Berry Lake

Oconto & Menominee Counties, Wisconsin

Aquatic Plant Management Plan

November 2023

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Onterra, LLC
De Pere, WI

Funded by: Berry Lake Property Owners Association Inc.
Wisconsin Dept. of Natural Resources
(ACEI-277-22)

Acknowledgements

This management planning effort was truly a team-based project and could not have been completed without the input of the following individuals:

Berry Lake Planning Committee

Jennifer McDermot – Committee Chair	Jim DePrey	Gina Kozlik
Mike McDermot – BLPOA President	John Holman	
Mark DePrey	Carol Asselmeier	

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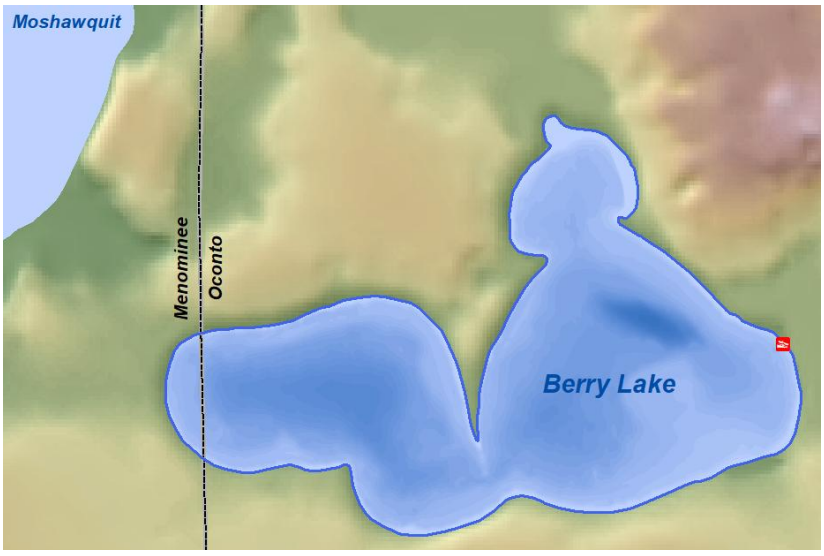


Figure 1.0-1. Berry Lake, Oconto-Menominee Counties.

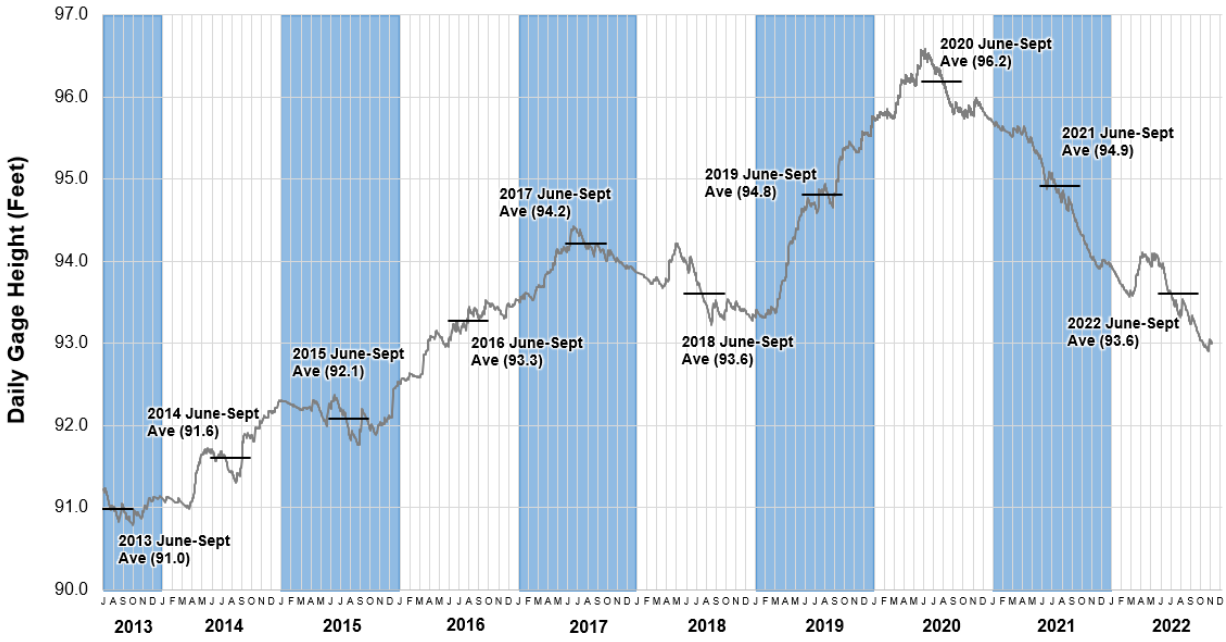
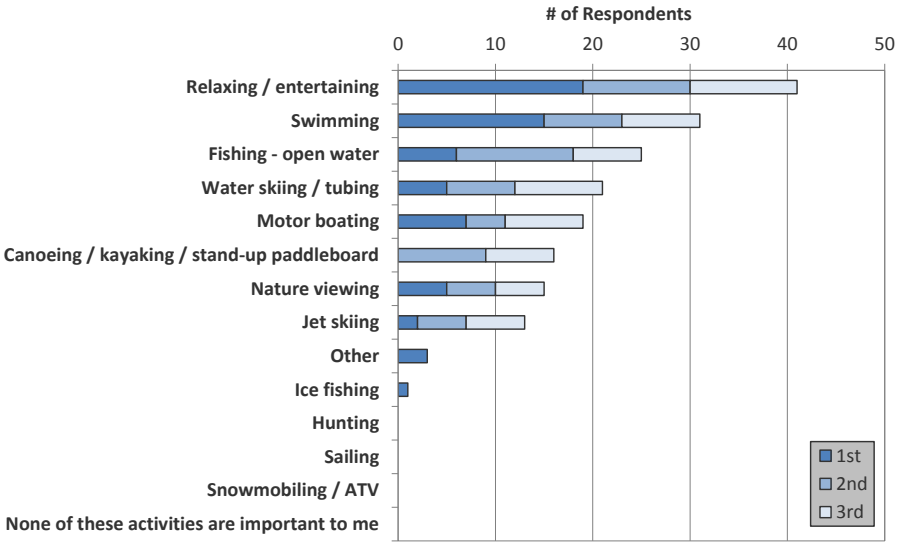


Figure 1.0-2. Berry Lake water levels from July 2013 through November 2022. Created using data obtained from the USGS Berry Lake water level monitoring station (USGS 2022).

Question 6: Please rank up to three activities that are important reasons for owning your property on or near Berry Lake.



Question 13: What types of watercraft do you currently use on Berry Lake?

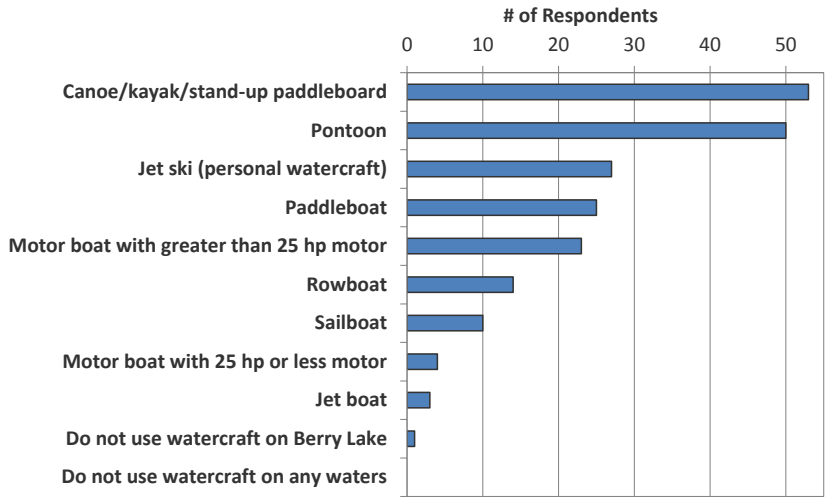


Figure 2.0-1. Select survey responses from the Berry Lake Stakeholder Survey. Additional questions and response charts may be found in Appendix B.

Question 16: Please rank your top three concerns regarding Berry Lake.

