TASK FORCE ON THE FUTURE OF LAKE ACCOTINK

Subcommittee on Options to Consider Other than Traditional Full Dredging

Subcommittee Report

(Revised 11/25/2023)

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INTRODUCTION

Lake Accotink ("the Lake") is a man-made Lake that originally covered approximately 110 acres in the Springfield area of Fairfax County. Currently, the Lake covers approximately 49 acres and is most comparable, in terms of open water amenities with a marina and boat rentals, to Lake Fairfax, a 28-acre lake in Reston. Burke Lake, at 218 acres, and the Occoquan Reservoir, a 2,100-acre water supply impoundment, also offer marinas and boat rentals. Other lakes in the County include the 28-acre Huntsman Lake in West Springfield, the 43-acre Lake Mercer in the Lorton/Fairfax Station area, Lake Royal, a 38-acre lake in Fairfax, and many others that are less than 20 acres. These lakes are managed by the Department of Public Works and Environmental Services (DPWES) primarily for Pohick Creek flood control and do not support Fairfax County Park Authority (FCPA) facilities for water-based recreation.

Significant sediment flow has continuously filled in the Lake over time, and the County has dredged the Lake several times to restore some of its original size. In 2019, the Board of Supervisors (BOS) approved a plan to dredge the entire 49-acre lake and then engage in regular maintenance dredging. Cost estimates continued to increase, and in March 2023, the County, through its DPWES, recommended not dredging the Lake and restarting the Master Plan review process to consider other options for the area. The BOS then established this Task Force. This subcommittee is part of the greater Task Force.

EXECUTIVE SUMMARY

The Subcommittee on Options to Consider Other than Traditional Full Dredging (the "Subcommittee") was asked to explore and make findings of potential future(s) for Lake Accotink other than the full dredging called for in the 2019 plan or the recommendation not to dredge put forward by DPWES.[1]

The Subcommittee finds that a smaller lake, in the range of 20 to 40 acres, can preserve a significant open water feature with a program of regular maintenance dredging. The Subcommittee further finds that most, if not all, of the dredge spoils can, and should, remain on-site in Lake Accotink Park (the Park). The Subcommittee also finds that some combination of a managed wetland and a grassland are viable options for the portions of the original 110-acre lake that have already, or will in the near to mid-future, fill in. Moreover, the Subcommittee finds that kayaks and other recreation options could accompany a managed wetland/grassland and a smaller lake.

[1] The Subcommittee stayed within the limits of its mission. This report does not offer an opinion as to whether the Lake should be fully dredged, as provided in the 2019 Plan, or not dredged at all, as recommended by the DPWES. The Subcommittee was tasked with reviewing options other than those two potential outcomes. It is important to interpret this report from that perspective.

SUBCOMMITTEE ANALYSIS

I. CRITERIA FOR ANALYZING OPTIONS

Paramount in our findings is that we must consider strategic interventions that will allow Fairfax County residents and leadership to plan carefully and then implement the most sustainable option for the best use of Lake Accotink in fulfilling its potential to:

- ✓ Serve as a center of robust biodiversity within its suburban enclosure.
- ✓ Be resilient to climatic change through its capacity to function as a Stormwater Management Facility.
- ✓ Improve and protect water quality in downstream habitats.
- ✓ Provide educational opportunities and serve as an example of best practices for similar projects.
- ✓ Offer visitors an aesthetic and calming resource through its substantial open water feature.
- ✓ Afford all Fairfax County residents and visitors with publicly delivered equitable and inclusive recreational opportunities in keeping with the principles of One Fairfax Policy[2].

The Subcommittee finds that the following criteria would be appropriate for analyzing options regarding the future of Lake Accotink.

Any option for the future of Lake Accotink should consider the implementation cost, including financial cost, timeline, and disruption to the community. Additionally, the following criteria were part of our analysis and consideration when determining the viability and value of each proposed solution.

A. **Sustainability Criteria, both economic and ecologic:**

1. Cost
   a. Initial cost and ongoing, i.e., maintenance costs (including dam)
   b. Dredging implications, even if reduced, including disposal

2. Ecological
   a. Ability to withstand ecological threats and remain ecologically viable

B. **Environmental Criteria:**

1. Water quality and sediment
   a. Sediment reduction downstream?
   b. Nutrient (nitrogen and phosphorus) reduction downstream?

2. Implication of trapped nutrients in a wetland - Benefit? Problem?

   a. Compare sediment trapping in the lake now vs. anticipated sedimentation in the proposed solution (in a lake or spread out in a wetland or a combination)
   b. Impact of the dam on sedimentation

[2] https://www.fairfaxcounty.gov/topics/one-fairfax.

c. Compare nutrient pollution entering the park vs. nutrient pollution leaving the park
d. Would a managed wetland improve the quality of the stormwater it receives?
e. TMDL impact and debris management

3. Habitat:

a. Wildlife
    i. Impacts
    ii. Biodiversity
    iii. Availability of various species for diversity
    iv. Fishery
b. Aquatic and Land Vegetation
    i. Biodiversity
    ii. Quality of vegetation
    iii. Tree canopy considerations
    iv. Availability of various species for diversity
c. Grants/subsidies availability for native species and grassland habitation

4. Topological changes

a. Dam - can the current dam be repurposed?
b. Impact on community infrastructure
c. Stream channel degradation and instability
d. Impact on flood plain

5. Climate changes

a. Carbon sink value and sequestration
b. Impact of more significant and more frequent storm events
    i. Flooding potential:
        1. Implications of keeping or removing the dam
        2. Implications of wetlands vs. lake vs. combination

C. **Community and Social Criteria:**

1. Aesthetic value
3. Recreational options
    a. Passive (enjoyment of nature)
    b. Active (miniature golf, carousel, ball field, boating, kayak, playground, biking)
4. Fairfax County resident value (especially those who may not have access to natural areas and parks in their communities)
5. Equity analysis
6. Natural environment equity/justice and accessibility
7. Impact on all the stakeholders
8. Educational benefits from options implemented

9. Revenue stream considerations (from recreation usage, “membership,” access, donation drives, and tax levies)

II. OPTIONS TO RETAIN A SMALLER LAKE ACCOTINK

The subcommittee finds that maintaining a smaller Lake Accotink is feasible. Our assessment included three smaller-sized lakes. Each is viable. All would require an initial dredge and then periodic maintenance dredging. County staff recommends separating a smaller lake from the mainstream channel to reduce silt buildups and thereby reduce future dredging. LimnoTech, however, stated that an “offline” lake would be susceptible to algae blooms and not necessary for viable construction, although an online lake would require maintenance dredging. The Subcommittee finds that the "offline" lake is not a viable option as it does not serve the greater purposes of the lake.

Figure- 1. A Smaller Lake Solution to Dredging Lake Accotink Word Cloud

A. Lake Structure

1. An approximately 41-acre lake would cover the area from the marina to the “big island” currently visible from the marina. It would require an approximately 9 million cubic feet initial dredge at a ballpark-estimated cost of $34 million to reach an 8-foot depth (not including handling of dredge spoils).

