Maryland Department of Natural Resources

Tidewater Ecosystem Assessment

New Germany Lake Submerged Aquatic Vegetation Survey Summer 2011

Report of Survey Activity and Results

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Prepared For

Maryland Department of Natural Resources

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INTRODUCTION

In response to concern regarding increased amounts of submerged aquatic vegetation (SAV) in New Germany Lake, the Maryland Department of Natural Resources initiated an SAV survey in summer 2011. The goal of the SAV survey was to define the distribution and relative abundance of SAV species present by sampling several points throughout the lake.

Background

Located in New Germany State Park in western Maryland, New Germany Lake is a 13 acre lake surrounded by forests. Prior to 1837, it was a 9-15 foot channelized stream called Poplar Lick Run. In 1837 the Swauger Mill Dam was constructed, creating a 9 acre lake. Lake size increased to 13 acres in 1933 when the current dam was constructed two feet higher with a concrete spillway at the same site as Swauger Mill Dam.

Today the lake is the State Park's center of summertime activity. Non-motorized small boats are available to rent, fisherman enjoy the largemouth bass, catfish, bluegill, and trout, and swimming is available from the "east beach" within a guarded swimming area. Snorkelers are likely to get a glimpse of the many salamanders that hide within and among the SAV and submerged tree limbs, and possibly even a Hellbender, a species of giant salamander endemic to North America. Hellbenders are becoming exceedingly rare and although they normally inhabit areas with large rocks and swiftly moving water, one was seen several years ago in New Germany Lake.

Because the lake is stream-fed, it receives nutrient and sediment run-off from the surrounding watershed. Beginning in late spring and fueled by the incoming nutrients and increased water temperatures, SAV begins growing throughout the lake. Submerged aquatic vegetation can be found in a variety of aquatic habitats and forms the foundation of a healthy lake ecosystem. Similar to their terrestrial counterparts, SAV are underwater grasses which provide a myriad of important ecological functions. Through the process of photosynthesis, SAV produces oxygen which is vital to the survival of all lake organisms. It provides food, habitat and nursery grounds for many species of fish and invertebrates, absorbs nutrients which decreases the likelihood of algal blooms, improves water clarity by reducing turbulence which allows suspended solids to settle to the bottom and get incorporated into the plants root systems, reduces shoreline erosion by reducing the effects of waves and currents, and is a major food source for waterfowl. Healthy native aquatic plant communities also help prevent the establishment of invasive plants like Eurasian water milfoil (*Myriophyllum spicatum*).

METHODS

Field

Submerged aquatic vegetation surveys took place on June 15, August 10, and September 13, 2011. Using SCUBA or snorkel gear, divers sampled 39-50 0.25m^2 quadrats placed systematically but haphazardly throughout the lake. Exact quadrat locations (latitude and longitude) were recorded using a Garmin handheld GPS device, as was the depth at each

quadrat sampled. Within each quadrat, a total SAV percent cover was estimated, which included all macrophytes, both vascular plants and macroalgae, as well as the percent cover of each genus present.

Data Analysis

Data were first entered into an Excel spreadsheet. For each sampling event, mean percent cover values were calculated for total SAV, total macroalgae, and for each vascular plant genus observed. To show trends in the distribution and density of each macrophyte group, distribution and density maps were created in ArcGIS ArcMap using the georeferenced percent cover data. Shapefiles for each sampling event were created, and from these, grid surfaces were interpolated using the default settings of the Inverse Distance Weighted (IDW) function in the Spatial Analyst Extension. Depth, total SAV, total macroalgae, and each genus of vascular plants observed were interpolated and mapped for each sampling period. An outline of the lake was used as an analysis mask, so that only interpolated surfaces within the lake boundaries were shown. Surface covers were classified and color-coded.

RESULTS

We observed four genera of vascular plants and two genera of macroalgae in New Germany Lake during the 2011 SAV surveys. These plants include *Najas flexilis, Najas gracillima, Najas guadalupensis, Najas minor, Potamogeton pusillus, Potamogeton vaseyii, Potamogeton spirillus, Potamogeton diversifolius, Utricularia vulgaris, Isoetes spp., Chara vulgaris*, and *Nitella flexilis*. Common names are given in Table 1.

Table 1. List of macrophytes observed in New Germany Lake during summer 2011 SAV surveys.

Species	Abbreviation	Common name
Potamogeton pusillus	Pp	Slender pondweed
Potamogeton vaseyii	Pv	Vasey's pondweed
Potamogeton spirillus	Ps	Spiral pondweed
Potamogeton diversifolius	Pd	Waterthread pondweed
Najas flexilis	Nf	Nodding naiad
Najas gracillima	Ng	Slender naiad
Najas guadalupensis	Ngp	Southern naiad
Najas minor	Nm	Brittle naiad
Utricularia vulgaris	Uv	Common bladderwort
Isoetes spp.	Iso	Quillwort
Chara vulgaris	Cv	Chara (macroalgae)
Nitella flexilis	Nit	Nitella (macroalgae)

Average total SAV cover increased from 62% on June 15, 2011 to 81% on September 13, 2011 (Table 2). Macroalgae, specifically *Chara vulgaris*, was the dominant plant during the late spring survey (average cover of 53%). *Chara* was particularly abundant in the southern, deeper end of the lake near the dam (Figures 1 and 2). Also observed in June were small amounts of *Najas flexilis, P. spirillus, P. pusillus, P. vaseyii,* and *Isoetes spp*. (species unidentified).