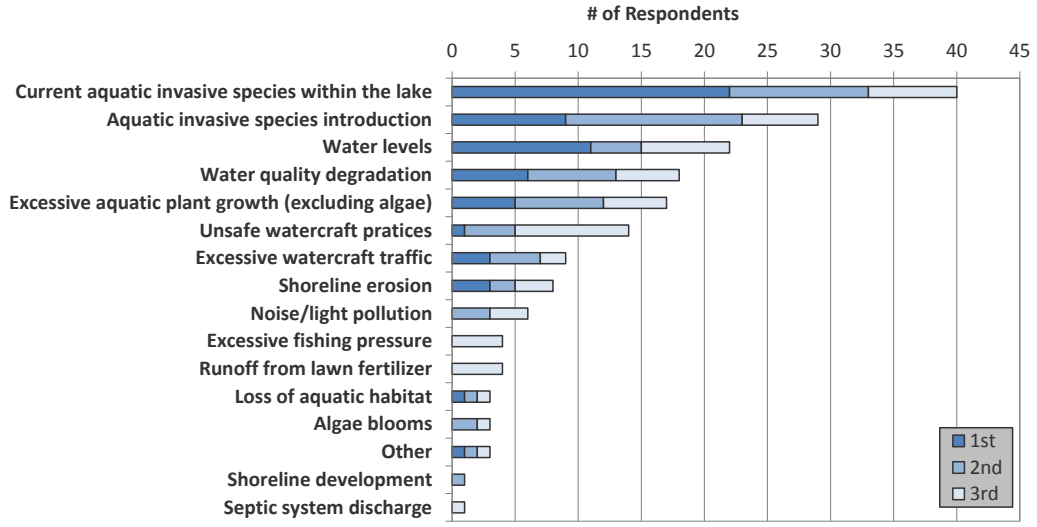


Figure 2.0-2. Select survey responses from the Berry Lake Stakeholder Survey, continued. Additional questions and response charts may be found in Appendix B.

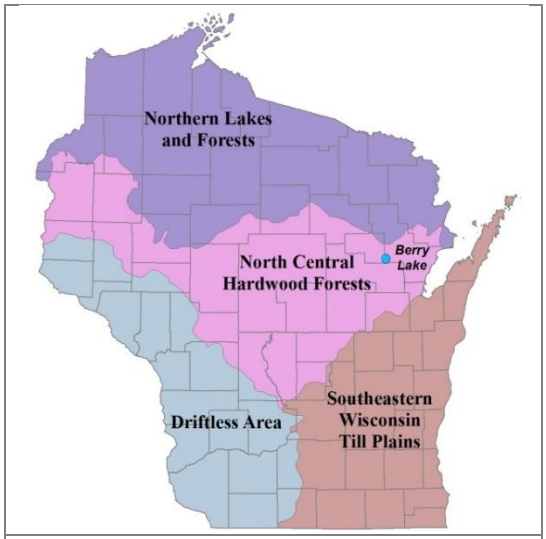


Figure 3.1-1. Location of Berry Lake within the ecoregions of Wisconsin. After (Nichols, 1999).

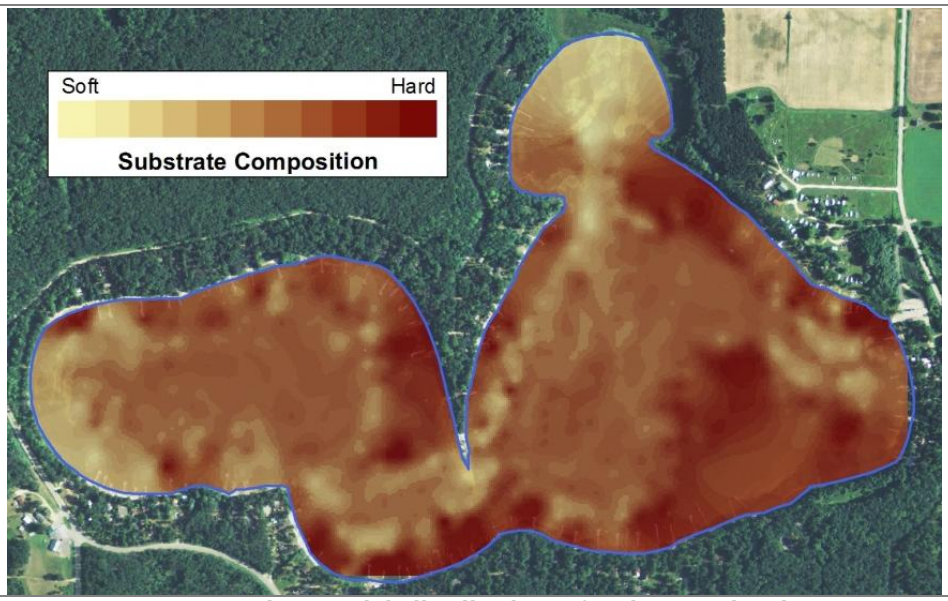


Figure 3.2-1. Berry Lake spatial distribution of substrate hardness. Created using data from August 2017 acoustic survey.

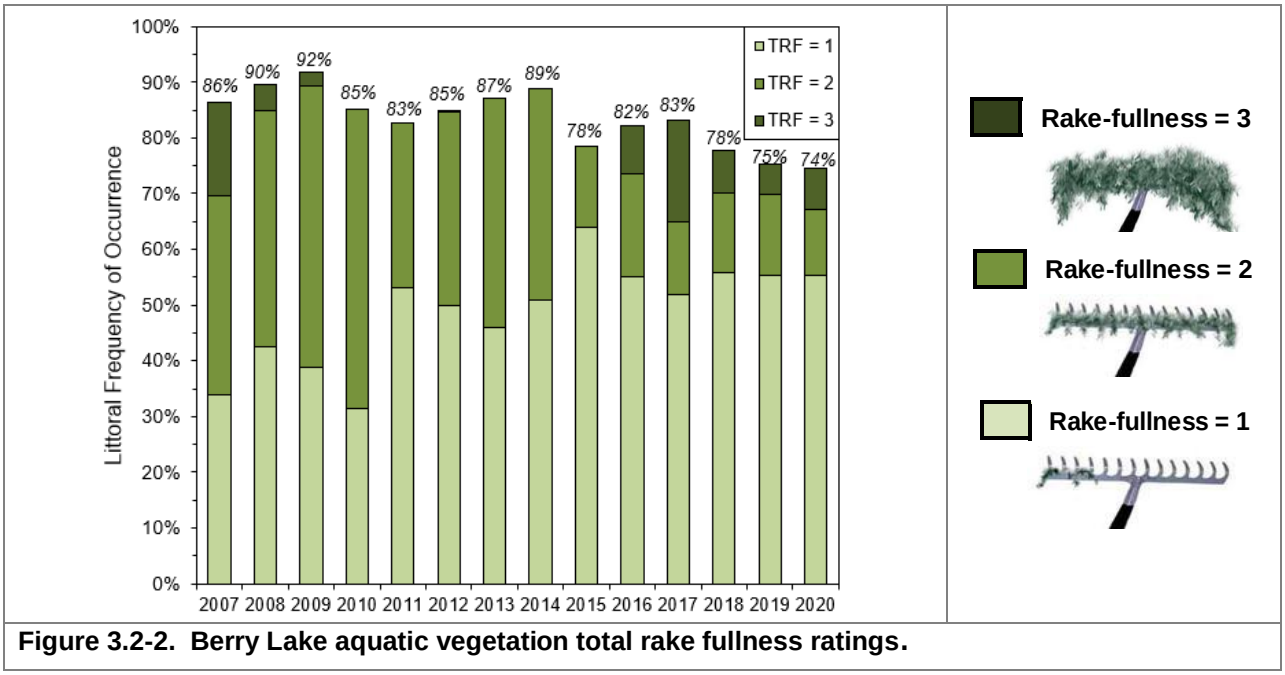


Figure 3.2-2. Berry Lake aquatic vegetation total rake fullness ratings.

Table 3.2-1. Aquatic plant species located in Berry Lake.

