

Wrighter Lake
C/O Mr. Bob Lissner
114 Locust Lane
Thompson, Pennsylvania 18465

**RE: Wrighter Lake – 2023 SAV Survey
Thompson, Pennsylvania
Project #1950.004**

August 14, 2023

Dear Mr. Lissner,

Princeton Hydro is pleased to submit the following letter report detailing the submerged aquatic vegetation (SAV) survey conducted on July 11, 2023, at Wrighter Lake located in Thompson, Susquehanna County, Pennsylvania.

Introduction

Wrighter Lake is an approximately 87-acre waterbody located in Susquehanna County, Pennsylvania. The immediate watershed surrounding Wrighter Lake is comprised of a mixture of forests, agriculture, and low-density residential which encompasses, primarily, the lake houses immediately surrounding the shoreline. The maximum depth of Wrighter Lake is approximately 11 m (36') with an extensive littoral zone where submerged aquatic vegetation (SAV) flourishes.

Wrighter Lake approached Princeton Hydro to conduct a SAV survey of the lake and to utilize this data to recommend SAV control measures. As such, Princeton Hydro conducted a complete survey of the lake on July 11, 2023. This survey is a follow-up to previous surveys conducted on:

- July 7, 2020
- July 7, 2021
- July 14, 2022

The consistent monitoring of the Lake serves as the best means of detecting changes in invasive species distribution over time and to also quickly detect any potential new invasive species that could harm the ecological, recreational, and aesthetic characteristics of the lake. Other non-native / invasive plants that are known to occur in the area, but not in Wrighter Lake, include but are not limited to:

- Hydrilla (*Hydrilla verticillata*)
- Water chestnut (*Trapa natans*)
- Eurasian watermilfoil (*Myriophyllum spicatum*)
- Parrotfeather (*Myriophyllum aquaticum*)
- Fanwort (*Cabomba caroliniana*)

- Brazilian elodea (*Egeria densa*)

This list does not consider other invasives, such as zebra mussels (*Dreissena polymorpha*), which are present in the Commonwealth and pose a risk to freshwater resources.

The results of this survey, and implications for management, are discussed below.

Methodology

The SAV survey was conducted by two (2) Princeton Hydro staff scientists on July 11, 2023. During this survey, nine (9) transects were sampled (Figure 1).