Table 2. Mean cover values for Total SAV, Macroalgae, *Najas spp.*, *Potamogeton spp*., and Other, which includes *Utricularia vulgaris* and *Isoetes spp*., during June, August, and September SAV surveys in New Germany Lake.

	Average Total Percent Cover				
Date	**SAV**	**Macroalgae**	***Najas***	***Potamogeton***	**Other**
6.15.11	**62**	**53**	**1**	**4**	**6**
8.10.11	**76**	**23**	**15**	**13**	**0**
9.13.11	**81**	**20**	**54**	**4**	**2**

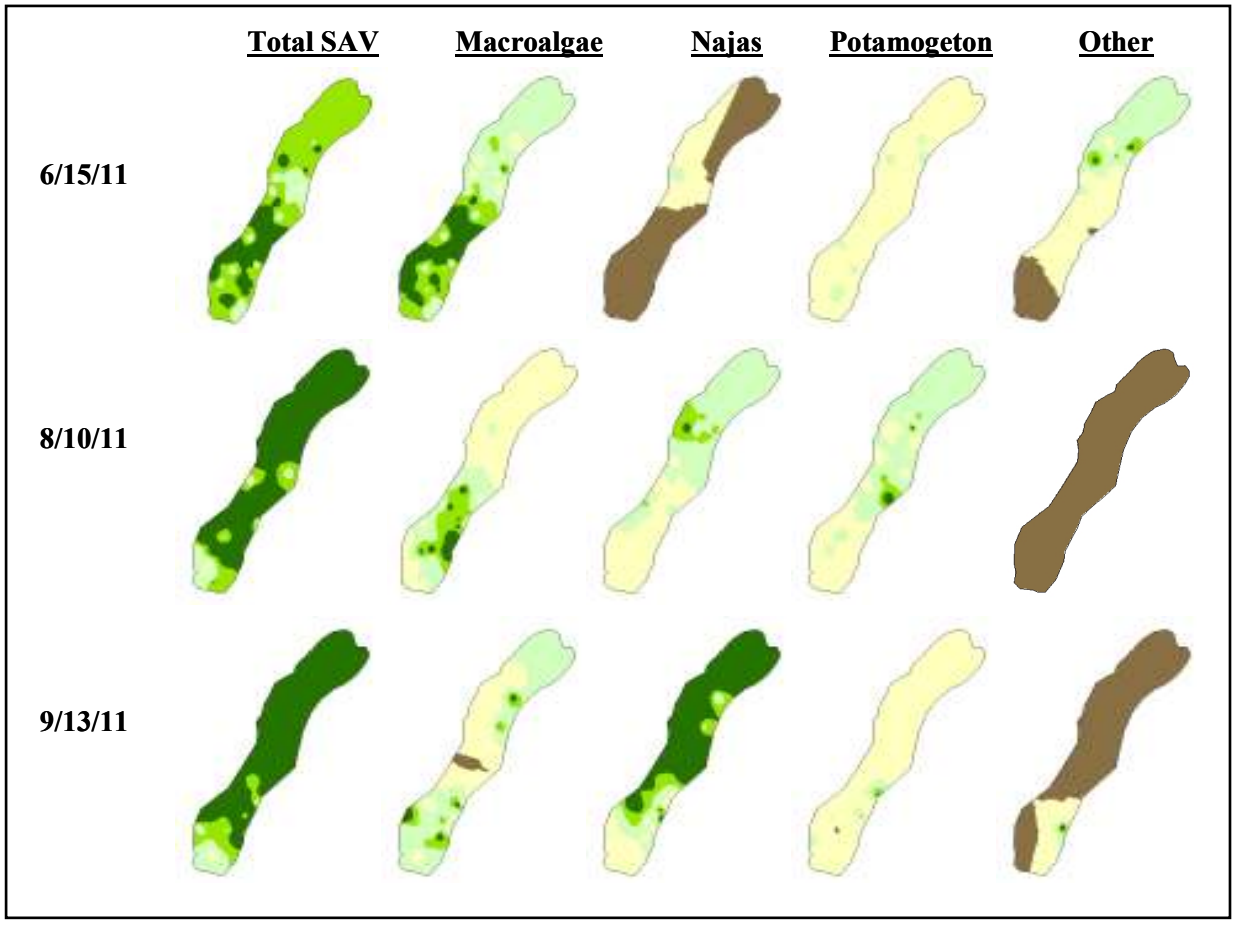

Figure 1. Interpolated percent cover maps of the macrophytes observed in New Germany Lake during summer 2011 surveys. Total SAV includes the vascular plants, such as *Najas spp*., as well as macroalgae.