2. A 22-acre lake would cut across the current round/visible lake, although it would track projected silt fill-in over the next several years in its design. This option would require a dredge of approximately 3.9 million cubic feet at a ballpark-estimated cost of $24 million (not including the cost of handling dredge spoils). Both options would require periodic maintenance dredging.

3. A 33-acre lake is a mid-point, discussed later in the grassland section.

The attachments provide an outline of the dredging costs, statistics, and design of each option.

4. Per County staff, dredging would require construction activities to prepare locations for sediment stockpile and dredging operations, equipment staging, a pipeline to transport the slurry to a stockpile and drying location, and periodic maintenance dredging operations.

    i. Staging of equipment and materials in the vicinity of the Marina can occur throughout the park, and vehicles can enter the park via Accotink Park Road. Some smaller loads could come from the Heming Avenue entrance, but the narrow, steep road from that area down to the Marina would likely limit the load size.

    ii. Staging equipment and materials in the upper end of the lake can occur via the service road that enters the park near the intersection of Queensberry Avenue and Hatteras Lane, used during the installation of the 54-inch sanitary sewer across the lake bed in 1967. This access route may require maintenance or repair to carry loads expected during dredging operations.

B. **Dredge Methods**

1. Hydraulic dredging would probably be necessary, given the limitations of mechanical dredging. (Mechanical dredging requires one machine with limited reach to scoop sediment and then deposit it into a barge or land area within reach of the machine's arm. Hydraulic dredging allows the pumping of wet sediment to drying areas farther away.) Hydraulic dredging will require one or more drying areas. For comparison's sake, the original full dredge in the 2019 Plan called for up to seven acres of drying area. The 41-acre lake option would require half of that (or less if some spoils were available for immediate use, as discussed below). A smaller lake would require a smaller drying area. Sediment processing includes stacking in a drying area with proper supports and moving sediment again once dried.

2. The subcommittee also finds that DPWES should reconsider using dry dredge methods to move silt. Dry dredge involves draining the lake and having heavy-duty earthmoving equipment excavate the silt to accomplish the desired depth and area of the dredge. DPWES has failed to explore all options for this method by not including the use of coffer dams and other technology to protect the dredge area from washouts during storm events.

C. **Handling of Dredge Spoils**

1. Per County staff, the following options may be available on-site for handling dredge spoils, presenting the issues discussed:

    a. The 1850's railroad embankment could retain the spoils. The drainage system installed as part of the 1985 dredge is failing, and there are significant concerns in the current condition about a sinkhole that is developing.
    b. Structural and geotechnical evaluations are critical to determine if the 1850s railroad embankment and the associated stacked stone drainage culvert can support the deposition of additional sediment on the upstream side.
    c. If the embankment and culvert can support the pressures, drainage system replacement must occur prior to pumping spoils up to the basin from the lake.
    d. The basin is about 6 acres in size. Sediment would likely be about 40 feet deep across the entire basin, so the embankment reinforcement would need to accommodate those loads.
    e. The basin contains wetlands that would be eliminated and require mitigation. The current federal guidance is that the County would need to buy credits in a wetland bank to compensate for the impacts. Another option may be to create additional wetlands from the reduction in the lake size to make up for those filled by drying operations.
    f. Pipeline construction to the basin is required. Due to the elevation changes, the most logical route would be the trail along the lake's southern edge up to the basin. This pipeline would either be on the surface temporarily for later removal or buried for future use. There would be temporary trail impacts.
    g. Construction access to the basin to rebuild the drainage system, reinforce the railroad embankment, manage the deposit of spoils, and other dredge activity would be along the Washington Gas driveway and public trail from Rolling Road.

2. For deposition of spoils on an expanded Lake Accotink Island:

    a. There would need to be heavy construction access from Queensbury Avenue and Hatteras Lane to build necessary coffer dams and turbidity curtains to contain material while it is drying out and initial vegetation becomes established. The height of the spoils would determine the duration and extent of the construction activity.
    b. The County would have to mitigate wetland impacts. The current federal guidance is that the County would need to buy credits in a wetland bank to compensate for the impacts.
    c. Materials would be pumped from the barge into containment within the lake footprint. Note that given the quantity of material, hydraulic dredging would likely be a better option than mechanical dredging. Mechanical dredging would require trucks to move material around in the fill areas to deposit it and bulldozers to shape the deposited spoils. It would be wet, and the drying process would greatly slow construction. Hydraulic dredging would rely on repeated cycles of pumping materials into containment structures/materials and then waiting for it to

dry enough to set up additional infrastructure to deposit more material on top of it. A larger deposit area would likely reduce construction time and costs.

D. **Assessment of Smaller Lake Options**

The Subcommittee assesses the smaller lake options under its assessment criteria as follows:

1. There are significant costs to dredging even a smaller lake and providing ongoing maintenance dredging and handling dredge spoils. The costs, however, are far less than those of a full lake dredge and are in line with the 2019 estimated costs of a full lake dredge, which the BOS approved. The costs are reasonable and viable given the tremendous community and environmental benefits of preserving a lake at this location.

2. The small lake options present significant environmental benefits. A smaller lake would help capture sediment that would otherwise go downstream. It would maintain a lake habitat and increase the biodiversity of the entire park in conjunction with a managed wetland and grassland. Indeed, the smaller lake option would achieve the desired preservation of a fishery habitat and a habitat for bald eagles and other predator birds.

3. There is no doubt that preserving a smaller lake meets significant community and social goals. Even a small lake would allow the maintenance of the current marina area, a community gathering place for picnics, birthday parties, and many others who enjoy the calming effects of a lake environment. And, importantly, a small lake would still preserve the beauty that so many find in a lake for generations to come.
4. Preserving a smaller lake would contribute to the County's equity policy. Historically, land use policies did not designate public parks and recreation for people of color, other marginalized groups, those with low income, or people with disabilities or provide the opportunity to experience and engage in high-quality parks and recreation, thus magnifying the inequity. Lake Accotink provides access and accommodations to everyone regardless of income, education, race, disabilities, or ethnicity. Lake Accotink strives to continuously offer a tremendous opportunity for equity and inclusion by providing an open space and recreational area for everyone by removing barriers. Lake Accotink is proud to welcome community members throughout the county to enjoy all the amenities and recreation the park offers.
5. Preserving the Lake will likely support more options for recreation in the Park as a whole than could a lake-less park environment.

III. MANAGED WETLANDS OPTION

A managed wetland option for Lake Accotink presents several unique opportunities to preserve existing wetlands, restore and create a new wetland habitat, and add recreational amenities to Lake Accotink, all while lowering dredging costs and reducing, but not eliminating, the timeline towards permanent, on-going dredging. Analysis of the wetlands option is provided

here as a companion to a smaller lake, but it could also stand on its own. A wetlands option is also compatible with a grassland option.

