous plants are generally grasses, forbs, and sedges
2. Impervious surfaces: Examples include decks, stone/concrete paths or stairs, over turned boats, rip-rap, etc.
3. Manicured lawn
4. Agriculture
5. Other: duff, bare soil, gravel, mulch, etc.

If a ground layer cover was not present in the riparian zone, it was written as a zero on the data sheet.

Human structures present within the riparian zone were then counted. Buildings, boats on shore, and fire pits are the most common. Small, easily moveable objects do not get counted, for example, lawn chairs near the water's edge.

The next step is to record the presence of run-off concerns within and outside of the riparian zone. A run-off concern being present within the riparian zone is a more critical problem to fix than one being present outside the riparian zone. A run-off concern outside the riparian zone can still be a problem but may not affect the lake as quickly as a concern within the riparian zone. The run-off concerns assessed during a shoreline survey are listed below:

1. Point source: Examples could be a culvert, rain gutter, drain pipe or sump pump
2. Channelized flow or gullies
3. Stair, trail, or road leading to the lake
4. Lawn or soil sloping to the lake

[1] Wisconsin Department of Natural Resources Lake Shoreland & Shallows Habitat Monitoring Field Protocol 2016

5. Bare soil
6. Sand/silt deposits
7. Other run-off concerns

The bank zone is then looked at to determine the length, in feet, of bank modifications and/or erosion. Erosion of shoreline can cause problems for the lake as well as the landowner. Seawalls and rip-rap are the most common types of erosion control structures. Artificial beaches and bank erosion are also factors to be considered during the bank zone analysis. The bank erosion is broken up into greater than one foot and less than one-foot face erosion.

Finally, the littoral zone of each parcel is described. The human structures present within the littoral zone are counted. The common structures present are piers, boat lifts, swim rafts or water trampolines, boathouses over the water, and marinas. Swim rafts may not always be counted during the survey due to their proximity to shore, the rafts need to be within 50 feet of the shore. During this portion of the survey presence of emergent and/or floating-leaf vegetation are documented. If there is obvious removal of such plants, it is also documented.

During the coarse woody habitat assessment, the wood is categorized by:

1. Branches: no branches, a few branches, tree truck with full crown
2. If it touches shore
3. If it is in the water

Only coarse woody habitat greater than 4 inches in diameter are considered.

These attributes help determine the quality of the coarse woody habitat presence within the lake. GPS points are taken on each piece of coarse woody habitat to showcase their presence around the lake.

Cloverleaf Lakes Survey Results

There were a total 264 spaces surveyed during the Cloverleaf Lakes survey. Two hundred and sixty of those spaces contained a tax parcel ID while four spaces were added by the watershed coordinator to connect those previously identified parcels. The added spaces were things like boat launches or areas where roads led to the lake with no home

Before diving into the results, Adams Beach needs to be described and discussed. Adams Beach is an area located on both Pine and Grass Lakes where multiple properties own a portion of a single tax parcel. Due to the methodology of the survey, the Adams Beach parcels in Pine Lake were surveyed individually due to the width of Adams Beach in that lake. The portion of Adams Beach in Grass Lake were surveyed as one long parcel, again due to the width of the tax parcel. The results will show all of Adams Beach in Grass Lake containing beach or seawall where in reality only portions of the shoreline contain those items. If property owners within Adams Beach are interested in improving their shoreline, a shoreline visit will need to occur to ensure proper restoration occurs.

The area surveyed totaled approximately 5.2 miles. Of the 5.2 miles of shoreline surveyed, 35% of the shoreline contained a shrub/herbaceous layer, 11% of the shoreline had some type of impervious

surface, 41% contained manicured lawn, and 13% contain some other type of ground layer cover. Many of the parcels contain multiple types of ground cover, so each ground type will be discussed separately. Table 1 and Figure 1 show the breakdown of all parcels by 25% increments.

Table 1. Percent breakdown of parcel canopy cover and ground cover. Each row will equal 264 for the 264 parcels surveyed.

	0-25%	25-50%	50-75%	75-100%
Canopy Cover	59	60	50	95
Shrub/Herbaceous	187	40	17	20
Impervious Surface	226	30	4	4
Manicured Lawn	74	35	59	96
Agriculture	0	0	0	0
Other	220	26	14	4

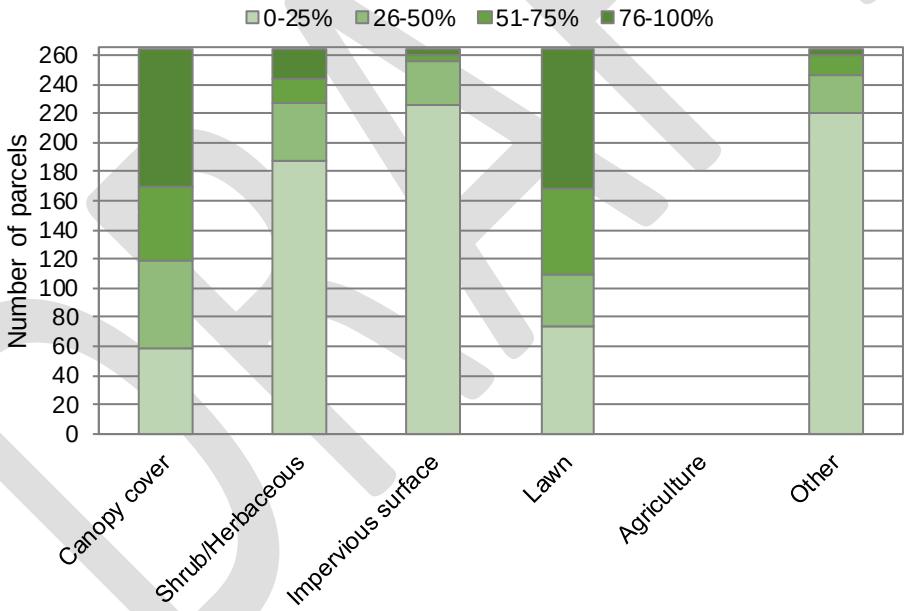


Figure 1. Percent breakdown of parcel canopy cover and ground cover. Each column will equal 264 for the 264 parcels surveyed.

Percentage increments do not do a great job of explaining what is good or bad about a property, so more descriptive terms will be used for this report: ideal, acceptable, minor improvements, and major improvements. For canopy cover and shrub/herbaceous layer, 75-100% is considered ideal, 50-75% is considered acceptable, 25-50% could benefit from suggested minor improvements, and 0-25% is in

major improvements. For impervious surfaces, manicured lawns, and other ground cover, 0-25% is considered ideal, 25-50% is considered acceptable, 50-75% could benefit from suggested minor improvements, and 75-100% could benefit from suggested major improvements.

Canopy cover

The Cloverleaf Lakes contained properties that ranged from 0% canopy cover to 100% cover with the average parcel around the Cloverleaf Lakes having 58% canopy cover. Figure 2 displays the Cloverleaf Lakes and each parcel's respective canopy cover within the riparian zone. Of the 264 parcels, 22% (59 parcels) have a canopy cover which needs suggested major improvements, 23% (60 parcels) have a canopy cover needing suggested minor improvements, 19% (50 parcels) have acceptable canopy coverage, and 36% (95 parcels) have ideal canopy cover. The greater the canopy cover, the more habitat it provides, and the more time it takes for precipitation to hit the ground. This slowdown of precipitation can aid in that precipitation infiltrating into the ground rather than running off into the lake.

As discussed above, canopy cover is assessed only on trees above 16 feet in height. A concern for many property owners is that the presence of many trees on their property. Large trees can lead to safety concerns during extreme weather events as well as potentially blocking their view of the lake. The number of trees present on a property does not always correlate to a high percentage of canopy cover. A few larger, mature trees may create as much canopy cover as many smaller trees.

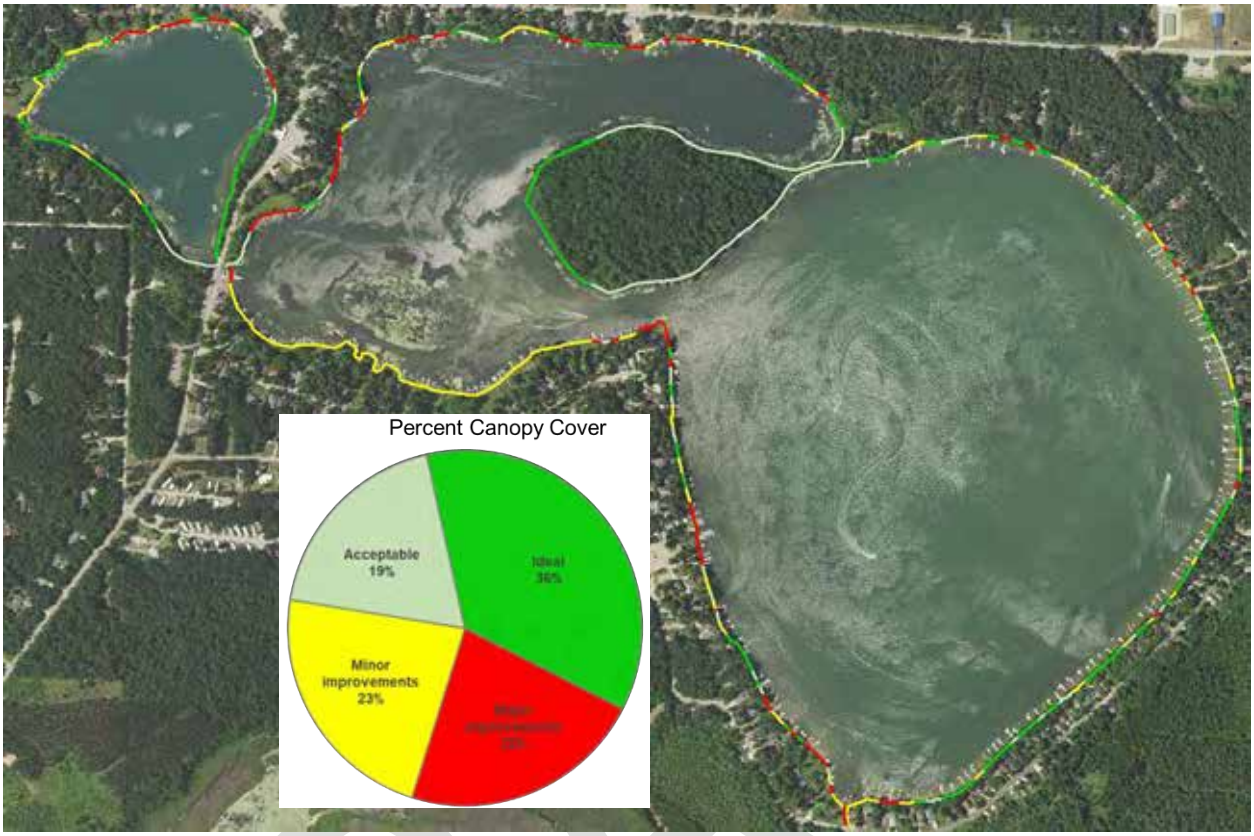
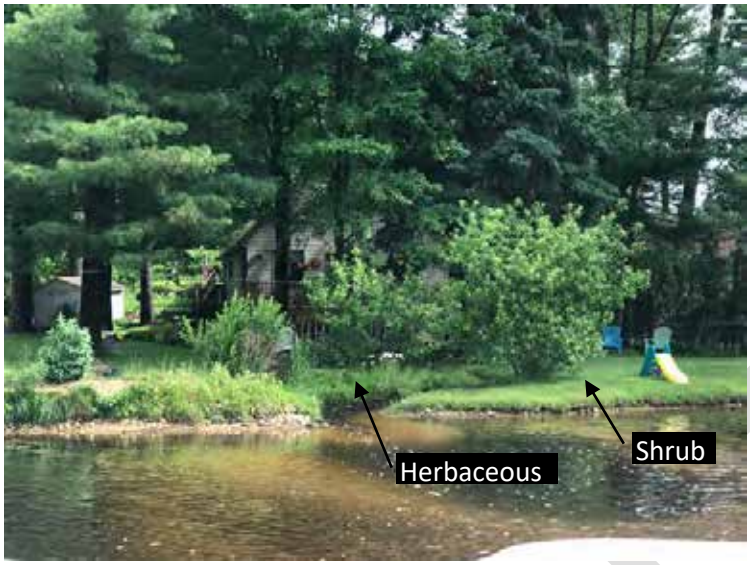


Figure 2. Canopy cover of the Cloverleaf Lakes. The ideal shoreline contains 75-100% canopy cover within the riparian zone, an acceptable shoreline contains 50-75% canopy cover, a shoreline with 25-50% canopy cover is in need of minor improvements, and a shoreline with 0-25% canopy cover is in need of major improvements.

Shrub/Herbaceous Layer

Similar to canopy cover, a strong shrub and/or herbaceous layer can aid in slower run-off on a property. Of the 264 parcels, 203 contain either a shrub or herbaceous layer within the riparian zone, with 122 containing a shrub layer and 192 containing an herbaceous layer. Figure 3 displays the Cloverleaf Lakes and each parcel's respective shrub/herbaceous layer. Of the parcels with a shrub and herbaceous layer, 71% (187 parcels) had no shrub and/or herbaceous layer or a shrub and/or herbaceous layer that would benefit from suggested major improvements, 15% (40 parcels) had a shrub and/or herbaceous layer that



would benefit from suggested minor improvements, 6% (17 parcels) have an acceptable shrub and/or herbaceous layer present, and 8% (20 parcels) have an ideal shrub and/or herbaceous layer present.

