Maryland Department of Natural Resources Welcomes You to an Open House

November-December 2018

Purpose of the Open House

1. Communicate the Department's plan and timeline for managing the new State Lakes Protection and Restoration Funds

2. Gather public and local government input to help identify worthwhile projects to protect and improve Maryland's state-owned lakes

Please help yourself to the refreshments while you review the materials we have provided.

If you have any questions, please ask one of the Department staff in attendance.

How we got here

Hydrilla Discovery Timeline

- In 2013, hydrilla was discovered in Deep Creek Lake. Likely introduced through recreational boating
- In 2014 the Department initiated 5-7 years of herbicide treatments for hydrilla control and a voluntary launch steward program to inspect vessels launching at Deep Creek Lake State Park.
- Herbicide treatments and launch steward program are ongoing in 2018.

House Bill 860 (2015)

- Aquatic Invasive Species – Inspection and Decontamination of Vessels (State Lakes Invasive Species Act of 2015)

  - After April 1, 2017, it is illegal for the owner of a vessel to launch in Maryland waters unless the owner has cleaned the vessel and removed all visible organic material.
  - Violators subject to fines of up to $2,500 for introducing Aquatic Invasive Species.
  - Department required to convene a workgroup to evaluate actions that reduce the spread of AIS from vessels placed in sixteen lakes owned and/or managed by the State.

House Bill 860 Workgroup Results

Convened Summer 2015.

Outcomes

- Recommend actions to reduce the spread of aquatic invasive species from vessels placed in lakes that are owned or managed by the State.
- Continue the voluntary vessel inspection and education and outreach effort.
- Lake management units will identify the most appropriate AIS options to implement at each lake.
- Conduct baseline survey of all 16 state lakes.
- Provide a written report to the legislature by December 31, 2015.

Survey of Aquatic Invasive Species in Maryland Lakes

- To establish a baseline, in the summer of 2016 Department biologists visited each state lakes and gathered data on submerged aquatic vegetation, mollusks, and algae.
- Twenty-nine species of submerged aquatic vegetation and six species of floating or emergent plants were documented during this survey. Invasive species were found in eleven of the sixteen reservoirs.
- Results are summarized in a report available online: https://dnr.maryland.gov/Invasives/Documents/Aquatic-Invasive-Reservoir-Summary.pdf

Senate Bill 396 (2017) -Protection and Restoration of State-owned Lakes

- Established the State Lakes Protection and Restoration Fund as a special, non-lapsing fund.
- Specified the **purpose of the Fund is to protect and restore State-owned lakes**.
- Requiring the Department of Natural Resources to develop a specified budget.
- Requiring the Department, in coordination with local governments, organizations, and citizens, to develop an annual work plan that prioritizes and details projects that will receive funding from the Fund.

Senate Bill 501 (2018)- State Lakes Protection and Restoration Fund

- Governor Approved Plan May 15, 2018.
- Established funding of $1,000,000 annually beginning in Fiscal Year 2020 and each fiscal year for three years.
- Purpose of the fund is to protect state-owned or state managed lakes by:
    - Removing sediment
    - Treating contaminated sediment
    - Preventing the spread of invasive species
    - Improving ecological and recreational value
    - Taking any other action the Department deems necessary

Status of Maryland Lakes

While there are no naturally formed lakes in Maryland, there are hundreds of man-made water bodies. Referred to as lakes, ponds, or reservoirs, by any name they are popular destinations for fishing, swimming, boating, and many other types of outdoor recreation.

State-owned lakes are managed by three different units within the Department- Maryland Park Service, Fishing and Boating Service, and Wildlife and Heritage Service.

Maryland's state-owned lakes are almost all 50 years old or older. As they age, lakes typically become filled with nutrient bearing sediments. As the lakes become more shallow they are colonized by both native and non-native submerged aquatic vegetation (SAV). SAV is ecologically beneficial, but can become an impediment to water-based recreation.

Algae, an important part of lake ecosystems, tend to become more abundant as our lakes become more eutrophic. Harmful algae blooms now occur regularly in some lakes.

As state-owned lakes aren't used for drinking water and are not a focus for nutrient sampling, historically there has been little water quality monitoring in most of Maryland's lakes.

MONITORING TO IMPROVE MARYLAND LAKES

While streams and the Chesapeake Bay have dedicated monitoring programs, no such monitoring exists for Maryland's lakes. With the exception of Deep Creek Lake, basic ecological monitoring of Maryland's state owned lakes hasn't been performed for twenty-five years. For the Deparment to effectively manage the lakes and identify the projects that will bring the most value to the ecosystems, basic information is needed.