By August, average total SAV cover increased to 76% but dominance shifted to a more equal distribution of macroalgae and vascular plants. Macroalgae (both *Chara* and *Nitella,* with an average cover of 23%) was more prevalent in the deeper, southern part of the lake while *Najas spp.*(15% cover) and *Potamogeton spp*. (13% cover) were more prevalent in the northern portion of the lake

During the early fall survey, which took place in September, average total SAV cover was 81%. Macroalgae cover dropped substantially to only a 20% average. *Najas spp*. increased to 54%, while *Potamogeton spp*. was on average only 4% cover, having already peaked in August. Macroalgae continued to be more prevalent in the southern portion of the lake near the dam. *Najas spp*. was very abundant in the northern portion of the lake.

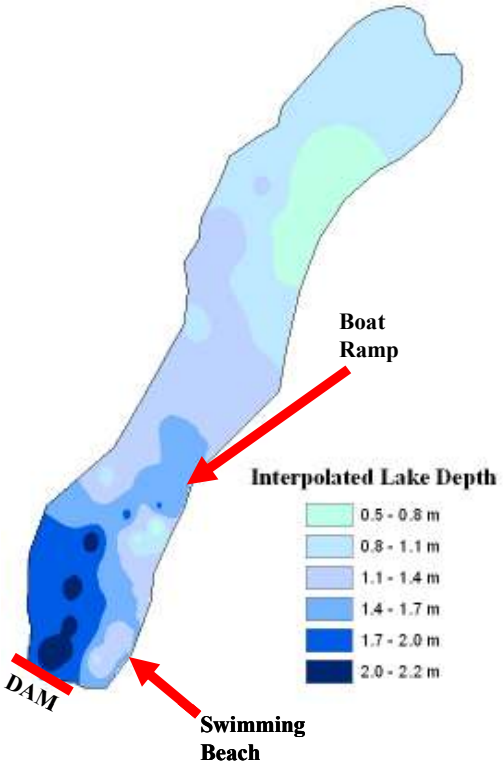

Figure 2. Interpolated water depth (meters) in New Germany Lake during summer 2011 surveys.

DISCUSSION/CONCLUSION

The goal of the SAV survey was to define the distribution and abundance of the SAV community throughout New Germany Lake. As such, the results of the survey provide a comprehensive view of the Lake's SAV community as a whole and how this community changes in space and time. The survey methodology is a globally accepted method to identify changes in a SAV community; it does not focus on any one species over another.

Our results indicate that New Germany Lake supports a healthy and somewhat diverse population of SAV, including four genera of vascular plants and two species of macroalgae. Of the four vascular plants, the Naiads (*Najas spp*.) and the Pondweeds (*Potamogeton spp*.) were the most abundant. Pondweeds are perennial flowering plants with creeping rhizomes and leafy branches. Their leaf blades may either be floating or submersed and it can be difficult to differentiate one species from another. Naiads are annual plants that grow in small freshwater streams. Naiads vary in size from inch-high tufts to highly branched plants two or three feet high. They are considered an excellent food sources for waterfowl. *Chara vulgaris* superficially resembles the vascular plants in the lake because of its stem-like and leaf-like structures. *Chara* plants are rough to the touch because of deposited calcium salts on the cell wall. *Nitella flexilis* is a robust freshwater alga that grows up to a meter long with axes up to 1mm wide.

Based on our spatial analyses, it appears that although macroalgae and the vascular plants overlap to an extent, macroalgae is dominating in the deeper areas at the southern end of the lake (towards the dam) and the *Najas* and *Potamogetons* are dominating in the shallow, northern portion of the lake. We observed much clearer water in the northern portion of the lake, which may account for the difference in distribution. The water near the dam was particularly dark. Because macroalgae does not require as much light as vascular plants for photosynthesis, we assume that macroalgae is occupying the niche where it can out-compete the other plants.

Macroalgae such as *Chara* and *Nitella* have undifferentiated cells which absorb nutrients directly from the water column. This allows for rapid growth and reproduction during periods of excess nutrients. Vascular plants, such as the *Najas* and *Potamogetons*, have a root system wherein they must get the majority of their nutrients from the sediments in which they are growing. Because of this, they do not respond as quickly to excess nutrients.

The shift from a macroalgae dominated community to a vascular plant dominated community later in the summer may be attributable to spring snowmelt carrying excess nutrients and sediment into the lake. Nutrient pollution may cause algae blooms in late spring/early summer. As the summer progressed and precipitation decreased, less run-off delivered less nutrient pollution, which slowed the growth of macroalgae and in turn allowed the vascular plants to more successfully compete with the macroalgae. The expansion of rooted vascular plants in turn may have increased water clarity, which in turn may have allowed for the further expansion of the rooted plants.

To conclude, given its size, New Germany Lake hosts a relatively diverse and healthy SAV community. SAV percent cover is high though patchy throughout the lake, with the exception of the area closest to the dam, and within the swimming area where it's manually removed. Where SAV grows uninhibited, it's contributing to a healthy ecosystem by providing food and habitat for a number of invertebrates, fish, amphibians, and other organisms. Although the ecosystem was dominated by macroalgae in the early spring, vascular plants were dominant later in the summer.