Submerged Aquatic Vegetation (SAV)
Nuisance Control Options Agenda

12/10/24

6:00 Introductions and Intent of Workshop (Richard Ortt- DNR)

6:10 Status of Deep Creek Lake Water Quality (Stephanie Hall- DNR)

6:20 Status of SAV in Deep Creek Lake (Mike Naylor- DNR)

6:30 Define Problem Statement (Richard Ortt- DNR)

6:45 Nuisance SAV Management Options (Mike Naylor- DNR)

7:05 John McCoy- Columbia Association (retired) Harvesting Unwanted Aquatic Vegetation for Aesthetic Maintenance, Habitat Retention and Phosphorus Removal.

7:30 John Phelps- SOLitude Lake Management: Mechanical Harvesting and other SAV SOLutions.

8:00 Closing - Options to follow-up on (Rich Ortt- DNR)

SAV Nuisance Control Options Workshop Intent

Update stakeholders on:

- Deep Creek Lake water quality conditions
- SAV Benefits
- Nuisance SAV control options

Deep Creek Lake

Deep Creek Lake Water Quality and Nuisance Submerged Aquatic Vegetation (SAV) Management Options

December 10, 2024

MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

Deep Creek Lake Water Quality

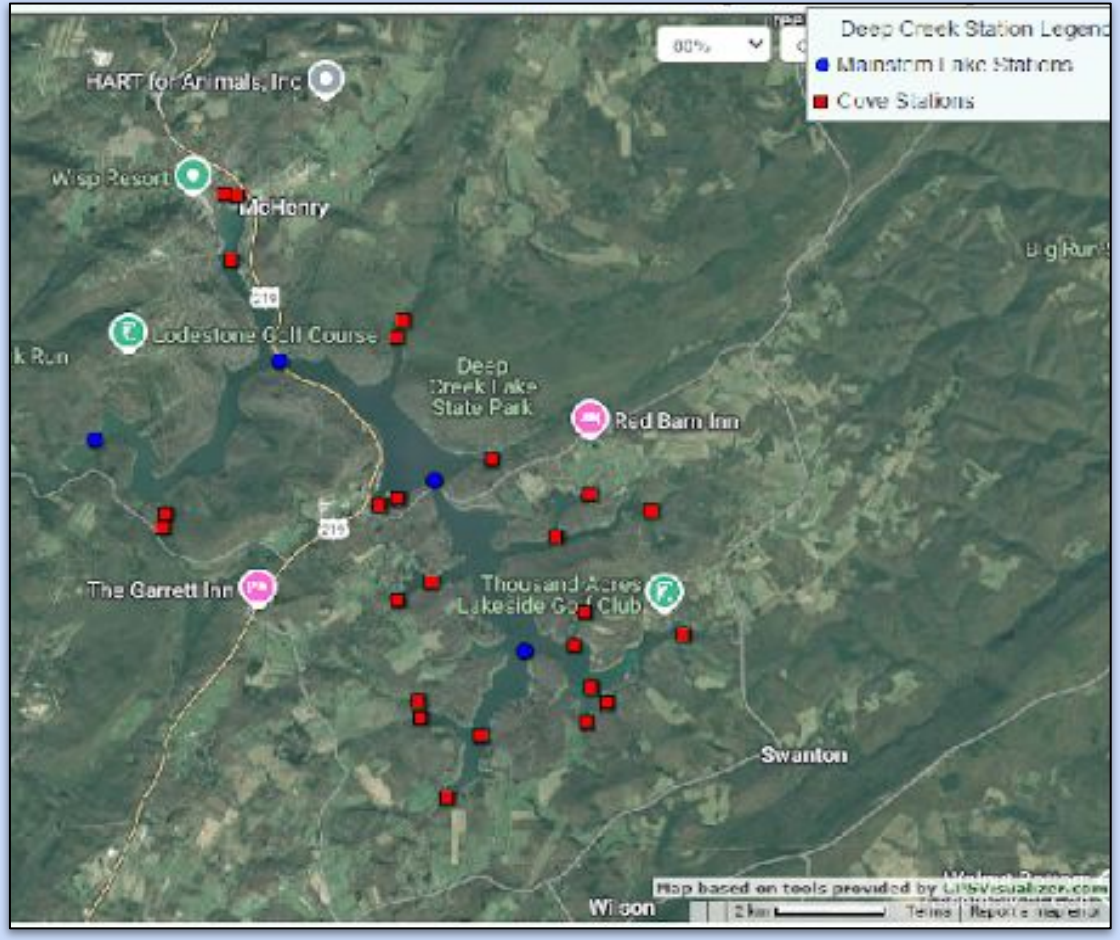
Why is it important?

- Clean water for swimming, fishing, boating, paddling, enjoying
- Healthy water for abundant and diverse fish, SAV (submerged aquatic vegetation), waterfowl
- Increased property value
- Tourism
- Energy production

How do we protect it?

- Reduce urban and agricultural runoff rich with sediment, nutrients, and pollution
- Use Pumpout stations
- Preserve forested areas
- Upgrade wastewater treatment plants
- Monitor water quality to be aware of concerns

Deep Creek Lake Monitoring Stations - 2024



- 4 Main Lake stations
- 34 Cove stations (25 currently)

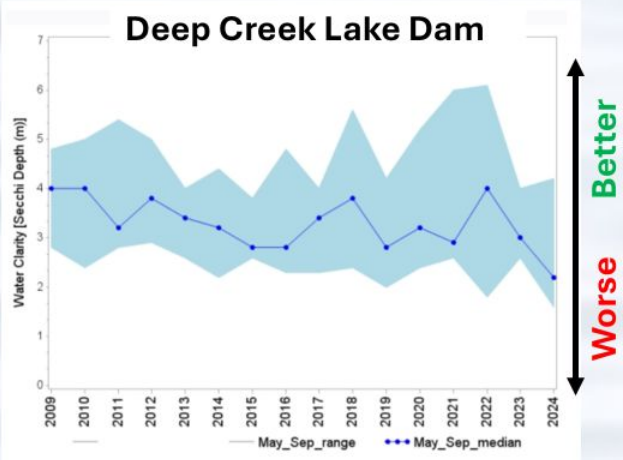
Deep Creek Lake Water Quality Monitoring

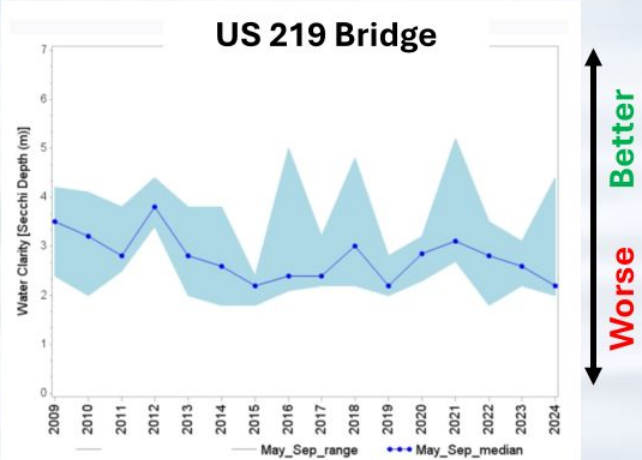
Monitoring monthly April-October/November since 2009 by MD DNR

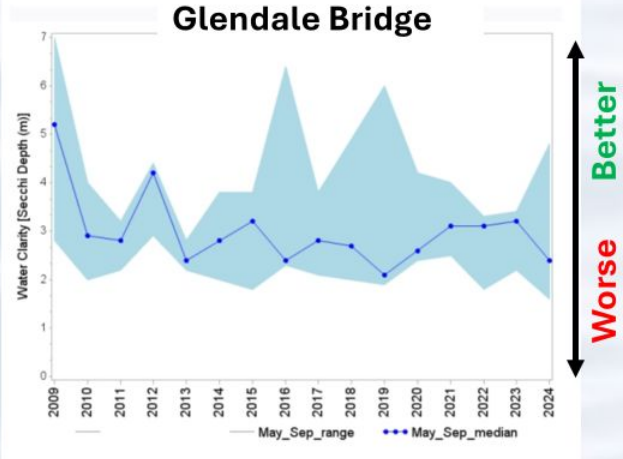
- Water Temperature
- Dissolved Oxygen
- pH
- Conductivity
- Turbidity
- Chlorophyll
- Secchi Depth
- Chlorophyll
- Total Suspended Solids (TSS)
- Phosphorus
- Nitrogen

