Deep Creek Lake
Submerged Aquatic Vegetation Survey

Report of Summer 2010 Survey Activity

February 4, 2011

MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

ABSTRACT

Maryland Department of Natural Resources (DNR) Resource Assessment Service (RAS) staff initiated Submerged Aquatic Vegetation (SAV) monitoring in Deep Creek Lake (DCL), Garrett County, Md, during summer 2010 as part of the lake's expanding water quality and aquatic habitat monitoring program. The project's goal was to define the distribution and relative abundance of SAV species present by sampling several areas throughout the lake. SAV survey data was complemented by aerial photography taken in late summer. Aerial photos are currently being processed. Survey results indicate that there is a highly diverse population of SAV growing throughout the lake with densities ranging from sparse to 100% cover where present. Nine genera of vascular plants and two genera of macroalgae were observed. The high density and diversity of SAV in DCL is promoting water clarity throughout the lake and providing habitat for a healthy population of fish and invertebrates.

INTRODUCTION

Submerged aquatic vegetation (SAV) provides a number of important ecological functions in aquatic and marine habitats. SAV provides habitat and nursery grounds for many species of fish and invertebrates, absorbs nutrients which decreases the likelihood of algal blooms, removes suspended solids from the water column, and is a major food source for waterfowl.

In unbalanced ecosystems, SAV may grow rapidly and cause impediments to recreation and boat traffic. Due to complaints and concerns raised by the residents of Deep Creek Lake regarding the density of SAV during the late summer season, RAS staff initiated an SAV survey. This survey is now part of the much larger water quality monitoring program currently active in DCL. Study objectives were to define the distribution and relative abundance of SAV species present by sampling several areas throughout the lake and with this information provide guidance for future management decisions.

In June 2010 RAS staff, accompanied by local SAV experts, identified six areas to survey throughout the lake. These locations include an area near the town of McHenry (-79.35787, 39.55087), Green Glade Cove (-79.26206, 39.47844), Red Run Cove (-79.3711, 39.49977), Meadow Mountain Run Cove (-79.30334, 39.51182), Deep Creek Cove (-79.30904, 39.45368), and near the Honi Honi Bar and Restaurant in Thayersville (-79.32091, 39.50485) (Figure 1). At this time, three informal transects were surveyed and sampled at McHenry, Meadow Mountain Run Cove, and Deep Creek Cove. The purpose of these transects was to establish the types of SAV present, the approximate size of the SAV beds, and the depths to which the SAV beds extend. Later in the summer, two full surveys were completed at the six locations chosen. The first survey took place August 4-5, 2010; the second took place September 15-16, 2010. Methods were the same for each sampling event.

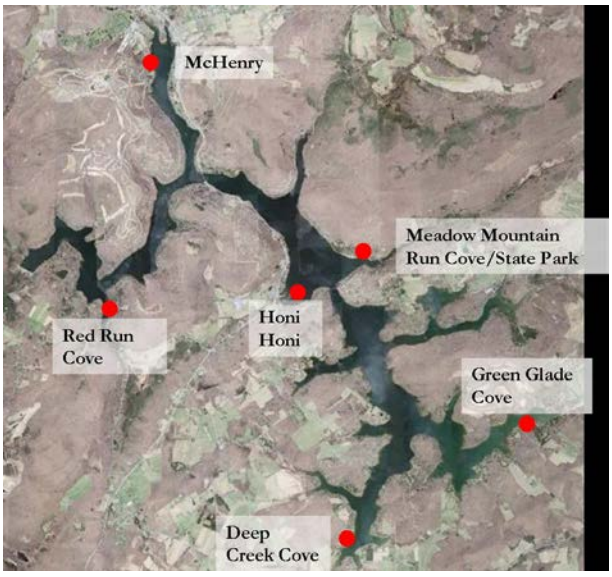

Figure 1. Deep Creek Lake with transect locations.

METHODS

At each location, the shoreward edge of the Submerged Aquatic Vegetation (SAV) bed was identified. Along the shoreward edge of the bed, a spot was randomly identified to begin a transect. Rebar was used to mark each point and secure a transect tape. A diver then swam the tape out, perpendicular to shore, to the deep edge of the SAV bed where a weighted buoy was placed to mark the point and secure the opposite end of the tape. If conditions were considered unsafe due to heavy boat traffic, transects were terminated prior to the edge of bed. If the SAV bed extended farther than 200 meters from shore, transects were terminated at 200 meters.