The Cloverleaf Lakes Protective Association and its members have made efforts to get shoreline property owners to add native plants in shoreline buffers and rain gardens to their properties. A number of these projects were seen but only a few areas had these types of projects present throughout the entire 35-foot riparian zone., As a reminder, the easiest way to improve the shrub and herbaceous layer is by adding more plants within the riparian zone. Rain gardens and shoreline restoration projects can be completed to have that same manicured garden look with a nice border. Native plants have the tendency to spread but by adding that border it may help maintain a level of order to the project. An increase in percentage of shrub and/or herbaceous present would be very beneficial to the lake.

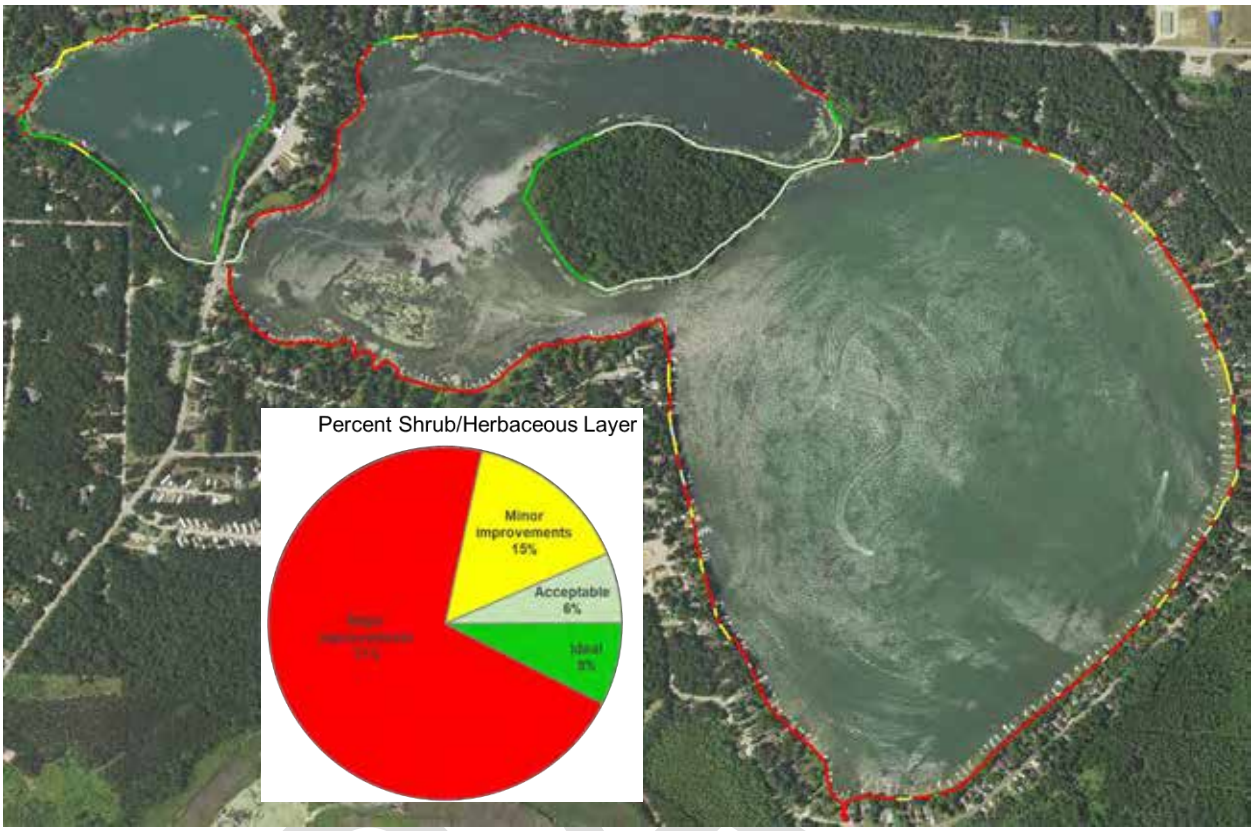


Figure 3. Shrub and herbaceous layer of the Cloverleaf Lakes. The ideal shoreline contains 75-100% shrub and/or herbaceous cover within the riparian zone, an acceptable shoreline contains 50-75% shrub and/or herbaceous cover, a shoreline with 25-50% canopy cover needs minor improvements to the shrub and/or herbaceous layer within the riparian zone, and a shoreline with 0-25% shrub and/or herbaceous cover needs major improvements.

Impervious surface

Impervious surfaces are one of the greatest causes of run-off. Unlike the shrub/herbaceous layer or manicured lawn, precipitation has no way of being slowed down, cooled down, or infiltrating when it hits an impervious surface.

Of the 264 parcels, 209 contained some type of impervious surface within the riparian zone. Figure 4 displays the breakdown of impervious surface around the Cloverleaf Lakes. Of parcels surveyed, 86% (226 parcels) contained 0-25% impervious surface, 11% (30 parcels) contained 26-50% impervious surface, 1% (4

parcels) contained 51-75%, and 2% (4 parcels) contained 75-100% impervious surface. The impervious surface categories do not follow the scale used throughout the rest of this report because no level of impervious surface is desirable. All areas of impervious surface need major improvements.

The parcels that contained 75-100% impervious surface were generally boat launches or parts of business that had roads or parking lots near the water.

A decrease in impervious surface would be very beneficial for the Cloverleaf Lakes. Even very small amounts of impervious surface can affect fish habitat. Shore spawning and nursery habitat, for many of our fish, are very close to the shoreline. Run-off, impervious surface, and scour causes a decrease in habitat availability for these young fish. Efforts towards removing all impervious surfaces should be made to further protect the shoreline, aquatic habitat, and the water quality.

If the removal of all impervious surface is not possible or undesired, changes to how the run-off leaves the property need to be explored and executed. By pointing down spouts or grading impervious areas toward rain gardens or native plant buffers, improvements can be made to the water running off the impervious surfaces present, while providing habitat.

The Wisconsin DNR does offer funding for the removal of impervious surface from the riparian zone under their surface water management grants in the surface water restoration category. Reach out to your lake biologist to learn more.

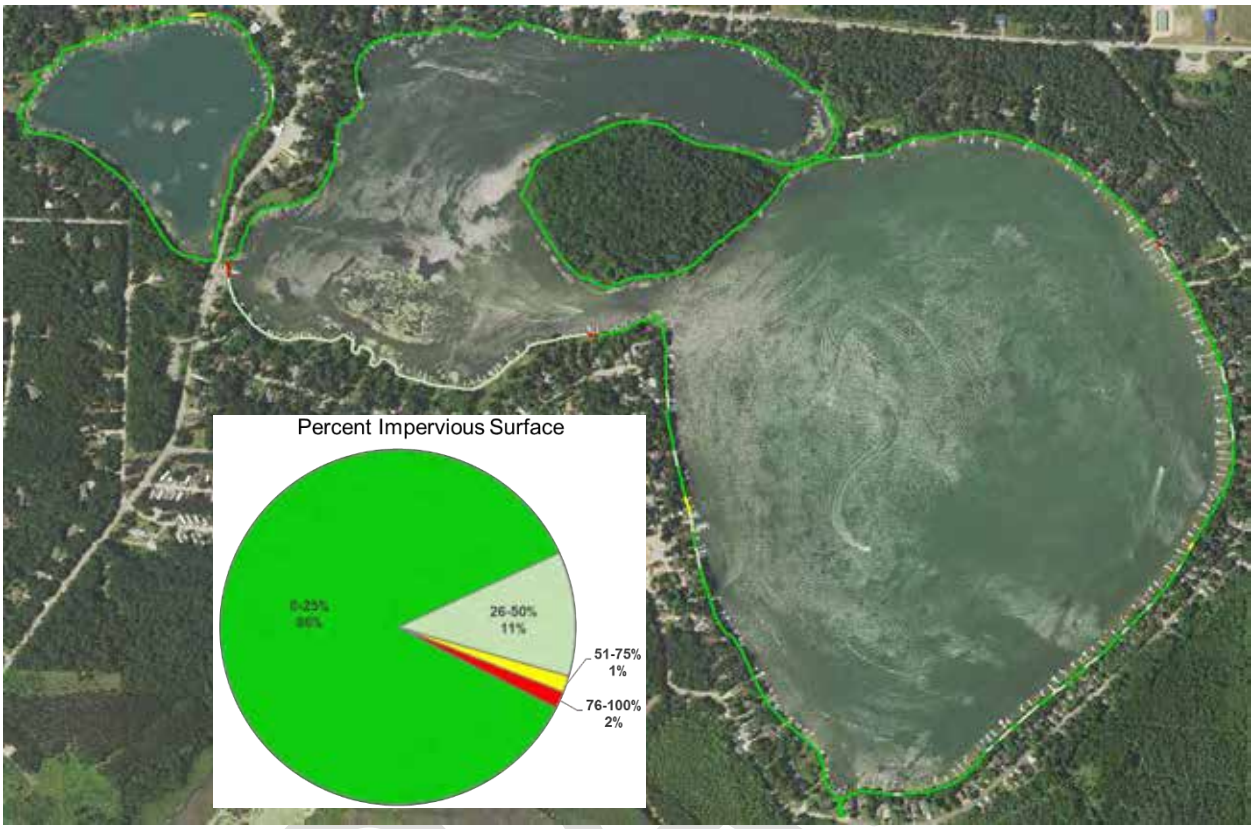


Figure 4. Impervious surface around the Cloverleaf Lakes. There is no level of impervious surface that is acceptable within the shoreline. The shoreline is broken down into 25% increments to showcase what is present around the Cloverleaf Lakes.

Manicured Lawn

As mentioned above, manicured lawns were one of the more commonly seen things within the riparian zone around the Cloverleaf Lakes. Of the 264 parcels around the Cloverleaf Lakes, 220 contained manicured lawn at varying levels. Of the parcels surveyed, 28% (74 parcels) contained an ideal amount of manicured lawn, 13% (35 parcels) contained an acceptable amount of manicured lawn, 22% (59 parcels) that would benefit from suggested minor improvements, and 37% (96 parcels) contained manicured lawn that would benefit from suggested major improvements.

A properly fertilized and maintained lawn can aid to slowing down run-off and allowing for proper infiltration of that run-off. The problems that can occur are over fertilization and improper handling of

grass clippings. A soil test can be helpful in establishing the proper fertilizer for your lawn. Collecting grass clippings during mowing can also aid in stopping a phosphorus source from entering the lake.

Geese are also attracted to manicured lawns because of the visibility. Geese get wary of areas where they cannot fully see their surroundings. The addition of taller native plantings in the riparian zone can deter geese from coming onto a lawn. They cannot see their surroundings in the taller plant and avoid them in an effort to not be attacked by predators.

The thing to remember is property owners can have a manicured lawn and native plants to protect the shoreline and add habitat. As discussed in the shrub and herbaceous layer section, more traditional looking gardens can be created with the native plants to give you that balance of lawn and buffer.

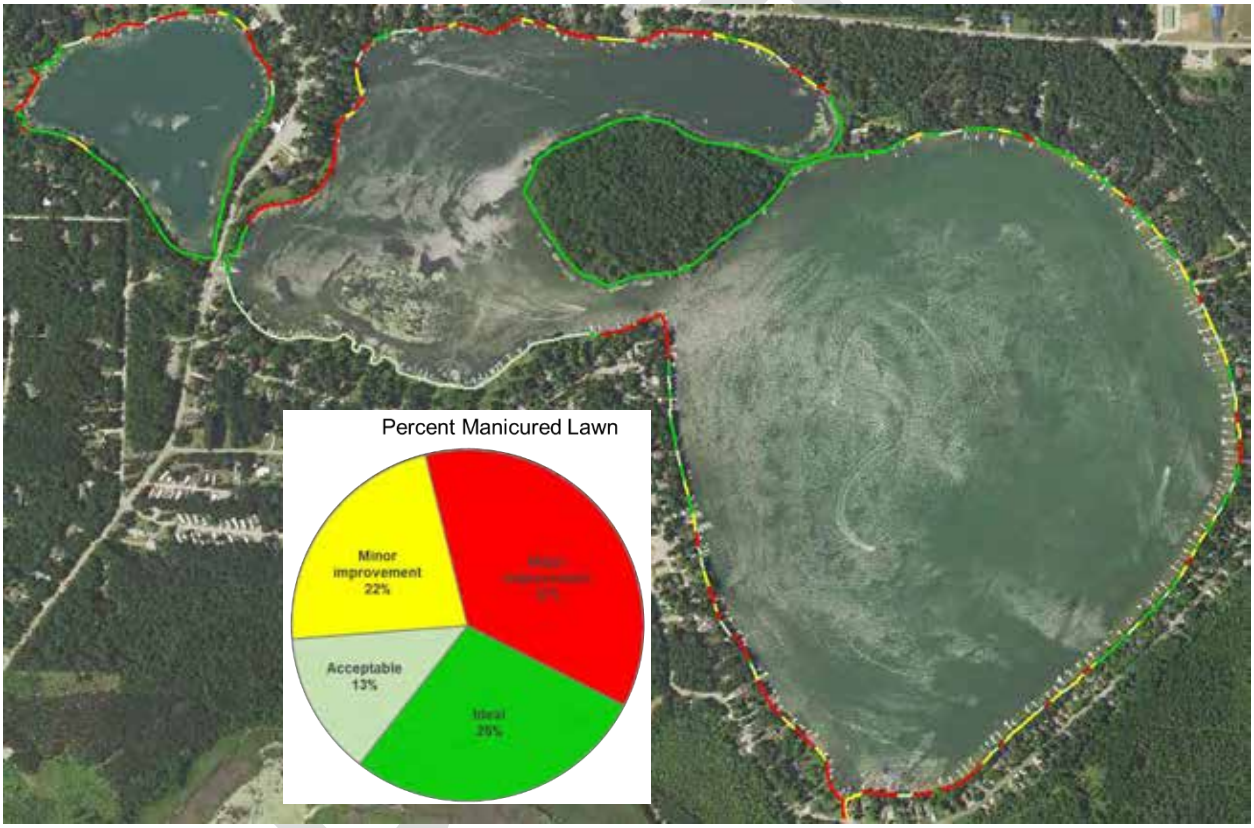


Figure 5. Manicured lawns around the Cloverleaf Lakes. The ideal shoreline contains 0-25% manicured lawn within the riparian zone, an acceptable shoreline contains 25-50% manicured lawn, a shoreline with 50-75% manicured lawn needs minor improvements, and a shoreline with 75-100% manicured lawn needs major improvements.