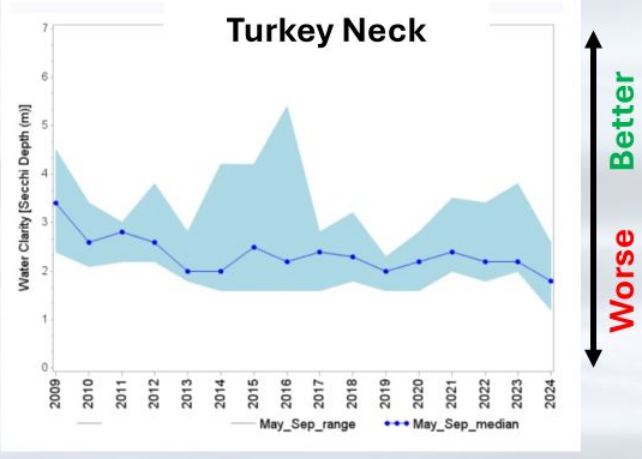
Monitoring sondes were provided courtesy of the Deep Creek Watershed Foundation

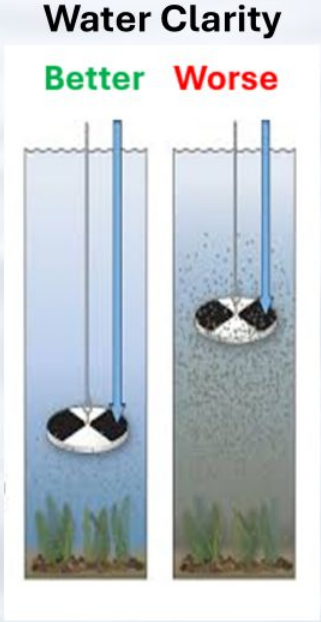
Deep Creek Lake Water Clarity 2009-2024







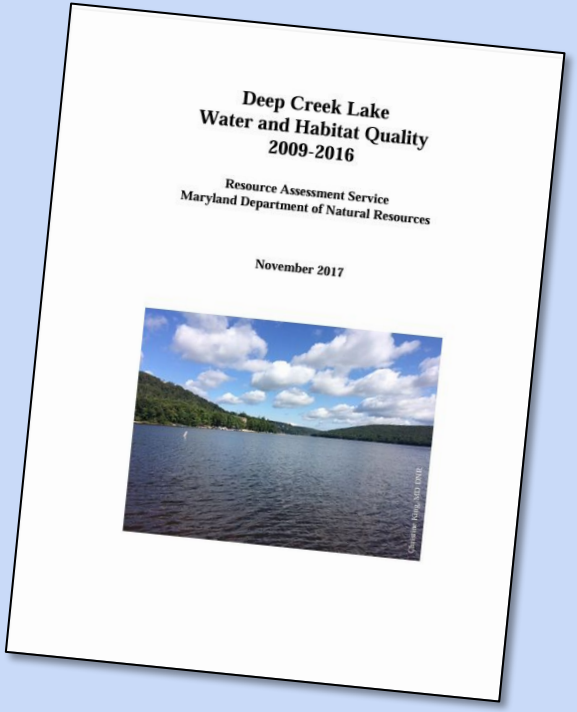




Deep Creek Lake Water and Habitat Quality Analysis 2009-2016

Assessment of lake conditions

- Land-use
- Precipitation
- Water Temperature
- Dissolved Oxygen
- pH
- Conductivity
- Trophic State
- Chlorophyll
- Phosphorus and Nitrogen
- Water Clarity



Deep Creek Lake Water and Habitat Quality Analysis Summary

Land Use (2010)

- Forest was largest land use category (56%)
- Suburban/urban (20%)

Water Temperature

- Seasonal (May-September) average slightly higher in cove stations than mainstem stations
- Seasonal (May-September) average surface waters fairly consistent year to year
  - Slightly higher in 2012

Dissolved Oxygen

- Remained above 5mg/L (adequate to support living resources) in surface waters throughout each year across all stations
- Seasonal (May-September) average surface waters fairly consistent across all years and stations
- Higher in surface waters in coves than mainstem stations
  - Possibly due to photosynthesis by SAV and algae and increased thermal mixing
- Low levels (< 1mg/L) in 2013 in bottom waters at Glendale Bridge and Turkey Neck mainstem stations

Deep Creek Lake Water and Habitat Quality Analysis Summary (Continued)

Chlorophyll

- Seasonal (May-September) average highest at all stations in 2013
- Generally increased moving upstream from the Dam to Turkey Neck
- Generally higher in coves than mainstem (except for Meadow Mountain Cove)

Phosphorus (P)

- Seasonal (May-September) average P generally increased moving upstream from the Dam to Turkey Neck
  - Highest in North Glade Cove
  - Lower in 2012 across stations (lower seasonal total precipitation)

Nitrogen (N)

- Seasonal (May-September) average N usually higher in coves than mainstem stations
- Highest in April and generally decreases throughout summer as consumed

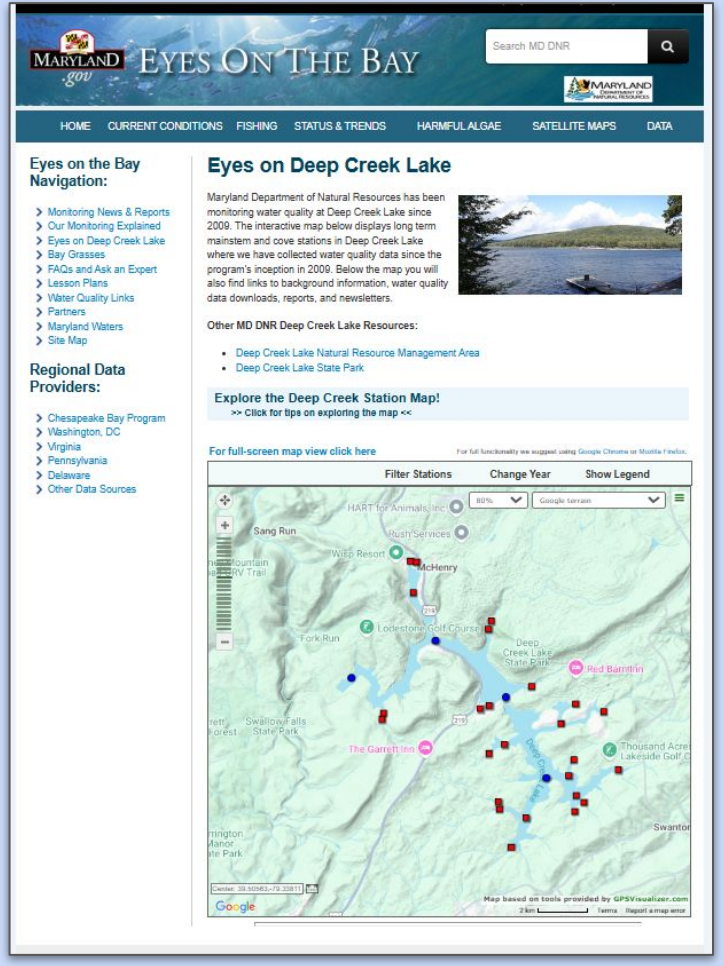
Water Clarity (Secchi Depth and Turbidity)

- Lower in cove stations than mainstem stations
- Secchi depths continually declined throughout summer
- Seasonal (May-September) average clarity (Secchi depth and turbidity) generally decreased moving upstream from Dam to Turkey Neck
- Clarity (Secchi depth) worst in North Glade Cove and Green Glade Cove
- Best clarity (Secchi depth) in 2012 across stations (lower seasonal total precipitation)

Deep Creek Lake Water Quality

Eyes on Deep Creek Lake Website

- Current water quality conditions
- Deep Creek Lake reports
- Data Download
- Deep Creek Lake Links



Deep Creek Lake Water Quality Takeaways

- Everyone relies on clean, healthy water
- Good water quality overall in Deep Creek Lake
- Deeper mainstem stations generally have best quality, along with Meadow Mountain Cove.
- Water clarity improves moving downstream towards Dam
- For more information about lake conditions visit ***Eyes on Deep Creek Lake***