Figure-2. A Wetlands Solution to Dredging Lake Accotink Word Cloud

A. **A managed wetland can take different forms.**

1. No one-size-fits-all solution to a managed wetland at Lake Accotink exists. A managed wetland could incorporate areas dominated by trees (i.e., swamp forests), areas dominated by wildflowers and grass-like plants (i.e., marshes), or established as distributed islands along the lake's margins or some combination thereof.
2. The establishment of managed wetlands does not preclude the creation of other habitats elsewhere in the lake, such as grassland plant communities, restoration to upstream sections of Accotink Creek, or restoration of upland plant communities in the surrounding parkland.
3. A managed wetland can function to buffer and protect a smaller lake by bringing that lake functionally "off line."[3] It could incorporate the entirety of the lake. Likewise, a wetland limited to the margins of the existing lake footprint could provide a similar function. Many of those options may be similar in terms of delivering useful wetland habitat. Still, different configurations can significantly impact public use of the lake and the park at large.
4. This flexibility allows the integration of a managed wetland option into many visions for the future of Lake Accotink.

B. **A managed wetland can provide recreational features to Lake Accotink**.

1. County DPWES staff and WSP-LimnoTech contractors stated that new amenities and features, such as boardwalks created in Lake Accotink Park, can become a part of a

[3] Per communication with Charles Smith, DPWES September 6, 2023 & WSP-LimnoTech presentation on October 2, 2023.

managed wetland. Elevated walkways, designed to be ADA accessible, prioritize habitat connectivity and limit disruptions to wildlife movement.[4]

2. A managed wetland can coexist with other recreational features envisioned during or implemented after a Master Plan process, such as water trails for kayaks and boats. Trails, walkways, viewing platforms, or other methods of passive recreation could expand recreational options for photographers and wildlife enthusiasts.

C. **The creation of managed wetlands would provide a new habitat that is currently absent or of inferior quality in and around the lake.**

1. Per DPWES staff correspondence, Floating Aquatic Vegetation and Submerged Aquatic Vegetation are less abundant in Lake Accotink than expected, likely due to high turbidity levels in the lake. A lack of aquatic vegetation means a less diverse plant community in and around the lake but less habitat for wildlife ranging from invertebrates to amphibians, reptiles, birds, and fish. Degraded habitats with low native biodiversity and cover are also more vulnerable to invasive species, which can further degrade habitat quality. A wetland restoration could reintroduce a natural plant community to the lake and provide the necessary habitat for a more diverse array of wildlife in the park.

2. This condition of heavy silt deposition leading to degradation of wetland plant community and animal habitat is similar to degradation from construction silt deposition that Huntley Meadows suffered in 1987. Restoration of smaller lakes, e.g., Royal Lake, included lakeshore restoration of native emergent vegetation and functions as habitat for native birds like Blue Heron and Red-shouldered Blackbirds. In addition to the value to wildlife, prioritized restoration of lakeshore habitat in areas of high visibility could increase aesthetic appeal and encourage bird watching. Establishing a managed wetland "could greatly improve water quality… [and] could provide improved habitat for aquatic life and associated terrestrial life."[5]

D. **Reusing dredge spoils, a necessary component of wetland creation at Lake Accotink, will reduce the frequency of required permanent dredging and is essential to reducing costs.**

1. The WSP-LimnoTech report assumes the reuse of dredge spoils for wetland creation, regardless of the form that may take. Consultants presenting to the Task Force strongly recommended against trucking in sediment from outside the lake for wetland creation (see Oct. 2 meeting).

2. Reusing dredge spoils on site for wetland creation reduces cost and allows deeper dredging elsewhere in the lake. Such reuse eliminates the need for a dredge-spoils pipeline to Braddock Road and a permanent dewatering facility at the entrance to

[4] We note, however, that the volume and velocity of stormwater during major weather events, unless mitigated, could create difficulties in maintaining any manufactured infrastructure within a wetland enclave, such as boardwalks or viewing stands.
[5] Email correspondence with Charles Smith, DPWES, Sept 14. 2023.

Wakefield Park substantially reduces costs associated with dredging. It also reduces the impact on carbon sequestration from clearing trees for a dewatering site and the carbon load generated by truck traffic to relocate dredge spoils.

3. While reusing dredge spoils on site does not eliminate the incoming sediment into the lake, it provides a low-cost option for those spoils and significantly prolongs the requirement before permanent maintenance dredging must occur to maintain a smaller open lake.

4. Other lakes in our region, on private and public lands, have ongoing dredging operations. Evaluating those conditions for lessons learned may be appropriate. Likewise, the development or discovery of other solutions could alter dredging costs. Establishing wetlands by reusing dredge spoils and extending that timeline to maintenance dredging is not "kicking the can down the road." Instead, this management strategy would allow a generation of park users to appreciate the lake, derive recreational value from it, and create ecologically meaningful habitat along the way.

5. Moving sediment from locations outside Lake Accotink presents an increased risk of invasive species into the lake, surrounding forests, and downstream areas – an ecological hazard that would be costly to manage. Invasive species are an ever-present risk at every park, but limiting the movement of soils and sediments is an effective risk mitigation strategy. Reusing the dredge spoils on site for as long as possible reduces invasive species risk to Lake Accotink and other potential deposit sites.

E. **A managed wetland could function to store atmospheric carbon – a goal for Fairfax County.**

As a habitat class, wetlands are more effective than forests, grasslands, or croplands at sequestering carbon into the soil. The staff report data indicates that wetlands store 643 tons of carbon, while losing only 43 tons, and a temperate grassland stores 236 tons, while losing only seven tons.[6] Reusing dredge spoils on site (see above) would also save significant levels of greenhouse gas emissions into our environment, at a time when the County has pledged to reduce its carbon footprint, by diminishing the need for continuous heavy trucking of dredge spoils as envisioned in the staff recommendation.

F. **A managed wetland can protect a smaller lake.**

1. Wetland islands that isolate a high-velocity channel from a deeper, dredged lake could reduce sedimentation rates within the lake footprint. Diverting sediment around and away from the remaining lake area achieves reduced maintenance costs and preservation of an open-water area for recreation. The creation of these wetland islands would likely utilize dredge spoils in the lake (see above).

[6] IPCC and NASA data as cited in the FCPA presentation, August 7, 2023, p.4.

2. Wetland islands, designed to isolate a main channel, could be aesthetic elements in their own right, be interesting to boaters, provide cover and habitat for wildlife, and be unobtrusive enough to allow a sufficiently sizeable continuous body of open water for passive and active recreational needs.

3. The ability to hold the sediment in the islands largely depends on establishing proper native vegetation, likely including a mix of wetland forbs (i.e., wildflowers), graminoids (sedges, rushes, grasses), and trees and shrubs. Engineered solutions like large stone borders (armoring), coconut coir mats, or deployment of other methods could protect islands during vegetation establishment.

G. **A managed wetland does not create hazards for park users or nearby property owners; in fact, it may reduce them.**

1. A managed wetland will not worsen flooding impacts in the lake or upstream from the lake. A managed wetland could reduce downstream flooding impacts by reducing water velocity over the dam, reducing sediment remobilization, or catching woody debris.

2. A healthy, managed wetland would not significantly impact mosquito presence in the park. Indeed, increased habitat for other invertebrates that prey on mosquitoes, like dragonflies, would increase in a managed wetland scenario. Similarly, increasing native wetland vegetation will reduce algal blooms, which are already a problem in Lake Accotink.