Agriculture

No parcels on the Cloverleaf Lakes contained agriculture within the riparian zone.

Other

As discussed above, the other category includes any other ground layer cover that does not fit in the previously mentioned categories. Properties around the Cloverleaf Lakes contained duff, mulch, bare soil, sand, and/or gravel. Of the 264 parcels around the lake, 114 parcels contained some other type of ground layer cover. Figure 6 displays the breakdown of other ground layer types around the Cloverleaf Lakes Of the surveyed parcels, 83% (220 parcels) contained the ideal amount of other types of ground layer cover, 10% (26 parcels) contained an acceptable amount of other types of ground layer cover, 5% (14 parcels) contained an amount of other types of ground layer cover that would benefit from suggested minor improvements, and 2% (4 parcels) contained an amount of other types of ground layer cover that would benefit from suggested major improvements.

Most of the other ground layer cover that was found around the Cloverleaf Lakes was in the form of duff or sandy beaches. One way to decrease the amount of other ground cover types around the Cloverleaf Lakes would to transform the beaches into native plantings or even maintained lawns. The most important thing to do is to keep the soil and sand on the landscape. This can be accomplished by more and better root structures. While the ideal situation would be to completely remove beaches and other ground cover types and replace them with native plants, we understand that is unrealistic. Even changing a small portion of beach, or other area, to native plantings can have great benefits.

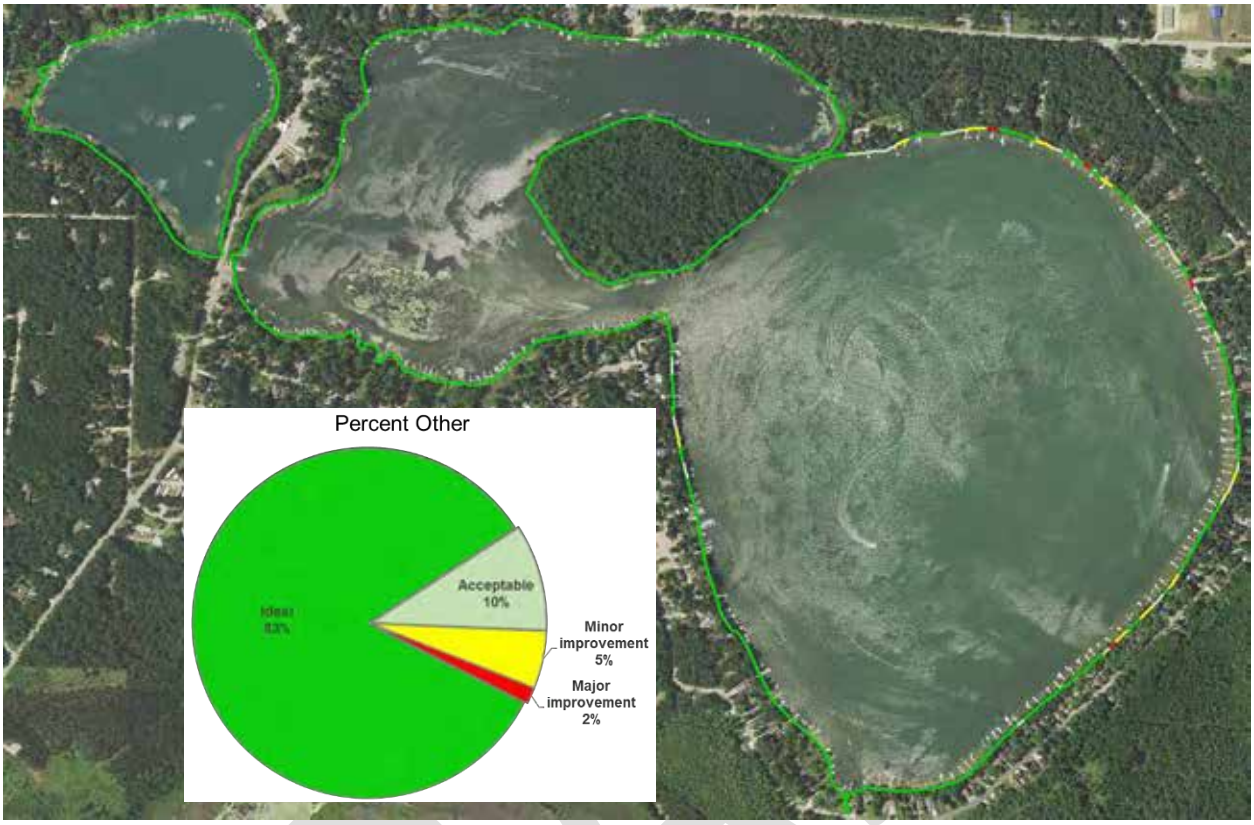


Figure 6. Other types of ground layer cover around the Cloverleaf Lakes. The ideal shoreline contains 0-25% other types of ground layer within the riparian zone, an acceptable shoreline contains 25-50% other types of ground layer, a shoreline with 50-75% other types of ground layer needs minor improvements, and a shoreline with 75-100% other types of ground layer needs major improvements.

Human structures

Human structures within the riparian and the littoral zone were counted during the survey (Figure 7 and Figure 8). Buildings counted included sheds, garages, and similar structures. Boats that were left on shore were counted. This ranged from kayaks to pontoons on shore. Fire pits were also counted around the lake, this included in ground and non-permanent fire pits. If the fire pit was outside the riparian zone, it was not counted. Finally, a number of other human structures were counted around the Cloverleaf Lakes. The majority of the other human structures found were large wooden swings or benches and boatlifts or piers that were left on land.

Human structures within the littoral zone that were counted during this survey were piers, boat lifts, swim rafts, boat houses, marinas, and any other structure that may be present. Boats in the water were not counted as part of this survey. The most common other human structures within the littoral zone were basketball hoops, volleyball nets, slides, and floating lifts for jet-skis or boats.

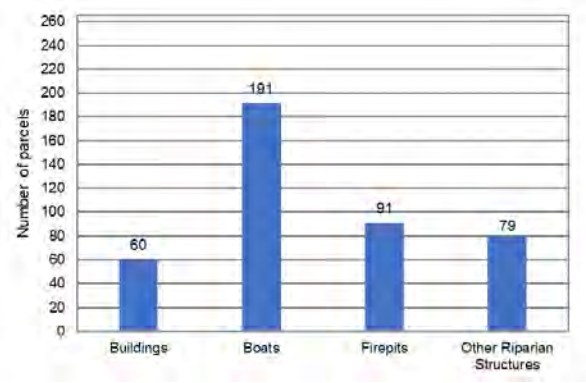


Figure 7. Human structures within the riparian zone.

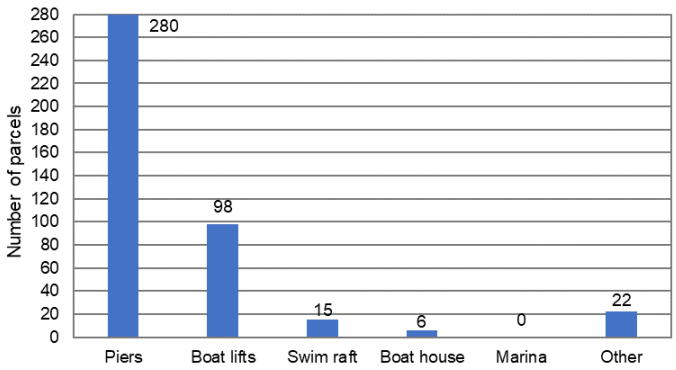


Figure 8. Human structures within the littoral zone.

Run-off concerns

The Cloverleaf Lakes contain a number of run-off concerns around the shoreline. Most of these concerns can be easily mitigated with some small changes on the land. The largest concerns around the Cloverleaf Lakes are stairs, trails, or roads leading to the lake and lawn or soil sloping towards the lake. Also, as mentioned above, a number of properties contain sand or silt deposits within the riparian zone.

Table 2 lists the run-off concerns and their presence within or outside the riparian zone. As mentioned above, while a run-off concern outside the riparian zone may not immediately affect the lake, it may eventually cause the same issues as if it were present within the riparian zone.

The steeper shorelines around the Cloverleaf lakes causes run-off to enter the lake at an accelerated rate. The survey protocol does not currently take into account the degree of slope but any degree of slope causes run-off to gain speed as it moves towards the lake.

Table 2. Run-off concerns around the Cloverleaf Lakes within and outside the riparian zone.

	Point Source	Channelized flow/gully	Stair/trail/road leading to lake	Lawn/soil sloping to lake	Bare soil	Sand/silt deposits	Other run-off concern
Present in riparian zone	10	2	158	142	13	22	12
Present outside riparian zone	4	0	44	52	0	0	6
Absent	251	263	63	71	252	243	247

The easiest ways to improve the run-off concerns around the Cloverleaf Lakes is by adding native plantings or rain gardens to the landscaping. Stairs, trails, roads, and manicured lawns need some sort of buffer zone to slow down run-off and help it infiltrate and add habitat. This buffer does not need to be large but it is crucial to help keep warm, dirty water out of the lake.

Bank Zone

During the Cloverleaf Lakes shoreline survey, it was found that approximately 65% of the shoreline (3.4 miles) were unaltered or lacked erosion, 27% of the shoreline (1.4 miles) contained rip-rap, 4% (994 feet) contained seawall, 1.5% (421 feet) contained less than one-foot erosion, 1.4% (381 feet) contained beach, less than 1% (135 feet) contained other erosion control structures, and less than 1% (79 feet) contained greater than 1-foot erosion. Figure 9 displays the breakdown of the bank zone around the Cloverleaf Lake.

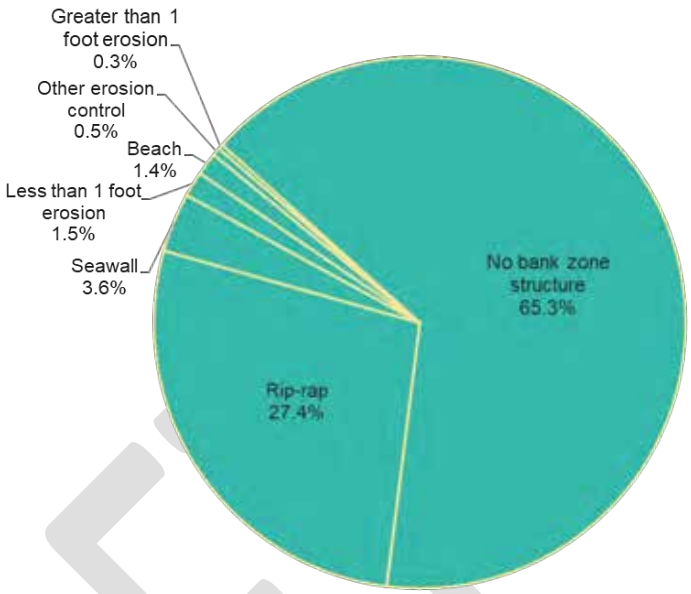


Figure 9. Bank zone structures and concerns around the Cloverleaf Lakes.

Rip-Rap

Rip-rap has become a recommended method of stabilizing the shoreline, rather than a seawall. Natural plantings with coir biologs is still the best option for the environment, but some shorelines need more protection from erosion than a natural shoreline can provide. Rip-rap needs to be made of clean field stone or quarry stone. It allows ice shoves to climb up the shoreline rather than push the shoreline out of place. Scouring, as discussed in seawalls, is also less likely to happen with rip-rap. The removal of a seawall and replacing it with rip-rap and native plantings could be very beneficial to the shoreline and lake health of the Cloverleaf Lakes. Mixing in native plants throughout the rip-rap can also give extra support to the shoreline.