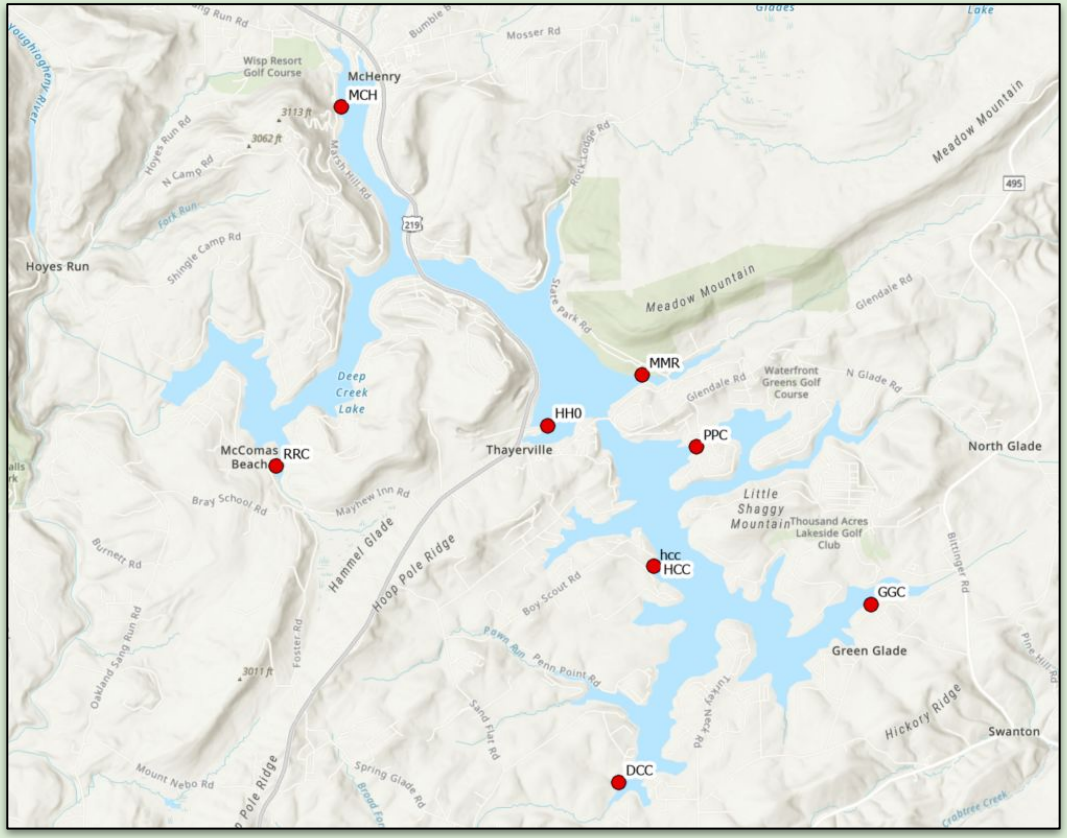
SAV Monitoring and Nuisance SAV Management Options

Wild celery plants restored to Arrowhead Cove 2024

Long-term SAV Monitoring Survey Sites

Deep Creek Lake Annual SAV Surveys 2010-2020

- Six transects sampled in 2010
- Eight transects sampled in 2015
- One, 1 meter-wide transect most years
- Two, 1 meter-wide transects per station 2015-2017

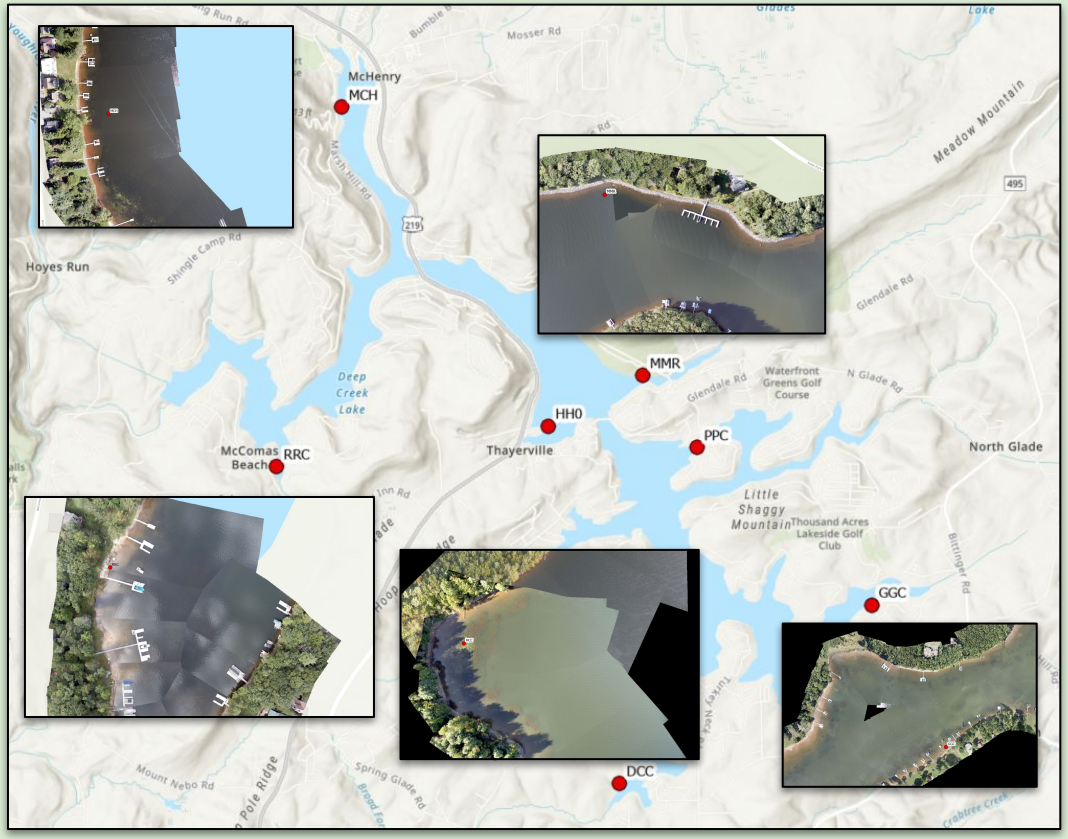


Drone SAV/Shoreline Survey

Deep Creek Lake SAV Drone Survey 2023

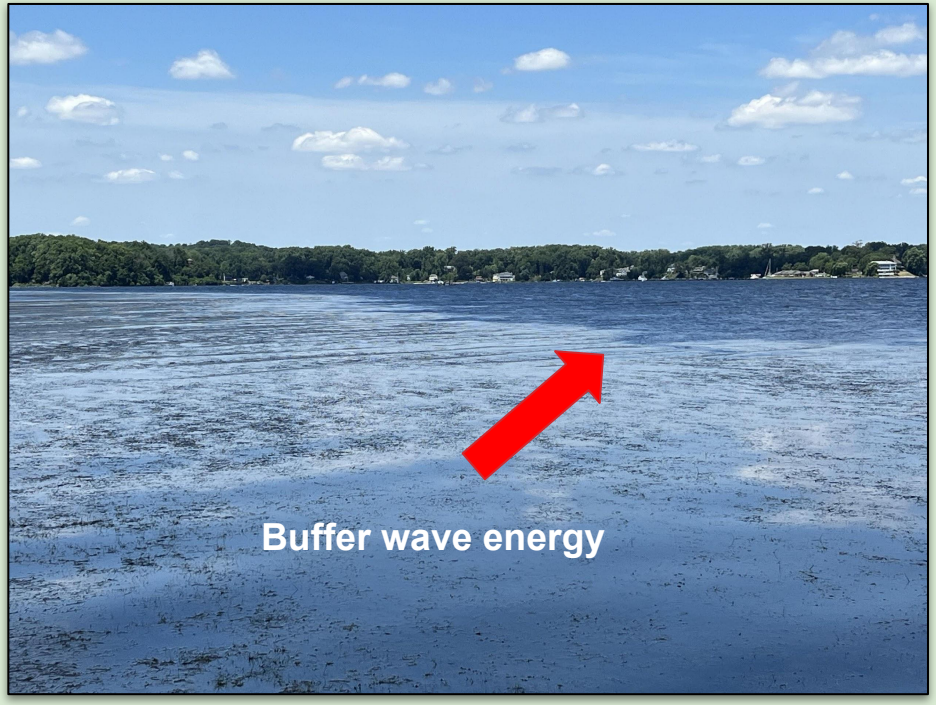
Covered majority of Deep Creek Lake Shoreline

- SAV often extends deeper than visible in photos
- Does not distinguish between SAV species
- Map shows SAV at long-term SAV survey sites