Lake monitoring is a cost–effective way to maximize ecological and recreational value

With targeted monitoring, lake managers can make more informed decisions about the lakes to improve the ecological and recreational value of the resources they manage. Lake monitoring could assess the following components:

Shoreline conditions and lake-wide bottom depths

Lake bottom sediments and benthic invertebrate conditions

Fish populations and fishability

Water quality of lake and feeder streams

Algal community, including harmful algae

Underwater plant abundance and community composition

Presence of invasive plants and fish

Approximate Monitoring Costs (per lake- varies based on lake size)

Shoreline conditions and lake-wide bottom depths

- Sonar surveys- determine lake volume and create modern lake depth maps ($6,000)
- Drone photography- create geographically correct, recent image of lakes to facilitate SAV bed delineation, fishing access metrics ($3,000)

Lake bottom sediments and benthic invertebrate conditions

- Sediment samples- sediment quality assessment and grain size analysis ($14,000)

Fish populations and fishability

- Fishability Survey- determine shoreline and boat accessibility for fishermen ($2,000)

Water quality of the lakes and their feeder streams

- Tributary Sampling- benthic macroinvertebrate sampling to calculate Benthic Index of Biotic Integrity to supplement existing Maryland Biological Stream Survey data ($2,500)
- Water quality sampline- collect data on oxygen, temperature, pH,
- Maryland Biological Stream Survey- review data for upstream tributaries to determine the health of streams that provide water to each lake ($0, in-kind service)

Algal community, including Harmful Algal Blooms

- Harmful Algae Blooms- collect water samples to determine populations of potentially harmful cyanobacteria and/or the toxins themselves ($5,000 + $15,000 start-up for equipment)

Underwater plant communities

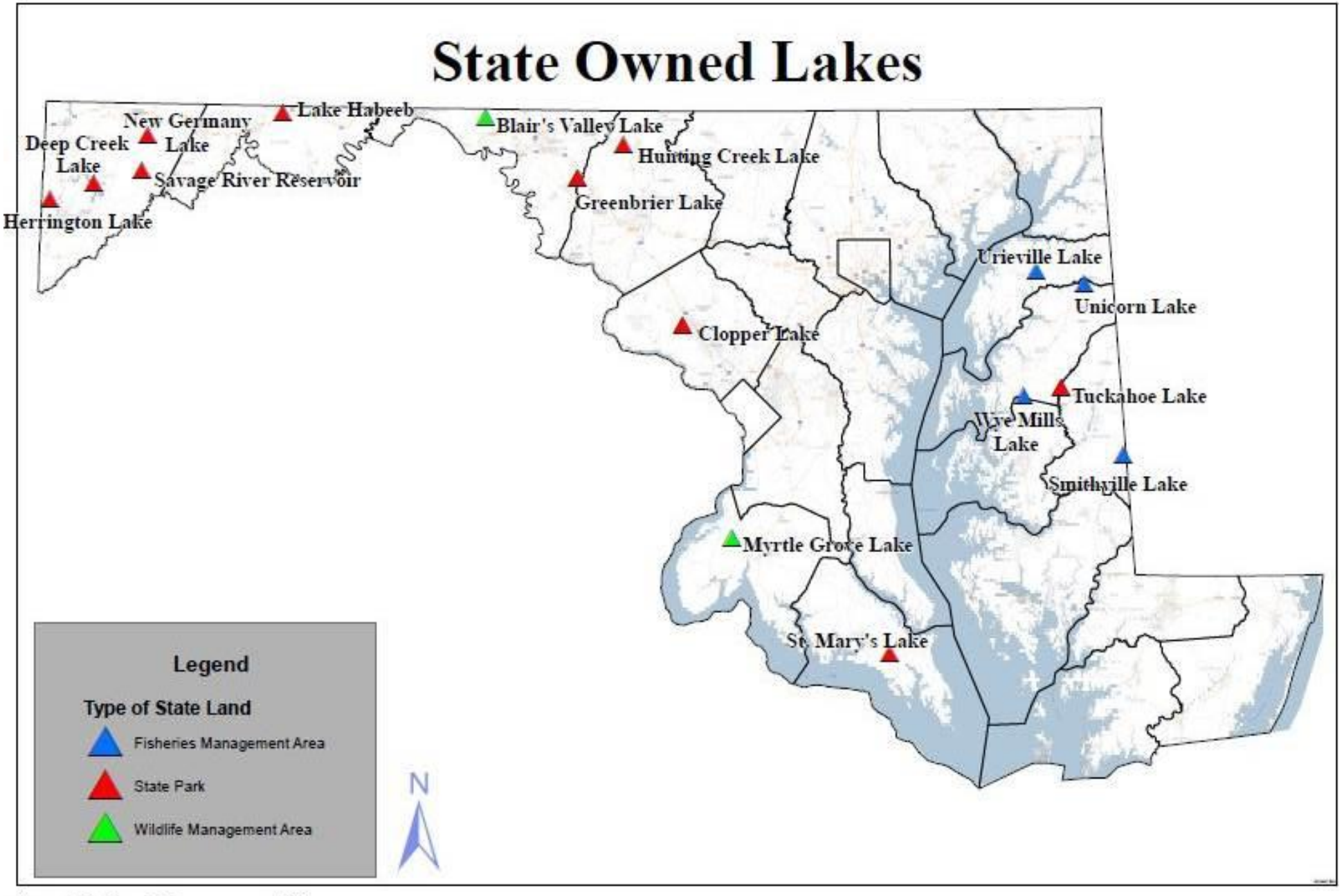
- Submerged Aquatic Vegetation (SAV) survey to determine SAV acreage and species ($2,000)