Divers using SCUBA sampled eleven $0.25m^2$ quadrats (Figure 2) per transect. To establish the sampling positions, the transect lengths were divided by 10 for a total of 11 quadrats per transect. For example, if a transect was 100 meters long, quadrats were sampled at 0m, 10m, 20m, 30m, 40m, 50m, 60m, 70m, 80m, 90, and 100m from the shoreward edge of bed. Within each quadrat, a total SAV percent cover was estimated, as well as a percent cover for each species observed. When feasible and if time allowed, shoot counts were completed within a smaller square in the bottom right corner of the quadrat. Canopy height for each species present was also recorded when possible, as well as water depth at each quadrat.

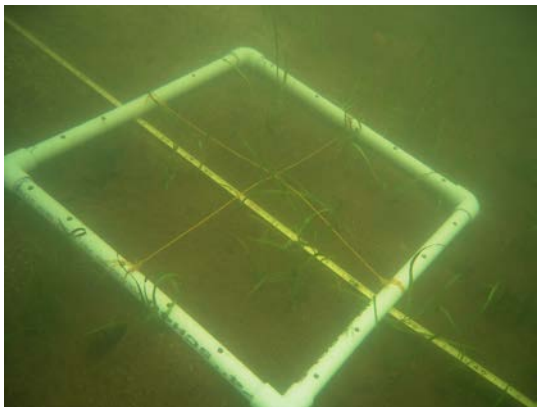

Figure 2. Quadrat ($0.25m^2$) used to survey SAV in Deep Creek Lake.

In addition to in-water SAV surveys, an aerial photogrammetric survey of the entire lake was flown on September 9, 2010. High resolution photographs taken during this survey are being processed and analyzed. The results of the analysis will be added to this report as an addendum.

RESULTS

We observed nine genera of vascular aquatic plants and two species of macroalgae in DCL. These plants include *Vallisneria americana* (Wild celery), *Sagitaria cristata* (Crested arrowhead), *Elodea canadensis* (Canadian waterweed), *Myriophyllum spp.* (Water millfoil), *Ceratophyllum demersum* (Coontail), *Najas flexilis* (Slender naiad), *Utricularia vulgaris* (Common bladderwort), *Isoetes spp*. (Quillwort), and four species of *Potamogeton*, including what we suspect is *Potamogeton robbinsii*, a species thought to be extirpated from Maryland waters. The two macroalgae observed include *Nitella flexilis* and *Chara vulgaris.* Most species that we observed were seen throughout the Lake, but most coves were dominated by just one or two species (Figure 3 and Table 1). For example, some coves were dominated by Wild celery, but several other species were present within or on the edges of the Wild celery beds. Figure 1 includes sampling locations within Deep Creek Lake and the dominant SAV types identified at each location. Table 1 includes a summary of sampling results, including transect length, maximum water depth and SAV mean percent cover.

Deep Creek Cove

Deep Creek Cove has an extensive SAV bed that stretches across the entire cove; the transect was terminated at 200m. The maximum depth measured was approximately 2.5 meters. The bed was dominated by *E. canadensis* during both August and September sampling. Total SAV cover was 100% in most quadrats. During September, it was observed that *C. demersum* had expanded in both distribution and abundance. *Sagitaria cristata* (present in shallower water), *Potamogeton vaseyi* (Vasey's pondweed), *Potamogeton pusillus* (Slender Pondweed), *U. vulgaris*, and *C. vulgaris* were also identified at low to medium densities in this cove.

Green Glade Cove

This is a very narrow cove in which the SAV bed stretches across (70m) its entire length. The 70m transect reached a maximum depth of 2.75m. *Sagitaria cristata* dominated the shallow water, while *E. canadensis* and *Nitella flexilis* dominated in the mid-depth and deeper water. *Potamogeton pusillus, P. vaseyi*, and *C. vulgaris* were observed at lower densities in this cove.

Oakland near Honi Honi

This transect ran 195m from shore to a depth of approximately 5m. The shoreward edge of the bed was dominated by *S. cristata* and *C. vulgaris*. *Myriophyllum sp*. dominated the deeper edge. *Najas flexilis, E. canadensis, Nitella flexilis,* and *P. pusillus* were present in low densities.