Seawalls

Seawalls can be a controversial subject when it comes to the shoreline of lake. Ice shoves and high wind wave action can cause the desire to armor the shoreline with seawalls. However, adding, fixing, or replacing seawalls can be expensive for the landowner where native plantings or rip-rap may be a more affordable option. Permits can also be hard to get for adding a seawall due to the environmental implications they can have on the lake.

Figure 10. Illustration of wave action against a seawall. Courtesy of Michigan Natural Shoreline Partnership

Research has found that wind and wave action against seawalls can cause a lack of submergent and emergent plants to be present in front of seawalls. This scouring of the lake bottom can have negative effects for lake-life (Figure 10). Other concerns with seawalls are: loss of fish spawning and nursery habitat, preventing amphibians and reptiles from getting into and out of the lake, prevention of future recruitment of fisheries habitat.

There can be a difference in how water moves against a sloped seawall versus a vertical seawall. According to the Army Corps of Engineers, scour still occurs with sloping structures but is less significant than against a vertical seawall[2]. The more energy a wave has as it crashes against a seawall the greater the scour whether the seawall is sloped or vertical.

In a perfect world, seawalls would be pulled out and replaced with practices like coir biologs and native plants but this is not always realistic for property owners. Adding native plants near the border of seawalls can help alleviate the run-off concerns that occur with the presence of seawalls.

Figure 11 displays the presence of seawall and rip-rap around the Cloverleaf Lakes.

[2] Design of Maritime Structures: Scour and Scour Protection. Steven A. Hughes

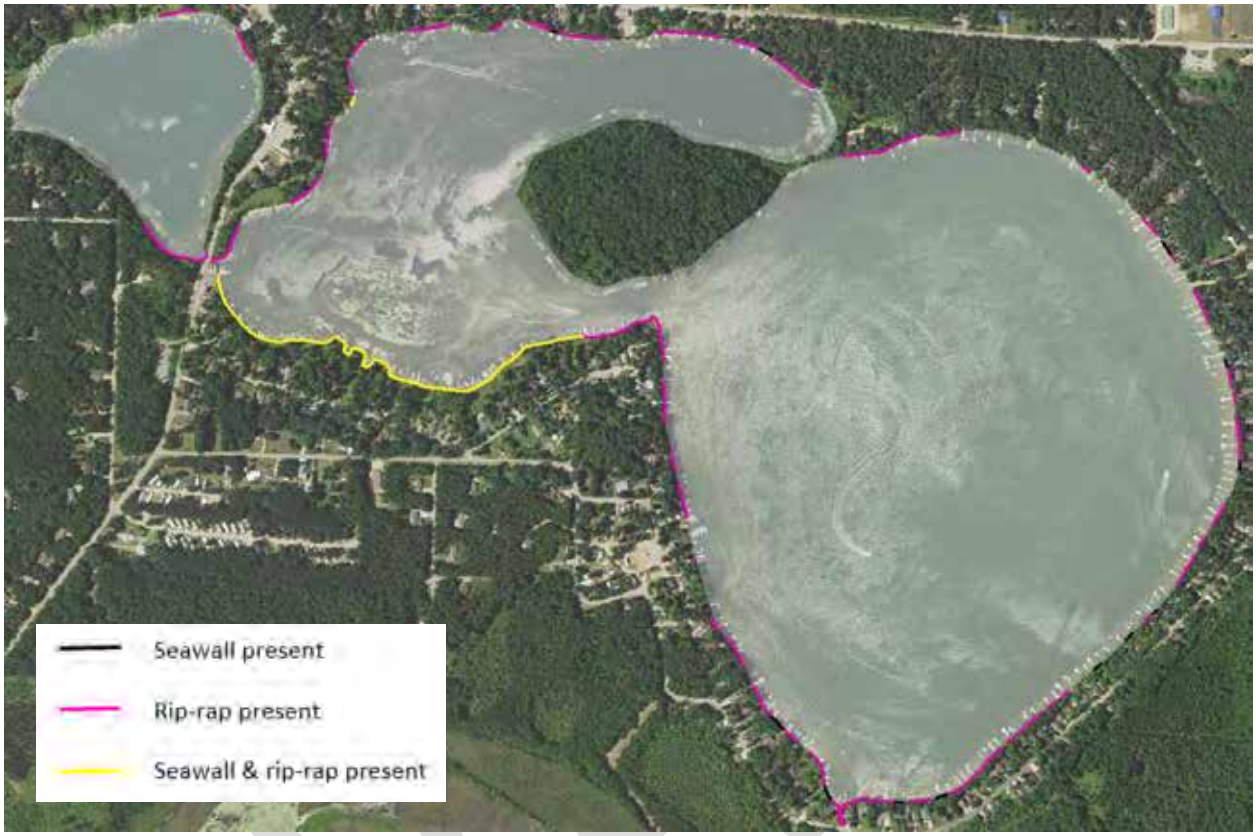


Figure 11. Seawalls and rip-rap present within the bank zone of the Cloverleaf Lakes.

Erosion

Eroding and slumping shorelines around the Cloverleaf Lakes are directly adding nutrients to the lake and action needs to take place to improve these areas. Not only is the property losing land but they are directly contributing to the water quality issues on the lake by adding phosphorus and total suspended solids to the lake. Aquatic animals, like fish, struggle with these extra pollutants and nutrients. These excess sources of nutrients can add to the nuisance level of native plants found near shore.

There are different options to help with soil and shoreline stabilization. Geoweb cellular confinement structures have been used to help keep the soil from moving (Photo 1). These Geoweb structures would be used on majorly eroding shorelines. Around the Cloverleaf Lakes, properties that contained channelized gullies or eroding shoreline greater than 1 foot may consider this an option to help contain the erosion.

The use of Curlex blocs (similar make up to biologs) have also been used to help stabilize eroding shorelines. These blocks can be stacked to help hold back slightly eroding shorelines (Photo 2). These blocks can be planted into with native plants, also. Properties around the Cloverleaf Lakes containing less than 1-foot erosion and greater than 1-foot erosion may consider this an alternative to stabilizing their shoreline.

Photo 1. Geoweb cellular confinement structure. Photo courtesy of Menominee County.

Photo 2. Curlex blocs. Photo courtesy of Menominee County.

Other erosion control structures

This category is more of a catchall for things found around the bank zone that do not readily fall into the prescribed categories. Other erosion control structures examples are biologs, fine pea gravel or erosion control structures during active construction. It was also hard to tell, at times, if the material present in the bank zone was an eroding seawall or rip-rap, or something else. The presence of biologs was also hard to note since they become overgrown. As mentioned above, it can be expensive to add rip-rap or a seawall but making sure your shoreline structure is not failing is also very important. Failing seawalls or broken down seawalls or rip-rap can have negative impacts on your shoreline as well as the health of the lake.

Beaches

The presence of beaches around the Cloverleaf Lakes was a concern brought to Connecting Our Waters as we were preparing for the presentation given at the Cloverleaf Lakes Protective Association's annual meeting.

The DNR states that sand blankets that are placed below the OHWM and in the lake are very bad for water quality and for shoreline erosion. The physical placement of sand within the riparian zone is a permitted activity, needing approval from both the DNR and the county. Sand can smother benthic organisms and aquatic plants which are both crucial to the health of the lake. Figure 12 shows where there are beaches are present around the Cloverleaf Lakes

Figure 12. Beaches present around the Cloverleaf Lakes.

Emergent and Floating-leaf presence

Of the 264 parcels around the Cloverleaf Lakes, 133 parcels included emergent and/or floating-leaf plant communities. Of those parcels, 56 of them contained emergent plants and 77 parcels contained floating-leaf plants.

The presence of floating-leaf and/or emergent plants is very important for young fish as well as helping slow down wind/wave action headed toward the shoreline. Generally, a lake is calmer behind a large stand of emergent or floating-leaf plants. As discussed in the seawall section, emergent and floating-leaf plants are not generally found in front of seawalls due to the scouring that can occur.

Seiche *(sāsh)* Lake water can resonate in its basin under certain conditions of sustained unidirectional winds followed by calm. The seiche may be externally visible or unseen, only in hypolimnion (internal seiche). Seiche cause entrainment (mixing) of layers.

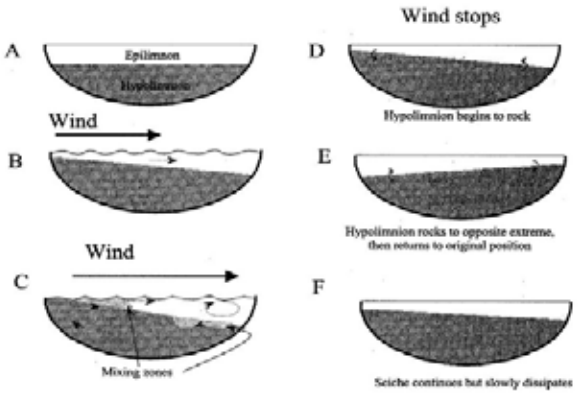


Photo courtesy of https://slideplayer.com/slide/6667616/

It was also found that 2 parcels around the Cloverleaf Lakes had removed plants from the lake. As a reminder, both native and invasive plants can naturally dislodge themselves from the lake sediment. Property owners can remove any and all floating plants, not to be confused with floating-leaf plants, from their waterfront. Floating-leaf and emergent plants should be kept in place to protect the shoreline.

Coarse woody habitat

The coarse woody habitat survey was completed on July 30th. One hundred and sixty-five pieces of coarse woody habitat were found around the lake. The majority of the habitat found were of higher quality, meaning they had some branching, crossed the high water mark, and were in the water.

Coarse woody habitat provides great fish habitat. Addition of tree drops, anywhere on the lake, will be beneficial for the lake. The Healthy Lakes grant program offers cost sharing for adding fish sticks (tree drops) to the lake. The Healthy Lakes grant Action Plan can be found in Appendix B.

Figure 13. Coarse woody habitat around the Cloverleaf Lakes.

Conclusions

In conclusion, the Cloverleaf Lakes' shoreline, like a lot of lakes, is in need of restoration efforts. Most of the concerns can be addressed with small, management projects or changes completed by the property owner.

Simple restoration suggestions are to increase native plantings within the riparian buffer zone, installation of rain gardens, and changes to or removal of large human structures with riparian zones. All three of these can help increase infiltration as well as decrease in run-off. Adding diversion practices to the uplands is another way to stop run-off from reaching the lake.

Changes to lawn maintenance can also aid in improving water quality around the Cloverleaf Lakes. By increasing the height of cut when mowing, a greater root mass can remain to help water infiltrate before reaching the lake. As mentioned, the removal of impervious surface would be beneficial to the lake and funding should be pursued in accomplishing that goal.

Shawano County offers 50% cost-share funding up until $2500 for shoreline restoration projects and rain gardens. The Healthy Lakes grant program offers up to $1000 per qualified practice and up to $25,000 can be applied for. These two funding sources can be used in combination to keep costs low for the participants. More information on the Shawano County program can be found in Appendix C.

Recommendations

On September 9th, 2020 Connecting Our Waters presented the results of the survey to the members of the Cloverleaf Lakes Protective Association. Prior to this meeting, the CLPA submitted a pre-proposal for a Healthy Lakes Grant with the plan to submit a full Healthy Lakes grant application on November 1st. In addition to the individuals participating in the Healthy Lakes grant, it is suggested that individuals interested in shoreline buffers and rain gardens apply for Shawano County funds as they are available year round and do not need an association to apply on their behalf. The addition of rain barrels is also highly suggested in an effort to remove point sources pointed at the lake.

It should be noted that the Shawano County LCD funding will be expiring in 2021. If there is interest in utilizing those funds, applications need to be sent in before the end of the summer of 2021.

Shoreline Restoration Project Resources

Shawano and Menominee Counties are very fortunate to have many partners willing to assist with shoreline restoration on waterfront properties. Connecting Our Waters, a partnership of the Fox-Wolf Watershed Alliance and the Waterways Association of Menominee and Shawano Counties, is a newer program that aims to improve water quality through shoreline restoration projects. Both Shawano County Land Conservation Department and Menominee County Land Conservation Department offer cost sharing programs for applicable shoreline restoration projects. The Wisconsin Department of Natural Resources has funds available through the Wisconsin Healthy Lakes Program. There are also landscapers throughout the counties, as well as the state, familiar with completing shoreline restoration projects.

Table 3. Contact information for the different resources in Shawano and Menominee Counties.

