Lake Accotink Discovery Report

Interim Deliverables September 19, 2023

prepared for:

Fairfax County, VA

Draft

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LimnoTech

Water Environment | Scientists Engineers

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prepared by:
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under contract to:
Fairfax County, VA

ACKNOWLEDGEMENTS
We would like to acknowledge the Lake Accotink Task Force who assembled the discovery question and Charles Smith who served as our liaison throughout this project.

Note:
All materials in this report are based on high-level, rapid assessments and should be considered preliminary.

Introduction

The sections of this report are formatted to reflect the eight primary questions posed in the Task Force's discovery scope document. This deliverable report documents responses to all of the sub-questions under the first primary question (Question #1) and half of the sub-questions under the second primary question (Question #2). The remaining sub-questions will be addressed in future deliverables reports.

1 WHAT WILL HAPPEN TO THE LAKE IF NOTHING IS DONE?

1.1 Will mud flat form?

- Will the lake fill in and become a mudflat and how long would that take?
- Will "mud flats" dry and become windborne?
- Under a managed wetland option, would mud flats ever develop?

In our experience, mud flats typically form via one of the following mechanisms:

1. Saltwater tides inhibit vegetation growth.
    a. This will not be an issue for Lake Accotink
2. Extreme dry conditions cause hard pan mud flats
    a. These are common in desert conditions and not anticipated in Lake Accotink.
3. Sediment deposition smothers vegetation
    a. Depositional mud flats are common in flash flood zones with high sediment transport rates. In this scenario, flash floods deposit large quantities of sediment in the floodplain. These types of mudflats are transient features that spur new vegetation growth. They are not likely to become a nuisance issue for Lake Accotink.
4. Shore bird herbivory consumes vegetation faster than it can grow (Figure 1).
    a. This type of mud flat requires a large shore bird population. If this were to become an issue there are simple deterrence that are proven effective, such string lines to interrupt landing flight paths.

Figure 1 Herbivory mud flat at Tifft Nature Preserve in Buffalo, NY

5. Water level fluctuations may expose lakebed sediments.

    a. If the water surface level in the lake were to go down, perhaps to a flash board breaking, some of the lakebed sediment may be exposed, leaving a mud flat. This is a transient phenomenon. In 2023, the water levels in Burke Lake were reduced by approximately one foot to facilitate a shoreline protection project. This exposed sediment at the upstream end of the lake and within a few months the mud flat had completely revegetated itself via volunteer seeding (See Figure 2).

Figure 2 Former Burke Lake Mud Flat (Photo taken 9/10/23)

1.2 b. Will there be quicksand that poses a risk to park users?

Quicksand is formed by confined aquifer whose groundwater bubbling to the surface. Since the groundwater and lake are at the same level, quicksand is not likely. In our investigation, we didn't find any evidence of quicksand near Lake Accotink. Infilling of the lake with sediment should not increase the likelihood of quicksand.

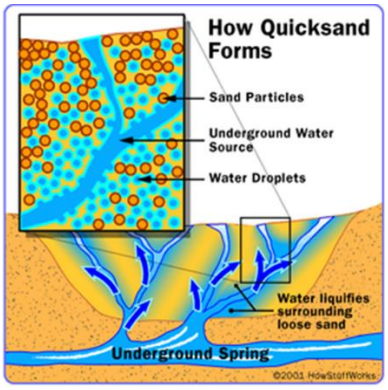

Figure 3 Quicksand Illustration (from How Stuff Works 2001)

Soft, sticky mud – which is often mistaken for quicksand – is present within the lake now and will likely continue to be present. The key difference between soft sticky mud and quicksand is that, as muck accumulates, it compacts the lower layers and makes it firmer; consequently, there is typically a limit to how far one sinks into soft, sticky mud. For this reason, it is often more of a nuisance than a safety hazard.

If soft, sticky mud is a concern, the planting of riparian vegetation often helps make soft sediments firmer.

1.3 Will there be nuisances such as mosquitoes, odors, etc.?

1.3.1 Mosquitoes

Typically, wherever there is standing water, there will be mosquitoes. Mosquitoes are more common in small water bodies (pools and puddles). A one-gallon bucket of water left in a yard can grow mosquitos. To that end, shallow areas with emergent vegetation are more likely to contain mosquito larvae than open water lakes. On the other hand, more mosquitoes also mean more panfish, more dragonflies, more bats, and more insectivores in general that feed on mosquitoes and mosquito larvae. The food web and predator/prey interactions are complicated so it is difficult determine if the mosquito population will increase and even more difficult to define when/if they will be a nuisance.