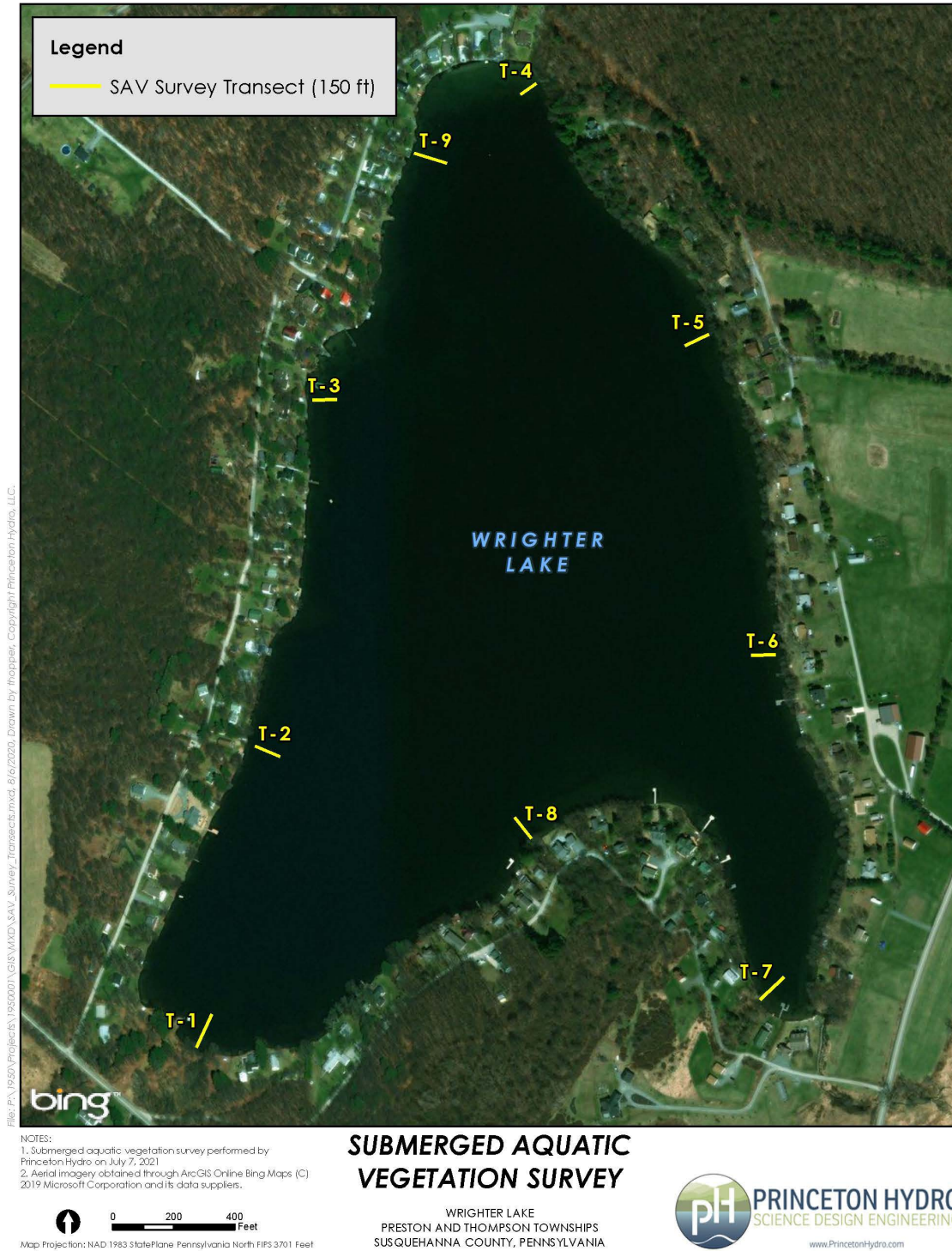


Figure 1: Wrighter Lake – 2023 SAV Survey Locations

Princeton Hydro conducted a SAV survey of nine (9) transects on July 11, 2023. Each transect was established near shoreline with a floating rope which was then extended 150' towards the center of the lake. The start and end point of each transect was then marked via GPS. Along each transect, Princeton Hydro surveyed a 1 m² quadrat at 20-25' intervals for a total of eight (8) distinct quadrats per transect. At each quadrat, Princeton Hydro surveyed all above ground plant biomass and identified each plant to lowest practical taxon; typically, species. At each quadrat, abundance was described utilizing the following protocol: (A) Abundant - > 50% of quadrat area, (C) Common - 20 - 50% of quadrat area, (P) Present - 10 - 20% of quadrat area, (R) Rare - < 10% of quadrat area. Finally, at a representative quadrat at each station, all above ground biomass was harvested and weighed as wet weight.

Results

The following Table (Table 1) depicts the species list while Tables 2 and 3 provide the survey data.

Table 1: Species List

Wrighter Lake - 2023 Species List		
Common	Scientific	Type
Nitella	<i>Nitella</i> sp.	Submerged - Macroalgae
Aquatic Moss	<i>Fontinalis</i> sp.	Submerged
Broadleaf Pondweed	<i>Potamogeton natans</i>	Submerged
Curlyleaf Pondweed	<i>Potamogeton crispus</i>	Submerged
Largeleaf Pondweed	<i>Potamogeton amplifolius</i>	Submerged
Quillwort	<i>Isoetes</i> sp.	Submerged
Robbin's Pondweed	<i>Potamogeton robbinsii</i>	Submerged
Slender Naiad	<i>Najas flexilis</i>	Submerged
Thinleaf Pondweed	<i>Potamogeton pusillus</i>	Submerged
Water Crowfoot	<i>Ranunculus</i> sp.	Submerged
White Water Lily	<i>Nymphaea odorata</i>	Floating
Pickerel Weed	<i>Pontedaria cordata</i>	Emergent
Spikerush	<i>Eleocharis</i> sp.	Emergent

Table 2: Wrighter Lake – 2023 SAV Results

Wrighter Lake - July 11, 2023 - SAV Survey (1 of 2)											
Transect	Species		Quadrat Distance (*)							Biomass (g)	
	Common	Scientific	0'	20'	40'	60'	80'	100'	125'		150'
T1	Pickereel Weed	<i>Pontedaria cordata</i>	A	P		C*					277
	White Water Lily	<i>Nymphaea odorata</i>	P	C	A	C					
	Curlyleaf Pondweed	<i>Potamogeton crispus</i>		C	P	P	C	A		P	
	Thinleaf Pondweed	<i>Potamogeton pusillus</i>		P							
	Robbin's Pondweed	<i>Potamogeton robbinsii</i>		P		P	A	A	A		
	Water Crowfoot	<i>Ranunculus sp.</i>		C	P	A	P	P		P	
	Slender Naiad	<i>Najas flexilis</i>								P	
T2	Pickereel Weed	<i>Pontedaria cordata</i>		A	C						14
	Thinleaf Pondweed	<i>Potamogeton pusillus</i>		P							
	Curlyleaf Pondweed	<i>Potamogeton crispus</i>		P	P	C		P*			
	White Water Lily	<i>Nymphaea odorata</i>			P						
	Robbin's Pondweed	<i>Potamogeton robbinsii</i>			P	P					
	Water Crowfoot	<i>Ranunculus sp.</i>				P					
	Slender Naiad	<i>Najas flexilis</i>					P				
	Nitella	<i>Nitella sp.</i>						C	A	A	
T3	Curlyleaf Pondweed	<i>Potamogeton crispus</i>	P				C	A	C	A*	301
	Slender Naiad	<i>Najas flexilis</i>		P	P	P					
	Water Crowfoot	<i>Ranunculus sp.</i>		P							
	Quillwort	<i>Isoetes spp.</i>			P						
	Nitella	<i>Nitella sp.</i>			P	P				P	
	Broadleaf Pondweed	<i>Potamogeton natans</i>				P	P	P			
	Robbin's Pondweed	<i>Potamogeton robbinsii</i>				P	P		A		
T4	Curlyleaf Pondweed	<i>Potamogeton crispus</i>	P	P	P	C	A*	A	A	A	51
	Pickereel Weed	<i>Pontedaria cordata</i>	P								
	Nitella	<i>Nitella sp.</i>		P	P						
	Slender Naiad	<i>Najas flexilis</i>			P						
	Robbin's Pondweed	<i>Potamogeton robbinsii</i>			P	P	P	P			