H. **A dam retrofit is compatible with a managed wetland and may be desirable to park users.**

1. The Commonwealth of Virginia ranks the existing dam as a high priority for removal or retrofit because of fish impacts. The dam, retrofitted with fish passages, can reconnect Accotink Creek fish populations to the lake. Improved connectivity should benefit "anadromous and catadromous fish" (e.g., Striped Bass or American Eel).

2. A fish passage could be an aesthetic feature of the dam, e.g., a riffle run incorporating stone and other natural elements to create a heterogeneous water pattern that allows a great diversity of fish species and sizes to enter the lake and upstream creek. These riffle runs could incorporate native wetland vegetation.

3. Incorporating a new aesthetic and ecological function into the dam itself, as part of a managed wetland option, also allows avenues for park users who have limited mobility – young families with strollers, users in wheelchairs or walkers, or those with mobility-limiting disabilities – to appreciate a lake-feature directly accessible from the lower parking lot without the need for a lengthy walk.

I. **A dam retrofit may also include changes to water level and depth, increasing the function and value of a managed wetland.**

Per the WSP-Limnotech presentation, a modified dam could drop the lake's level lower than it currently sits. This could result in wetland development along the shoreline (an area that otherwise does not have significant emergent wetland vegetation). This could allow a water control structure to allow water levels to fluctuate (similar to a primary aspect of the Huntley Meadows Wetlands Restoration project). According to the FCPA staff report, allowing a natural hydrological cycle to a managed wetland benefits wildlife and plant establishment – even during droughts or periods of extended high water. This could also allow the lake to retain extra water as it fills back up to the current "full" capacity during storms. It could also enable it to interrupt the velocity of stormwater flowering over the dam into lower areas, potentially allowing the lake to function as a stormwater management facility[7].

J. **Management of a wetland will be ongoing but is an affordable option.**

Per the FCPA staff presentation, the Annual Wetland Management Plan at Huntley Meadows Park costs roughly $50,000 annually, including staff time. Infrastructure associated with the wetland (e.g., dam retrofits, removal of woody debris, mowing/brush-hogging) would be an ongoing maintenance concern. However, it is to the County's advantage that the FCPA has deep expertise owing to their management at Huntley Meadows Park. While FCPA has experience at Huntley Meadows, the subcommittee finds that a simple duplication of that facility would be inappropriate for the environment, volume, velocity, and size of the Lake. Significant planning and engineering will be required to implement a sustainable wetland feature at Lake Accotink.

K. **Regardless of the County's approach, we can expect ongoing requirements for managing non-native invasive species.**

1. In its September 11, 2023, report, LimnoTech suggested that the County develop and execute an invasive species management plan. Invasive species threaten all County parks and degrade the ecological, functional, and aesthetic value for park users.

2. FCPA manages the Invasives Management Area (IMA) program, a volunteer-based program to target invasive plant removal in parks. In June 2023, The Fairfax County Park Foundation (FCPF) received a $40,000 three-year grant as part of the Society for Ecological Restoration's (SER) Standards-based Ecological Restoration in Action program to support the FCPA's Invasive Management Area (IMA) projects at Lake Accotink Park. This work helps to protect existing plant communities in and around

[7] There are four documents that note Lake Accotink as an SWMF: (1)Alternatives Analysis Report, Lake Accotink Dredging Project, Arcadis Project # SD-000041-001, July 21, 2021, Appendix A, Technical Memorandum. (2) Lake Accotink Park General Management Plan, July 1992, p.1. (3) Parks and Recreation, Fairfax County Policy Plan, adopted August 6, 1990, p.1. (4) Lake Accotink Sustainability Plan, WSSI #22647.01 May 31, 2017

the Lake, and future IMA work can mitigate and manage the risk of invasive species as part of a managed wetland scenario.[8]

L. **Community and Social Criteria.**

A wetlands option, if implemented in conjunction with a smaller lake, would meet the equity advantages of the smaller lake option by providing a novel, nature-based recreational and educational entity within short travel distance for tens of thousands of lower-income and immigrant communities in the Springfield area, and create wonderful opportunities for people from various ethnic, educational, and economic backgrounds to gather in the same physical space, providing additional opportunities for personal growth.

IV. GRASSLAND OPTION FOR LAKE ACCOTINK

A. Why This Option Works for Lake Accotink

Fairfax County has the unique opportunity to implement a strategic intervention that would help move the lake toward a place that would prepare it for the long-term restoration of a fully supported and maintainable body of water. The Grassland option creates a feature built upon dredged spoils deposited within the lake's footprint. The slightly elevated plateau would serve several purposes during the planning of the long-term restoration and execution of that plan. This intervention ties in with a smaller lake option, which produces dredged spoils require temporary storage. Creating a grassland provides protective cover for the spoils to prevent erosion, an area for natural on-site dewatering of dredged spoils, and reintroduces native grasses and plants to the region. As the grasses and plants on the plateau mature, they can serve as a contributing source of material for establishing other grassland acreage in the region and donate their seeds to ongoing grassland conservation projects in state, regional, and national parks, especially those in the National Capital Region.[9]

Figure -3. A Grassland Solution to Dredging Lake Accotink Word Cloud

[8] https://www.fairfaxcounty.gov/parks/park-news/2023/lake-accotink-invasive-grant

[9] Borowy, Dorothy, Ecologist and Integrated Pest Management (IPM) Coordinator, National Park Service, National Capital Region. *Re-Growing Southeastern Grasslands*, Published in *Natural Resource Quarterly, Fall 2022.*

B. **Why Consider a Grassland as an Alternative or as a Complement to a Wetland?**

During the past several years, scientists, environmental groups, environmental researchers, and non-profit organizations have begun to rediscover the significance of grasslands to the health of our ecosystems. The Southeastern Grasslands Institute, associated with the Austin Peay State University, has been one of the leaders in exploring what the lands of the Southeastern United States looked like before the changes brought on by European settlement within the region. In many cases, research has found that the description of a squirrel being able to travel from treetop to treetop from the Atlantic to the Mississippi was just a myth. In fact, vast sections of the Southeast were grassland. The Northern Virginia region experienced early settlement because the native grasslands were hospitable environments, often with deep, fertile soils. Of course, little evidence of those original grasslands still exists in our region. However, the establishment of the large Ravensworth Plantation demonstrates the existence of a historic grassland that disappeared as farm operations took its place. Fairfax County has current expertise in grassland management and establishment. FCPA has ongoing wet meadow management at Huntley Meadows Park, has established upland meadow grasslands (including rare-species reintroductions) through the Helping Our Lands Heal program, and has successfully restored small-scale meadows across moisture gradients at Fitzhugh Park in Annandale. The use of this natural infrastructure deserves thoughtful consideration[10].