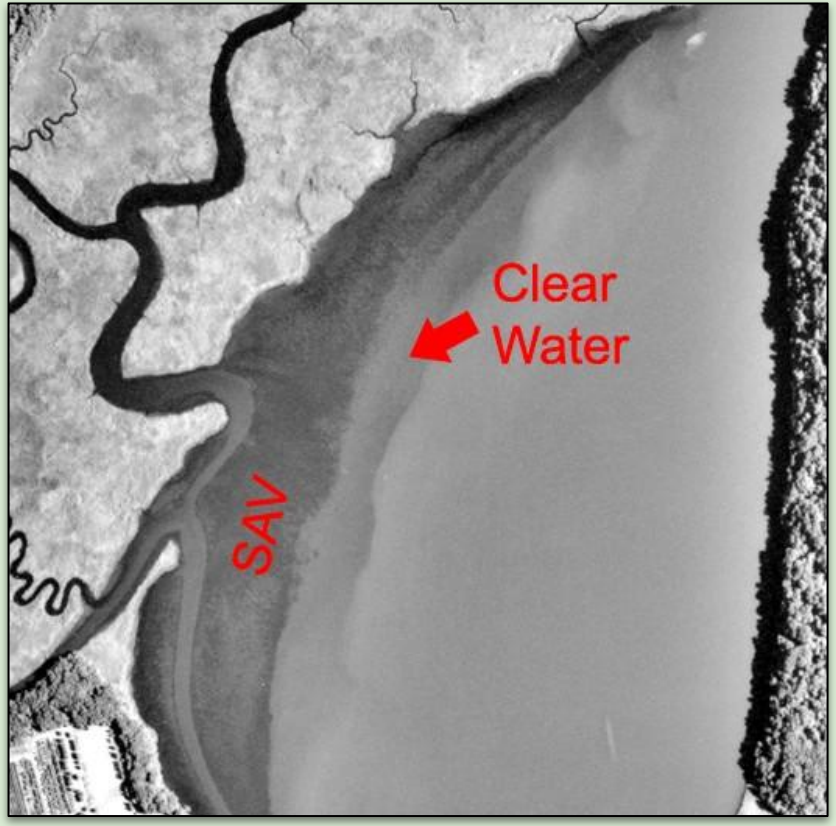
Benefits of Submerged Aquatic Vegetation

- Physical
  - Stabilize sediment
  - Buffer wave energy
- Chemical
- Biological



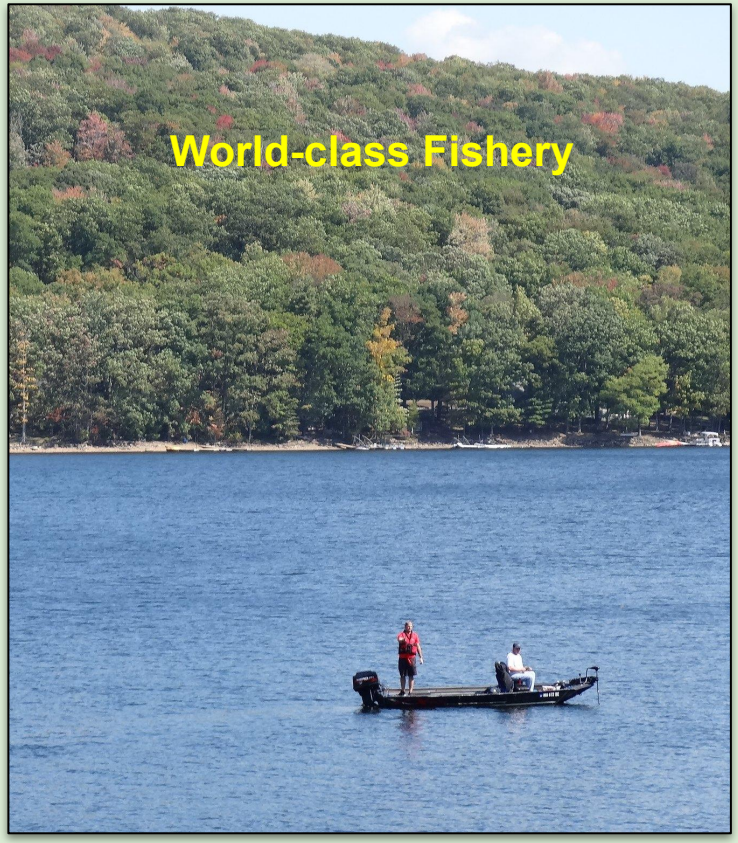
Benefits of Submerged Aquatic Vegetation

- Physical
- Chemical
  - Fix carbon
  - Produce oxygen
  - Absorb and sequester nutrients
- Biological



Benefits of Submerged Aquatic Vegetation

- Physical
- Chemical
- Biological
  - Critical habitat for many fish species, crabs, waterfowl and invertebrates
  - Seeds and vegetative matter are a food source for many species of birds, mammals and fish

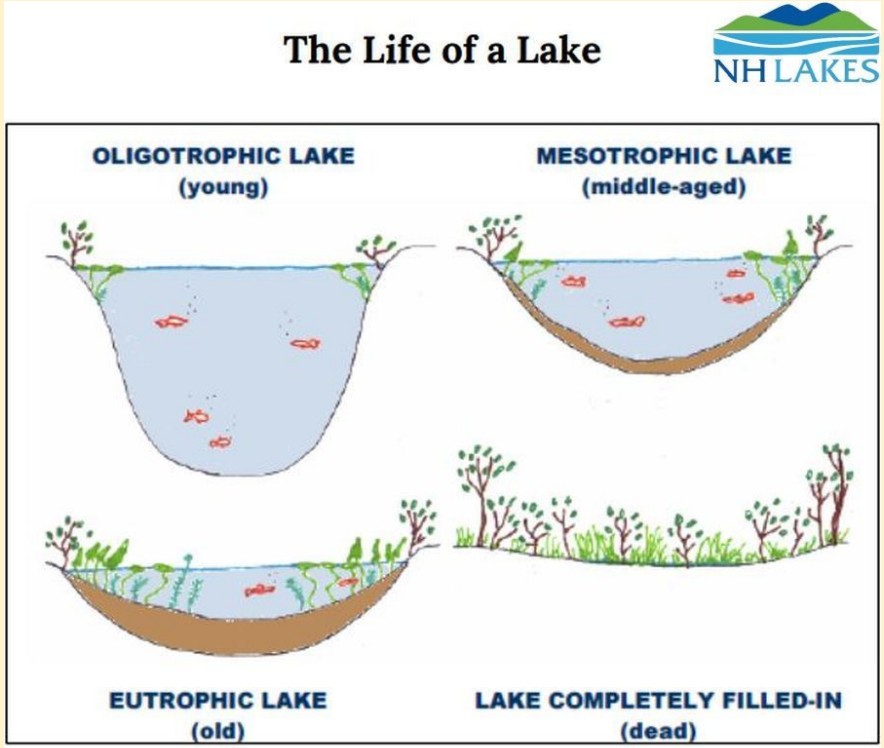


Nuisance SAV Management Options

Defining the Problem Statement

Deep Creek Lake - Why are we here?

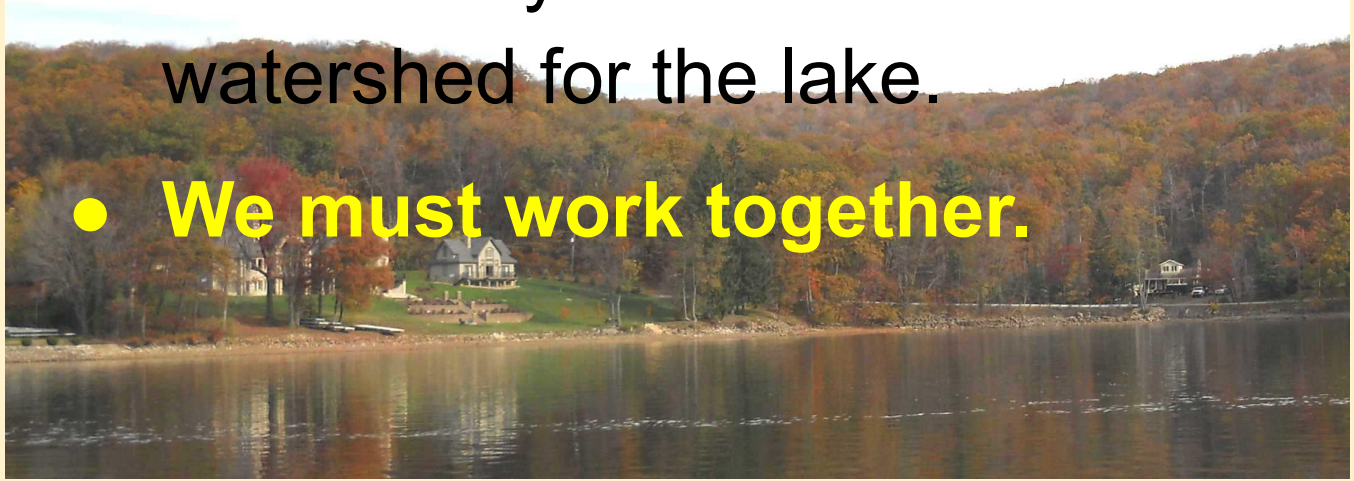
- Everything ages
- As the Lake ages, vegetation will increase.
- Currently, DCL is *generally* in the Mesotrophic Lake state.



As lakes fill with sediment, they age and move through three different trophic states before "dying."

Deep Creek Lake DNR

- DNR owns the lake and the buffer strip around the lake.
- The County and Citizens own a majority of the watershed for the lake.
- **We must work together.**



Deep Creek Lake Watershed Plan

Through partnerships with private landowners and government agencies, the Deep Creek watershed will improve its environmental stability and economic viability while retaining its rural landscapes and natural beauty so that, for generations to come, local citizens and visitors have a special place to live, work, and play.