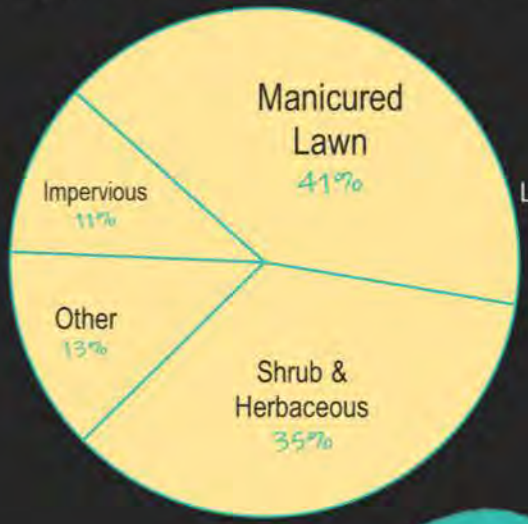
Resource Program	Contact	Contact information
Connecting Our Waters http://fwwa.org/connecting-our-waters	Emily Henrigillis	emily@fwwa.org; 920.851.6472
Healthy Lakes Grant Program https://healthylakeswi.com/	Pamela Toshner	Pamela.toshner@wisconsin.gov; 715.635.4073
Menominee County Land Conservation Department	Jeremy Johnson	jeremyj@co.menominee.wi.us; 715.799.5710
Shawano County Land Conservation Department	Scott Frank	Scott.frank@co.shawano.wi.us; 715.526.4632
Waterways Association of Menominee and Shawano Counties https://wamsco.org/	Shanda Hubertus	wamsco@gmail.com
Wild Ones – Wolf River Chapter	Gail Sarnwick	gailwildones@gmail.com
Wisconsin Department of Natural Resources	Brenda Nordin	Brenda.nordin@wisconsin.gov

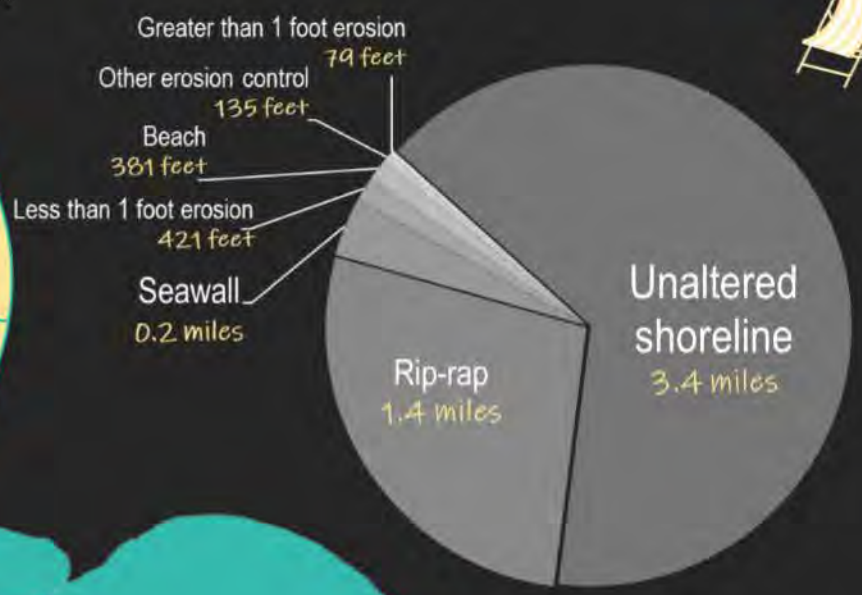
Cloverleaf Lakes Shoreline Survey 2020 RESULTS

Present around Cloverleaf Lakes

- 280 Piers
- 98 Boat Lifts
- 15 Swim Rafts
- 10 Beaches
- 6 Boat Houses
- Emergent plants found at 56 parcels
- Floating-leaf plants found at 76 parcels
- 167 pieces of coarse woody habitat found

Riparian Zone Composition





264 tax parcels surveyed

5.2 miles of shoreline

Suggestions:

- Add rain gardens
- Decrease impervious surface
- Decrease manicured lawn by planting native plants
- Add more coarse woody habitat to the lakes to improve fish habitat
- Restore areas with erosion concerns by stabilizing then planting with native plants

Connecting our Waters

Fox-Wolf Watershed Alliance

WAMSC

E

APPENDIX E

Fisheries Reports and Data Summaries

2017 Spring Electrofishing (SEII) Summary Report

Cloverleaf Chain of Lakes (WBIC 299000)

Shawano County

Introduction and Survey Objectives

In 2017, the Department of Natural Resources conducted a one night electrofishing survey of the Cloverleaf Chain of Lakes in order to provide insight and direction for the future fisheries management of this water body. Primary sampling objectives of this survey are to characterize species composition, relative abundance, and size structure. The following report is a brief summary of that survey, the general status of the fish populations and future management options for the Cloverleaf Chain of Lakes.

Acres: 316 Shoreline Miles: 5.15 Maximum Depth (feet): 52
Lake Type: Deep Headwater Public Access: Two Public Boat Launches
Regulations: 25 panfish of any size may be kept, except 5 or fewer can be bluegill and pumpkinseed over 7". All other species statewide default regulations.

WISCONSIN DNR CONTACT INFO.

Jason Breeggemann—Fisheries Biologist
Elliot Hoffman - Fisheries Technician
Wisconsin Dept. of Natural Resources
647 Lakeland Rd.
Shawano, WI 54166

Jason Breeggemann phone and emial:715-526-4227; jason.breeggemann@wisconsin.gov

Elliot Hoffman phone and email: 715-526-4231; elliot.hoffman@wisconsin.gov

Survey Information							
Site location	Survey Date	Water Temperature (°F)	Target Species	Total Miles Shocked	Number of Stations	Gear	Number of Netters
Cloverleaf Chain	5/18/2017	61	All	4.23	5	Boomshocker	2

Survey Method

- The Cloverleaf Chain of Lakes was sampled according to spring electrofishing (SEII) protocols as outlined in the statewide lake assessment plan. The primary objective for this sampling period was to count and measure adult largemouth bass and panfish. Other gamefish may be sampled but are considered by-catch as part of this survey.
- The entire shoreline of Grass and Pine Lakes was sampled with a boomshocker. All fish captured were identified to species and gamefish and panfish were measured for length. All gamefish were weighed as a part of this survey.
- Fish metrics used to describe fish populations include proportional stock density, catch per unit effort, and length frequency distributions.

Fish Metric Descriptions
PSD, CPUE, and LFD

Proportional Stock Density (PSD) is an index used to describe size structure of fish populations. It is calculated by dividing the number of quality size fish by the number of stock size fish for a given species. PSD values between 40 - 60 generally describe a balanced fish population.

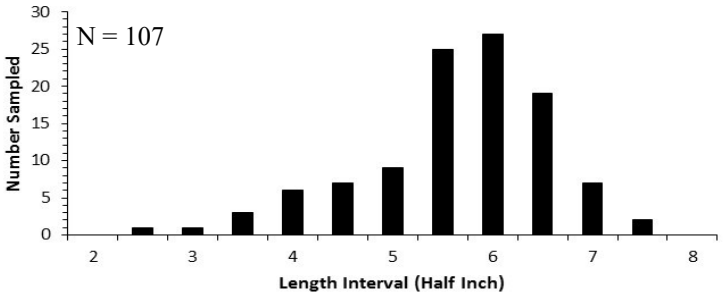
Catch per unit effort (CPUE) is an index used to measure fish population relative abundance, which simply refers to the number of fish captured per unit of distance or time. For electrofishing surveys, we typically quantify CPUE by the number and size of fish per mile of shoreline. CPUE indexes are compared to statewide data by percentiles. For example, if a CPUE is in the 90th percentile, it is higher than 90% of the other CPUEs in the state.

Length frequency distribution (LFD) is a graphical representation of the number or percentage of fish captured by half inch or one inch size intervals. Smaller fish (or younger age classes) may not always be represented in the length frequency due to different habitat usage or sampling gear limitations.

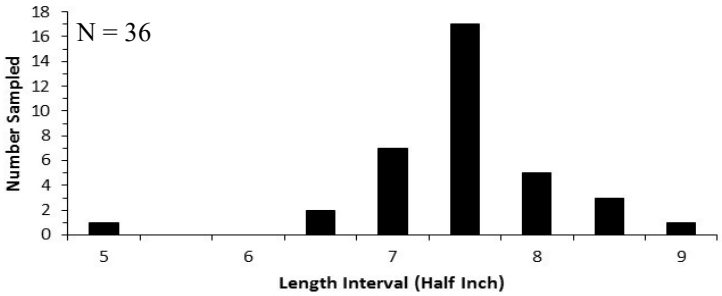
Size Structure Metrics									
Species	Total	Average Length (inches)	Length Range (inches)	Stock and Quality Size (inches)	Stock Number	Quality Number	PSD	Percentile Rank	Size Rating
BLUEGILL	107	5.9	2.5 - 7.6	3.0 and 6.0	106	55	52	79	High
PUMPKINSEED	17	6.1	4.8 - 7.6	3.0 and 6.0	17	9	53	79	High
BLACK CRAPPIE	36	7.7	5.4 - 9.3	5.0 and 8.0	36	9	25	41	Moderate
WALLEYE	35	12.0	10.5 - 16.7	10.0 and 15.0	35	2	6	20	Low
LARGEMOUTH BASS	174	10.5	4.1 - 16.4	8.0 and 12.0	121	73	60	60	Moderate
NORTHERN PIKE	19	15.3	9.7 - 21.2	14.0 and 21.0	11	1	9	13	Low

Abundance Metrics							
Species	CPUE Total (number per mile)	Percentile Rank	Overall Abundance Rating	Length Index (inches)	Length Index CPUE	Length Index Percentile Rank	Length Index Abundance Rating
BLUEGILL	107	56	Moderate	≥ 7.0 inches	9.0	59	Moderate
PUMPKINSEED	17	73	High	≥ 7.0 inches	3.0	84	High
BLACK CRAPPIE	36	87	High	≥ 10.0 inches	0	0	Low
WALLEYE	8.3	46	Moderate	≥ 18.0 inches	0	0	Low
LARGEMOUTH BASS	41.1	81	High	≥ 14.0 inches	5.0	67	Moderate– High
NORTHERN PIKE	4.5	83	High	≥ 26.0 inches	0	0	Low

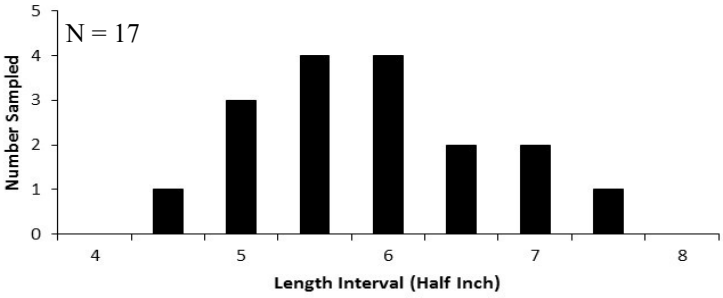
Bluegill Length Frequency



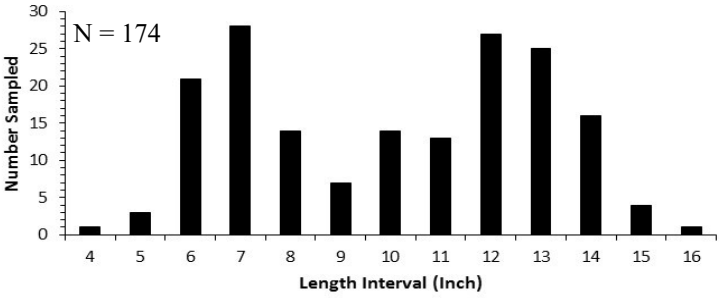
Black Crappie Length Frequency



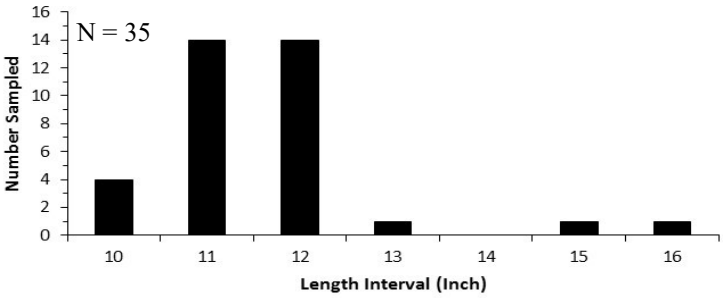
Pumpkinseed Length Frequency



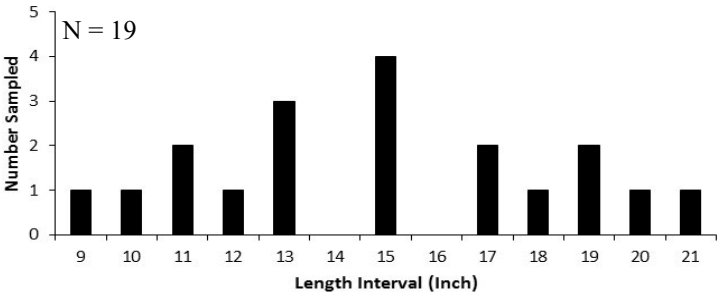
Largemouth Bass Length Frequency



Walleye Length Frequency



Northern Pike Length Frequency



Stocking History					
Waterbody Name	**Year**	**Species**	**Age Class**	**Number Stocked**	**Average Length (Inches)**
CLOVERLEAF CHAIN	2017	WALLEYE	LARGE FINGERLING	3,172	3.3
CLOVERLEAF CHAIN	2017	NORTHERN PIKE	LARGE FINGERLING	900	8.5
CLOVERLEAF CHAIN	2017	MUSKELLUNGE	LARGE FINGERLING	316	12.0
CLOVERLEAF CHAIN	2015	WALLEYE	LARGE FINGERLING	3,184	7.8
CLOVERLEAF CHAIN	2015	WALLEYE	LARGE FINGERLING	2,100	7.0
CLOVERLEAF CHAIN	2014	NORTHERN PIKE	LARGE FINGERLING	796	9.5
CLOVERLEAF CHAIN	2014	MUSKELLUNGE	LARGE FINGERLING	316	9.8
CLOVERLEAF CHAIN	2013	WALLEYE	LARGE FINGERLING	6,338	6.8
CLOVERLEAF CHAIN	2010	MUSKELLUNGE	LARGE FINGERLING	193	13.2
CLOVERLEAF CHAIN	2008	MUSKELLUNGE	LARGE FINGERLING	640	10.3
CLOVERLEAF CHAIN	2008	WALLEYE	SMALL FINGERLING	11,290	1.5
CLOVERLEAF CHAIN	2006	MUSKELLUNGE	LARGE FINGERLING	140	10.8
CLOVERLEAF CHAIN	2006	MUSKELLUNGE	LARGE FINGERLING	200	13.0
CLOVERLEAF CHAIN	2006	WALLEYE	SMALL FINGERLING	15,985	1.4
CLOVERLEAF CHAIN	2004	MUSKELLUINGE	LARGE FINGERLING	638	10.5