Presence of invasive plants and fish

- Identified through SAV, shoreline and fish surveys

- **Total Cost - $34,500** (per lake, minimum 2 lakes) +$15,000 one-time cost for equipment

State Owned Lakes



Potential Lake Enhancements

Dredging to increase water depth

Invasive species removal- fisheries

Fish Stocking

Invasive species removal- aquatic plants

Habitat Creation– in-water structures

Potential Lake Enhancements

Water quality and SAV monitoring

Herbicide Treatments

Launch Steward Program

Spawning area improvements- in-water grading, gravel installation

Angler access improvements- docks, ramps, trails

Stream habitat improvement

Shoreline stabilization

Cyanobacteria in Maryland Lakes

Eight State owned lakes (Clopper Lake, Deep Creek Lake, Hunting Creek Lake, Lake Habeeb, Myrtle Grove Lake, Savage Reservoir, Smithville, St Mary's Lake) show potential for toxic algae blooms. In addition, limited monitoring has detected algal toxin production in five of these lakes (Deep Creek Lake, Hunting Creek Lake, Lake Habeeb, Savage River Reservoir and Smithville Lake) which requires ongoing study. Two lakes had microcystin levels which exceeded the World Health Organization threshold for recreational contact and resulted in no-contact advisories being issued (Hunting Creek in 2011 and Smithville Lake in 2013). Four State owned lakes remain unsampled.

Background: Inland waters across the U.S. are at risk for increased outbreaks of toxic cyanobacteria blooms (aka bluegreen algae) resulting from elevated water temperatures, extreme hydrologic events and increased nutrient loading. Several special studies (National Lake Assessment, Maryland Department of the Environment trophic status, and Department of Natural Resources invasive species) have been conducted that included testing to determine if any harmful cyanobacteria were present in some State owned lakes.

Impacts: Cyanobacteria produce three main groups of toxins: neurotoxins (anatoxin, saxitoxin), hepatotoxins (microcystin, nodularians) and dermatoxins (lyngbyatoxins & lipopolysaccharides). Cyanobacteria toxins have caused animal poisonings in Maryland and many other parts of the world and can present risks to human health.

An in-depth study of the occurrence of harmful cyanobacteria could help develop appropriate management strategies for water resources at a local scale. Genetic based testing could be used to determine if potentially toxic cyanobacteria are present in lakes instead of microscopic analyses, but this requires special skill and is far more time consuming.

Additional phytoplankton sampling during August/September and Solid Phase Adsorption Toxin Tracker samplers deployed during peak cyanobacteria bloom period (the month of August) would allow us to determine if toxins are being produced.

Satellite detection of harmful algae blooms is used in many areas around the US for the protection of human health (West Coast, Gulf of Mexico, Lake Erie). The National Oceanic and Atmospheric Administration (NOAA) has developed an algorithm to remotely detect potentially harmful cyanobacteria blooms in Lake Erie. This method has also been used to detect cyanobacteria blooms in the Chesapeake Bay. Current remote sensing does not have the resolution to detect blooms in smaller lakes but the State is working with Federal partners as part of the CyAN project to develop an early warning system for U.S. freshwater systems allowing the detection of blooms in lakes (545 lakes in Maryland).

