Lake Water Quality Monitoring

Lake wide water quality monitoring was conducted monthly at nearly 50 sites from April-October 2017. A meter was used to assess the water quality parameters including temperature, conductivity, pH, dissolved oxygen, depth, chlorophyll and turbidity. Secchi depth (a measure of light attenuation) was also measured.

DNR technician calibrating continuous water quality meter for deployment in lake

Additionally, continuous monitoring meters (pictured right) were deployed in as many as 10 coves around the lake to gain a better understanding as to how these shallow water systems function. These meters record various water quality data autonomously every 15 minutes. Meters were deployed during the spring and fall particularly in the coves that have larger tributaries. In these areas, meters were often deployed in pairs, with one meter in the cove and the other meter near the mouth of the tributary to better understand the impacts of the tributary on water quality in the cove. During the summer months, the meters were rotated in many of the shallow water coves that were simultaneously included in the lake wide monitoring in an effort to better understand how water quality varies over time. When resources allowed, meters were deployed in pairs, with one meter located in the cove and the other near the shoreline in an effort to better understand the effects of changing water levels, boat wakes and shoreline erosion and relate that to water quality in the main portion of the cove. Water quality data from the 2017 sampling season is currently undergoing review but natural resource managers are learning a great deal about the spatial and temporal variability in the lake and better understanding how the tributaries of the lake and the nearshore environment relate to the deeper mid-water stations.

Hydrilla **Treatment and Monitoring**

2017 Marks the fourth consecutive year of *Hydrilla* treatment using the herbicide Flouridone (trade name SONAR). 13 Zones around the lake were treated 4 separate times throughout the summer months (June-September) with the herbicide. These sites continued to show a positive response to the herbicide with *Hydrilla* growth being greatly suppressed and altogether limited by August 2017 in the treated areas. Unfortunately, several small beds of *Hydrilla* were discovered in Arrowhead cove on August 4, 2017. The newly discovered beds were treated on August 9 and again on September 21th, 2017 with a liquid herbicide and will be included in the planned 2018 *Hydrilla* treatment. This will bring the total number of treated areas up to 14 for

Proposed 2018 Hydrilla Treatment Locations

New Hydrilla beds found in Arrowhead Cove August 2017
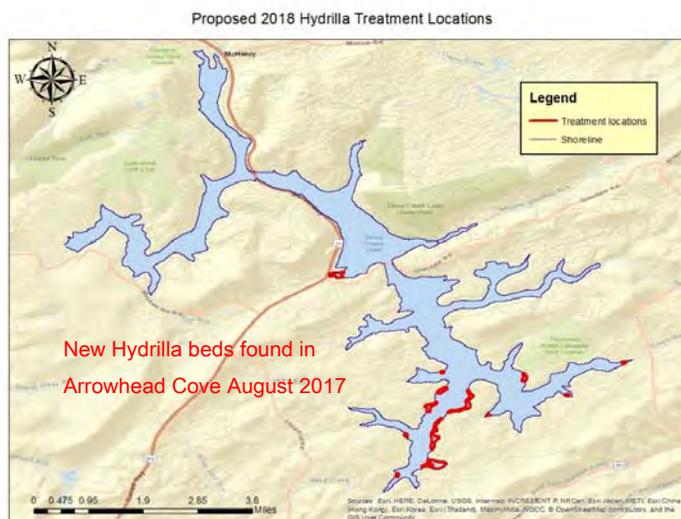
2018 (see adjacent map). The new find of *Hydrilla* in Arrowhead Cove in 2017 highlights the need for continued education to prevent further introduction of aquatic invasive species (AIS) as well as routine surveys throughout the lake with the purpose of early detection of AIS. *Hydrilla* is one of many aquatic invasive species that threatens the ecology of the lake and highlights the need for boat owners to exercise good stewardship practices and properly clean and disinfect their boats, trailers, and any gear before launching and after leaving any water body.

Map showing the locations where *hydrilla* has been found in Deep Creek Lake; New location of *hydrilla* was found in 2017 in Arrowhead Cove and has been added to the proposed locations for the 2018 *Hydrilla* herbicide treatment

Submerged Aquatic Vegetation (SAV) Monitoring

In 2017, the Department completed the eighth year of SAV related monitoring. This monitoring includes two primary efforts: the annual SAV underwater transect survey (done at a total of 8 sites around the lake), and the annual SAV shoreline survey whereby the entire 68 mile shoreline of the lake is surveyed. Both efforts are aimed at providing baseline SAV data capable of detecting changes in the plant community over time.