Growth Form	Scientific Name	Common Name	Status in Wisconsin	Coefficient of Conservatism	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Emergent	*Asclepias incarnata*	Swamp milkweed	Native	5									I					
	Bolboschoenus fluviatilis	River bulrush	Native	5							I							
	Carex pseudocyperus	Cypress-like sedge	Native	8								I						
	Carex sp. 1	Sedge sp. 1	Native	N/A				I										
	Cladium mariscoides	smooth saw grass	Native	10								I						
	Dulichium arundinaceum	Three-way sedge	Native	9						I								
	Eleocharis palustris	Creeping spikerush	Native	6					I						X	X	X	
	Eleocharis robbinsii	Robbins' spikerush	Native - Special Concern	10									X					
	Eupatorium maculatum	Spotted joe-pye-weed	Native	4					I									
	Iris pseudacorus	Pale-yellow iris	Non-Native - Invasive	N/A								I						
	Iris versicolor	Northern blue flag	Native	5					I		I	I						
	Lysimachia terrestris	Bulbil loosestrife	Native	7					I									
	Lythrum salicaria	Purple loosestrife	Non-Native - Invasive	N/A										I				
	Phalaris arundinacea	Reed canary grass	Non-Native - Invasive	N/A								I						
	Phragmites australis subsp. americanus	Common reed	Native	5					I	I		I				I		
	Phragmites australis subsp. australis	Giant reed	Non-Native Invasive	N/A								I		I	I			I
	Pontederia cordata	Pickerelweed	Native	9			I			X		I	I			X		
	Schoenoplectus acutus	Hardstem bulrush	Native	5								I		X	X	X	X	X
	Schoenoplectus pungens	Three-square rush	Native	5		I			X	X	X	X			X		X	
	Schoenoplectus tabernaemontani	Softstem bulrush	Native	4					X	X		X						
	Sparganium eurycarpum	Common bur-reed	Native	5														X
	Typha spp.	Cattail spp.	N/A	N/A								X	I					
FL	*Brasenia schreberi*	Watershield	Native	7	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Nuphar variegata	Spatterdock	Native	6			I	I		X		X	X					
	Nymphaea odorata	White water lily	Native	6	X	X		I	X	X	X	X	X		X	X	X	X
	Persicaria amphibia	Water smartweed	Native	5					I	I	I				I	I	X	I
Submergent	*Bidens beckii*	Water marigold	Native	8			X	X	I					X				
	Ceratophyllum demersum	Coontail	Native	3				X			X		X					X
	Chara & Nitella	Charophytes	Native	7	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Chara spp.	Muskgrasses	Native	7	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Elatine minima	Waterwort	Native	9					I									X
	Elodea canadensis	Common waterweed	Native	3	X	X	X	X	X		I		X			X		
	Elodea canadensis & E. nuttallii	Common & Slender waterweeds	Native	N/A	X	X	X	X	X	X		X	X			X		
	Elodea nuttallii	Slender waterweed	Native	7				X		X		X						
	Eriocaulon aquaticum	Pipewort	Native	9					I		X			X	X			
	Isoetes spp.	Quillwort spp.	Native	8												X		X
	Myriophyllum sibiricum	Northern watermilfoil	Native	7	X	X	X	X	X	X	X							
	Myriophyllum spicatum	Eurasian watermilfoil	Non-Native - Invasive	N/A	I	X	X	X	X	X	X	X	X	X	X	X	X	X
	Myriophyllum tenellum	Dwarf watermilfoil	Native	10	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Najas flexilis	Slender naiad	Native	6	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Najas flexilis & N. guadalupensis	Slender & Southern naiads	Native	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Najas guadalupensis	Southern naiad	Native	7		I		X	X	X	X	X	X	X	X	X	X	X
	Nitella spp.	Stoneworts	Native	7	X	X	X	X	X	X	X	X	X	X	X	X		X
	Potamogeton amplifolius	Large-leaf pondweed	Native	7	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Potamogeton gramineus	Variable-leaf pondweed	Native	7	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Potamogeton gramineus & P. illinoensis	Variable-leaf & Illinois pondweeds	Native	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Potamogeton illinoensis	Illinois pondweed	Native	6	X	X	X	X	X	X	X	X		X	X	X	X	X
	Potamogeton natans	Floating-leaf pondweed	Native	5		I	X				X		I	X	I		X	X
	Potamogeton praelongus	White-stem pondweed	Native	8	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Potamogeton pusillus	Small pondweed	Native	7			X	X	X	X	X	X		X	X		X	X
	Potamogeton richardsonii	Clasping-leaf pondweed	Native	5		X										X		X
	Potamogeton robbinsii	Fern-leaf pondweed	Native	8	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Potamogeton strictifolius	Stiff pondweed	Native	8	X			X	X	X				X				X
	Potamogeton X scoliophyllus	Large-leaf X Illinois pondweed	Native	N/A				X										
	Potamogeton zosteriformis	Flat-stem pondweed	Native	6	X		I	X					X	X				X
	Ranunculus aquatilis	White water crowfoot	Native	8														X
	Sagittaria sp. (rosette)	Arrowhead sp. (rosette)	Native	N/A										X	X			
	Stuckenia pectinata	Sago pondweed	Native	3	X	X	X	X	X	X	X	X	X	X				
	Utricularia cornuta	Horned bladderwort	Native	10			I											
	Utricularia geminiscapa	Twin-stemmed bladderwort	Native	9										X	X	X	X	
	Utricularia gibba	Creeping bladderwort	Native	9		X	X	X	X	X	X	X	X	X	X	X	X	
	Utricularia intermedia	Flat-leaf bladderwort	Native	9	X						I	X	X	X	X	X	X	X
	Utricularia minor	Small bladderwort	Native	10									I				X	X
	Utricularia resupinata	Northeastern bladderwort	Native - Special Concern	9	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Utricularia vulgaris	Common bladderwort	Native	7	I				X	X	X	X	X	X	X	X	X	X
	Vallisneria americana	Wild celery	Native	6	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SE	*Alisma spp.*	Water plantain sp.	Native	N/A														X
	Eleocharis acicularis	Needle spikerush	Native	5		X		X	X	X	X		X	X		X	X	X
	Juncus pelocarpus	Brown-fruited rush	Native	8	X	I	X	X	X		X	X		X				
FF	*Lemna minor*	Lesser duckweed	Native	5				X										

X = Located on rake during point-intercept survey; I = Incidentally located; not located on rake during point-intercept survey

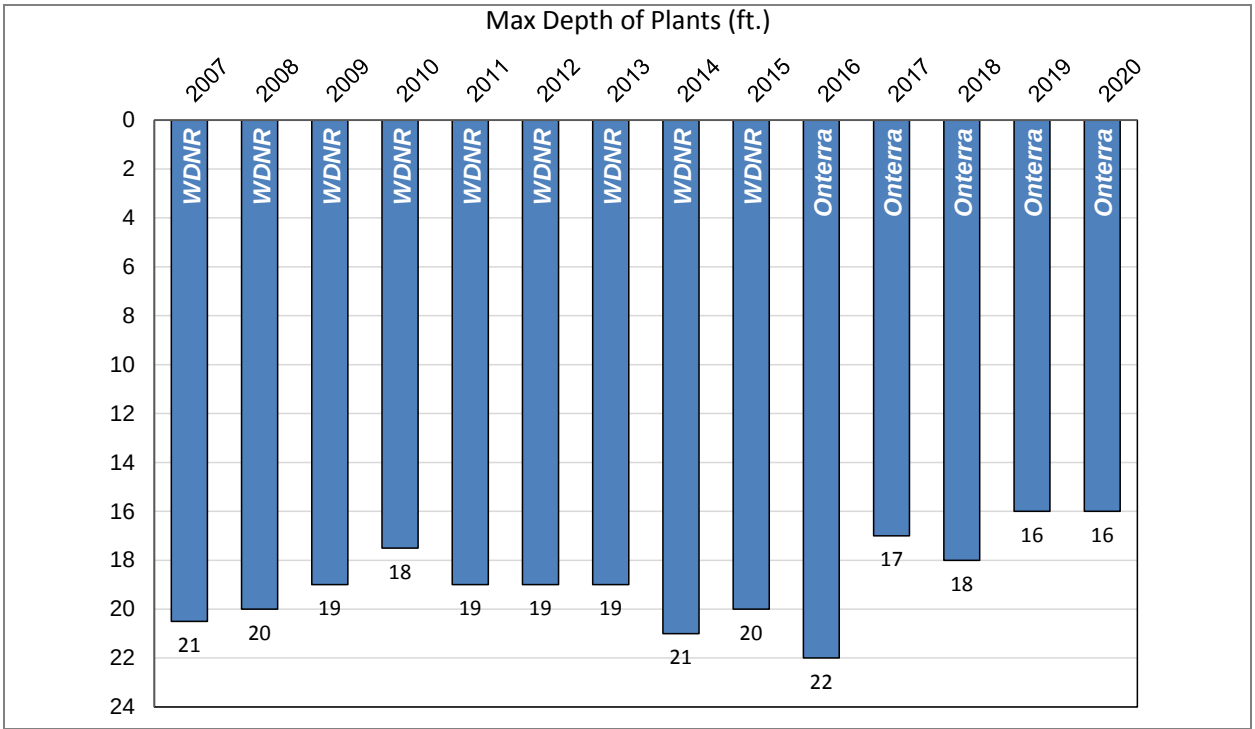


Figure 3.2-3. Maximum depth of plants from point-intercept surveys in Berry Lake.