C. **Evolution and Future of The Accotink Watershed**

Like all natural features, Lake Accotink has undergone continued evolution. Human actions have significantly influenced changes to the Watershed, especially to the Lake, following the installation of the dam by the Army Corps of Engineers in 1943 to create a reservoir for Fort Belvoir. Since then, residential, commercial, and associated infrastructure development have impacted the Watershed. This infrastructure, in combination with resulting impervious surfaces and, since the early 1970s, an increasing number and severity of storm events, have contributed to more substantial volumes and velocities of stormwater runoff that ravage the stream banks of Accotink Creek, its tributaries, and other streams in the Watershed. In the intervening 80 years, more than half of the original 110-acre reservoir has silted in, thus developing wetland areas and forming a delta at the creek's entrance to Lake Accotink, which presents the current lake footprint of approximately 49 acres. Adding a grassland section would combine with the existing wetland and an open water feature of increased depth to create the most beneficial environment for a robust hybrid habit, leading to a degree of biodiversity more abundant than any of the single-purpose solutions offers. The combined characteristics of the wetland, grassland, and open water environments of this option provide the highest degree of variability that lends robustness to the Lake Accotink ecosystem and encourages plant, insect, and aquatic life, including fish, reptiles, and amphibians, nesting and migratory birds and animals. In addition, the hybrid environment satisfies a substantial number of objectives envisioned and expressed by respondents during public meetings about Lake Accotink Dredging projects from 2016-2018, the summary of public

[10] https://www.fairfaxcounty.gov/parks/nature/helping-our-land-heal#

comments on the County's Lake Accotink Dredging Alternatives Analysis compiled in November 2021, [11] and the "Lake Accotink Dredging – Results from April 2023, Community Survey."[12]

D. **The key to Lake Accotink's future health**

The key to the conservation and protection of Lake Accotink is to preserve biodiversity while sustaining a healthy ecosystem. Native grasslands will fulfill these purposes based on undisputable evidence that these environments remain vitally important for their contributions to:

- Water Quality,
- Soil Health and Stabilization,
- Carbon Sequestration,
- Protection in Drought, and
- Habitats for Robust Biodiversity, which include communities of:
  - ✓ Native Plant Species
  - ✓ Pollinators
  - ✓ Beneficial Insects
  - ✓ Nesting and Migratory Birds
  - ✓ Beneficial Small Mammals
  - ✓ Native Raptors, including nesting Eagles, Hawks, and Osprey

E. **Grasslands Defined**

There is a multitude of defined grassland types. Three main types of grasslands deserve evaluation to achieve the best result in the Lake Accotink environment.

1. Savannas are a vital ecosystem with many ecological functions. They provide habitat for numerous species of grasses, trees, and animals, support nutrient cycling, contribute to carbon sequestration, and play a role in maintaining regional climates. Savannas are:
   a. Historically, these large-patch or matrix communities range from one to dozens of square kilometers (with local smaller patches).
   b. Dominated by two vegetation layers consisting of a sparse tree layer with 10-30% canopy coverage and a dense grass/herb layer with scattered clumps of low shrubs (0.5–3 m, 1.6-10 ft).
   c. Deep and well-drained to hydric soils or a clay fragipan (underlayment).
   d. Maintained historically by fire and grazing adaptation (i.e., Fire is a natural occurrence in the savanna and helps maintain balance).
   e. Commonly associated with rolling to slightly hilly landforms of plains, plateau surfaces, broad ridges, foothills, basins, and wide valleys.
   f. Supportive of a wide variety of plant and animal species. They can host diverse bird species and other wildlife.
   g. Grasses are the predominant vegetation, often forming a dense and continuous cover.

[11] https://www.fairfaxcounty.gov/publicworks/sites/publicworks/files/Assets/documents/projects/Lake-Accotink-Dredging-Alternatives-Analysis-Public-Comments-Summary.pdf
[12] https://www.fairfaxcounty.gov/publicworks/sites/publicworks/files/Assets/Documents/projects/lake-accotink-dredging_april-2023-survey-results.pdf

2. River scours typically consist of eroded paths or channels created by the flow of water in rivers and streams. The scours form over time as the water carries sediment, eroding the underlying bedrock or sediments. Scours are also known as river channels or stream channels.
   River Scours are:
   a. Linear small patch communities mostly less than 0.8 ha (2 ac).
   b. Dominated by low- to mid-statured perennial grasses and forbs, shrubs, and small saplings (0.5–3 m, 1.6-10 ft) represented by a mix of upland, wetland, and riparian species.
   c. Substrates formed of unconsolidated cobbles or boulders with sandy interstices or exposed bedrock.
   d. Soils consist primarily of sand, often limited to interstices or forming deep accumulations near the far edge of a flood zone.
   e. Hydro xeric (saturated winter to spring and after rain events, xeric summer to fall).
   f. Found on perched alluvial bars in entrenched river gorges, mostly along high-gradient streams.
   g. Providers of habitats for aquatic organisms, facilitate the movement of water and sediment, and impact the overall hydrology and geomorphology of river systems.
   h. Important to understanding water resource management, flood prevention, and enhancing ecosystem health. Their study provides insights into river dynamics, sediment transport, and overall watershed processes.

3. Meadows are open, grassy areas characterized by a diverse collection of plants, grasses, and wildflowers. Meadows are valuable for their ecological functions as they provide habitat for diverse plants and animal species. They support pollination, help mitigate the impact of flooding and erosion, and promote nutrient cycling.
   Meadows are:
   a. Small patches or linear communities. Original sizes are uncertain but likely range~~d~~ from several to dozens of hectares.
   b. Dominated by mid- to tall-statured forbs, grasses, sedges, and shrub thickets 0.5–2 m tall (2-6.5 ft). They often form dense carpets of grass blades that range in height and texture.
   c. Associated with floodplains of gently meandering small- to mid-sized streams of narrow valleys.
   d. Soils that are deep and consist of gravelly or silty alluvium.
   e. High water tables will control hydrology from associated streams, groundwater seepage, surface runoff from adjacent slope bases, and periodic short-duration floods following flash flood events.
   f. Usually consists of rich wildflowers, forbs, and non-woody plants. These plants contribute to the biodiversity of the meadow and often provide a vibrant display of colors with their blooms, adding to their aesthetic quality.
   g. Ecologically, meadows provide critical habitat for a variety of wildlife, including insects, birds, small mammals, and pollinators like bees and butterflies.
   h. Prized as picturesque landscapes that offer beauty and tranquility.

i. Historically, they developed as part of the mosaic of beaver-created habitats that were common before French and Indian fur-trapping in the early 1700s and from Native American burning in valleys. [13]

F. Determining the Optimal Grassland Composition for Lake Accotink

An estimation of the conditions that may exist when forming a plateau of dredged spoils reveals that a hybrid mix of grassland types may best assimilate to the Lake Accotink environment. The hybrid grassland can produce a more robust environment than a definition of singular focus since not all species prevalent in the above-defined grassland patches are suitable for the nutrients or water content of the resulting plateau created from the dredged material. At this point, determining the specific native grasses, forbs, shrubs, and saplings best able to thrive in the dredged material requires further study. Among other planning considerations, recent research indicates grassland community composition (diversity and turnover) generated by site and year effects during establishment can promote beta diversity across landscapes dominated by carefully timed planting of native perennial species.[14]

G. Proposed Placement, Size, and Shape of the Accotink Grassland Option

The best placement of the proposed grassland option is in the northwest section of the lake surrounding the large island formed in a previous dredging event. The Subcommittee used a 22.3-acre grassland for purposes of calculating costs and assessing pros and cons. (There is no magic in this number; a different one could be chosen.) In this example, a plateau formed from dredged spoils from approximately 33.4 acres in the existing stream channel and the central portion of the lake's footprint. Refer to Figure 2., Lake Accotink Grassland Plateau & Dredge Proposed Locations map in the attachment.