Meadow Mountain Run Cove at the State Park

This transect was 63m long and reached a maximum depth of approximately 3m. The SAV bed here was composed of *S. cristata* in the shallow water and *V. americana* in the deeper water with some overlap in the mid-depth range. Trace amounts of *Isoetes sp*., *Najas flexilis, P. vaseyi*, and *P. pusillus* were also observed.

Red Run Cove

The transect at Red Run Cove was 127 m long and reached a maximum depth of 3.25m. This SAV bed was dominated by *S. cristata* on the shoreward edge, and yielded to a mix of *E. canadensis* and *Nitella flexilis* as the water deepened. *Potamogeton vaseyii, P. pusillus,* and *C. vulgaris* were also abundant in patches along the transect.

McHenry

This transect was terminated at 80m in August and 90m in September due to dangerous levels of boat traffic in the immediate vicinity. The maximum depth reached was 4m. The shallow edge had apparently been cleared by the property owner, but had a healthy population of *S. cristata* growing in where *Vallisneria americana* had been removed. In the shallow end where the *V. americana* was removed, the water was incredibly turbid. At about 4 m from the edge, a thick bed of *V. americana* began (we assume this is where the owner stopped pulling it up). The *V. americana* was very dense and taller than the water surface. Beyond this bed of thick *V. americana, E. canadensis* and *P. pusillus* dominated, with some *C. vulgaris* mixed in.

TABLE 1. Summary of Deep Creek Lake SAV survey results. For each cove surveyed, Transect Length, Maximum Water Depth, Mean Total SAV % Cover, and Mean % Cover for each type of SAV observed along the transect are given. DCC = Deep Creek Cove, GGC = Green Glades Cove, HHO = Honi Honi in Oakland, MMR = Meadow Mountain Run Cove, RRC = Red Run Cove, and McH = McHenry.

Date	Transect ID	Transect length (m)	Max Water Depth (cm)	Mean Total SAV % cover	Sagittaria	Vallisneria	Elodea	Ceratophyllum	Myriophyllum	Najas	Utricularia	Isoetes	P. pusillus	P. robbinsii	P. vaseyi	P. spirillus	Chara (algae)	Nitella (algae)
8/5/10	DCC	200	250	100	<1	0	60	<1	7	0	0	0	11	0	9	0	13	0
9/16/10	DCC	200	230	75	2	0	44	17	0	0	0	<1	3	0	<1	0	7	0
8/5/10	GGC	70	300	60	20	0	27	0	0	0	0	0	2	0	<1	0	<1	11
9/15/10	GGC	70	350	60	20	0	13	0	0	0	0	0	1	0	0	0	14	13
8/5/10	HHO	195	580	48	15	0	1	0	22	<1	0	0	<1	0	0	0	16	14
9/15/10	HHO	200	300	54	6	0	2	0	31	0	0	0	0	8	0	0	8	0
8/5/10	MMR	63	300	51	30	21	0	0	0	<1	0	<1	<1	0	<1	0	0	0
9/15/10	MMR	60	390	51	34	17	0	0	0	0	0	<1	0	0	0	0	0	0
8/4/10	RRC	127	325	63	6	0	5	0	3	<1	<1	<1	10	0	9	0	12	16
9/15/10	RRC	125	370	73	9	0	10	0	<1	0	<1	0	<1	0	11	0	0	40
8/4/10	McH	80	400	38	2	10	12	0	0	0	0	0	9	0	0	0	3	1
9/15/10	McH	90	400	18	<1	10	2	0	0	0	0	0	<1	0	<1	<1	0	5