In this author's personal experience, mosquitoes are more of a nuisance in the woods, where there is less wind. To that end, I would not anticipate a noticeable increase in mosquito "nuisance events" if the lake were allowed to infill with sediment or the percentage of wetland area were to increase.

1.3.2 Algae and odors

Algae and odors are two other potential nuisances which may be of concern. Shallow, stagnate water tends to produce algal blooms which can cause bad odors. Algal blooms and consequent odors tend to accumulate in shallow wind blown bays. There is evidence of algal blooms and odors in Lake Accotink and the surrounding watershed (Figure 4).

Figure 4 Small algae-filled pond adjacent to Lake Accotink

If the lake were allowed to fill in via a ”Do Nothing” scenario, one can expect the frequency of algal blooms and odors to increase as the lake depth decreases. Several of the strategic intervention scenarios under consideration would promote the growth of emergent vegetation in shallow bays tht would counteract the risk of algal blooms and bad odors.

1.4 Will it become overrun with invasive species?

There is a high risk of invasive species under all scenarios. Whichever invasive species in the upstream watershed are a threat to Lake Accotink and several are readily identifiable around the lake (Figure 5).

Figure 5 Phragmites (left) and Purple loosestrife (right) found along the banks of Lake Accotink.

If the lake infills with sediment, the existing vegetation pallet will need to adapt to the new conditions. Changing conditions can create opportunities for invasive species to push out existing species. The same is true if the lake is dredged or some other strategic intervention is utilized.

The flash boards on the dam create a unique opportunity. In some cases, managing lake levels can help manage invasive species. For example, at the Tifft Nature Preserve in Buffalo, NY (Figure 1) they found that increasing lake levels would drown the phragmites along the water's edge.

If the goal is to combat invasive species, then an invasive species management plan will be required. If a "Do Nothing" or management-only strategy is adopted, the site will require ongoing invasive species management. If the lake is dredged or a designed intervention strategy is adopted, then the constructed site will require at least 5 years of intensive invasives species management followed by ongoing management.

1.5 Will flood risk increase?

Lake Accotink and the surrounding areas are within the FEMA 100-year floodplain (Figure 6). The Lake Accotink Dam is a "run of the river" dam, meaning that it was not designed to capture, control, or attenuate flood waters. Consequently, the normal pool water level within the lake does not effectively contribute to flood storage or conveyance. Given this, the dam will behave similarly if the existing lake is full of water or sediment.

Figure 6 FEMA Floodplain Map for Lake Accotink and surrounding areas.

If an intervention that introduced large landforms to the lake were selected, they would need to be designed in such a way that they do not significantly increase flood risk.

2 IS MANAGING THE LAKE AS A WETLAND A VIABLE OR POTENTIALLY DESIRABLE OPTION?

2.1 What is a stream/wetland complex? How is it different than what we typically think of as wetlands?

A stream/wetland complex is also known as an anastomosing stream. This type of water system is a multi-threaded stream that has two or more channels. These channels weave together to form islands and dynamic waterways throughout the landscape. They are most common when the longitudinal slope of the channel is less than 0.5%. Two examples of anastomosing streams are provided in Figure 7 and Figure 8.

Figure 7 Backwater of the Mississippi (Photo by: Google Earth)

Figure 8 Lost Creek (Project by: The Nature Conservancy, Photo by: Richard Scott Nelson)

Because the dam has made Lake Accotink a nearly flat system, as the upstream end of the lake has infilled with sediment, it has taken on an anastomosing channel form (Figure 9). If the dam is removed or the crest lowered, the longitudinal slope of the stream will increase and the channel could evolve into a single thread channel similar to what is present upstream and downstream.