Stocking History Continued					
Waterbody Name	**Year**	**Species**	**Age Class**	**Number Stocked**	**Average Length (Inches)**
CLOVERLEAF CHAIN	2004	WALLEYE	SMALL FINGERLING	15,990	1.4
CLOVERLEAF CHAIN	2002	MUSKELLUNGE	LARGE FINGERLING	640	10.1
CLOVERLEAF CHAIN	2002	WALLEYE	LARGE FINGERLING	1,150	6.0
CLOVERLEAF CHAIN	2000	MUSKELLUNGE	LARGE FINGERLING	450	11.4
CLOVERLEAF CHAIN	2000	WALLEYE	SMALL FINGERLING	11,000	1.7
CLOVERLEAF CHAIN	1998	WALLEYE	SMALL FINGERLING	8,850	1.7
CLOVERLEAF CHAIN	1997	WALLEYE	SMALL FINGERLING	11,000	2.7
CLOVERLEAF CHAIN	1997	YELLOW PERCH	FINGERLING	3,000	5.0
CLOVERLEAF CHAIN	1996	WALLEYE	FINGERLING	14,954	1.6
CLOVERLEAF CHAIN	1995	MUSKELLUNGE	LARGE FINGERLING	200	14.0
CLOVERLEAF CHAIN	1994	WALLEYE	FINGERLING	16,303	3.6
CLOVERLEAF CHAIN	1992	MUSKELLUNGE	FINGERLING	646	11.0
CLOVERLEAF CHAIN	1992	WALLEYE	FINGERLING	8,120	3.0
CLOVERLEAF CHAIN	1991	MUSKELLUNGE	FINGERLING	640	10.9
CLOVERLEAF CHAIN	1989	WALLEYE	YEARLING	4,500	10.0
CLOVERLEAF CHAIN	1989	MUSKELLUNGE	FINGERLING	640	11.0
CLOVERLEAF CHAIN	1989	NORTHERN PIKE	LARGE FINGERLING	325	11.0
CLOVERLEAF CHAIN	1989	YELLOW PERCH	LARGE FINGERLING	300	5.5

Summary

- A total of 463 fish from 13 species were collected during our survey. The most frequently encountered and common species were largemouth bass (174), bluegill (107), rock bass (56), and black crappie (36).
- Other fish species encountered in lower abundances included walleyes (35), northern pike (19), pumpkinseed (17), yellow bullhead (9), yellow perch (4), brown bullhead (2), common carp (2), bluntnose minnow (1), and bowfin (1).
- Two common carp, an invasive species, were encountered during our survey.
- Largemouth bass were the dominant gamefish captured in our survey. Densities were found at high levels whereas size structure was found at moderate levels. We averaged 5.0 legal size (≥ 14.0 inches) per mile of shoreline, which was moderate-high compared to other lakes throughout WI. However, only five largemouth bass > 15 inches and one > 16 inches were captured.
- Nineteen northern pike were captured. However, fyke netting would be a more appropriate sampling technique to assess the northern pike population. A fyke net survey was conducted in spring 2017. A separate report was written for the fyke net survey.
- Panfish populations were comprised primarily of bluegill, black crappie, and pumpkinseed. Densities and size structure of all three species were found at moderate to high levels.
- Bluegill and pumpkinseed populations were dominated by individuals between 5 - 7 inches that should grow to be desirable size in the next year or two.
- The black crappie population has a strong year class of individuals between 7 - 8.5 inches that will be reaching harvestable size in the next year or two.
- Four yellow perch were captured, but only one was > 8 inches.
- Survey results showed that the Cloverleaf Chain has a good population of rock bass. Fifty six rock bass per mile of shoreline were captured during our electrofishing survey. Many of the captured rock bass were harvestable size, averaging 6.5 inches with the biggest being 9.8 inches.

Management Recommendations

This survey was primarily intended to assess largemouth bass and panfish populations. Other species are captured but different survey techniques are typically used to better assess their population metrics. Therefore, management recommendations are focused on bass and panfish.

Largemouth Bass

- Despite having a PSD of 60 and averaging 5.0 largemouth bass ≥ 14 inches per mile of electrofishing, only one bass > 16 inches was captured. This is likely due to the high bass density resulting in slow growth rates in combination with anglers harvesting some of the legal size bass. Results from the last comprehensive survey in 2013 also showed a higher density of largemouth bass in the Cloverleaf Chain and slower growth. Efforts should be made to promote good largemouth bass habitat including adding coarse woody habitat along the shoreline, promoting native submergent and emergent vegetation, and enhancing natural shoreland areas.

Panfish

- The special panfish regulation limiting harvest to five or fewer bluegill and pumpkinseed >7” was put in place in 2016. Only nine bluegills and three pumpkinseed ≥ 7.0 inches were captured with electrofishing. No bluegills or pumpkinseed ≥ 8.0 inches were captured with electrofishing and only two bluegills ≥ 8.0 inches were captured in fyke nets. Given that only one year had passed since the regulation was put in place, it is not surprising that a significant number of large bluegills and pumpkinseed were captured. The next comprehensive survey in 2021 will provide more comprehensive information on the effect of the regulation.

Other Management Objectives

- The majority of the shoreline around the Cloverleaf Chain, except the island, is highly developed with little woody habitat. Landowners should consider adding fish sticks similar to those that were added around the island in 2016 to increase near-shore habitat for fish. Additionally, a large-scale deepwater fish sticks project could be considered to add habitat complexity to the Cloverleaf Chain.
- Walleye stocking will be necessary to maintain a walleye fishery in the future.

2017 Spring Netting (SNI and SNII) Summary Report

Cloverleaf Chain of Lakes

Shawano County (WBIC 299000)

Introduction and Survey Objectives

In 2017, the Department of Natural Resources conducted a fyke netting survey of the Cloverleaf Chain of Lakes in order to provide insight and direction for the future fisheries management of the water body. Primary sampling objectives of this survey are to characterize species composition, relative abundance and size structure. The following report is a brief summary of the activities conducted, general status of fish populations and future management options.

Acres: 316 Shoreline Miles: 5.15 Maximum Depth (feet): 52
Lake Type: Deep Headwater Public Access: Two Public Boat Launches
Regulations: 25 panfish of any size may be kept, except 5 or fewer can be bluegill and pumpkinseed over 7". All other species statewide default regulations.

WISCONSIN DNR CONTACT INFO.

Jason Breeggemann—Fisheries Biologist
Elliot Hoffman - Fisheries Technician
Wisconsin Department of Natural Resources
647 Lakeland Rd.
Shawano, WI 54166

Jason Breeggemann: 715-526-4227;
jason.breeggemann@wisconsin.gov

Elliot Hoffman: 715-526-4231;
elliot.hoffman@wisconsin.gov

Survey Information						
Site location	**Survey Dates**	**Water Temperature (°F)**	**Target Species**	**Gear**	**Number of Nets**	**Net Nights**
Cloverleaf Chain	4/3/2017 - 4/14/2017	42 - 50	Northern Pike, Walleye, Muskellunge, Panfish	Fyke Net	9	85

Survey Method

- The Cloverleaf Chain of Lakes was sampled according to spring netting (SNI and SNII) protocols as outlined in the statewide lake assessment protocol. The primary objective for this sampling period is to count and measure adult walleye and muskellunge. However, this survey can also be used to target adult northern pike. Other gamefish may be sampled but are considered by-catch as part of this survey.
- Fyke Nets were deployed in areas of the Cloverleaf Chain of Lakes that contained spawning habitat or were likely travel areas for northern pike, walleyes, or muskellunge. All newly captured northern pike and walleyes were given a partial fin clip (top caudal fin) to try to estimate population abundance using mark - recapture. All muskellunge were weighed and given a Passive Integrated Transponder (PIT) tag to track each individual. Age structures (i.e., otoliths) were collected from a subsample of bluegill and black crappie for age and growth analysis.
- Fish metrics used to describe fish populations include catch per unit effort, total abundance, proportional stock density, length frequency distribution, mean length at age, and mean age at length.

Fish Metric Descriptions

Catch per unit effort (CPUE) is an index used to measure fish population relative abundance, which simply refers to the number of fish captured per unit of distance or time. For netting surveys, we typically quantify CPUE by the number and size of fish per net night. CPUE indexes are compared to statewide data by percentiles and within lake trends. For example, if a CPUE is in the 90th percentile, it is higher than 90% of the other CPUEs in the state.

Total abundance is a metric that describes population size and is estimated by mark and recapture. In our study, all northern pike that were captured were given a partial caudal fin (i.e., tail fin) clip and released. Each time the nets were checked, all northern pike were examined for a partial caudal fin clip. The number of previously captured individuals (i.e., fin clipped) was recorded and proportions of marked individuals to unmarked individuals was used to estimate the total abundance of the northern pike population.

Proportional Stock Density (PSD) is an index used to describe size structure of fish populations. It is calculated by dividing the number of quality size fish by the number of stock size fish for a given species. PSD values between 40 - 60 generally describe a balanced fish population.

Length frequency distribution (LFD) is a graphical representation of the number or percentage of fish captured by half inch or one inch size intervals. Smaller fish (or younger age classes) may not always be represented in the length frequency due to different habitat usage or sampling gear limitations.

Mean Length at Age is an index used to assess fish growth. Calcified structures (e.g., otoliths, spines, or scales) are collected from 5-10 individuals per half inch or one inch length bins. Age estimates from these fish are used to estimate mean lengths at ages for the population.

Mean Age at Length is an index used to assess fish growth. Growth structures (otoliths, spines, or scales) are collected from a specified length bin of interest (e.g., 7.0-7.5 inches for bluegill). Mean age is compared to statewide data by percentile with growth characterized by the following benchmarks: slow (<33rd percentile); moderate (33rd to 66th percentile); and fast (>66th percentile).

Relative Abundance (Catch per Unit Effort)						
Species	**2017 Total Number Captured**	**CPUE (number per net night)**			**2017 Statewide Percentile Rank**	**2017 Abundance Rating**
		2008	**2013**	**2017**		
BLACK CRAPPIE	662	35.6	22.6	7.8	69	Moderate - Hight
BLUEGILL	1,300	43.0	30.5	15.3	60	Moderate
BOWFIN	12	0.1	0.3	0.1	-	-
LARGEMOUTH BASS	20	1.6	1.1	0.2	10	Low
MUSKELLUNGE	42	1.8	0.6	0.5	55	Moderate
NORTHERN PIKE	109	3.0	2.5	1.3	45	Moderate
PUMPKINSEED	299	2.6	3.2	3.5	71	High
ROCK BASS	100	7.8	3.2	1.2	-	-
WALLEYE	17	0.3	0.1	0.2	8	Low
YELLOW PERCH	33	0.8	0.5	0.4	25	Low

Cloverleaf Chain of Lakes (WBIC 299000) - Summary Report Continued

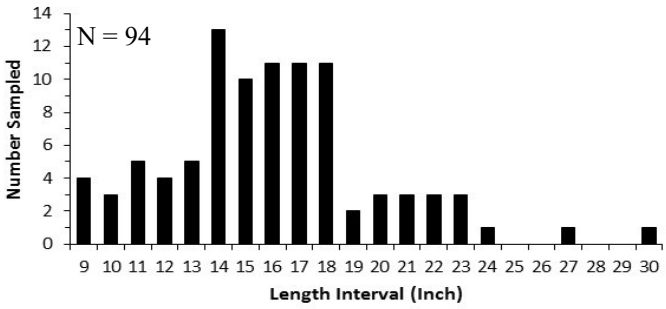
Gamefish Summary

Shawano County

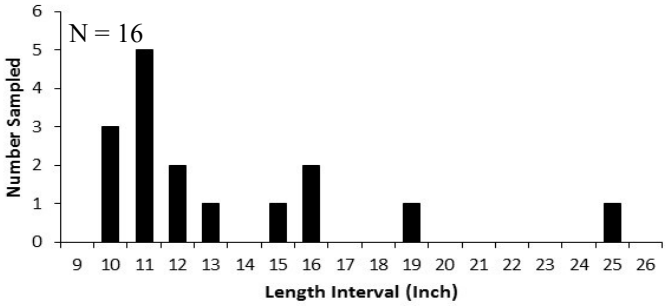
2017 Size Structure Metrics

Species	Total	Average Length (inches)	Length Range (inches)	Stock and Quality Size (inches)	Stock Number	Quality Number	PSD	Percentile Rank	Size Rating
NORTHERN PIKE	94	16.6	9.5 - 31.0	14.0 and 21.0	73	12	16	13	Low
WALLEYE	16	13.8	10.6 - 25.8	10.0 and 15.0	16	5	31	18	Low
MUSKELLUNGE	34	39.7	33.3 - 47.4	30.0 and 34.0	34	33	97	97	High
LARGEMOUTH BASS	20	9.2	5.8 - 16.5	8.0 and 12.0	8	4	50	56	Low