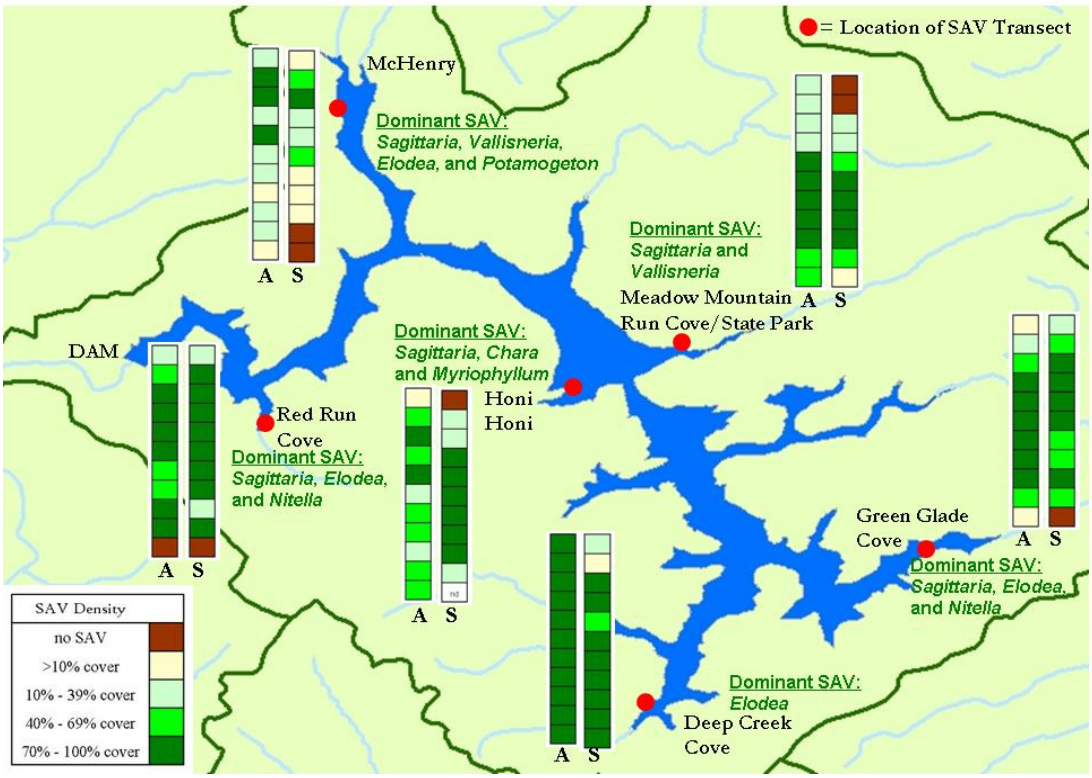

Figure 3. Graphic of transect locations and survey results. Transect graphics show total SAV percent cover for each quadrat from shore (top) to the deep edge of bed (bottom). Dominant SAV observed at each transect is also noted.

DISCUSSION

There is a thriving Submerged Aquatic Vegetation (SAV) population in Deep Creek Lake. The presence of SAV provides commonly accepted benefits to the lake that would only be apparent if these plants were absent. For example, in areas where SAV had been removed near personal piers, the water was turbid. Where SAV was present, the water was clear. At the transect in McHenry where *V. americana* was removed by the property owner, the non-native aquatic plant, *S. cristata*, was observed re-colonizing the area. *Sagittaria cristata* may have been inadvertently introduced to Deep Creek Lake by boaters visiting from the Great Lakes region. When native vegetation such as *V. americana* is removed, non-native plants have an opportunity to colonize and become established - sometimes outcompeting native plants that provide better benefits. *S. cristata* is now one of the dominant SAV species throughout the Lake (Figure 1). While most vegetation types are generally considered favorable, particularly from a fish habitat perspective, some types are more beneficial than others. In the case of the McHenry transect, *S. cristata* was not as effective as *V. americana* at preventing the resuspension of sediments, particularly in shallow water where there is more disturbance from swimmers and boaters.

Aside from some shallow water areas, the water in Deep Creek Lake is clear and allows light to penetrate to impressive depths. SAV and macroalgae were observed growing as deep as 5-6 m on some transects and fish were observed in all of the SAV beds surveyed, using the SAV shoots and blades as habitat and refuge. In general, the more diverse a habitat, the more species of both fish and invertebrate will be supported. With such a diverse collection of plants in Deep Creek Lake, one can conclude that overall biodiversity in the Lake is relatively high.

With the exception of some of the smaller coves and very shallow areas, Deep Creek Lake supports a highly diverse SAV population, which in turn supports a healthy ecosystem in general. In some of the smaller coves and shallow areas, where lake waters are relatively stagnant and nutrient levels are likely higher, SAV grows to the surface more efficiently than in other deeper areas and becomes a temporary nuisance to property owners and visitors in late summer. As fall approaches and the water begins to cool down, the plants naturally senesce and no longer pose a navigational or recreational nuisance.

Like most any ecosystem, Deep Creek Lake has a fluctuating environment. Because of its role as a hydroelectric utility, the water level in the lake changes often, which affects the SAV growing near shore. There are also periods of heavy precipitation, drought conditions, and record high and low temperatures. Because of its fluctuating environment, it is necessary to conduct surveys repeatedly in order to understand what is normal and what is anomalous. SAV surveys will be conducted again in summer 2011 for inter-annual comparison with 2010.