The 2017 underwater transect survey was expanded from 8 locations to include 4 additional locations found within the coves where water quality monitoring is actively taking place. The reason for this addition was to better relate water quality data to SAV data. The 4 locations where transects were added include Cherry Creek Cove, Blakeslee Cove, Poland Run Cove and Paradise Cove (see map). SAV beds are critical habitat for lake biota such as fish and invertebrates and help provide needed oxygen to the water column, absorb excess nutrients and filter out suspended sediments. Species composition, density and depth of water in which plants inhabit are valuable biological indicators of overall lake health and water quality. Changes over time in species composition, density or depth can signal changes in water quality and help scientists target areas of the lake where additional monitoring would be beneficial. The 4 locations added to the underwater SAV survey provide better coverage lake-wide in addition to helping relate SAV to water quality.
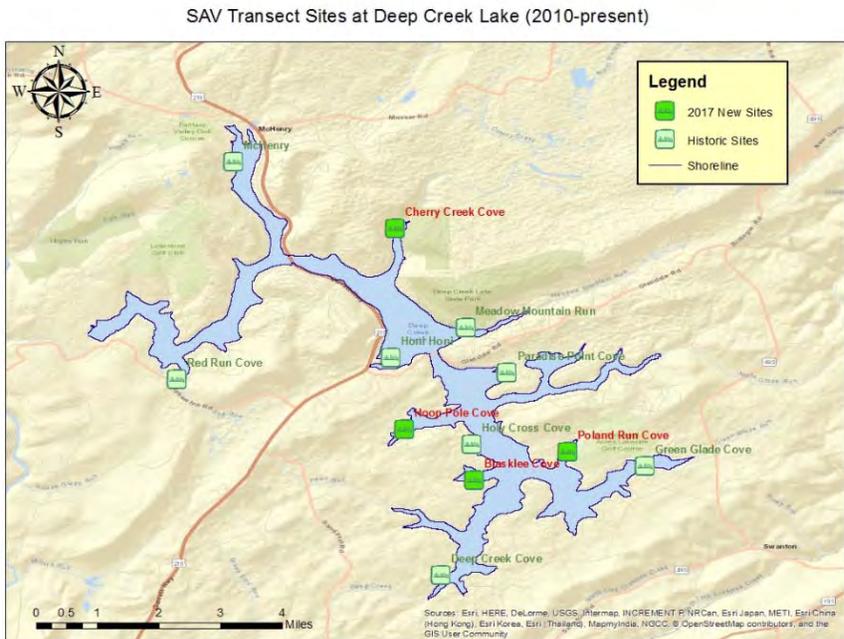
Map showing locations of 8 'historic' transect sites along with the 4 new transect sites added to the monitoring effort in 2017

While the 2017 SAV report won't be available until spring 2018, scientists observed continued increases in native plants *Vallisneria americana* (wild celery) and *Potamogeton amplifolious* (Broad-leafed pondweed) which are both great habitat for both juvenile and larger fish as well. The native plant, *Elodea* (common waterweed), which was once more common throughout the lake historically but had diminished in abundance and density in recent years, was still evident throughout the lake but perhaps not as abundant as was observed in 2016. The presence of these three species allow for diverse, native SAV habitat that provides ground cover species to hold sediments in place as well as diverse canopy forming species that provides ample fish habitat.

Pictured below: *Elodea* (common waterweed)
Pictured middle: *Vallisneria americana* (wild celery)
Pictured far right: *Potamogeton amplifolious*
(broadleafed pondweed)

Aquatic Invasive Species Education and Monitoring

Aquatic invasive species (AIS) educational efforts and monitoring continued in Deep Creek Lake in 2017. One of the most important aspects of this effort is the Boat Launch Stewards that offer voluntary boat inspections at

the Deep Creek Lake State Park Boat Ramp. This was the 4th year of the effort, and 3rd year whereby the Deep Creek Lake Natural Resource Management Area (DCL NRMA) in cooperation with Garrett College, provided inspections from Memorial Day through Labor Day. In addition to inspecting boats and educating boaters about the need for proper cleaning of their boats and gear, data from this effort is used to

direct other AIS efforts. For example, boat steward data was used to identify the most heavily traveled roads whereby AIS educational road signs were posted. The AIS road sign effort was completed in the spring 2017, in cooperation with the Property Owners Association of Deep Creek Lake

(POA). AIS Road signs, educating the public of the importance of properly cleaning, draining and drying their boat prior to launching on DCL, were placed at over 8 roadside locations around the lake. Not only did the POA pay for and install the AIS road signs but they wanted to further help the Department with AIS education and paid for the materials and signage to build AIS disposal stations which were donated to participating local marinas that

are capable of launching public boats.

