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FROM: Pamela Toshner, Lake & Watershed Protection Specialist

SUBJECT: 2017 Namakagon Lake Hybrid Watermilfoil Treatment Summary

DNR and partners confirmed an early population of Hybrid watermilfoil (HWM) on Namakagon Lake in the summer of 2016. A planning committee met several times 12/05/2016 and 04/03/2017 to strategize management activities. DNR staff served as technical advisors during those committee meetings and for the treatment itself. This document summarizes DNR activities and is intended to serve as a supplement to future planning.

Management Considerations:

- 2016 professional and volunteer monitoring, including a full point-intercept survey, a lakewide AIS early detection survey with multiple boats, and many follow-up professional and volunteer monitoring surveys resulted in the majority (i.e. hundreds of HWM plants) identified in Lakewoods Marina with sparse single plants located and removed across from Paine's Island in the southwest bay and near the outlet to the Namakagon River.
- The marina continued to have easily detectable HWM plants throughout the growing season and into November 2016, even though professional and volunteer crews manually removed them on at least 9 occasions. The single plants located across from the island and near the outlet were not found again after initial manual removal efforts.
- HWM can be especially difficult to manage, depending on the strain, and there is some evidence the most commonly used Eurasian watermilfoil herbicide 2,4-d is not as effective on HWM. An alternative herbicide Diquat has shown treatment efficacy both for HWM and spot treatments similar in size to Lakewoods Marina, which is less than 2 acres.
- DNR staff consulted with colleagues and technical experts to determine appropriate management strategies, given the lack of control with manual removal and potential spread from the marina. A fall 2016 Diquat treatment was contemplated, but communication glitches prevented it from occurring so an early spring treatment was proposed.
- Monitoring at small spatial scales can be difficult so it was determined pre/post native plant species richness monitoring and rhodamine dye applied with the herbicide would be used to evaluate treatment efficacy.

Treatment Strategy:

Native Plant Community:

DNR staff Mark Sundeen and Alex Smith monitored aquatic plants from the shoreline and marina docks, which extended into the center of the treatment area on 10/25/2016. Species richness was greatest at the shoreline edge and least off-shore. The following aquatic plants were observed:

1. *Typha sp.*
2. *Lemna minor*
3. *Sparganium sp.*
4. *Calla palustris*
5. *Pontederia cordata*

6. *Nymphaea ordata*
7. *Vallisneria Americana*
8. *Elodea nutallii*
9. *Myriophyllum sibiricum*
10. *Myriophyllum sibiricum X M. spicatum*
11. *Potamogeton robbinsii*
12. *Potamogeton amplifolius*
13. *Potamogeton zosterformis*
14. *Potamogeton epihydrus*
15. *Potamogeton richardsonii*
16. *Potamogeton gramineus*
17. *Potamogeton praelongus*
18. *Megalodonta beckii*
19. *Polygonum amphibium*
20. *Ceratophyllum demersum*

2017 spring and summer post treatment observations indicated the native plant community did not experience negative impacts with similar species richness and thriving plants. Anecdotally, the 2017 post-treatment native plant community appeared more robust and diverse than the prior season. Lakewoods Resort reconfigured their marina docks, which may have alleviated prior disturbances like shading and motorboat traffic, promoting new areas for native plant recolonization.

Dye Study:

John Skogerboe created a dye sample plan (attached), including designating sites and time intervals for sampling, and Mark Sundeen and/or Pamela Toshner implemented it. The purpose of the plan was to monitor exposure time and determine if the dye moved outside the bay. Staff did not monitor adjacent site(s) if the measurement was at background concentration (2 ppb). It took less than 10 minutes to complete the monitoring on a given interval. Dye monitoring results indicate the dye did not move Site 5, and most sites were approaching background concentrations (2 ppb) by 72 hours after treatment.

SITE NUMBER	DYE CONCENTRATION (ppb - parts per billion)								
	1 HAT	2 HAT	3 HAT	4 HAT	6 HAT	9 HAT	24 HAT	50* HAT	72 HAT
1	12.25	21.33	15.90	22.27	17.90	14.99	10.80	6.4	2.73
2	16.90	16.55	16.56	18.53	16.55	14.51	10.40	5.97	3.10
3	22.50	22.5	17.58	14.87	16.81	14.60	11.95	5.77	2.90
4	not accessible -								
5	12.11	1.00	7.57	9.05	10.75	2.66	2.5	4.52	2.90
6	1.25	0.92	1.42	1.82	0.86	1.25	1	1.10	1.23
7	0.95	1.79	0.96	0.83	0.74	-	1.05	-	1.01
8	-	-	-	-	-	-	1.05	-	1.02
9	0.90	0.99	0.82	0.86	0.86	1.45	1.09	0.99	1.09
10	-	-	0.96	0.86	0.90	1.35	1.11	1.07	1.63
11	-	-	-	-	-	-	-	-	1.03
14	-	0.90	-	-	-	-	-	-	-

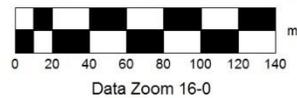
Dye monitoring results. Shaded cells are below background concentration of 2 ppb.



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Dye monitoring site locations. The dye did not move beyond Site 5.

Conclusions:

- While the spring diquat treatment did not eradicate HWM from Lakewoods Marina, it substantially reduced the population – both distribution and density – to level that was manageable with manual removal in 2017.
- Native plants were not visibly impacted, and diversity appeared to be similar, if not higher post-treatment. This may have had more to do with dock reconfiguration than anything else.
- The dye monitoring indicates the diquat had ample concentration exposure time for HWM control, and it did not move into the Namakagon Lake proper.

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