H. Engineering and Construction

A notional concept for constructing the grassland plateau consists of filling the designated acreage with dredged spoils beginning at the furthest northwest point and working toward the Southeast. A steel sheet pile cofferdam, which would serve to retain the dredged spoils and hold them from flowing back into the dredged area of the lake, would create the plateau. This plateau would, consequently, function as a natural dewatering area for the spoils placed in it. Installing properly selected plant species, possibly added by geotextile material, would also assist in dewatering the deposited spoils. A critical factor required to control the effects of continued siltation in the dredged lake is reducing the flow velocity, especially during

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[13] *Estes, D., M. Brock, M. Homoya, and A. Dattilo. 2016. A Guide to the Grasslands of the Mid-South. Published by the Natural Resources Conservation Service, Tennessee Valley Authority, Austin Peay State University, and the Botanical Research Institute of Texas.*

[14] Werner, Chhaya M., Truman P. Young, and Katharine L. Stuble. "Year Effects Drive Beta Diversity, but Unevenly across Plant Community Types." Ecology, October 25, 2023. https://doi.org/10.1002/ecy.4188.t Community Types." Ecology, October 25, 2023. https://doi.org/10.1002/ecy.4188.

storm events. Figure 2 includes the notional placement of horseshoe dams to slow and direct the flow entering the lake from Accotink Creek.

I. **Soil Erosion and Sediment Control Parameters**

All phases of the dredge and creation of the grassland plateau require proper soil erosion and sediment control parameters. Table-1. Soil Erosion and Sediment Control Parameters could, among other measures, include the following:

Soil Erosion and Sediment Control Parameters
Plan and delineate the site.
Establish protected areas and designated resources requiring protection.
Stabilize bare areas immediately with temporary vegetation where soil disturbance or excavation occurs.
Install principal basins to capture runoff from stormwater drains and steep slopes at the perimeter of the dredge site and plateau.
Install additional traps and barriers as needed during grading or excavation.
Install additional runoff control measures as required.
Stabilize the defined course of Accotink Creek as it enters the body of the lake.
Stabilize the defined perimeter of the grassland plateau.
Install selected plants and seeds to accomplish permanent stabilization immediately upon completion or significant delay in work.

Table-1. Soil Erosion and Sediment Control Parameters

J. **Analysis of Sustainability, Environmental, and Social Criteria of a Grassland Ecosystem Option for Lake Accotink**

Analysis of Sustainability of a Grassland Ecosystem: The following provides general information on how the Grassland Option meets the criteria of sustainability as defined by the working group:

K. **Cost Criteria**

1. Detailed cost information for implementing this option is beyond the current scope of this analysis. However, as an example, the subcommittee has derived figures for dredging 33.3 acres and depositing the materials on-site at Lake Accotink from the DPWES provided estimate for the 41 and 22-care smaller lake scenarios discussed earlier in this report. There are no dam maintenance costs expected or included in the Grassland Option. Table-2. Estimate of Dredged Volume and Cost for Grassland Option provides information on the cost estimate. The estimated costs do not include:
    a. Engineering and construction of structures required for the formation of the plateau;
    b. Acquisition and installation of plant materials for establishing the grassland patch;
    c. Design, construction, or placement of horseshoe dams within the dredged stream channel.

Estimate of Dredged Volume and Cost for Grassland Option	
Resulting Lake Area (FT^2) After Dredge	1,450,548
Resulting Lake Area (Acres) After Dredge	33.3
Average Water Depth (Based On 2021 Bathymetric Survey)	3.5
Average Excavation to Reach 8 FT Depth	4.5
Total Dredge (FT^3)	5,178,816
Total Dredge (YD^3)	295,482
Depth of Dredge Material Covering 22.2 Grassland Acres (FT)	6.75
Sediment Removal & Watering Cost (per YD^3)	$54.00
Water Treatment & Dewatering Costs*	$16,000,000
One-Time Cost to Dredge & Waste on Site*	$26,357,632
1. Data derived based on a model provided by FFX CO DPWES, subject to engineering review.[15]	
2. Estimate based on Arcadis dredge cost estimate updated January 2023.	
3. Estimate does not include the costs to clear land, conduct environmental assessments, or mitigate potential impacts.	
4. Estimate is for one dredging event and does not consider maintenance dredging frequency, quantities, necessary area to dispose of materials, or inflation.	
5. This estimate is for one dredging event and does not consider maintenance dredging frequency or quantities.	
*Note: The estimated Water Treatment & Dewatering cost is potentially less, based on the method selected for dewatering.	

Table-2. Estimate of Dredged Volume and Cost for Grassland Option

L. **Environmental Criteria**

The following provides general information on assessing the ecological aspects of the Grassland Option. Several criteria and sub-criteria are critical to the environmental success of any option considered for the future of Lake Accotink. These criteria measure both the beneficial and deleterious impacts of an option.

1. Water Quality and Sediment

    a. Sediment Reduction Downstream: The Grassland Option would encompass a dredge of the incoming stream channel and approximately 33 acres of the lake and should include methods to reduce the flow rate of the stream (such as stream horseshoe dams), especially during heavy storm events. These factors would temporarily reduce the downstream flow as the reduced speed of the silt-bearing water would allow heavier particles to drop out of suspension before continuing downstream over the dam. A conservative estimate of this benefit is at least five years and potentially longer, depending on the effectiveness of flow reduction measures.
    b. Nutrient Reduction Downstream: Nutrients are essential for plant growth, but the overabundance of nutrients in water can have many harmful health and environmental effects. An overabundance of nutrients—primarily nitrogen and

[15] E-mail from the Department of Public Works and Environmental Services (Charles Smith) to Subcommittee Chair John Cook 9/1/2023.

phosphorus—in water starts a process called eutrophication. Algae feed on the nutrients, growing, spreading, and turning the water green. Algae blooms can smell bad, block sunlight, and even release toxins in some cases.[16] When the algae die, they decompose by bacteria—this process consumes the oxygen dissolved in the water, which fish and other aquatic life need to "breathe." Without oxygen, the water can become hypoxic, with insufficient oxygen to sustain life, creating a "dead zone." The expected nutrient levels should not increase due to the work required for the Grassland Option. This expectation is based on the dredge depth not entering a zone where legacy nitrogen or phosphorus deposits under the lake bed would suffer disturbance. Steps to reduce these nutrients from entering the lake should continue. Better control of sources, accomplished through programs in the communities surrounding the lake and the entire watershed, reduces stormwater runoff that carries fertilizers, yard and pet waste, and certain soaps and detergents.

c. Impact on Total Maximum Daily Load (TMDL): As discussed in IV.I.1.b., Sediment Reduction Downstream, the expected reduction of downstream sedimentation would likely not impact the TMDL downstream calculation.