Deep Creek Lake Watershed Plan

Goal 2: Nurture an informed and engaged citizenry regarding the Deep Creek watershed.

Goal 3: Collect the information needed to make informed management decisions that achieve the desired condition of the Deep Creek Lake and watershed.

Goal 5: Manage SAV in Deep Creek Lake to maintain and improve the ecological stability of the lake, while working with waterfront landowners to minimize the interference of SAV with recreational uses of the lake around docks.

Goal 7: Promote policies that balance environmental sustainability and economic viability.

Goal 10: Preserve and enhance the quality of recreational opportunities, while ensuring that those opportunities are in harmony with environmental stewardship.

https://dnr.maryland.gov/ccs/Pages/DCL-Watershed-Management-Plan.aspx

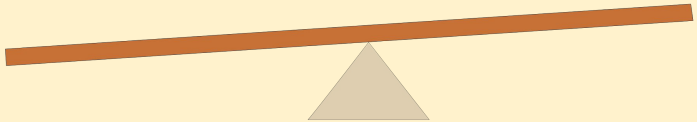
DNR Charge (COMAR, Nat Res)

The primary purposes for the promulgation of regulations for Deep Creek Lake are the **protection of the lake as a natural resource, the preservation of its ecological balance, and furtherance of its highest use as a recreational resource**, recognizing that abuse of the lake by its overuse could jeopardize its well-being. A further purpose underlying the codification of these regulations is a realization that there is a relationship between the quality of the recreational experience on Deep Creek Lake and the level of recreational use. It is recognized that at some point recreational use of the lake could be said to have reached a saturation level, and intensification of lake usage beyond that point would begin an increasing deterioration of the quality of the recreational experience and perhaps of the overall health and well-being of the lake as a natural resource. **Therefore, it is recognized that the highest and best plan for Deep Creek Lake as a recreational resource shall take into consideration a balance between the greatest possible level of recreational use of the lake and the quality of the recreational experience.**

http://mdrules.elaws.us/comar/08.08.01.01

BALANCE

- Protection of the natural resource
- Preservation of ecological balance
- Highest use as a recreational resource



Balance in Detail

Ecological Balance

-Water Quality
-Benthic
-Fisheries
-Wildlife
-Sediment
-SAV
-Native / Invasive Species

Protection

Recreation

-Fishing
-Boating
-Kayaking
-Hiking
-Swimming
-BirdWatching
-Hunting
-White Water Rafting
-River Fishing

OUR CHALLENGE

- SAV is currently hindering boating and swimming access at locations in the Lake.
- DNR is challenged to maintain boating and swimming access while ensuring ecologic balance AND balance with all other recreational uses.
- We must consider unintended consequences of any actions performed.

Deep Creek Lake
Nuisance SAV Management Options

Nuisance SAV Management Options

- Do nothing
- Physical control
- Chemical control
- Biological control

Nuisance SAV - Physical Control

Lake Drawdown - An inexpensive method of large scale control of some species in which lake water level is decreased in order to expose and kill the nuisance plant reproductive structures. The lowering of the water impacts plant growth and/or destroys seeds by exposure to drying or freezing conditions. It's recommended to do every three years to discourage the establishment of resistant plant species.

- **Pros**
  - Once established, no other actions necessary.
  - Species Specific - Must know which species are present and if this method is appropriate for those species = viable option if species present are susceptible. Must do surveys prior to drawdown to identify species present at location. Drawdown decreases milfoil, nuphar, utricularia, and coontail.
  - Best for species that reproduce by fragmentation or rhizomes.
  - Simple, inexpensive.
  - With the proper lake slope, can still provide water for other plants and wildlife and only impact near shore areas
  - Simultaneously allows for other lake management activities such as shoreline clean-up, dock or retaining wall repair, and erosion control structure maintenance

Nuisance SAV - Physical Control

Lake Drawdown - An inexpensive method of large scale control of some species in which lake water level is decreased in order to expose and kill the nuisance plant reproductive structures. The lowering of the water impacts plant growth and/or destroys seeds by exposure to drying or freezing conditions. It's recommended to do every three years to discourage the establishment of resistant plant species.

- **Cons**
  - Impact spawning and nursery areas for fish - potential for fishkills with oxygen depletion in the winter.
  - Difficulty working with companies that control water levels.
  - May cause mercury (Hg) to become bioavailable. Nutrient release may increase algal blooms.
  - May select for invasive species, or for resistant species may stimulate growth. Drawdown increases most pondweeds and naiads.
  - May impact more SAV outside of problem areas since water levels need to be quite low to be effective.
  - Dependent on deep frosts occurring in the winter and is only viable in lakes with some method of water level control.
  - Potential for increase in turbidity.
  - The faunal density and composition in the littoral zone may change: density may increase but biodiversity might decrease.

Nuisance SAV - Physical Control

Lake Drawdown

- Low/no cost, unpredictable, often backfires, may increase mercury (Hg) levels in fish.
- Cooke (1980) found that drawdown will result in at least short-term control of most rooted species if there is nearly complete dewatering of the sediments and a sufficient (>1 month) period of cold (freezing) or heat.
- It is recommended that a winter drawdown takes place once or twice every three years to discourage the establishment of resistant plant species (NYSDEC, 2005).
- Multiple local examples of drawdown impacts on local lakes (New Germany drawdown 2008, Greenbriar Lake drawdown 2023, U of California literature review 2022).

Nuisance SAV - Physical Control

Benthic Barriers - Use of a barrier to physically prevent plant growth.

- **Pros**
  - A benthic screen provides a physical barrier to plant growth and will last for several years if properly maintained = a viable option in small areas
  - Among the safest and most ecologically sound in-lake physical control techniques
  - Effectively used in a wide range of locations, conditions, and for wide range of nuisance vegetation
  - Doesn't impact recreational activities
    -
- **Cons**
  - Can be expensive to build and install these structures so typically limited to small areas (typically swimming areas).
  - Requires manual labor to remove problem species before installation. If plants are not removed prior to installation, the decomposition of plants below the barrier will lead to gas production and the ballooning up of the barrier at which point it becomes a navigational or recreational hazard.
  - Requires regular cleaning of structure underwater to ensure no regrowth occurs.

Nuisance SAV - Physical Control

Dredging - A large scale removal of plant and sediment matter in all or part of the lake

- **Pros**
  - Dredging can increase species diversity afterwards.
  - Removes problem species, but is highly disruptive to the benthic community.

- **Cons**
  - If not done properly, it can create a significantly bigger problem.
  - Requires an MDE permit, a site to dump dredge material, transportation of dredge material, equipment to perform actual dredging.
  - Loss of fishery and all plant biodiversity, at least temporary.
  - Loss of ecological value of the lake.
  - Extremely expensive.
  - Dredging sites are susceptible to invasives moving in first.

Nuisance SAV - Physical Control

Mechanical Harvesting - Similar to mowing a lawn, helps expedite the manual process of harvesting with the use of machinery.

- **Pros**
  - The control mechanism is highly effective for controlling vegetation.
  - Only trims the upper portion of SAV.
  - Does not kill the SAV.
  - Also removes trash.

- **Cons**
  - Results are temporary; requires a mechanical harvester, which are expensive.
  - Time consuming to move from site to site
  - Cannot selectively remove target species from weed infestations.

Nuisance SAV - Physical Control

Mechanical Harvesting - Of the three basic control methods (Physical, Biological, and Chemical), mechanical harvesting can be the least expensive and most convenient. Moreover, public support is often greater for this method because chemicals are not being introduced into the environment (University of Florida, 2021)

Nuisance SAV - Chemical Control

Shading Chemicals - Blocks UV from penetrating the water column, Aquashade is the most popular brand.

- **Pros**
  - Seems to have little impact on phytoplankton, water quality or fish.
  - Does not impact Turbidity.
  - Effectively removes Hydrilla.
  -
- **Cons**
  - Expensive and would require repeat applications = not a viable option
  - Seems to have little impact on Naiads
  - Non-selective, and would impact all SAV, not just nuisance SAV

Nuisance SAV - Chemical Control

Aquatic Herbicides - Chemicals that are applied to kill or control nuisance plants.

- **Pros**
  - Efficient.
  - Can be used to directly target species and avoid the introduction of a new species.
  - Different species are impacted by different concentration amounts.
  - Rapid results.
  - Site specific.
- **Cons**
  - Any use of chemicals must be carefully considered due to potential impacts on fisheries.
  - Overuse of herbicides can affect native plants and wildlife.

Nuisance SAV - Biological Control

Grass Carp - Grass Carp are effective at eradicating aquatic weeds as they consume most aquatic vegetation.