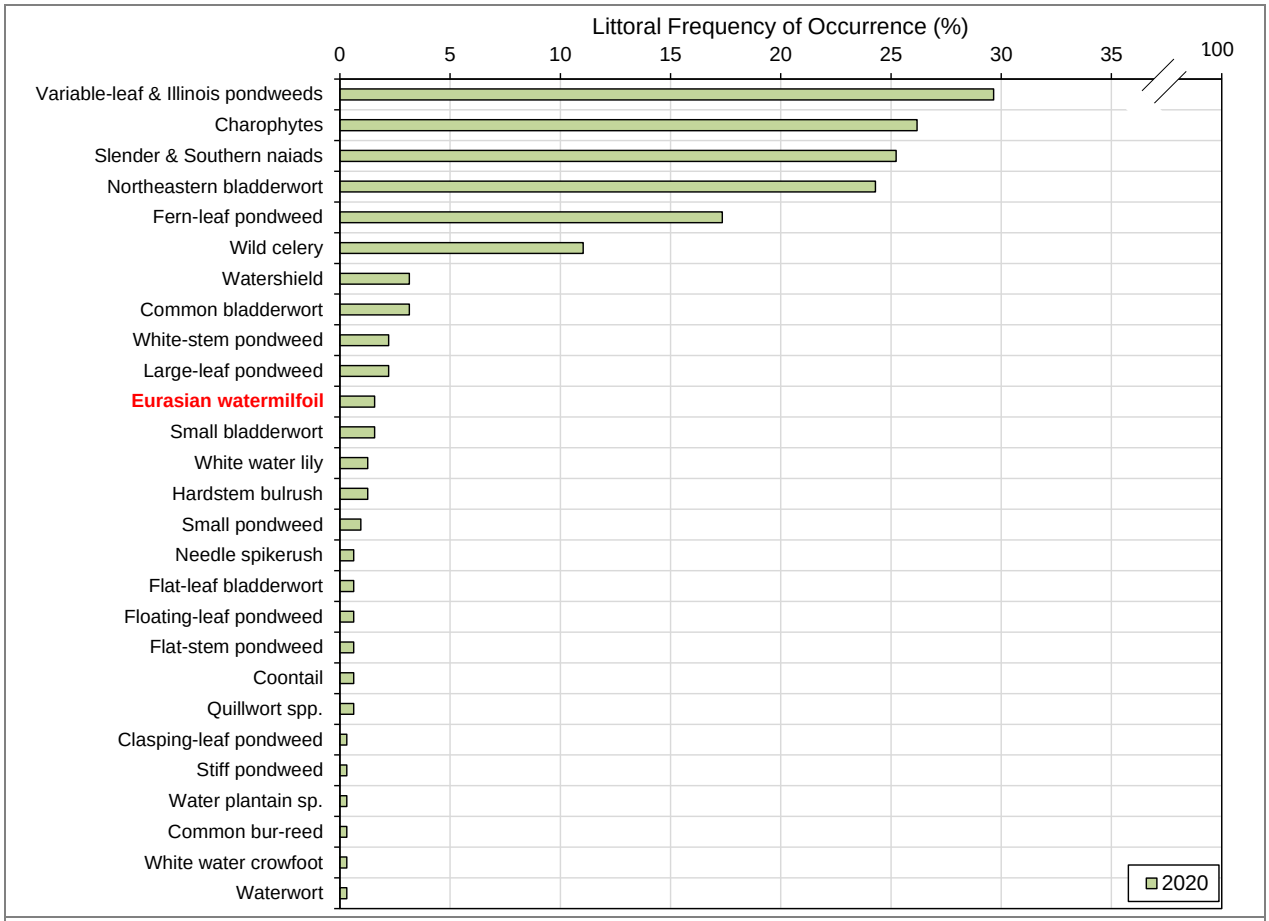


Figure 3.2-4. Berry Lake 2022 LFOO. LFOO = littoral frequency of occurrence.

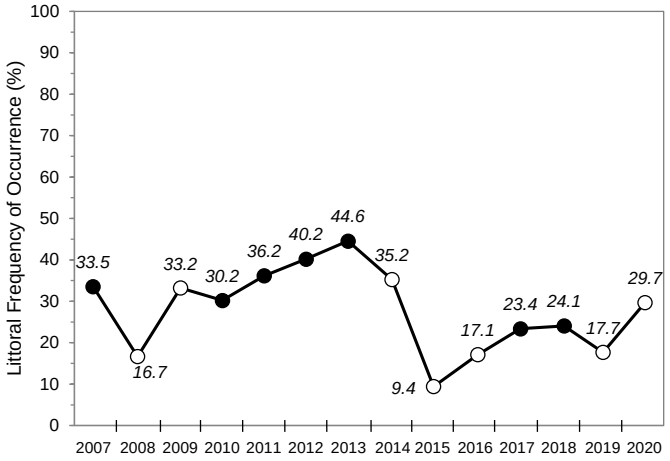


Figure 3.2-5. Variable-leaf & Illinois pondweed LFOO in Berry Lake. Open circle represents statistically valid change from previous survey (Chi-Square α = 0.05).

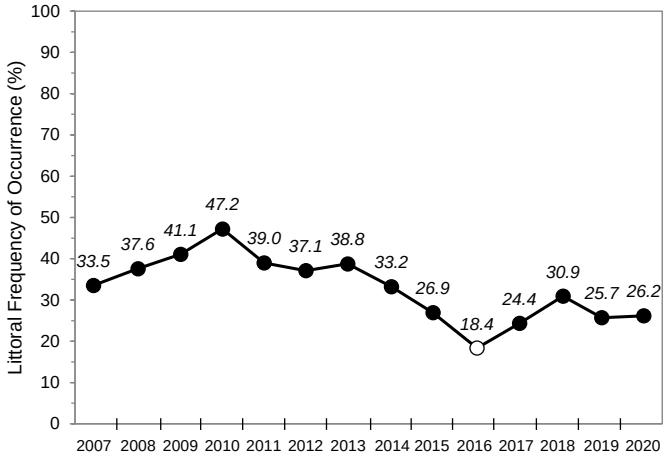


Figure 3.2-6. Charophytes LFOO in Berry Lake. Open circle represents statistically valid change from previous survey (Chi-Square α = 0.05).

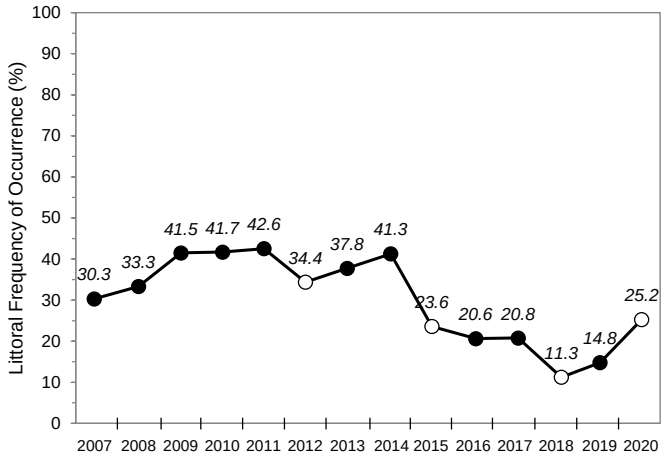


Figure 3.2-7. Slender and southern naiad LFOO in Berry Lake. Open circle represents statistically valid change from previous survey (Chi-Square α = 0.05).