2. Habitat

a. Biodiversity: This criterion considers factors such as species richness, population stability, presence of keystone species, and potential threats to biodiversity. Sustainable grassland acreage historically demonstrates resilience and support of a variety of species of plants and animals.
b. Grasslands Have a Positive Influence on Biodiversity: The combined characteristics of the wetland, grassland, and open water environments of this option provide the highest degree of variability that lends robustness to the Lake Accotink ecosystem and encourages plant, insect, and aquatic life including fish, reptiles and amphibians, nesting and migratory birds and animals.
c. High Ecological Health Scores: Specifically, grasslands produce scores of high ecological health considering all impacting factors such as water quality, habitat diversity, and biological integrity. They help mitigate the impacts of pollution, habitat degradation, and invasive species. Grasslands significantly improve soil health, which is crucial for sustaining vegetation, growth, water filtration, and nutrient cycling within the ecosystem.

[16]"Nutrients and Eutrophication | U.S. Geological Survey - USGS.gov"

d. Table-3., below lists many of the Ecological Contributions Provided by the Grassland Option.

Ecological Contributions of Grasslands	
Disperse seeds	Mitigate drought and floods
Cycle and move nutrients	Detoxify and decompose waste
Control agricultural pests	Maintain biodiversity
Generate and preserve soils and renew their fertility	Protect watersheds and stream and river channels
Regulate disease-carrying organisms	Protect soil from erosion
Contribute to climate stability	Pollinate crops and natural vegetation
Provide aesthetic beauty	Provide wildlife habitat
Provide wetlands, playas	Provide recreation
Provide research opportunities	

Table-3. Ecological Contributions of Grasslands

3. Topological Changes

   a. *Impact on the Dam*: The Grassland Option does not require alteration to the dam or its current use.
   b. *General Impact on Topology*: The Grassland Option would alter the topology of the lakes footprint. By necessity, the elevation of the grassland plateau would be higher in the designated perimeter than the existing lay of the land. The increase in elevation is due to the requirement to provide an offset for the dredge spoils and the need to have the grassland patch set above the surface of the final level of the lake. Elevations within the plateau may vary to create small hills or depressions, creating a landscape of visual interest.
   c. *Other Topologic Considerations*: Slopes into the existing wetland, other low-elevation areas, and accommodation of stormwater drainage of surrounding communities are important engineering considerations that would likely alter additional topographic features.

4. Climate Changes

   a. Carbon Sink Value and Sequestration: According to research, grassland stores sequestered carbon reliably and safely. The substantial carbon stocks in temperate grassland ecosystems located below ground in roots and soil are 150% greater than those in temperate forests.[17] Typical grass root systems benefit from protection from fire, and there is evidence that storage capacity may increase further with global warming as temperatures rise. Ongoing global emissions augment the concentration of CO_2 in the atmosphere. Apart

[17] From the report *Land Use, Land-Use Change, and Forestry*, The Intergovernmental Panel on Climate Change (IPCC), 2000 – Robert T. Watson, Ian R. Noble, Bert Bolin, N. H. Ravindranath, David J. Verardo, and David J. Dokken (Eds.) Cambridge University Press, UK. pp 375, cited at https://blog.cabi.org/2020/06/25/the-climate-battleground-grassland-or-forest/

from wetlands and boreal forest ecosystems, temperate grasslands are notable as the largest store of soil carbon, and 97% of those stores are in the soil.[18]

b. Impact of Larger and More Frequent Storm Events: We estimate that the Grassland Option would not alter the overall ability of the lake to maintain its present continuous flow from Accotink Creek. The downstream impacts of significant storm events would not change.
c. Flooding Potential: There is no expectation in the change of likelihood for the potential for flooding in the Watershed due to the implementation of the Grassland Option.
d. Implications of Grassland with Wetland vs. Lake vs. Hybrid Combination: As discussed earlier in this document, the combined characteristics of the wetland, grassland, and open water environments of this option provide the highest degree of variability that lends robustness to the Lake Accotink ecosystem and encourages plant, insect, and aquatic life including fish, reptiles and amphibians, and nesting and migratory birds and animals.

M. **Analysis of Social interaction of a Grassland ecosystem**

The following provides general information on assessing the social aspects of the grassland option and how well it meets the social criteria as defined by the workgroup:

1. Aesthetic Value
   a. The plethora of stunning photographs contributed to online Facebook and other internet sites speaks volumes for the beauty and wonders of nature found in Lake Accotink Park. The FCPA webpage about the lake sums it up:

      > "It's hard to believe that the beltway is less than a mile away when you're standing on the tranquil and quiet shores of Lake Accotink Park. This 476-acre park provides excellent opportunities to relax, learn, and enjoy the natural resources of both Lake Accotink and Accotink Creek. In addition to trail systems and waterfront activities, Lake Accotink Park offers many family-friendly activities, including picnic areas, classes, camps, and special events."[19]

   b. Another online County resource begins with the description: "Lake Accotink Park is one of Fairfax County's most beloved resources."[20] The evidence is clear that Lake Accotink is a place where people enjoy the beauty of nature so close to their communities.

[18] Ibid.
[19] *Lake Accotink Park | Park Authority - Fairfax County*, https://www.fairfaxcounty.gov/parks/lake-accotink.
[20] The Future of Lake Accotink Park, https://storymaps.arcgis.com/stories/b85512da45b8420085167291998d19af

2. Recreational Options

Lake Accotink Park Recreational Offerings: The FCPA lists active and passive activities for all ages, as shown in Table-4., Lake Accotink Activities and Amenities.

Lake Accotink Activities and Amenities		
Antique Carousel	Dog Walking	Open Play & Athletics
Birdwatching	Dog Waste Bag Stations	Picnic Areas
Boating	Fishing	Playgrounds
Biking	Hiking	Pollinator Garden
Community Celebrations	History Tours and Talks	Solitude and Relaxation
Classes and Camps	Information Kiosks	Volunteering
Disabled Parking at Marina	Jogging	Wildlife Observation
	Miniature Golf	

Table-4. Lake Accotink Activities and Amenities

3. Other Social Criteria

Detailed Study of Social Criteria of the Future of Lake Accotink: Another subcommittee, "Value of Lake Accotink to Lake Accotink Park and to the County," is conducting an in-depth study of the value of the lake to Lake Accotink Park and Fairfax County. We defer to that group's expertise and diligence to elaborate on these items.

a. Fairfax County resident value (especially those who may not have access to natural areas and parks in their communities)
b. Natural environment equity/justice and accessibility
c. Impact on all the stakeholders
d. Educational benefits from options implemented
e. Revenue stream considerations (from recreation usage, "membership," access, donation drives, tax levies)

N. Areas of Further Analysis for Full Implementation of the Grassland 0ption

The following provides general subcommittee findings on areas outside the scope and available time to the workgroup requiring further assessment.