- **Pros**
  - Sterilized Grass Carp can be introduced so they can feed on vegetation without reproducing and outcompeting native fishes. After a few years, the sterile carp will die out and allow for the native species to continue to flourish as native vegetation returns in place of the invasive weeds

- **Cons**
  - IT IS ILLEGAL to introduce grass carp in Maryland waters. In addition, DNR does NOT recommend introducing one species to control another
  - Only for use in lakes or ponds
  - Non selective

Nuisance SAV - Biological Control

Herbivorous Insects - Salvinia Weevils and Alligator Weed Beetles are often used at treatment sites as a more natural and site-specific control method. Unlike Grass Carp, these insects tend to only consume the intended target plant.

- **Pros**
  - The population of these insects can grow exponentially due to their short life cycles and increase the rate of control over time.

- **Cons**
  - NOT RECOMMENDED, DNR does NOT recommend introducing one species to control another
  - Species do not always survive the winter

Additional Nuisance SAV Control Options

- **Hand Harvesting**
- **Suction Harvesting**
- **Rotovating/Hydro Raking**

For more details (Explanation, Pros, Cons, Reference, etc) on these and the previously mentioned nuisance SAV control techniques, see “Nuisance SAV Control Options Table - December 2024.”

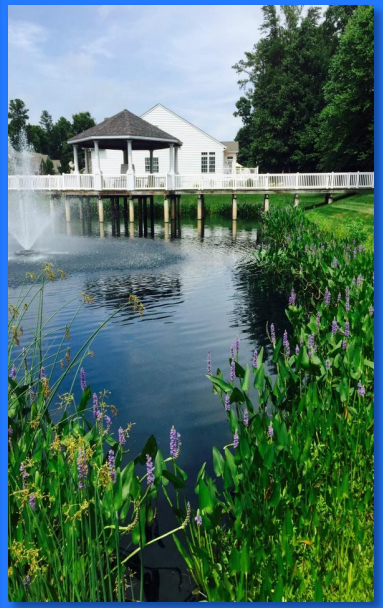
SAV Management with Mechanical Harvester & Other Superior Lake Management Services

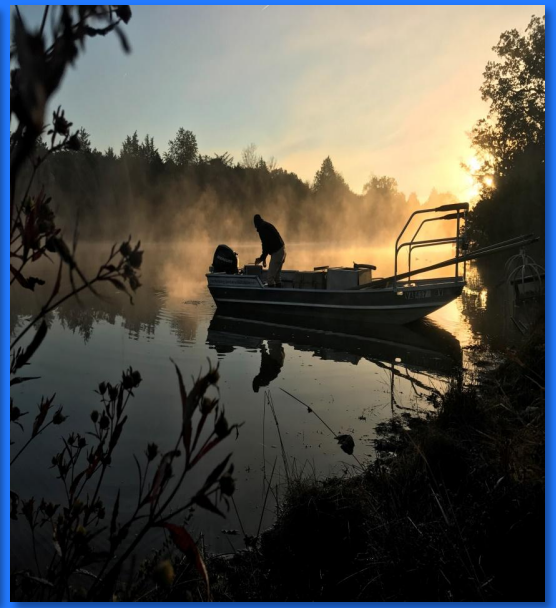
John Phelps
Senior Business Development Consultant
Environmental Scientist

Jeff Castellani
Director of Mechanical Services

SOLITUDE LAKE MANAGEMENT

Restoring Balance. Enhancing Beauty.



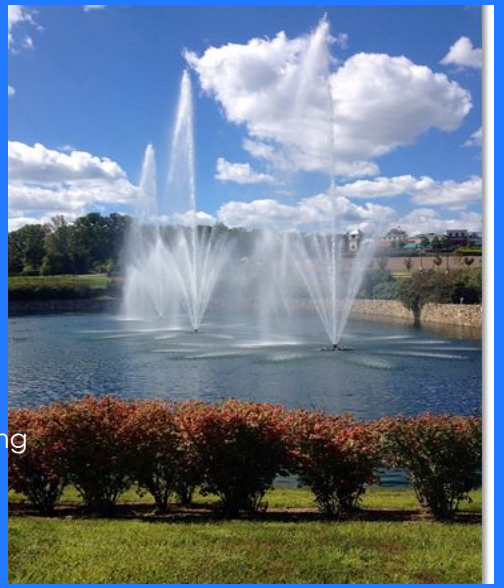


What We Do

Our Focus on Proactive Management

- Simply treating nuisance algae or aquatic vegetation is only treating a symptom of poor water quality; you are not dealing with the cause.

- We take a proactive approach to lake and pond management and implement sustainable solutions to help clients maintain healthy, beautiful and functional aquatic resources.



sōlitude \ sōl-i-tüde, säl-i-tüde \ n- **1:** the harmony found with sun, self, land and water through appreciation and preservation of lake and freshwater ecosystems. **2:** the peaceful calm resulting from the reflection on and centering of self through the restoration of ecological balance.

We Manage ALL Types of Freshwater Resources

STORMWATER FACILITIES

RECREATIONAL LAKES

DRINKING WATER RESERVOIRS

IRRIGATION PONDS

WETLANDS

TROPHY FISHERIES

INDUSTRIAL WASTEWATER

Who We Partner With

We are proud to partner with diverse stakeholders to preserve community safety and well-being:

- **Communities: HOAs & Apartments, Multi-Family, Lake Associations**
- **Private Landowners**
- **Golf Courses**
- **Municipalities: Parks & Rec, Public Works, Reservoirs, Irrigation Districts**
- **Commercial properties: Hospitality, Healthcare, Colleges/Universities, Corporate Campuses, Retail**

Specialty Services and Equipment

Specialty Services and Equipment

Restoring Balance. Enhancing Beauty.

Aquatic Weed and Algae Control

Aeration

Fisheries Management

Fountains

Reservoir Management

Biological Assessments

"What a great company! Customer service is what it's all about these days and SŌLitude Lake Management knows exactly that."

Cindy and Jim Bandy, Private Landowners

Specialty Services and Equipment

Restoring Balance. Enhancing Beauty.

Buffer Management

Wetland Management

Invasive Species Management

Water Quality Testing and Restoration

Stormwater BMP Inspections and Repair

Nutrient Remediation

"(The specialists at SOLitude) are all very knowledgeable, able to explain what is happening with any situation, and find solutions to problems as they arise. I have been very pleased with their work and would highly recommend them to anyone."

Joan M. Fowler, P.E., Development Services Coordinator

Specialty Services and Equipment

Restoring Balance. Enhancing Beauty.

Mechanical Harvesting

Hydro Raking

Plant Mapping and Surveys

Mosquito Control

Lake Mapping and Bathymetry

Regulatory Compliance and Permitting

"I wanted to thank you for the services you have provided. I have been very impressed. Specifically, I have to compliment Greg... he has solved our problems, listened to our concerns and acted professionally in every aspect of the word."

Julie Banks, Association Manager

Traditional Services

Aquatic Weed and Algae Control

We use environmentally-responsible solutions to keep aquatic weeds, algae, and toxic cyanobacteria at bay.

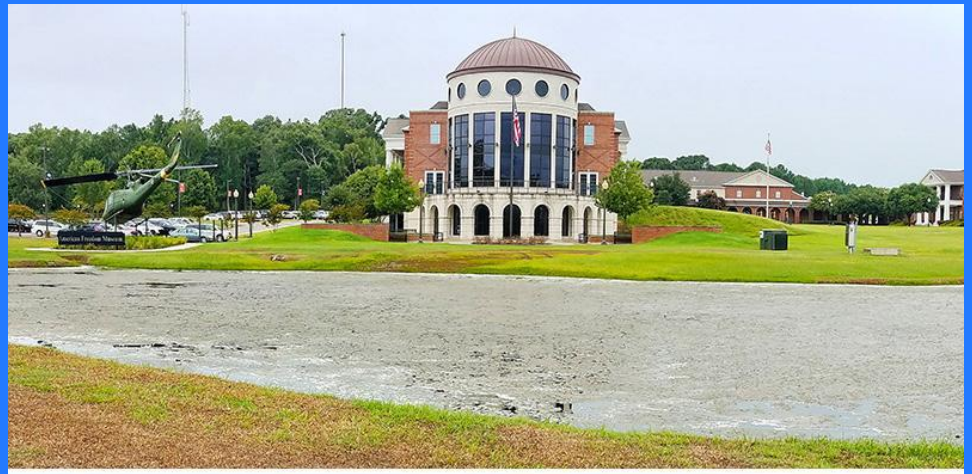
Aquatic Weeds

- Submersed
- Floating
- Emergent
- Wetlands

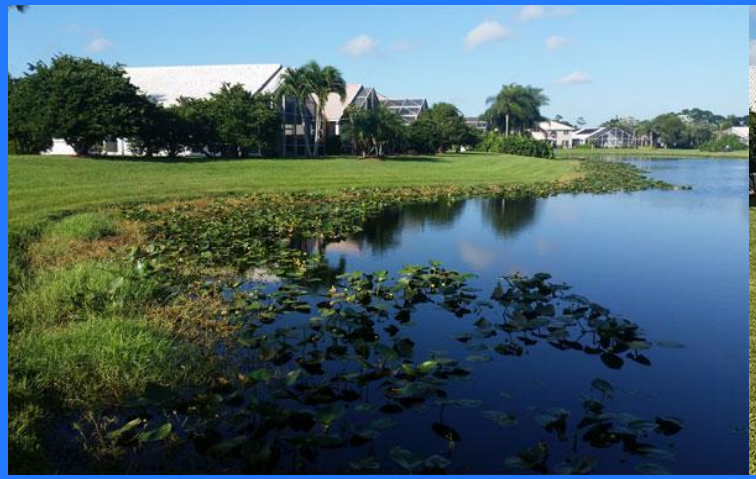
Algae

- Planktonic
- Filamentous
- Macro-algae

Algae Control, Stormwater Pond, Private School, TX



Nuisance Weed Control, Community Lake, FL



Toxic Algae Control, Drinking Water Reservoir, VA

Mechanical Services

Mechanical Harvesting and Hydro-raking

Remove organic matter and nuisance weeds to increase depth, restore open water, and improve safety.