*Denotes harvested quadrat

Table 3: Wrighter Lake – 2023 SAV Results

Wrighter Lake - July 11, 2023 - SAV Survey (2 of 2)											
Transect	Species		Quadrat Distance (*)								Biomass (g)
	Common	Scientific	0'	20'	40'	60'	80'	100'	125'	150'	
T5	Curlyleaf Pondweed	<i>Potamogeton crispus</i>	P		C	C	C	A*			P
	Pickerel Weed	<i>Pontedaria cordata</i>	P		P						
	Water Crowfoot	<i>Ranunculus sp.</i>	P								
	Slender Naiad	<i>Najas flexilis</i>		P	P						
	Quillwort	<i>Isoetes spp.</i>		P	P	A					
	Nitella	<i>Nitella sp.</i>			P		P		P	A	
	Robbin's Pondweed	<i>Potamogeton robbinsii</i>					P	C			
	Broadleaf Pondweed	<i>Potamogeton natans</i>						P			
T6	Pickerel Weed	<i>Pontedaria cordata</i>	P	A							
	Spikerush	<i>Eleocharis Spp.</i>		P							
	Curlyleaf Pondweed	<i>Potamogeton crispus</i>				P	A*	A	P	P	
	Broadleaf Pondweed	<i>Potamogeton natans</i>				P	P				
	Water Crowfoot	<i>Ranunculus sp.</i>					C				
	Largeleaf Pondweed	<i>Potamogeton amplifolius</i>					P	P			
	Robbin's Pondweed	<i>Potamogeton robbinsii</i>						C			
Nitella	<i>Nitella sp.</i>							P	C		
T7	Water Crowfoot	<i>Ranunculus sp.</i>	C	A*	P	C		P			
	Curlyleaf Pondweed	<i>Potamogeton crispus</i>	P	C	A	A	P	P		P	
	Pickerel Weed	<i>Pontedaria cordata</i>	P								
	White Water Lily	<i>Nymphaea odorata</i>		A	P						
	Nitella	<i>Nitella sp.</i>			P	P	C	P	P	P	
Slender Naiad	<i>Najas flexilis</i>				P	P		P	C		
T8	Curlyleaf Pondweed	<i>Potamogeton crispus</i>		P	P	P	A*	P	P		
	Quillwort	<i>Isoetes spp.</i>		P	A	A					
	Slender Naiad	<i>Najas flexilis</i>						P			
	Thinleaf Pondweed	<i>Potamogeton pusillus</i>						A	P		
	Nitella	<i>Nitella sp.</i>						P			
T9	Aquatic Moss	<i>Fontinalis spp.</i>	A	P							
	Curlyleaf Pondweed	<i>Potamogeton crispus</i>	C	P	P	P	P	P*		P	
	Spikerush	<i>Eleocharis Spp.</i>	P	P							
	Pickerel Weed	<i>Pontedaria cordata</i>		P							
	Quillwort	<i>Isoetes spp.</i>		P	A	C					
	Robbin's Pondweed	<i>Potamogeton robbinsii</i>				P	C	C	P		
Nitella	<i>Nitella sp.</i>							P	P		

*Denotes harvested quadrat

The SAV survey showed the only non-native, invasive species to be identified in the lake as curlyleaf pondweed. This species was present at every transect surveyed as was the case in prior years. The highest densities of curlyleaf pondweed were at Transect 4.

Total SAV biomass ranged from a minimum of 14 g/m² at Transect 2 to a maximum biomass of 453 g/m² at Transect 6. Historical SAV data is presented in Figure 1 below.