Pictured above left: Boat launch steward conducting voluntary boat inspection at Deep Creek Lake State Park ramp
Pictured above right: POA installing AIS signage along roadways leading to Deep Creek Lake; photo courtesy of Property Owners Association of Deep Creek Lake

One of the highlights of the Boat Launch Steward Program is for the past two years, they have intercepted an-

other high alert aquatic invasive species of concern, zebra mussels (*Dreissena polymorpha*), before the boat launched onto Deep Creek Lake (see http://news.maryland.gov/dnr/2017/07/17/zebra-mussels-found-on-boat-destined-for-deep-creek-lake/). On July 9, 2017 Boat Launch Stewards found viable zebra mussels attached to mifoil leaves (an AIS plant) on an incoming boat attempting to launch at the Deep Creek Lake State Park boat ramp. The plants and attached zebra mussels were removed from the boat and the boat did not launch at that time onto Deep Creek Lake. Zebra mussels are among the many species of AIS that threaten the ecology of Deep Creek Lake and fur-

ther highlight the need for responsible boating practices such as properly cleaning and decontaminating boats and gear. The Department is planning to begin a comprehensive zebra mussel monitoring program in the spring of 2018. More details as to the specifics of the program will be available in early 2018.

In addition to controlling for *Hydrilla* already found in the lake and preventing further introductions of both *Hydrilla* and zebra mussels, additional AIS monitoring is done for other species of concern as well. In 2015, DNR staff found Curly Pondweed (*Potamogeton crispus*) growing in a small section of the Pawn Run area of the lake. A manual hand removal effort was done at that time to try and limit the spread and test the efficacy of this type of approach with such a small population of plants. Since then, staff has been monitoring that population and searching the lake in an effort to determine if the population is spreading throughout the lake. Two other locations, Arrowhead Cove, and a location in Hickory Ridge Cove, were found in 2017 to have a few small plants of Curly Pondweed. This species and the few populations found in DCL will continue to be monitored closely.

Pictured above: Zebra mussel on attached milfoil plant found on boat attempting to launch onto DCL
Pictured right: Curly Pondweed (*Potamogeton crispus*) is one of the AIS plants found in Deep Creek Lake

Other Efforts

Tributary Monitoring:

The Deep Creek Lake Natural Resource Management Area (DCL NRMA) has been working with US Geological Survey (USGS) to monitor the flow of incoming water into DCL. As of 2017, DNR and USGS together monitor water flow and water quality of 3 tributaries (Cherry Creek, North Glade Run and Arrowhead Run) of Deep Creek Lake. The goal of this is to determine the quantity of water entering DCL as well as assess the quality of water coming in based on the amount of sediments and nutrients entering the lake from these streams. This data can help managers understand how the watershed affects the quality of receiving waters and possibly identify sub-watersheds in need of additional study. The USGS gage data is available real-time at :

Cherry Creek https://waterdata.usgs.gov/usa/nwis/uv?03075905
North Glade https://waterdata.usgs.gov/nwis/uv?site_no=03075825
Arrowhead https://waterdata.usgs.gov/nwis/uv?site_no=03075850

Pictured above: USGS Stream gage located at North Glade Run. The gage was installed in August 2016
Pictured below: Example of discharge data available online from USGS

2017 Goose Hunt: On Monday November 20-Wednesday November 22, 2017 three locations on Deep Creek Lake and four locations on Broadford Lake were open for a permitted goose hunt. Results of the hunt should be available at the upcoming Policy Review Board Meeting on January 8, 2017.
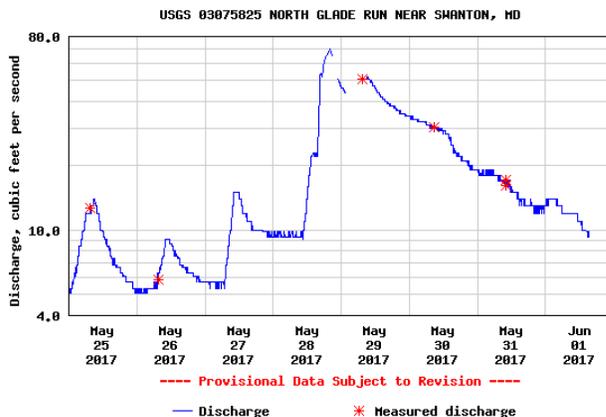
Upcoming DCL Public Meetings:

Policy Review Board (PRB) Meetings - January 8th 2017. All PRB meetings are open to the public.

Contact Information: For more information concerning the Department of Natural Resources related monitoring activities contact Julie Bortz, the Maryland Department of Natural Resources. Julie serves as the DNR representative to the Deep Creek Lake Watershed Management Plan Administrative Council. Julie can be reached at 301-387-3552 or via email at Julie.bortz@maryland.gov.

***You may find additional information about the monitoring programs mentioned here, along with background information and study findings on the soon to be updated webpage at http://dnr.maryland.gov/ccs/Pages/DCL-Watershed-Management-Plan.aspx ***