Bloom Level >50,000 cells/ml *Microcystis*
>100,000 cell/ml total potentially toxic species
World Health Organization Microcystin Threshold = 10 ppb

Individual Lake Summaries

Blairs Valley Lake (32 acres) – no data to date. Lake has phytoplankton blooms that cause oxygen to become depleted below a depth of eight feet during the summer impacting fish habitat.

Clopper Lake (90 acres, part of Seneca Creek State Park) – The 2002 phosphorus and sediment total maximum daily load (TMDL) for Clopper Lake states the lake is at the lower end of eutrophic (max chlorophyll levels 20 ug/L). During a response to a dog illness case in 2015, samples were collected and low levels of *Aphanizomenon* were detected (below toxin testing threshold). Benthic algae and hydrilla were noted in the area. In August 2015 background levels of potentially toxic (*Anabaena, Aphanizomenon, Microcystis aeroginusa, Cylindorspermopsis*) and non-toxic (*Cuspidothrix*, *Oocystis*, *Pseudoanabaena*) cyanobacteria species were observed. In 2016, the highest total cyanobacteria abundance observed was 31,326 cells/ml. Several potentially toxic species were observed at low concentrations (*Anabaena planktonica* 7,400 cells/ml and *Aphanizomenon sp* 5,400 cells/ml) as well as *Woronchinia*. Nine non-toxic species were noted including *Aphanocapsa incerta, Chroococcus, Coelosphaerium, M. incerta, M. wessenbergii, Oocystis and Pseudanabaena.*

Deep Creek Lake (3,900 acres) – No dedicated swimming area, but extensive water contact recreation. History of euglena blooms. In 2009, two species of *Microcystis* (*M. aeruginosa* and *M. wesenbergii*) below bloom levels were detected as well as a low density of *Aphanocapsa sp*. In 2010, a small cove showed low microcystin levels (1.68 ppb) as a result of low counts of *Microcystis sp, Woronichinia* and the non-toxic *Pseudanabaena*. This year, potentially toxic cyanobacteria species (*Woronichinia*) as well as low levels of microcystin have been detected in the southern part of the lake (max 0.15 ppb microcystin).

Greenbriar Lake (42 acres) – no data to date. Swimming area in the lake.

Herrington Lake (53 acres, Herrington Manor State Park) - The highest total cyanobacteria abundance observed was 5,000 cells/ml. One potentially toxic cyanobacteria were observed (*Woronichinia*). Four non-toxic cyanobacteria genera were observed (*Chroococcus*, *Coelosphaerium*, *Oocystis* and *Pseudanabaena*). Four were only observed at the dam site yet *Chroococcus* was highest in the center of the lake.

Hunting Creek Lake (43 acres, Cunningham Falls Park) – Swimming area. A no-contact advisory was placed on this lake in 2011 as a result of a mixed bloom of *Woronichinia* and *Oscillatoria* that resulted in microcystin concentrations up to 680 ppb microcystin.

Lake Habeeb (243 acres, Rocky Gap State Park) – The only data for this lake is from the three National Lakes Assessments in 2007, 2012 and 2017. The data shows inter-annual variability of blooms with potentially toxic cyanobacteria found in 2007 and 2012 but not in 2017. Microcystin was detected in the sample from 2012 at very low concentration (.08 ppb). Potentially toxic species present in 2012 included *Anabaena*, *Aphanizomenon spp* and *Aphanocapsa spp* (dominant cyano). Total cyanobacteria count was 34,636 cells/ml. In 2007, *Microcystis sp* and *Synechococcus sp* were also identified at low cell counts. The 2017 data is not yet available from EPA.

Mrytle Grove Lake (23 acres, Myrtle Grove Wildlife Management Area) – The highest total cyanobacteria abundance observed was 27,244 cells/ml. Six non-toxic (*Aphanocapsa, Chroococcus, Coelospaherium, Cuspidothrix, Merismopedia, Oocystis*) and two potentially toxic species (*Anabeana planktonic* <1,500 cells/ml and *Cylindrospermopsis sp.* at 5,000 cells/ml) were detected on October 5, 2016.

New Germany Lake (13 acres, part of New Germany State Park) – Swimming area in lake. The highest total cyanobacteria abundance observed was 37,314 cells/ml. One potentially toxic species was detected (*Woronichinia sp*) and four non-toxic cyanobacteria were observed (*Aphanocapsa*, *Chroococcus*, *Cuspidothrix*). Pennate diatoms dominated the counts. Cyanobacteria counts were highest at the dam site where *Aphanocapsa sp.* was the dominant algae (29,568 cells/ml).