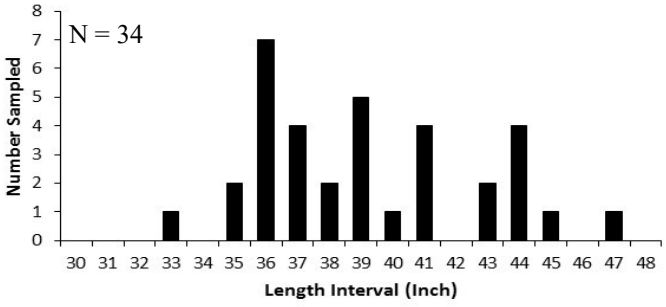
Northern Pike Length Frequency



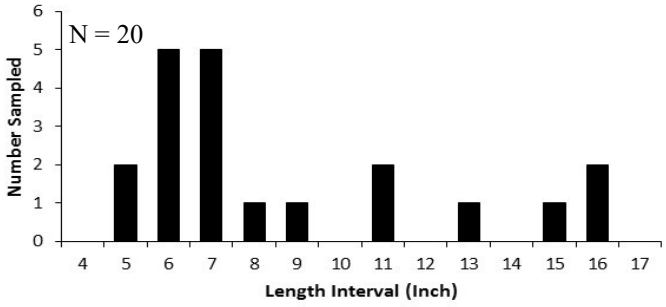
Walleye Length Frequency



Muskellunge Length Frequency



Largemouth Bass Length Frequency



Size Structure (PSD) Trends

Species	Historical Median (1980-Present)	PSD by Year							
		1980	1985	1988	1994	2000	2008	2013	2017
NORTHERN PIKE	8	6	6	5	4	10	18	10	16
WALLEYE	96	95	91	80	97	100	100	100	31
MUSKELLUNGE	75	46	83	68	74	74	75	81	97
LARGEMOUTH BASS	60	74	59	56	61	72	56	63	50

2017 Total Adult Abundance (Mark and Recapture Population Estimate)

Species	Number Marked (Netting)	Number Sampling Events (Netting)	Number Recaptures (Netting)	Schnabel Population Estimate (95%)	Number per Acre	Abundance Rating
NORTHERN PIKE	85	11	13	268 (170 - 629)	0.85	Low

Gamefish Summary

Northern Pike

- Northern pike were found in low to moderate densities with a population dominated by smaller individuals, including several immature individuals. Two stockings of large fingerling northern pike took place in 2014 and 2017 to try to increase densities.
- Limited habitat and high harvest are likely factors contributing to the small size structure. Historically, the northern pike population has been comprised of mostly small individuals as seen by the low PSD values through time.

Walleye

- Walleye were also found in low densities with a population dominated by smaller individuals. Only two walleyes >17 inches were captured. It is likely that the walleyes between 10 - 17 inches are from the 2013 and 2015 stocking events, making them 2 or 4 years old at the time of netting. No walleyes were stocked between 2009 and 2012, which likely explains why few large walleyes were caught in 2017 netting.
- Despite a history of walleye stocking going back to the 1980s, walleye population densities in the Cloverleaf Chain have remained low. Low densities are typical of lakes that do not have natural reproduction and are supported solely through stocking. Habitat in these lakes are not ideal for walleyes and therefore population numbers remain low regardless of stocking effort.

Muskellunge

- The Cloverleaf Chain supports a moderate density of large muskies. Despite being classified as a Class B musky fishery, size structure and growth potential of muskies are closer to that of a Class A fishery.
- Stocking will be necessary to sustain a musky fishery in the future.

Largemouth Bass

- Largemouth bass were found at low densities with a small to moderate size structure. However, electrofishing is the more preferred gear for evaluating the largemouth bass population. An electrofishing survey was also conducted in spring, 2017. Results from that survey can be found in a separate report.

Cloverleaf Chain of Lakes (WBIC 299000) - Summary Report Continued

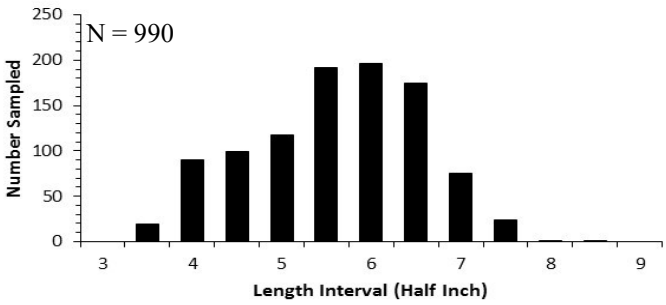
Panfish Summary

Shawano County

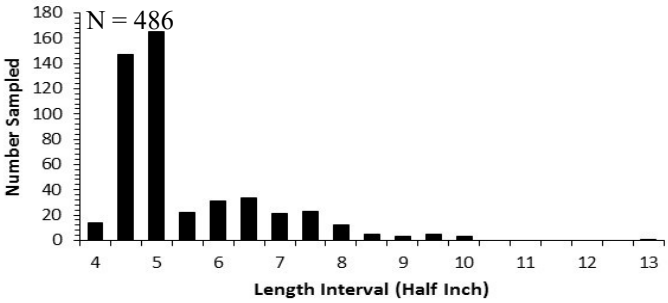
2017 Size Structure Metrics

Species	Number Measured	Average Length (inches)	Length Range (inches)	Stock and Quality Sizes (inches)	Stock Number	Quality Number	PSD	Percentile Rank	Size Rating
BLUEGILL	990	5.8	3.6 - 8.6	3.0 and 6.0	990	472	48	42	Moderate
BLACK CRAPPIE	486	5.7	4.2 - 13.2	5.0 and 8.0	325	29	9	5	Low
PUMPKINSEED	276	5.2	3.2 - 7.4	3.0 and 6.0	276	58	21	25	Low
YELLOW PERCH	33	6.3	4.6 - 8.8	5.0 and 8.0	27	4	15	50	Moderate

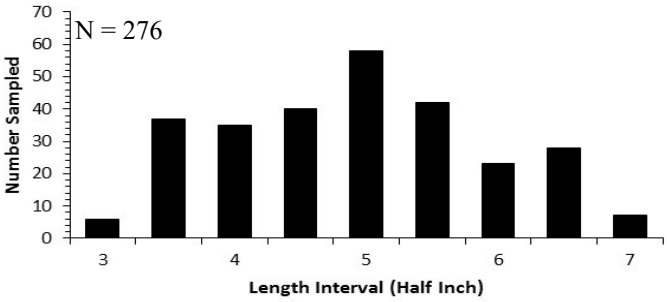
Bluegill Length Frequency



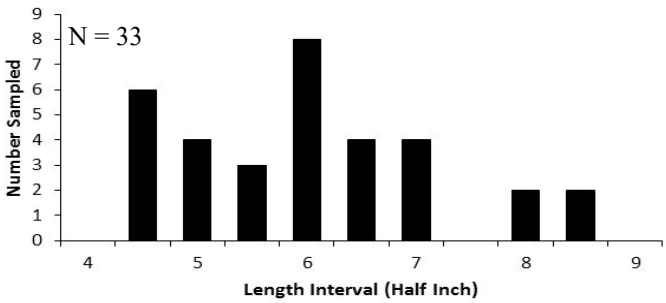
Black Crappie Length Frequency



Pumpkinseed Length Frequency



Yellow Perch Length Frequency



Size Structure (PSD) Trends

Species	Historical Median (1980-Present)	PSD by Year						
		1980	1985	1994	2000	2008	2013	2017
BLUEGILL	53	53	55	66	63	42	39	48
BLACK CRAPPIE	45	50	58	56	31	14	45	9
PUMPKINSEED	25	56	32	48	25	24	16	21
YELLOW PERCH	15	-	0	20	14	17	3	15

Growth Metrics

Species	Total (N)	Length Bin (inches)	Mean Age (years)	Age Range (years)	Percentile Rank	Growth Rating
BLUEGILL	34	5.5 - 6.4	5.3	4 - 6	39	Slow - Moderate
BLUEGILL	30	6.5 - 7.4	5.8	4 - 7	34	Slow - Moderate
BLACK CRAPPIE	8	7.5 - 8.4	4.1	4 - 5	48	Moderate
BLACK CRAPPIE	3	8.5 - 9.4	6.7	4 - 8	7	Slow

Panfish Summary

Bluegill

- Bluegill densities and size structure in 2017 were found at moderate levels. Bluegill relative abundance in 2017 was lower than what was observed in 2008 or 2013 whereas size structure in 2017 was higher than what was observed in 2008 or 2013.
- The majority of individuals captured in 2017 were between 5 - 7 inches with very few individuals >8 inches captured. Growth is still slow-moderate, likely due to the density of individuals in the population.

Black Crappie

- Black crappie were found at moderate - high densities in 2017, but densities were lower than densities observed in 2008 or 2013.
- Few black crappies >8.0 inches were captured and growth of the individuals between 7.5 - 9.5 inches was slow to moderate.
- There was a very strong year class of black crappies between 4.5 - 6 inches (likely two years old). This year class should provide a nice fishery once they grow to be harvestable size in the next couple of years.

Pumpkinseed

- Pumpkinseed densities remained high in 2017 and were only slightly higher than what was observed in the previous two fyke netting surveys. Size structure continues to be dominated by individuals 4 – 6 inches. No pumpkinseed over 7.5 inches were captured.

Yellow Perch

- Yellow perch densities continue to remain low with a population dominated by individuals 5 - 7 inches long. No yellow perch > 9.0 inches were captured.

Cloverleaf Chain of Lakes (WBIC 299000) - Summary Report Continued

Stocking History and Management Options

Shawano County

Stocking History 1972 - Present

Species	Year	Age	Mean Length (inches)	Number Stocked
WALLEYE	2017	LARGE FINGERLING	3.3	3,172
NORTHERN PIKE	2017	LARGE FINGERLING	8.5	900
MUSKELLUNGE	2017	LARGE FINGERLING	12.0	316
WALLEYE	2015	LARGE FINGERLING	7.8	3,184
WALLEYE	2015	LARGE FINGERLING	7.0	2,100
MUSKELLUNGE	2014	LARGE FINGERLING	9.8	316
NORTHERN PIKE	2014	LARGE FINGERLING	9.5	796
WALLEYE	2013	LARGE FINGERLING	6.8	6,338
MUSKELLUNGE	2010	LARGE FINGERLING	13.2	193
MUSKELLUNGE	2008	LARGE FINGERLING	10.3	640
WALLEYE	2008	SMALL FINGERLING	1.5	11,290
MUSKELLUNGE	2006	LARGE FINGERLING	10.8	140
MUSKELLUNGE	2006	LARGE FINGERLING	13.0	200
WALLEYE	2006	SMALL FINGERLING	1.4	15,985
MUSKELLUNGE	2004	LARGE FINGERLING	10.5	638
WALLEYE	2004	SMALL FINGERLING	1.4	15,990
MUSKELLUNGE	2002	LARGE FINGERLING	10.1	640
MUSKELLUNGE	2000	LARGE FINGERLING	11.4	450
WALLEYE	2000	SMALL FINGERLING	1.7	11,000
WALLEYE	1998	SMALL FINGERLING	1.7	8,850
WALLEYE	1997	LARGE FINGERLING	2.7	11,000
WALLEYE	1996	FINGERLING	1.6	14,954
WALLEYE	1994	FINGERLING	3.6	16,303
MUSKELLUNGE	1992	FINGERLING	11.0	646
WALLEYE	1992	FINGERLING	3.0	8,120
MUSKELLUNGE	1991	FINGERLING	10.9	640
WALLEYE	1989	YEARLING	10.0	4,500
MUSKELLUNGE	1989	FINGERLING	11.0	640
WALLEYE	1987	FINGERLING	7.0	33,150
MUSKELLUNGE	1987	FINGERLING	9.0	1,920
WALLEYE	1985	FINGERLING	2.0	14,100
MUSKELLUNGE	1985	FINGERLING	12.0	840

Mean Length (inches) at Age		
Age	Bluegill	Black Crappie
1	-	-
2	3.8	5.0
3	4.6	6.4
4	5.5	7.6
5	6.5	8.8
6	6.8	-
7	7.2	-
8	-	9.2
9	7.8	-

Management Options

Northern Pike

- Northern pike were found in low densities with few individuals >24 inches captured.
- Stockings of large fingerling northern pike took place in 2014 and 2017 to try to increase densities.
- A special regulation may protect some northern pike from harvest and improve size structure. However, limited habitat will likely result in limited success of any special regulations.
- Increasing northern pike habitat by promoting moderate densities of native aquatic plants throughout the littoral zone of all lakes will increase densities and growth and result in a more desirable northern pike fishery.