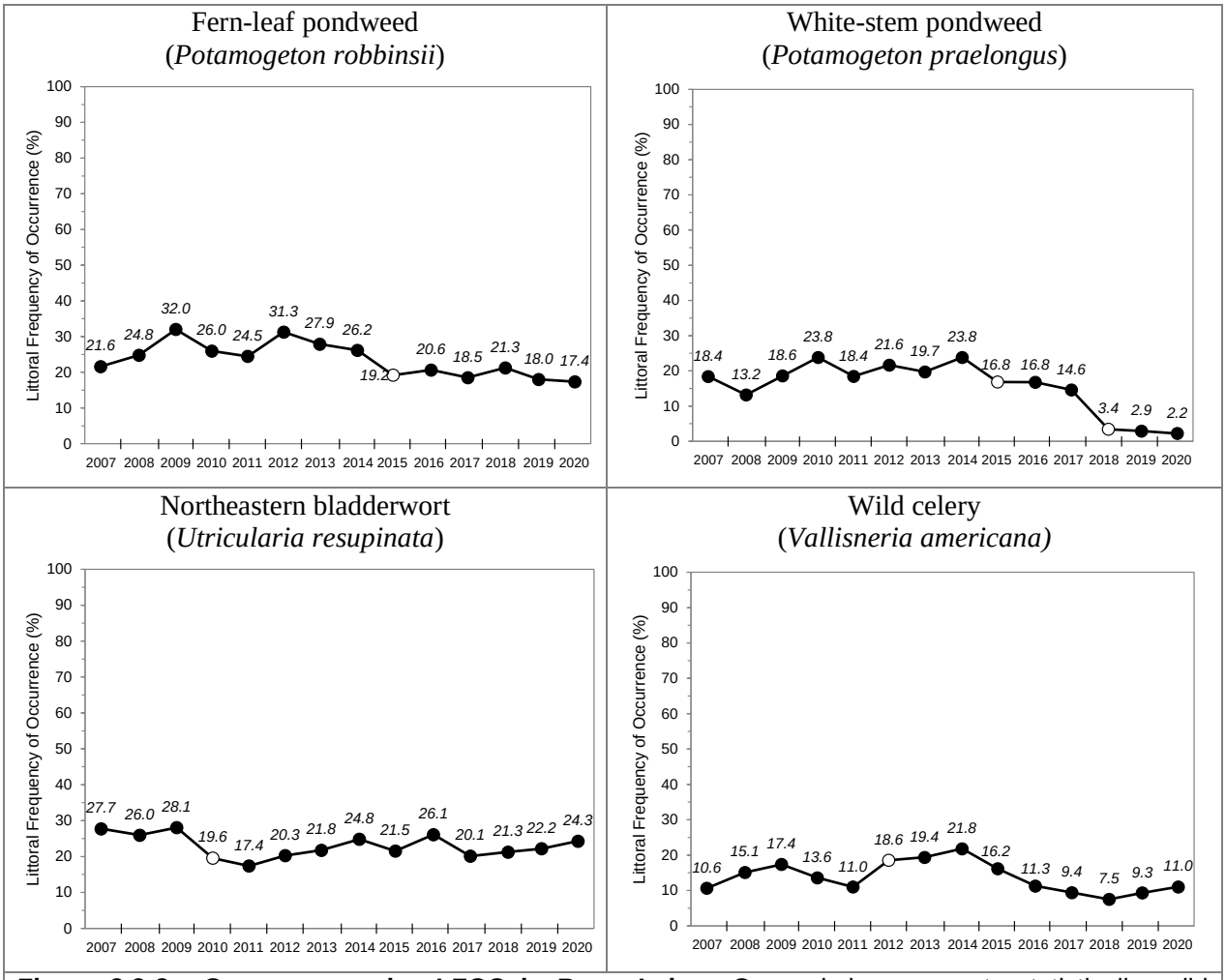


Figure 3.2-8. Common species LFOO in Berry Lake. Open circle represents statistically valid change in occurrence from previous survey (Chi-Square α = 0.05).

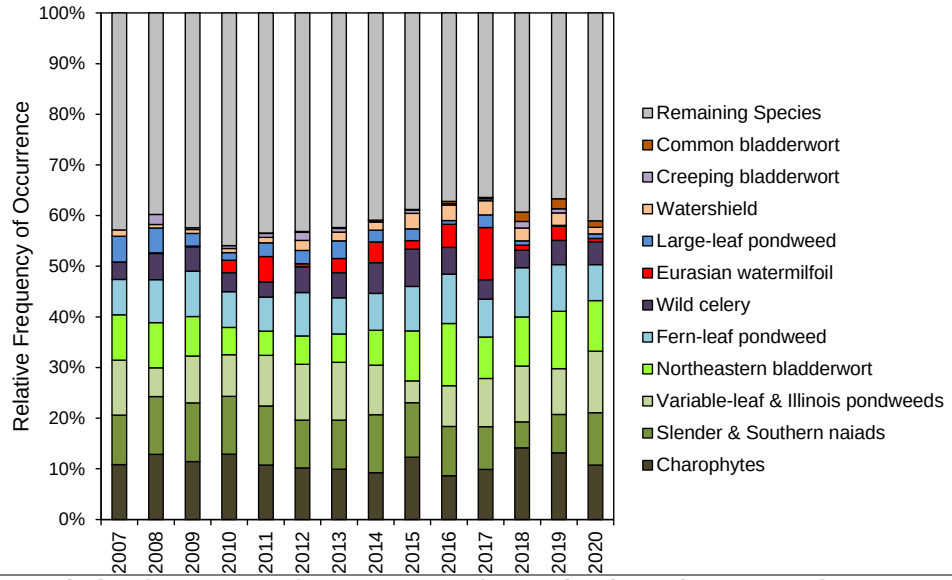


Figure 3.2-9. Relative frequency of occurrence of aquatic plants in Berry Lake.

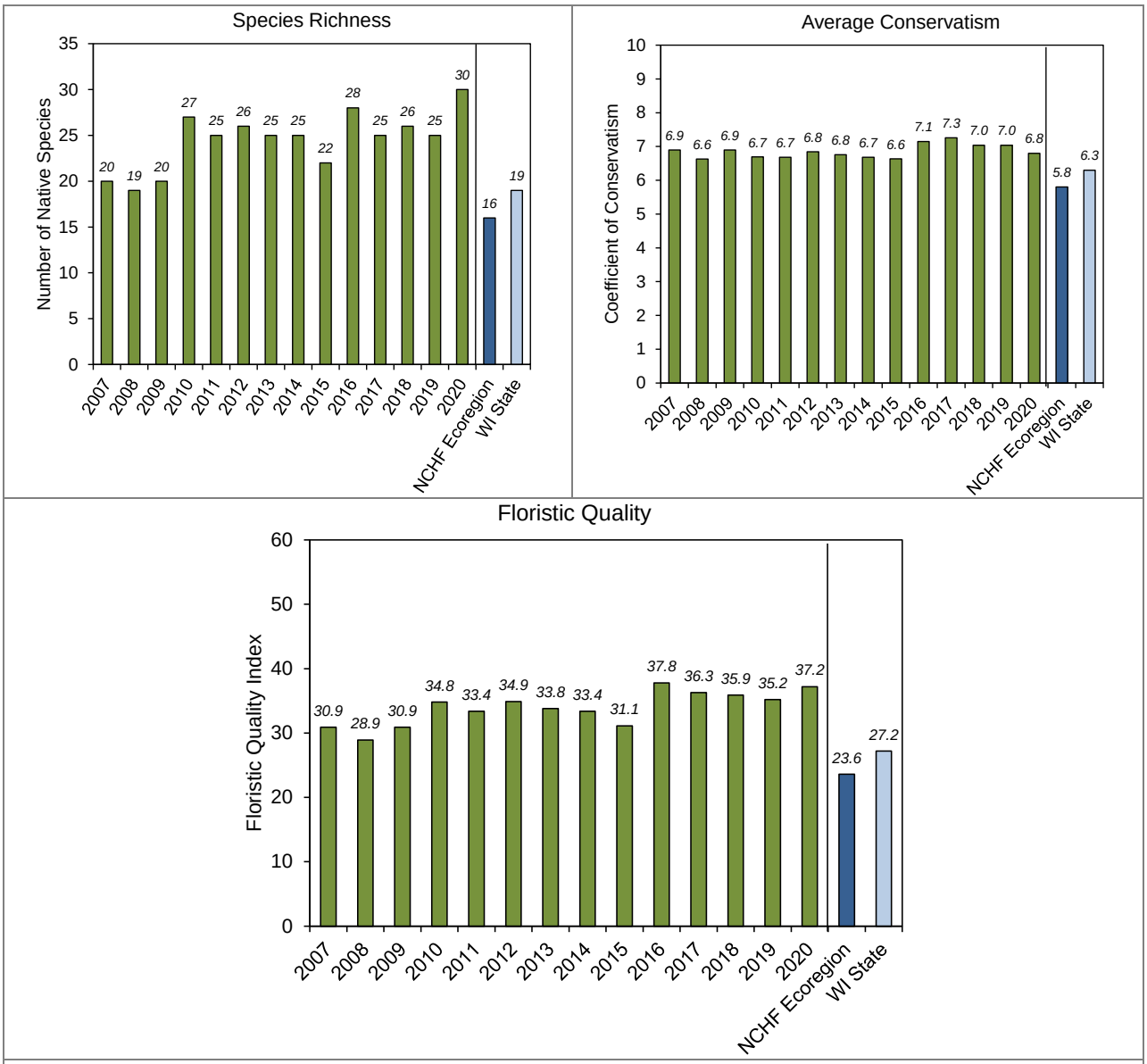


Figure 3.2-10. Native aquatic plant species richness, average conservationism, and floristic quality.

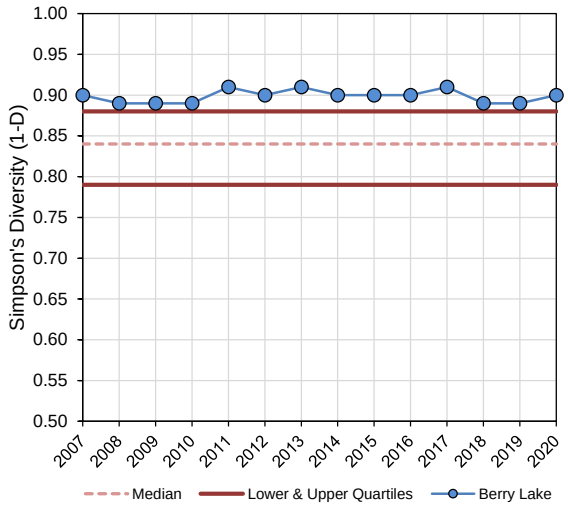


Figure 3.2-11. Berry Lake Simpson's Diversity Index.

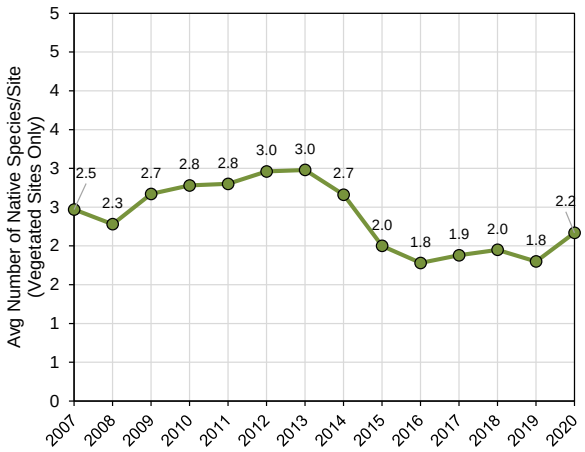


Figure 3.2-12. Average number of native plant species per littoral sampling site in Berry Lake.