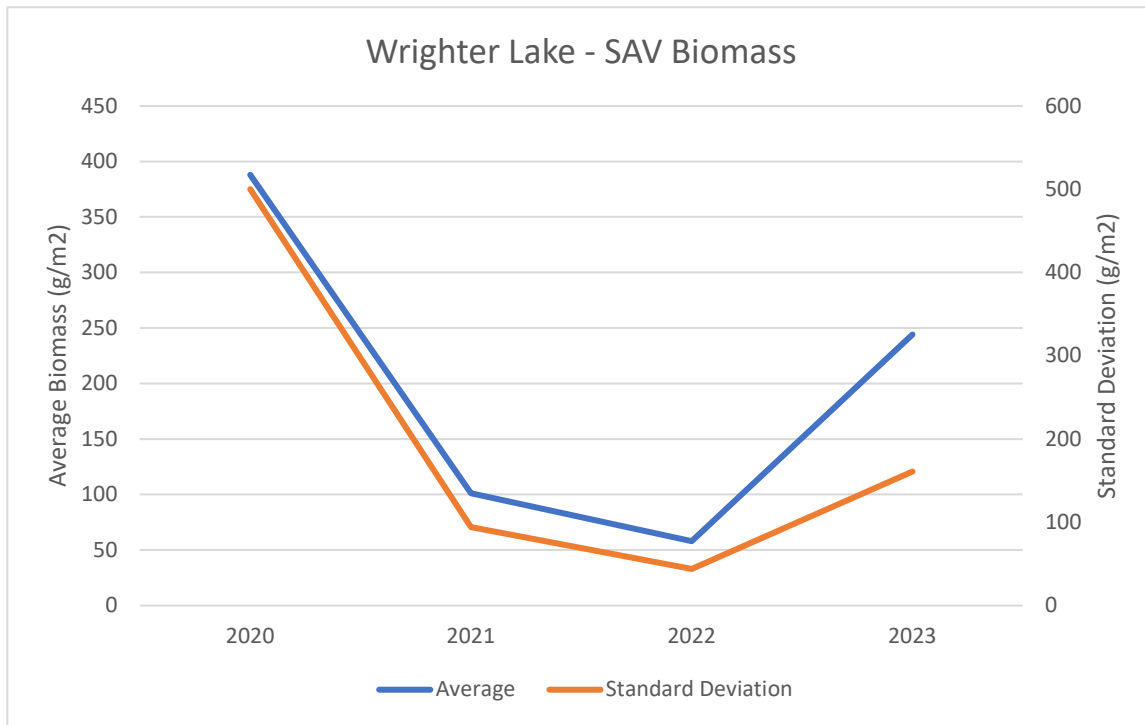


Figure 1: Wrighter Lake – Historical SAV Data

Peak biomass was recorded in 2020 and then dropped through 2021 and 2022 with a rebound in plant density in 2023. As such, management of curlyleaf pondweed is recommended.

Recommendations

The data collected as part of the 2023 event showed increasing abundance and density of plants overall including curlyleaf pondweed.

For management and eradication, Wrighter Lake can utilize the early-growth timing of curly-leaf pondweed, in conjunction with specific herbicides, to selectively target the eradication of this plant with little to no damage to desirable native macrophytes. A low dose (< 10 ppb) application of Fluridone (Trade name: Sonar) may serve to highly damage curly-leaf pondweed with intermediary or limited effects on desirable SAV including Robbin's pondweed, thin-leaf pondweed, and large-leaf pondweed (Smith et. al., 1997). Fluridone is a systemic based herbicide which is taken up by the plants roots and is distributed throughout the plant tissue. Optimal application timing is in early-May prior to turion formation by curly-leaf pondweed. A multiple (3-5 year) application period may be necessary to eradicate this plant. It is likely that one (1) split treatment is needed per year.

Utilization of a systemic herbicide is a permitted activity in the Commonwealth of Pennsylvania via a joint permit between the Pennsylvania Department of Environmental Protection (PADEP) and the Pennsylvania Fish and Boat Commission (PAFBC). Application is governed under an Aquatic Pesticide Permit with application of areas greater than 80-acres only approved with an additional National Pollutant Discharge Elimination System (NPDES) permit. Given the distribution of the plant, and the mechanism of the herbicide, the entirety of the lake would need to be treated.

Application of Sonar AS includes a zero-day restriction on swimming, drinking, fishing, pet and livestock consumption but does carry a 14-day restriction for use of lake water for irrigation.

Princeton Hydro recommends a follow up SAV survey in July 2024 to assess plant response to any management efforts.

Thank you for your review of this letter report. If you have any additional questions, please contact me at 908-237-5660.

Sincerely,



Michael Hartshorne
Director of Aquatics
Princeton Hydro, LLC

cc: Dr. Fred Lubnow, Senior Technical Director of Ecological Services, Princeton Hydro
Tyler Overton, Senior Field Operations Manager, Princeton Hydro