Walleye

- Walleye were found in low abundance with few large fish in the population.
- Stocking at a rate of 5 -10 large fingerlings per acre every 2 - 3 years will be necessary to continue to have low density put - grow - and take walleye fishery in the future.

Muskellunge

- Despite being a small water body, the Cloverleaf Chain of Lakes supports a moderate density of large muskellunge.
- Continue stocking at a rate one musky per acre every 2 - 3 years to maintain the musky population at its current level.

Largemouth Bass

- Maintain density and size structure observed in fyke netting and electrofishing surveys. A higher density of largemouth bass will help reduce the density of panfish. No management recommendation at this time.

Panfish

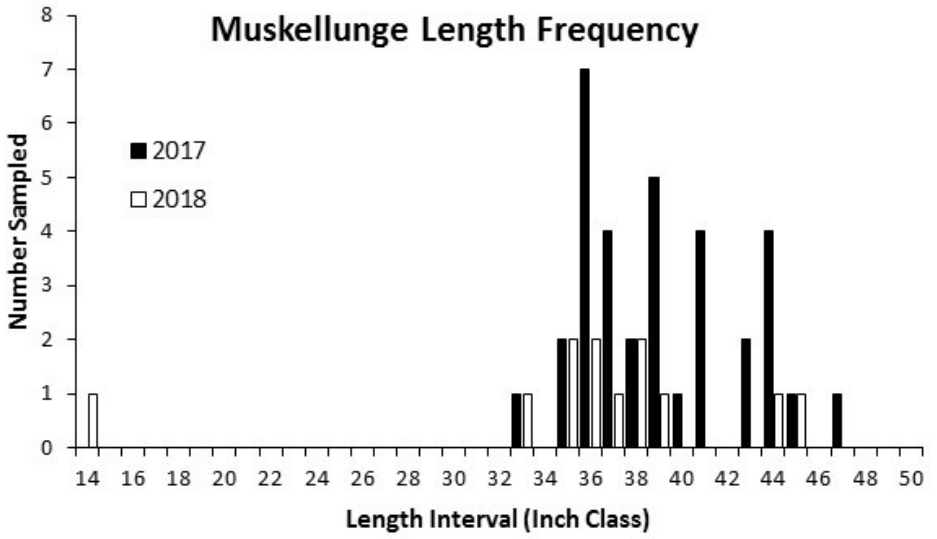
- Bluegill, black crappie, and yellow perch densities were lower in 2017 than in either of the two previous fyke netting surveys, whereas bluegill size structure was slightly higher in 2017 compared to the fyke netting surveys in 2008 and 2013.
- Maintaining higher densities of predators to keep panfish densities lower will results in less competition among panfish for resources. This will result in faster growth rates and larger panfish. Continue to stock predators as necessary to maintain adequate numbers or predatory fish.
- The special regulation put in place in 2016 will also hopefully help reduce the density of smaller bluegill and pumpkinseed by increasing harvest of individuals <7 inches. The regulation will also hopefully protect some of the larger bluegill and pumpkinseed from harvest. It is still to early to see any significant effects of this regulation.
- Reduced densities and faster growth rates combined with the special panfish regulation will hopefully result in a really good panfish fishery in the next couple of years.

Other Management Objectives

- Habitat is likely a limiting factor in the Cloverleaf Chain of Lakes. The majority of the shoreline is developed resulting in very little coarse woody habitat within the lakes. Furthermore, the littoral zones of Round and Grass Lakes are narrow in places due to steep lake bottoms. Areas for expansion of littoral zone fish sticks along with deep water fish sticks should be considered to increase habitat complexity within the lakes. Furthermore, critical habitat areas designated in 2004 should be preserved to prevent any future habitat loss within the Cloverleaf Chain of Lakes.

- The Cloverleaf Chain of Lakes is due for another comprehensive survey in 2021. This survey will provide better insight on the effects of walleye and northern pike stockings as well as the effects of the special panfish regulation.

This 47.7 inch female muskellunge was captured during fyke net survey on Grass Lake (Cloverleaf Chain), Shawano County, in April, 2014.



Size Structure Metrics									
Species	Year	Total	Average Length and Range	Stock and Quality Size (inches)	Stock No.	Quality No.	PSD	Percentile Rank	Size Rating
MUSKELLUNGE	2017	34	39.7 (33.3 - 47.4)	30 and 34	34	33	97	97	High
MUSKELLUNGE	2018	12	36.2 (14.6 - 45.0)	30 and 34	11	10	91	91	High

Stocking History (2002 - Present)					
Species	Year	Stocking Source	Age	Mean Length (inches)	Number Stocked
WALLEYE	2017	DNR	Large Fingerling	3.3	3,172
NORTHERN PIKE	2017	DNR	Large Fingerling	8.5	900
MUSKELLUNGE	2017	Club-Private	Large Fingerling	12.0	316
WALLEYE	2015	DNR	Large Fingerling	7.8	3,184
WALLEYE	2015	Club-Private	Large Fingerling	7.0	2,100
MUSKELLUNGE	2014	DNR	Large Fingerling	9.8	316
NORTHERN PIKE	2014	DNR	Large Fingerling	9.5	796
WALLEYE	2013	DNR-Private	Large Fingerling	6.8	6,338
MUSKELLUNGE	2010	DNR	Large Fingerling	13.2	193
WALLEYE	2008	DNR	Small Fingerling	1.5	11,290
MUSKELLUNGE	2008	DNR	Large Fingerling	10.3	640
WALLEYE	2006	DNR	Small Fingerling	1.4	15,985
MUSKELLUNGE	2006	Club-Private	Large Fingerling	13.0	200
MUSKELLUNGE	2006	DNR	Large Fingerling	10.8	140
WALLEYE	2004	DNR	Small Fingerling	1.4	15,990
MUSKELLUNGE	2004	DNR	Large Fingerling	10.5	638
MUSKELLUNGE	2002	DNR	Large Fingerling	10.1	640

Summary

- The Cloverleaf Chain supports a moderate density of muskellunge with a population estimate of approximately 0.26 muskellunge per acre. Relative abundance indexes (i.e., CPUE) corroborate total abundance as a CPUE of 0.4 per net night ranks out in the 50th percentile for lakes throughout Wisconsin. Catch rates in 2018 were similar to 2017, when CPUE was 0.5 per net night.
- The largest muskellunge captured in 2017 was 47.4 inches and the largest muskellunge captured in 2018 was 45.0 inches.
- Size structure indexes indicate the Cloverleaf Chain has good potential for growing large muskellunge with PSDs in both years being ≥ 91, 38% and 17% of the muskellunge captured in 2017 and 2018, respectively, being ≥ 40 inches, and muskellunge ≥ 45.0 inches being captured in both years.

Management Options

Management options in this report are focused on muskellunge. Management options for other species can be found in the 2017 survey reports.

- Common carp are present in the Cloverleaf Chain. Managing muskellunge as an apex predator may be beneficial in maintaining carp populations at a low level.
- Continue to maintain the muskellunge population at 0.1 to 0.3 fish per acre.
- Continue to manage for a quality muskellunge fishery in which PSD values are ≥ 75 and 25% or more of the muskies captured are ≥ 40.0 inches.
- Continue to stock muskellunge at a rate of 1.0 per acre every 2 - 3 years to maintain current densities and size structure.
- Add additional fish sticks complexes where feasible. Muskellunge of all sizes will use fish sticks as cover to escape predation and large muskies will use fish sticks to hide under and ambush prey from.
- Preserve native emergent, floating, and submergent aquatic vegetation. Muskellunge will use this habitat as well.
- Continue fisheries assessment on a 4 year rotation (next survey in 2021).

2018 Spring Netting (SNII) Summary Report

Cloverleaf Chain (WBIC 299000)

Shawano County

Introduction and Survey Objectives

In 2017, the Department of Natural Resources conducted a fyke-netting survey of the Cloverleaf Chain in order to provide insight and direction for the future fisheries management of this waterbody. Primary sampling objectives of these surveys are to characterize species composition, relative abundance, and size structure. In 2018, a follow-up fyke netting survey was conducted to evaluate the muskellunge population. The following report is a brief summary of that 2018 fyke netting, general status of the muskellunge population and future management options.

Acres: 316 **Shoreline Miles: 5.15** **Maximum Depth (feet): 52**
Lake Type: Deep Headwater **Public Access: 2 Public Landings**
Regulations: 25 panfish of any size may be kept, except 5 or fewer can be bluegill and pumpkinseed over 7". All other species statewide default regulations.

WISCONSIN DNR CONTACT INFO.

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Elliot Hoffman - Fisheries Technician
Wisconsin Dept. of Natural Resources
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Shawano, WI 54166

Jason Breeggemann: 920-420-4619
jason.breeggemann@wisconsin.gov

Elliot Hoffman: 920-420-9581;
elliot.hoffman@wisconsin.gov

Survey Information						
Site Location	**Survey Dates**	**Water Temperature (°F)**	**Target Species**	**Gear**	**No. of Nets**	**Net Nights**
Cloverleaf Chain	5/2/18 - 5/9/18	55.9	Muskellunge	Fyke Net	5	40

Survey Method

- The Cloverleaf Chain was sampled according to spring netting (SNII) protocols as outlined in the statewide lake assessment protocol. The primary objective for this sampling period is to recapture muskellunge that were marked during the previous spring's survey. Other gamefish and panfish may be sampled but are considered by-catch as part of this survey.
- Fyke nets were deployed in areas of the lake that contained spawning habitat for muskellunge or were likely travel areas. All muskellunge were measured for length, sexed and examined for PIT (passive integrated transponder) tags. All other fish were identified to species and counted.
- Fish metrics used to describe muskellunge populations included total abundance (mark and recapture population estimate), catch per unit effort, proportional stock density, and length frequency distribution.

Fish Metric Descriptions
CPUE, Total Abundance, PSD, LFD

Catch per unit effort (CPUE) is an index used to measure fish population relative abundance, which simply refers to the number of fish captured per unit of distance or time. For netting surveys, we typically quantify CPUE by the number and size of fish per net night. CPUE indexes are compared to statewide data by percentiles and within lake trends. For example, if a CPUE is in the 90th percentile, it is higher than 90% of the other CPUEs in the state.

Total abundance is a metric that describes population size and is estimated by mark and recapture. In our study, all muskellunge that were captured were given a Passive Integrated Transponder (PIT) tag and released. Each time the nets were checked, all muskellunge were examined for a PIT tag. The number of muskellunge previously captured in 2017 (i.e., PIT tagged) was recorded and proportions of marked individuals to unmarked individuals was used to estimate the total abundance of the muskellunge population.

Proportional Stock Density (PSD) is an index used to describe size structure of fish populations. It is calculated by dividing the number of quality size fish by the number of stock size fish for a given species. PSD values between 40 - 60 generally describe a balanced fish population.

Length frequency distribution (LFD) is a graphical representation of the number or percentage of fish captured by half inch or one inch size intervals. Smaller fish (or younger age classes) may not always be represented in the length frequency due to different habitat usage or sampling gear limitations.

Relative Abundance (Catch per unit Effort)				
Species	**Total**	**CPUE (no per net night)**	**Percentile Rank**	**Abundance Rating**
BLACK BULLHEAD	5	0.1	-	-
BLACK CRAPPIE	1,059	26.5	89	High
BLUEGILL	554	13.9	57	Moderate
BOWFIN	10	0.3	-	-
BROWN BULLHEAD	14	0.4		
LAKE CHUBSUCKER	3	0.1	-	-
LARGEMOUTH BASS	14	0.4	50	Moderate
MUSKELLUNGE	14	0.4	50	Moderate
NORTHERN PIKE	33	0.8	33	Low - Moderate
PUMPKINSEED	127	3.2	68	Moderate - High
ROCK BASS	25	0.6	-	-
WALLEYE	15	0.4	19	Low
YELLOW BULLHEAD	58	1.5	-	-
YELLOW PERCH	2	0.1	10	Low

Total Abundance (Mark and Recapture Population Estimate)						
Species	**Number Marked in 2017**	**Number Captured in 2018**	**Number Recaptured in 2018**	**Population Estimate (95% CI)**	**No per Acre (95% CI)**	**Abundance Rating**
MUSKELLUNGE	34	11	4	82 (48 - 185)	0.26 (0.15 - 0.59)	Moderate

F

APPENDIX F

Comment Response Document for the Official First Draft

Comments to Cloverleaf Lakes Draft Comprehensive Management Plan (4/28/2022)

WDNR Official Comments: Brenda Nordin (Lakes Biologist) - Received 5/3/2022

I don't have any comments. Nice job!

WDNR Official Comments: Aaron OConnell (Fisheries Biologist) - Received 5/12/2022

The management plan looks great.

I would like to highlight the sections that promote the use of coarse woody habitat such as the implementation of fish sticks. The addition of fish stick complexes would aid the system as both a shoreline erosion prevention method as well as a great fish habitat component. Working to add more of these structures could be a suitable action item to address part of management goal 5.