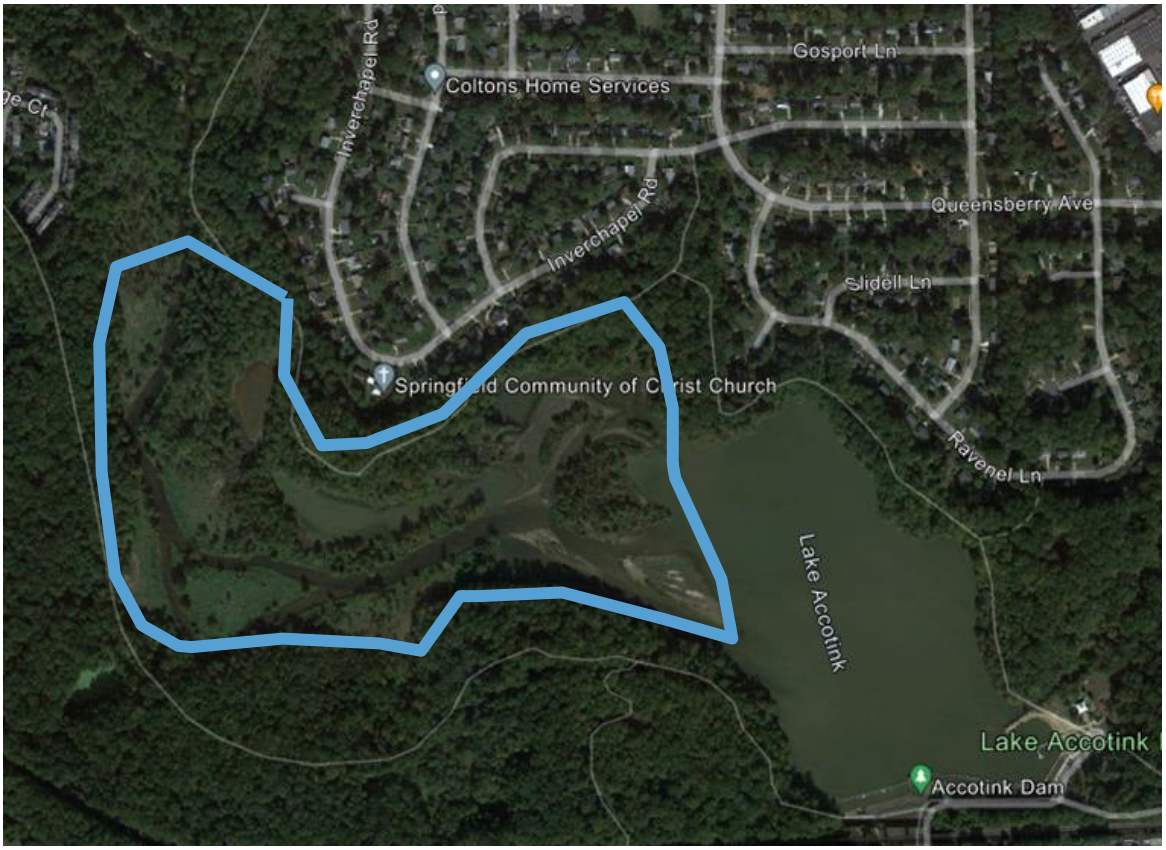

Figure 9 Lake Accotink aerial image showing anastomosing channel area (from Google Earth)

2.2 What is required to develop a plan to manage the lake footprint as a wetland?

To be addressed under a future deliverable.

2.3 What might it look like?

To be addressed under a future deliverable.

2.4 How long will it take to create a managed wetland that is a community asset providing environmental and recreational benefits?

To be addressed under a future deliverable.

2.5 Will a managed wetland be "overcome" by storm pulses and sediment loading with emphasis on extreme events?

Introducing wetland vegetation into the shallow areas of the lake or via managed wetlands should reduce the risk of scour within the current reservoir footprint. The morphology (channel shape) of many stream/wetland complexes is largely controlled by the vegetation present. These types of systems tend to be relatively stable and resilient to storm flows.

Water and sediment from upper Accotink Creek will continue to flow into the Lake Accotink footprint in all scenarios; consequently, there will always need to be a creek channel through the site that is at least as large as upper and lower Accotink Creek is today.

2.6 Will a wetland have a less cooling effect on the environment than an eight-foot or more depth lake? Will a wetland create a heat island?

In this context, the primary cooling mechanisms are evaporation and transpiration (water uptake via vegetation). The lake will primarily experience evaporation only, but a wetland will experience both evaporation and transpiration; consequently, the wetland will likely have a greater cooling effect than the lake.

The primary heating mechanism in this system is direct solar radiation. Since wetland plants intercept and reflect direct solar radiation (i.e., they shade the water), one can anticipate less solar heating in a wetland than in a lake.

There are many nuances that govern heating and cooling in lake and wetland systems. A detailed investigation of these mechanisms would require more time than is available for this project, but it is reasonable to assume that most people won't be able to notice the temperature difference of the lake verses the wetland without the aid of a thermometer.

2.7 Would managed wetlands have different regulatory requirements than a lake, and if so, summarize them?

To be addressed under a future deliverable.

2.8 What is the cost to design, permit, and construct and maintain a managed wetland?

To be addressed under a future deliverable.