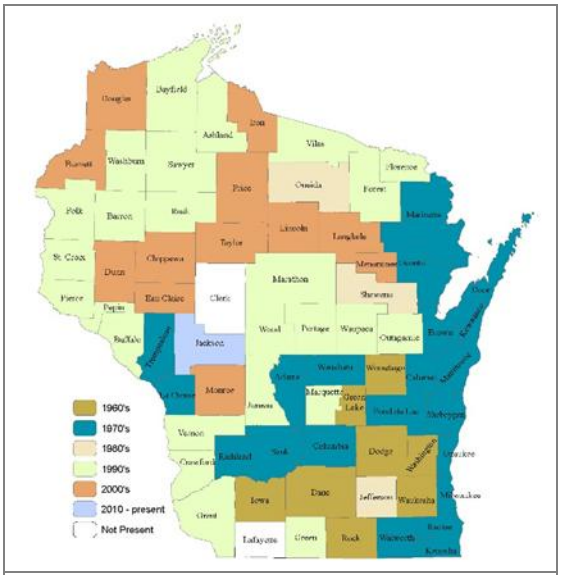


Figure 3.3-1. Spread of Eurasian watermilfoil within WI counties. WDNR Data 2022 mapped by Onterra.

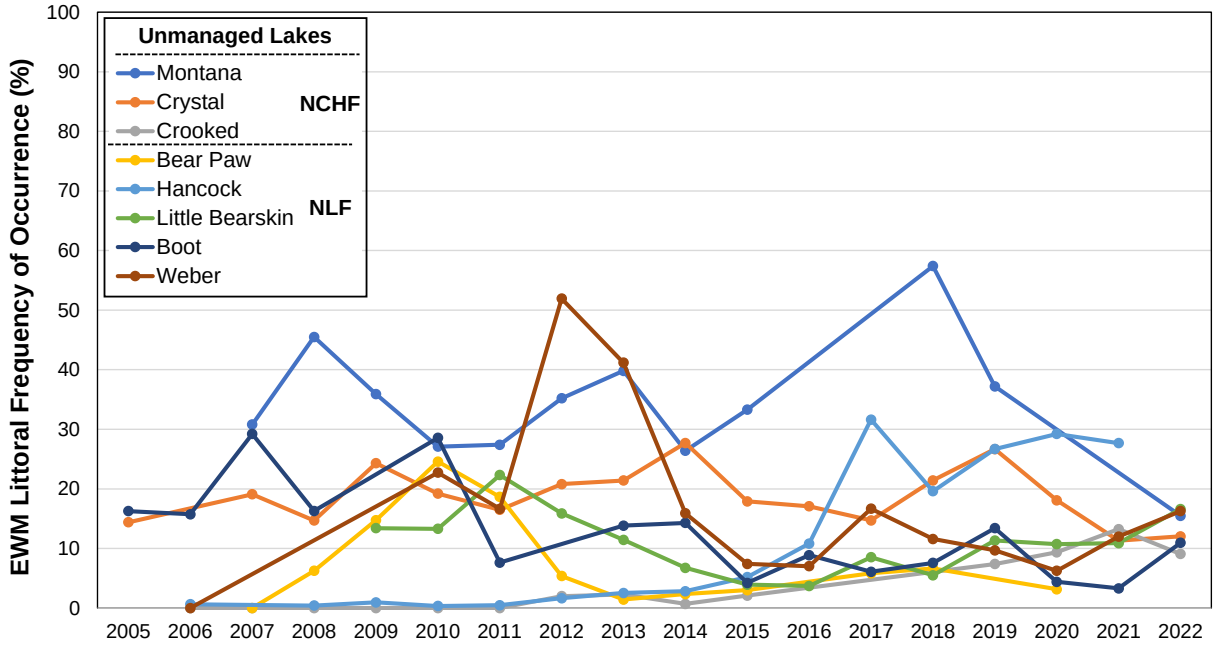


Figure 3.3-2. LFOO of EWM in northern ecoregions without management. Data provided by and used with permission from WDNR. LFOO = littoral frequency of occurrence.

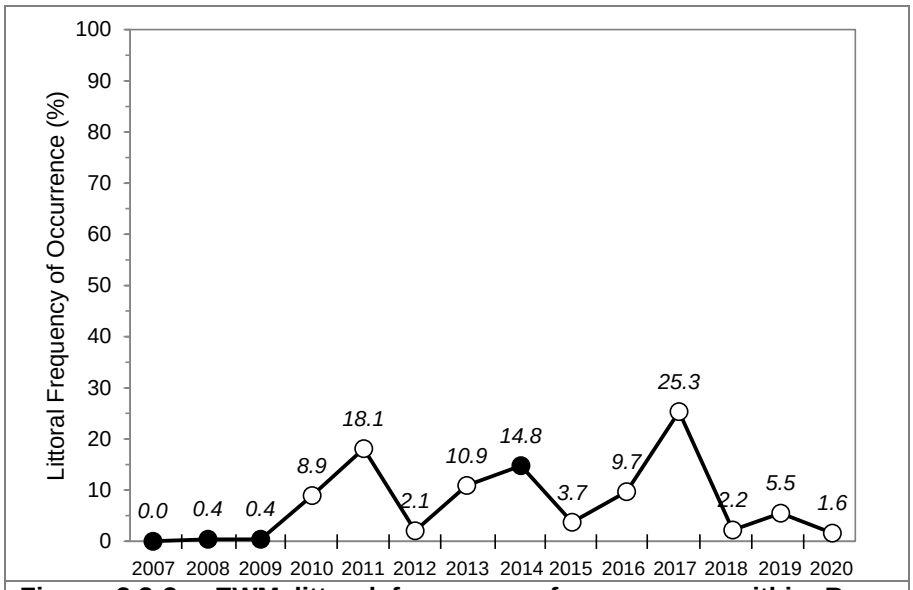


Figure 3.3-3. EWM littoral frequency of occurrence within Berry Lake. Data from available point-intercept surveys.

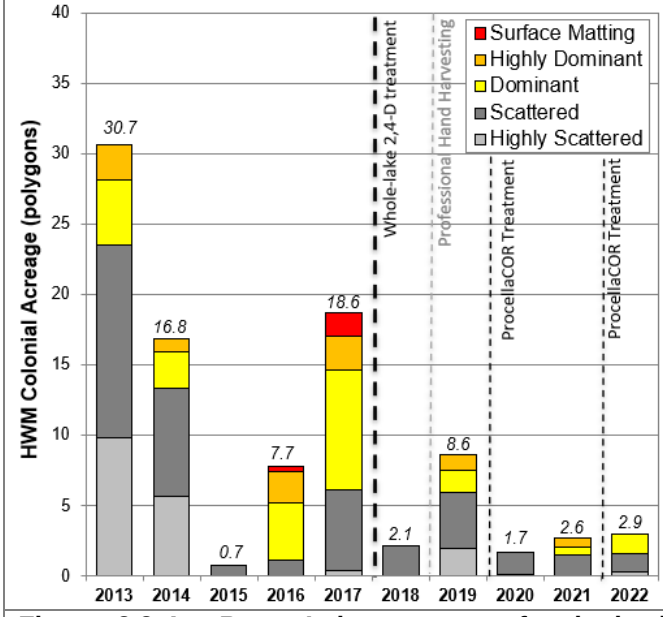


Figure 3.3-4. Berry Lake acreage of colonized EWM (polygons) from 2013-2022. Created using data from Onterra late-summer EWM mapping surveys.