Hydro-raking:

- Physically removes muck and debris
- Can reach small, selective areas
- Cost-effective alternative to dredging

Harvesting:

- Physically removes floating weeds
- Conducted 1-2 times per year
- Alternative to herbicides

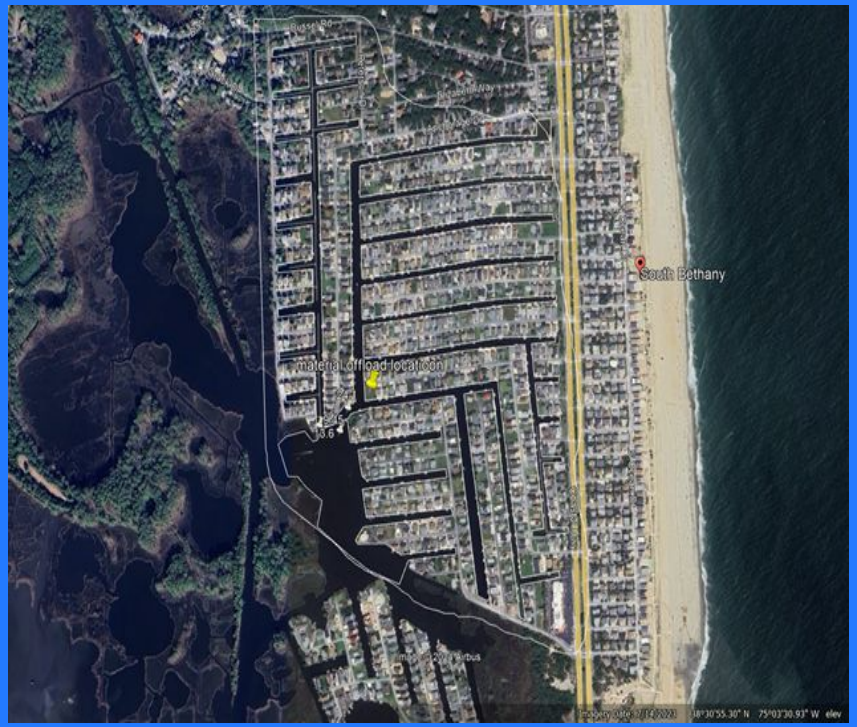
Aquatic Weed Harvester Service

The aquatic weed harvester is functionally designed to cut, collect and transport aquatic plant biomass from defined removal areas to designated offload site(s).

- Removal of invasive aquatic vegetation, limiting plant biodiversity (Water Chestnut, Giant Salvinia, Water Lettuce, Water Hyacinth)
- Removal of plant biomass, improving water circulation and navigation

DNREC - Macroalgae Collection

Delaware Natural Resources and Environmental Conservation



Primary Harvesting Locations:

1. Town of Fenwick canals
2. Town of South Bethany canals
3. Keenwick
4. Bayview Estates

Annual filamentous algae bloom occurrence between mid April and late May

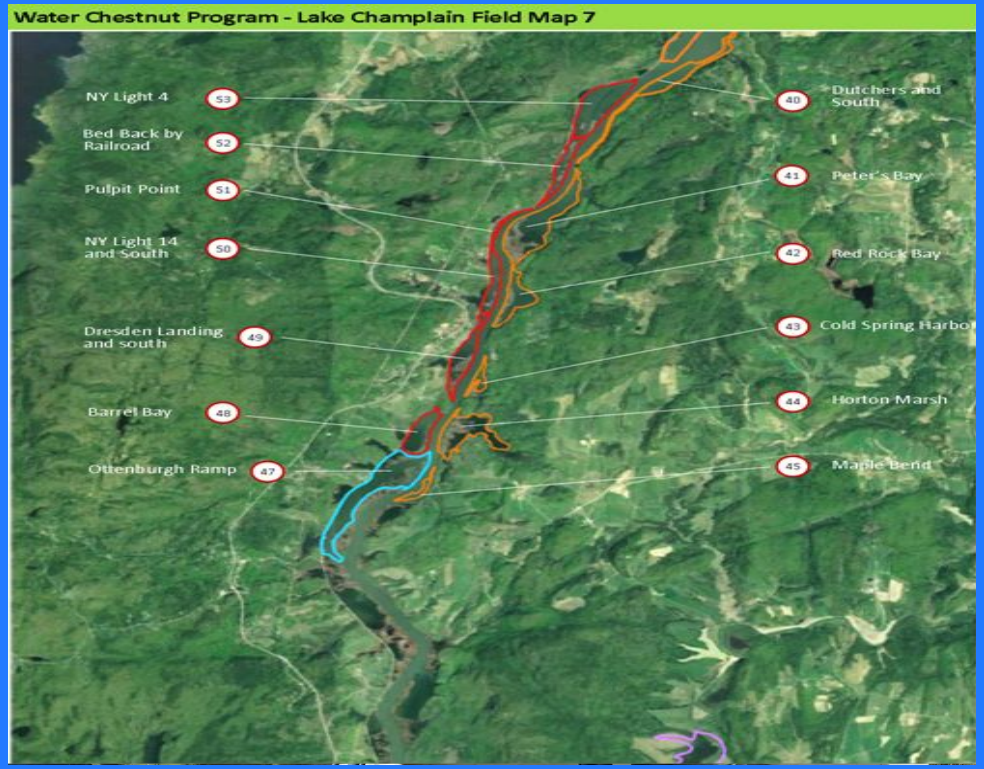
Constellation Energy - Bradshaw Reservoir, PA

Water Chestnut Removal

Removal of entire water chestnut plant and root matter to prevent clogging of intakes

Two annual water Chestnut removal period with hydro-rake and aquatic weed harvester

VT DEC - Lake Champlain, VT
Water Chestnut Removal



The Vermont Department of Environmental Conservation (VTDEC) Aquatic Invasive Species (AIS) Program oversees the annual mechanical harvesting operations of water chestnut in Lake Champlain.

13 traditional water chestnut harvesting sites representing approximately 650 acres.

Tennessee Valley Authority (TVA) - Lake Guntersville, AL

Rockstar Eelgrass Collection

- Guntersville Reservoir, formed by a hydroelectric dam on the Tennessee River, has 890 miles of shoreline and covers 67,900 acres of water surface.
- Rockstar Eelgrass is a hybrid of two non-native aquatic plant species: Vallisneria Denseserrulata and Vallisneria Spiralis
- The rapid growth of Rockstar Eelgrass has displaced native aquatic plant species to such an extent that biologists are struggling to locate and collect any native species.
- Rockstar eelgrass detaches from the reservoir bottom, either naturally or due to the forces of water level fluctuation, waves and wind. The resulting floating mats can be acres in size becoming a nuisance and hindering recreational activities. Boat ramps, shorelines, and public access points can become clogged by the weed mats.
- Annual six month program collecting over 150 acres of floating eelgrass mats, and treat an additional 1,400 acres to curtail the spread of this invasive species.