Savage Reservoir (360 acres, used for municipal drinking water, part of Big Run State Park and Savage River State Forest) – In 2007 National Lakes Assessment potentially toxic cyanobacteria and the toxin microcystin were detected in Savage River Reservoir. The highest total cyanobacteria abundance observed in 2016 was 11,912 cells/ml. A visible bloom was noted throughout the lake. Two potentially toxic cyanobacteria were observed in the lake (*Anabaena planktonica* and *Aphanizomenon*). Both are potential anatoxin (neurotoxin) producers. One sample exceeded 10,000 cells/ml of *A. planktonica*. In addition, *Didymo* (aka Rock Snot) was identified for the first time in the reservoir in 2016; it had previously been found downstream of Savage Reservoir.

Smithville Lake (43 acres) – Toxin was detected in 2010 (3.9 ppb microcystin) and 2013 (125 ppb microcystin). A 'no contact' advisory was placed on Smithville Lake in 2013 due to microcystin levels. Dominant species were *Microcystsis* (2010 upper lake) and mixed bloom (2013 near dam).

St. Mary's Lake (250 acres St Mary's State Park) - The highest total cyanobacteria abundance observed was 18,926 cells/ml. Three potentially toxic cyanobacteria species (*Anabeana planktonic, Cylindrospermopsis* and *Aphanizomenon sp.*) were identified from the October 11, 2016 samples. Four non-toxic genera (*Aphanocapsa*, *Chroococcus*, *Aphanizomenon* and *Pseudanabaena*) were also observed- *Psuedanabaena* was at bloom concentrations.

Tuckahoe Reservoir (19 acres, Tuckahoe State Park) – no data to date.

Unicorn Lake (43 acres average depth 4 feet, Unicorn Fish Hatchery) – The highest total cyanobacteria abundance observed was 38,315 cells/ml. No cyanobacteria of concern were observed during either the 2016 Dept. of Natural Resources survey or the National Lake Assessment in 2012. One site detected *Pseudanabaena sp* at very low levels, 1,756 cells/ml (not shown toxic in MD). While the second site was dominated by non-toxic *Aphanocapsa sp* (38,315 cells/ml) and *Chroococcus sp.*

Urieville Lake (35 acres average depth 3 feet, Urieville State Park) the lake has phosphorus and sediment total maximum daily loads (TMDLs) with history of aquatic vegetation problems. The highest total cyanobacteria abundance observed was 6,745 cells/ml. Non-toxic *Chroococcus sp* was found (<6,500 cells/ml) to be dominant at one site while the second site had overall low counts of algae and cryptomonads were dominant (1,000 cells/ml).

Wye Mills Lake (50 acres) – no data to date.

* *Anabaena* synonymous with *Dolichospermum*

State Lakes Funding Questions & Answers

Q: Are decisions being made for all $3 million over three years or just for year one?

A; As funding is appropriated annually, and could change due to new legislation, only the first year of funding will be considered.

Q: What kinds of projects are possible? Could a playground be constructed, or an amphitheater. What about planting trees in the watershed?

A; The passage of the bill resulting in these funds was the end result of a process that started with an investigation into invasive species in Deep Creek Lake. Based on the testimony given by supporters of the bill and the legislators who proposed it, we believe that projects that are in-water or in close proximity to the water and benefit lake ecology in some way are preferred.

Q: Who will decide how to spend the funds?

A; The Department has created an internal workgroup comprised of each of the units who are involved in managing Maryland's lakes. The workgroup will develop and implement project evaluation criteria to guide spending decisions.

Timeline for this Proposed Plan?

The Department is holding 5 open houses around the State in November and December, 2018. When these are completed suggestions and comments will be reviewed

The Department plans to prepare a workplan and budget by April of 2019 to outline the projects to be completed with the first $1 million.

First round of funding will be available July 1, 2019

Project is projected to end June 30, 2022.

Did you forget to tell us something?

If you have thought of issues we may have missed or potential solutions that would meet the goal and did not provide them at the Open House then please provide us with your comments. You can submit your comments in one of two ways:

1. **Write your comments down and mail them to us:**

   DNR- Tidewater Ecosystem Assessment
   State Lakes Comment
   580 Taylor Ave. C-2
   Annapolis, MD 21401

2. **Submit your comments by e-mail to:**

   mike.naylor@maryland.gov