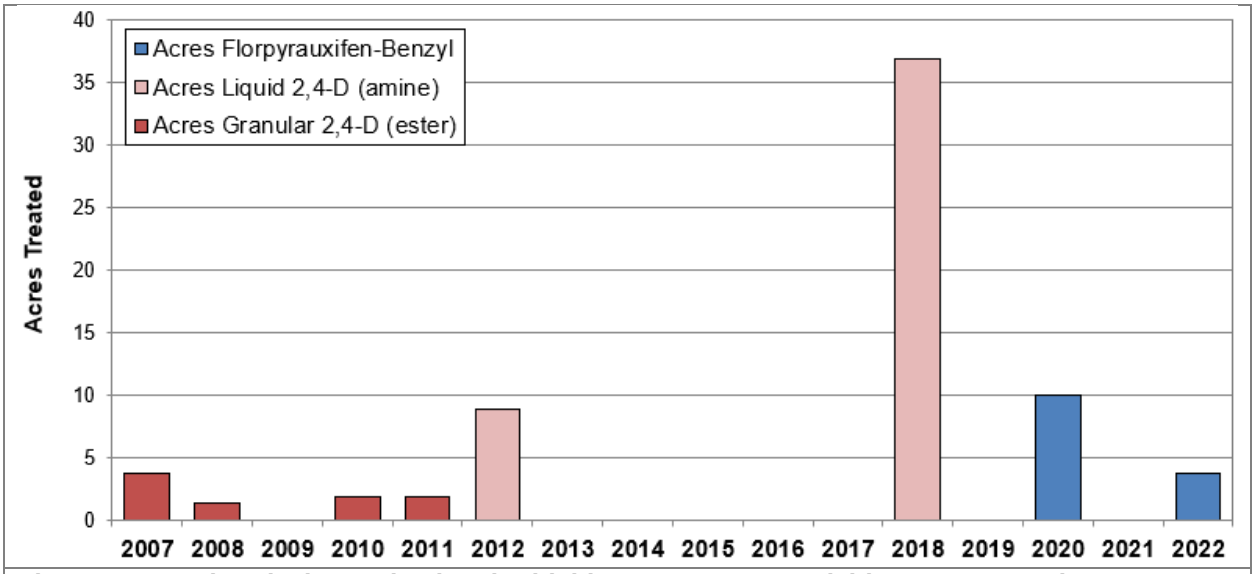


Figure 3.3-5. Historical aquatic plant herbicide management activities on Berry Lake.

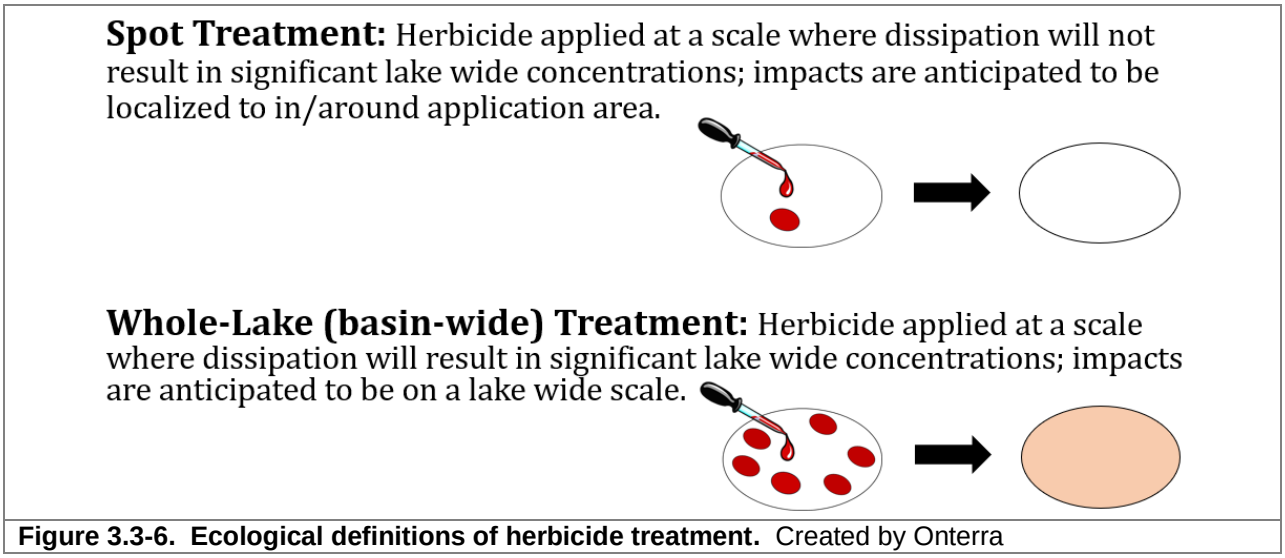


Figure 3.3-6. Ecological definitions of herbicide treatment. Created by Onterra

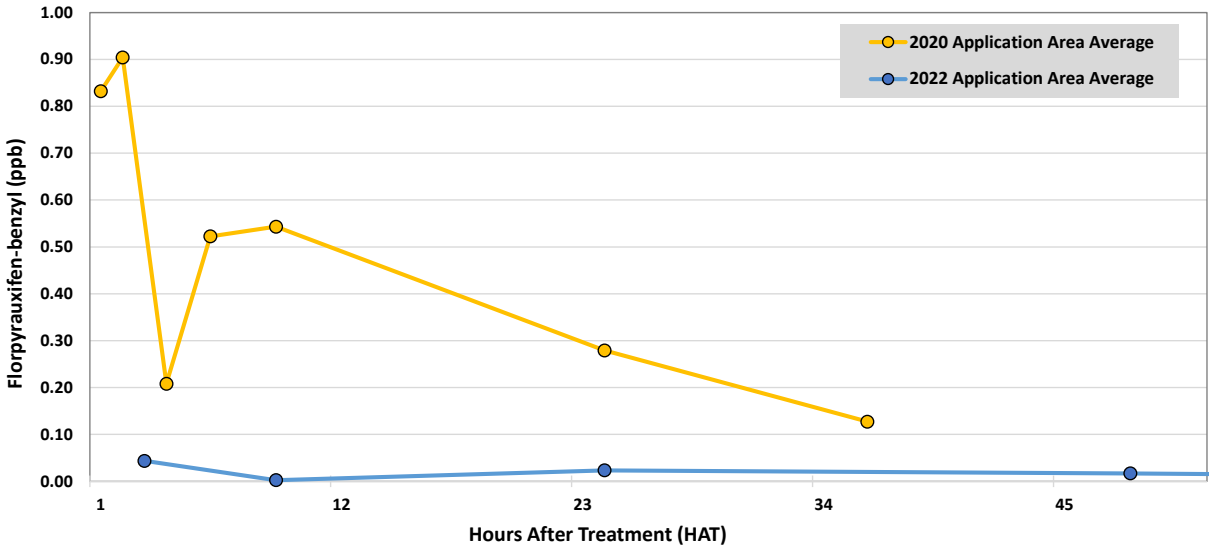


Figure 3.3-7. Berry Lake 2020 & 2022 ProcellaCOR concentration monitoring results. florpyrauxifen-benzyl: SX-1552.

1. **No Coordinated Active Management**
   (Let Nature Take its Course)
   - Focus on education of manual removal methods for property owners
   - Lake organization does not oppose contracted efforts, but does not organize or pay for them
2. **Reduce EWM Population on a lake-wide level**
   (Lake-Wide Population Management)
   - Would likely rely on herbicide treatment strategies (risk assessment)
   - Will not eradicate EWM
   - Set triggers (thresholds) of implementation and tolerance
3. **Minimize navigation and recreation impediment**
   (Nuisance Control)
   - Hand-harvesting alone is not likely able to accomplish this goal and herbicides or a mechanical harvester may be required

Figure 3.3-8. Potential EWM Management Perspectives

Queston 19 (2022): In 2018, 2020, and 2022 herbicide treatments occurred in Berry Lake. How effective do you believe these aquatic herbicide treatments were in managing EWM/HWM during these years?

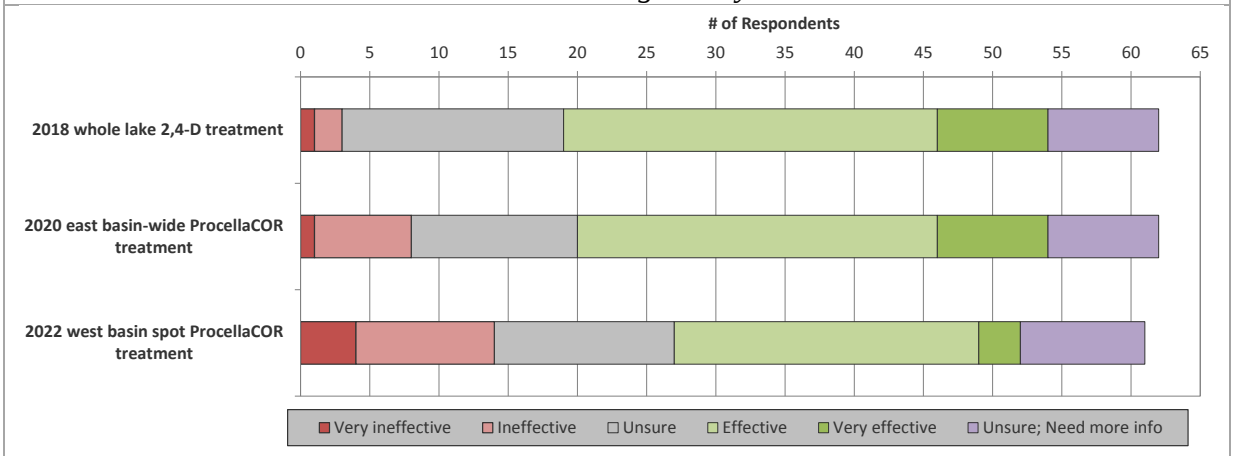
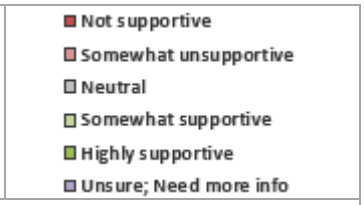


Figure 3.3-9. Select survey responses from the Berry Lake Stakeholder Survey. Additional questions and response charts may be found in Appendix B.