Hydro-Rake Service

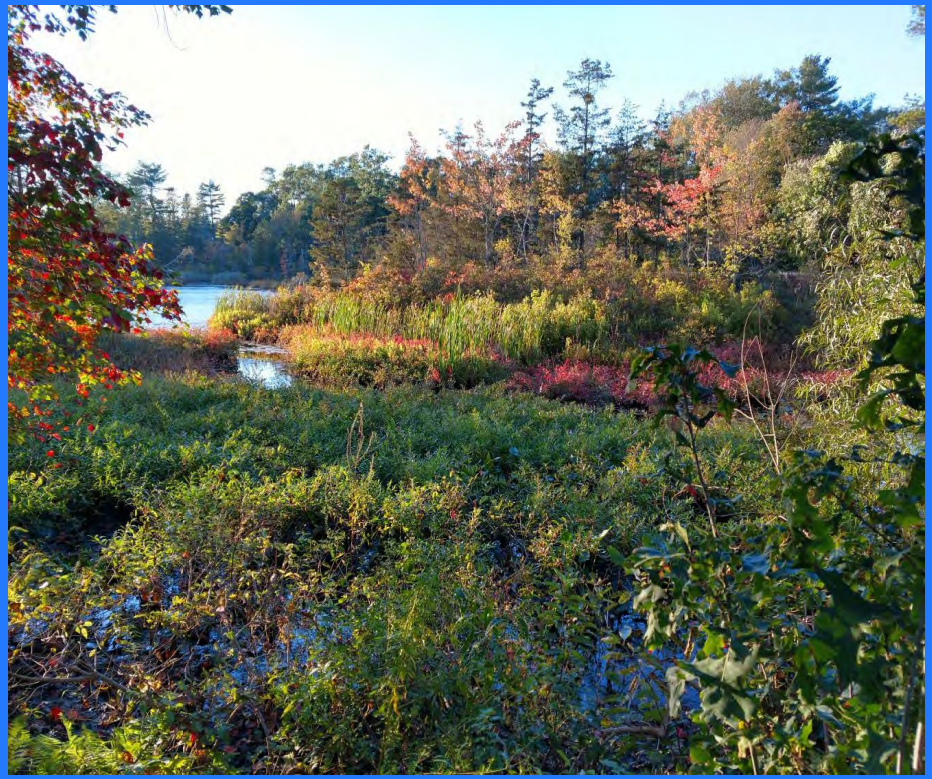
The Hydro-rake is best described as a “floating backhoe” with a York Rake modified attachment. The barge is paddle wheel driven to facilitate operation in shallow water (<2 feet) and it can effectively work to depths of about 10 feet.

It works from the water, thereby avoiding damage to sensitive shoreline habitat and property.

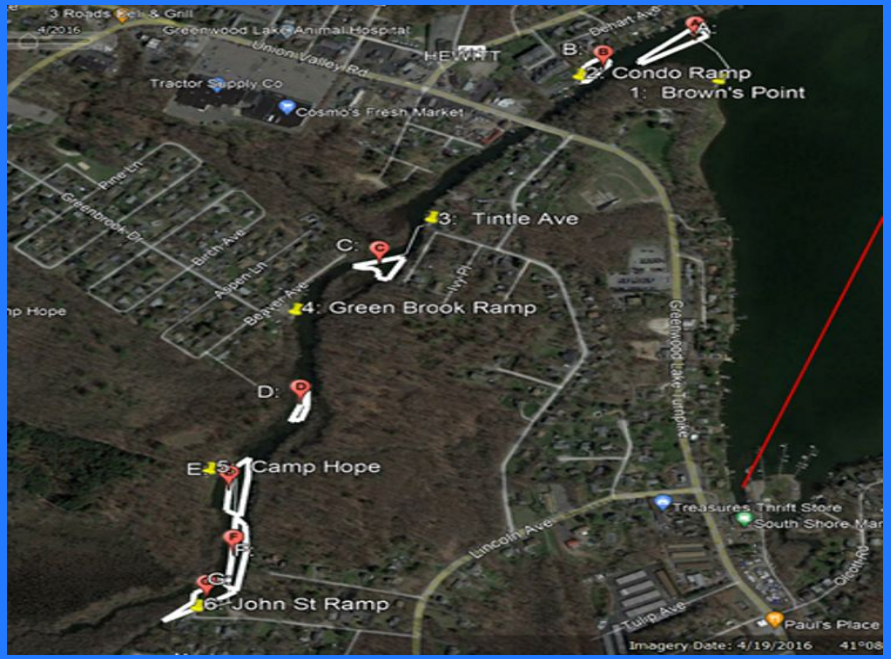
The hydro-rake is most effective at removing plants with large/well defined root systems and detritus (decomposing organic matter from leaf litter, branches and other debris as well as, soft organic sediment).

Hydro-Rake Service

Webster Lake Association - Hydro-Rake Outlet Channel Restoration - Pout Pond to Webster Lake MA



Greenwood Lake Commission (GLC)
Belchers Creek, NJ Aquatic Vegetation Removal



The GLC received a grant from the State of New Jersey for restoration and water quality improvements.

Aquatic Vegetation removal, primarily floating-leaf and emergent species to wide channel, restore water flow and navigation.

Before:
https://www.youtube.com/watch?v=XB674XVvcrk
After:
https://www.youtube.com/watch?v=c_dQJo57lK8

In Summary:

Thank you!

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Aquatic Vegetation Management Columbia's lakes

John McCoy

Columbia MD

17,000 acre planned community of 103,000 residents

approx. 15,000 single family homes, 15,000 multiple family units. New town plans were unveiled in 1967. Property acquisition had started in 1962. Development is on going.

Columbia Association a 501 (c) 4

CA owns and maintains more than 3,600 acres of Columbia's open space. This includes more than 114 miles of pathways and sidewalks for walking, biking and jogging; 165 tot lots; 284 footbridges; three manmade lakes; 41 manmade ponds; 34 miles of stream valleys; the 40-acre Symphony Woods; Wilde Lake Park; and the Lake Elkhorn Park and Pavilion; 23 outdoor pools; 4 indoor pools; 4 athletic clubs; 2 tennis facilities; an ice rink; a horse facility , a sports park and 2 golf courses.

CA is governed by a 11 Board of Directors and operated by a staff of 260 full time employees and up to 1300 part time employees. Annual budget $74 million.

Wilde Lake

Built 1966

22 acres 1194 acre watershed max depth 11 ft.

Functions stormwater management, visual amenity

Lake Kittamaqundi

Built 1966

27 acres 1384 acre watershed max depth 6 ft.

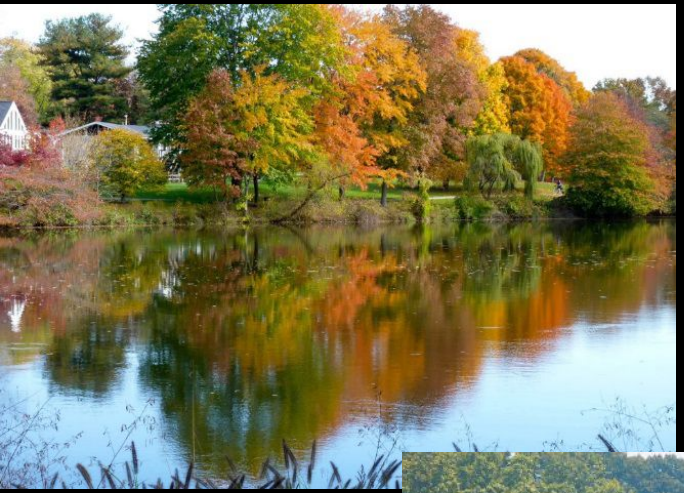
Functions stormwater management, visual amenity

Lake Elkhorn

Built 1973

37 acres 2363 acre watershed max depth 12 ft.

Functions stormwater management, visual amenity



Wilde Lake

Lake Elkhorn

Lake Kittamaqundi

Do not allow motorized boating or swimming.

Trophic status of the lakes has been eutrophic since the early 80's.

Three pronged approach to Lake Management

1. Watershed management; plan adopted in 2009, Watershed manager hired in 2010, committed approximately $400,000 per year to stormwater projects in the lake watersheds on CA and residential property with significant support from the State.
2. Vegetation and wildlife management; Lakes have algae bloom and aquatic plant issues. Wildlife particularly deer and geese contribute to bacteria problems in the lakes.
3. Sediment management. Sediment build up decreases stormwater storage capacity. Residents unhappy with the appearance.

Watershed management practices: Bio-Retention Facilities

Watershed Management Practices: Stream stabilization

Algae bloom in Wilde Lake

Water primrose, duckweed Water meal and Eurasian water milfoil In Lake Elkhorn

Mechanical Vegetation Management

- Habitat
- Phosphorus removal
- Aesthetics

- Aquatic vegetation is habitat and a food source for aquatic wildlife.
  - Ducks, turtles, fish, insects, amphibians, crustaceans, mollusks, mammals.


sundolphin

- Nutrients are a major problem in our lakes. Phosphorus in particular promotes plant growth, both macroscopic aquatic vegetation and microscopic vegetation (algae).

- Harvesting aquatic vegetation removes phosphorus that is in the plants.


16.08.2010 09:26

- Aesthetics: Columbia’s lakes are multipurpose facilities designed for both stormwater management and passive and active recreation.

Primary Vegetation Management Practice: Mechanical harvesting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Building a compost pile