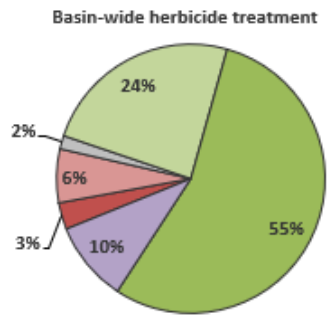
Question 24 (2014): What is your level of support for the responsible use of the following techniques on Berry Lake?

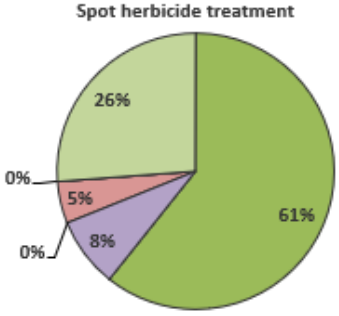
Queston 20 (2022): What is your level of support for the future use of the following EWM/HWM management techniques in Berry Lake?

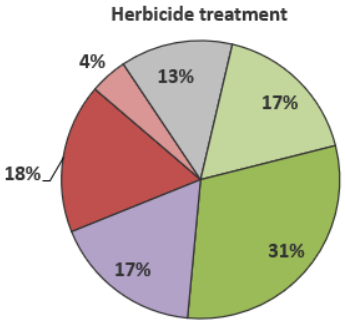


2022	***2014***

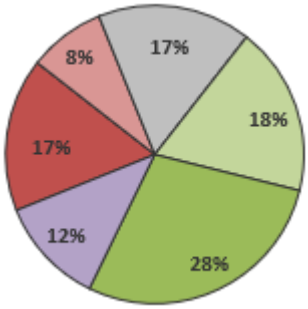
Herbicide Treatments

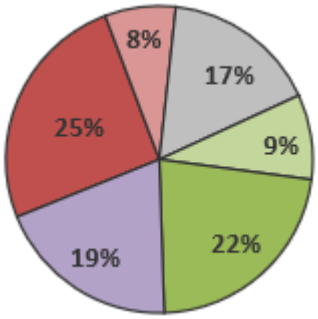




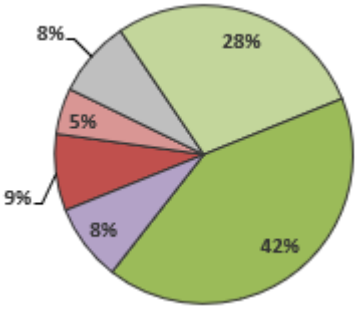


Mechanical Harvesting





Professional Hand Harvesting



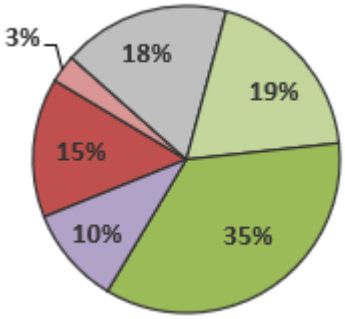


Figure 3.3-10. Select survey responses from the Berry Lake Stakeholder Survey. Additional questions and response charts may be found in Appendix B.

Queston 21 (2022): What is the reason or reasons you oppose the future use of the management techniques to target EWM/HWM in Berry Lake?

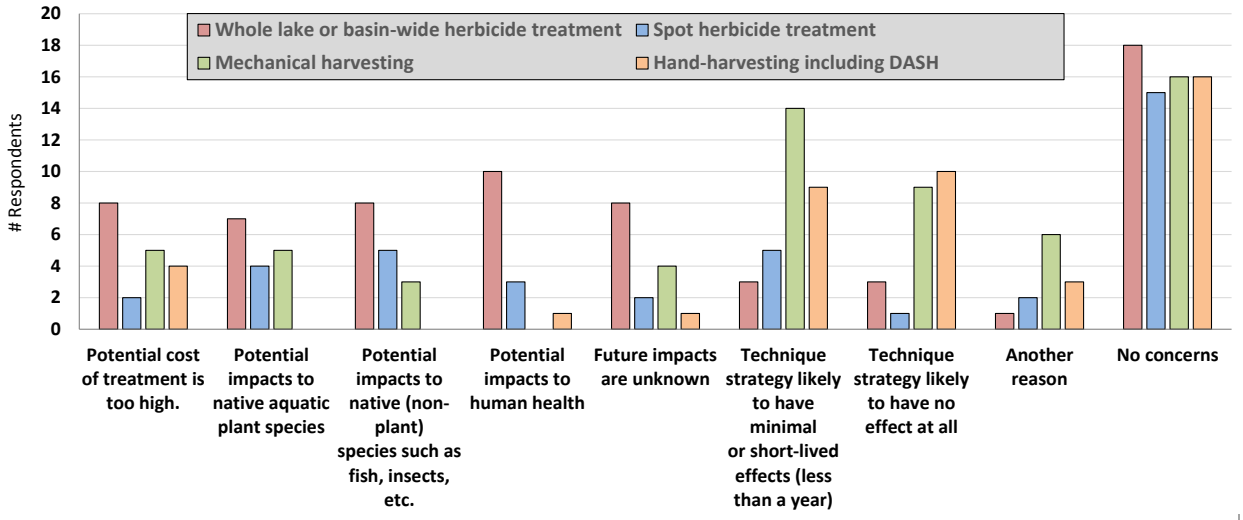


Figure 3.3-11. Select survey responses from the Berry Lake Stakeholder Survey. Additional questions and response charts may be found in Appendix B.

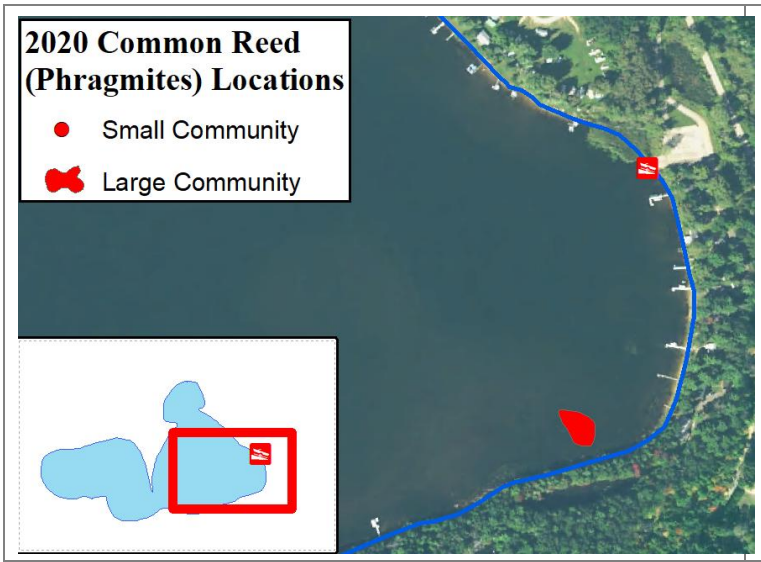


Figure 3.3-12. Berry Lake 2020 Non-native Giant reed (Phragmites australis) Population. Data from Onterra August 18, 2020 survey.

Photograph 3.3-2. Giant reed (Phragmites australis) from Berry Lake during 2020 survey. (Photo by Onterra, LLC)

1. Increase BLPOA's Capacity to Communicate with Lake Stakeholders and Facilitate Partnerships with Other Management Entities
    - Use education to promote lake protection and enjoyment through stakeholder education
    - Continue BLPOA's involvement with other entities that have responsibilities in managing (management units) Berry Lake.
    - Work with local fire departments to institute best management practices for dry hydrant use
    - Increase volunteerism within the BLPOA
2. Maintain Current Water Quality Conditions
    - Monitor water quality through WDNR Citizens Lake Monitoring Network
3. Control Existing and Prevent Further Aquatic Invasive Species Infestations within Berry Lake
    - Initiate Large-Scale Herbicide Control Strategy targeting EWM on Berry Lake
    - Explore the use of benthic mats in riparian use areas to control EWM
    - Reduce occurrence of pale yellow iris on Berry Lake.
    - Reduce occurrence of common reed (aka Phragmites) on Berry Lake
    - Enhance volunteer AIS surveillance monitoring and hand removal program.
    - Continue Clean Boats Clean Waters watercraft inspections
4. Protect and restore the shoreland condition of Berry Lake
    - Investigate restoring highly developed shoreland areas around Berry Lake
    - Protect natural shoreland zones around Berry Lake
    - Coordinate with WDNR and private landowners to expand coarse woody habitat

Figure 5.0-1. Berry Lake Property Owners Association management goals from 2016 CLMP. From *Berry Lake Comprehensive Lake Management Plan* (March 2015)