1. Sustainability & Environmental Considerations

a. Consider the water flow patterns and allocations to enhance storage capacity and retention of silt to prevent downstream damage.
b. Evaluate the need to implement soil erosion control measures to prevent excessive sedimentation.
c. Evaluate the impact of potential habitat loss and fragmentation on the biodiversity within a grassland ecosystem.
d. Analyze the potential threats to habitat quality, including pollution, land use changes, and encroachment.

e. Consider the health and fertility of the soil, including organic matter content, nutrient levels, and soil structure. Analyze management practices that may impact soil health, such as excessive fertilization or erosion.
f. Consider the capacity of the grassland to retain and filter water while minimizing runoff and erosion. Evaluate the impact of changes in hydrology, such as altered precipitation patterns or drainage modifications.
g. Examine the structure and composition of the grassland vegetation. Consider how soil properties influence the growth and resilience of the vegetation, nutrient cycling, and water retention within the grassland.
h. Consider the presence of herbivores, carnivores, and avian species. One must evaluate the ecological interactions between the distinct species and their role in shaping the grassland ecosystem.
i. Fire dynamics play an essential role in maintaining a native grassland. It is crucial to analyze the frequency, intensity, and seasonality of fires and their impact on the plant community, nutrient cycling, and habitat availability for wildlife.
j. Establish defined, measurable, and realistic metrics for the success of conservation and management practices and discover sustainable development strategies. Human activity impacts can provide insight into their unique ecosystems' dynamics and potential threats.
k. Consider analyzing issues such as water scarcity, altered watershed hydrology, reduced stream flow, and changes in seasonal water availability. Evaluate the implications for the overall health and functions of the Accotink Creek Watershed ecosystem.
l. Ensure that water quality measures will account for pollution, nutrient runoff, and harmful chemicals or contaminants throughout the watershed.
m. Establish and continually evaluate adaptation and mitigation measures to address climate-related challenges. Climate change can determine the vulnerability of native grasslands. As temperatures increase, altered precipitation patterns and extreme weather events may result.
n. Consider how climate conditions influence vegetation growth, water availability, and overall ecosystem dynamics within the grassland acreage. Factors such as temperature ranges, precipitation patterns, and distinct seasons are critical to its ecology.
o. Assess the acreage's hydrology to determine the water availability and flow within the grassland patch.
p. Consider the abundance of insects, birds, mammals, and other organisms that depend on the ecosystem. Analyze how the vegetation composition, availability of food sources, and habitat characteristics support wildlife populations within the grassland.
q. Establish an invasive species management program.

2. Social, Equity, Inclusion, and Justice Considerations

    a. Consider the interactions between the local communities and the grassland. Determine the positive and negative impacts on livelihoods, such as education, recreation, and tourism.
    b. Evaluate the extent to which different social groups can access and benefit from grassland acreage. Consider the equity for marginalized communities and inclusivity for patrons with developmental or physical challenges. Consider methods of promoting equitable and inclusive access to all who might have access to the grassland environment.
    c. In considering cultural considerations, analyze the social and cultural identity tied to native grassland. Assess the potential impacts of changes to the watershed and lake landscape and ecosystem dynamics on local communities' social fabric and identity.
    d. Consider the impact educational programs, community engagement, or nature interpretation initiatives will have in fostering public appreciation, awareness, stewardship, involvement in, and support for native grassland conservation.
    e. Consider whether local communities have a voice in shaping management practices, policies, or participation in conservation efforts. Analyze the effectiveness of community-based initiatives, partnerships, or co-management approaches for grassland ecosystems.
    f. Access the distribution of benefits and burdens associated with grasslands when considering social equity and justice concerns, such as gender equality, access to resources, or marginalized communities.

V. HANDLING OF DREDGE MATERIALS ONSITE WITH A SMALLER LAKE

One of the most difficult aspects of maintaining the Lake is disposing of large quantities of dredge materials. Dredge material transportation and disposal are the largest cost at 36%[21] of a full-dredge of Lake Accotink. Additionally, community members objected to the number of trucks that would travel through neighborhoods, parks, or already-congested roads, and the amount of forested land that would be cleared in Wakefield Park to support large dewatering operations, as well as impacts to the Cross-County Trail from a pipeline constructed between Lake Accotink and Wakefield Park. The carbon footprint that would be created by a full dredge and off-site sediment removal also caused community concern. Both variable and fixed costs of a lake dredging project are directly tied to the amount of sediment that must leave the park and be transported elsewhere. Sites to dewater and process the spoils within the study area were also evaluated for space requirements based on the volume of sediment and the daily throughput on a two-year work schedule[22].

[21] Arcadis, "Dredge Program Cost," February 3, 2023, p.1. https://www.fairfaxcounty.gov/publicworks/sites/publicworks/files/assets/documents/projects/2023-02_dredgeprogramcostsummary.pdf

[22] Arcadis, Dewatering Method Area Calculations, page 6, within "Alternatives Analysis Report" Appendix B, page 146.

To reduce the total volume of material that must be dredged, processed, and transported offsite, the subcommittee considered the following options:

- A Smaller lake;
- Islands, wetlands, and grasslands within the lake footprint;
- Other onsite beneficial uses or storage of dredge material; and
- Offsite processing and disposal for remainder of dredge material.

Figure-4. An Islands Solution to Dredging Lake Accotink Word Cloud

A. **A Smaller Lake**

For the purposes of estimating sediment volume and removal options, the Subcommittee analyzed the projected impact of dredging the largest and smallest of the three proposed smaller open water lake sizes:[23]

1) 41-acre lake (closest in size to Lake Mercer and Lake Royal),
2) 33-acre lake (5 acres smaller than Lake Royal), and
3) 22-acre lake (6 acres smaller than Lake Fairfax).

A full-dredge of Lake Accotink is estimated to require removing 500,000 cubic yards of sediment. For a 41-acre lake, the estimated amount of sediment that would need to be removed is 331,031 cubic yards, 295,482 cubic yards for a 33-acre lake, and 144,104 cubic yards for a 22-acre lake[24]. This assumes the same depth of 8 feet as proposed for a full-dredge to maintain the recreational uses of the lake for a longer length of time between dredging.

These volumes represent an initial dredge only, not amounts that will continue accumulating. An analysis by WSSI showed that an average of 46,000 cubic yards of sediment

[23] A 33-acre lake was studied for analysis of the grassland option.
[24] E-mail from Department of Public Works and Environmental Services to Subcommittee Chair John Cook 9/1/2023.

flowed into the lake from Accotink Creek each year from 2011 to 2015, with approximately 21,000 cubic yards retained per year, consistent with modeling reported by engineering firm HDR in 2002.[25] Projections show the rate of accumulation slows as the lake approaches sediment capacity, with fine solids remaining suspended in the water and sent over the dam rather than settling to the bottom and scouring from the faster-flowing creek carrying sand, gravel, and rocks downstream to deposit in the lake, forming a delta[26]. It is estimated that only 9,400 cubic yards per year of sediment was captured between 2015 and 2020 and that "the lake is nearly filled with sediment."[27] After a dredge, sediment will accumulate at higher rates once again. This cycle is expected in any scenario that features an open water area. A commitment to regular maintenance dredging should be considered in scenarios featuring a lake.

B. Islands within the Lake

Islands and wetlands provide views and glimpses of water into the distance, making the lake appear more expansive than if it is encircled by land. Positioning the islands in a way that would support a "Water Trail" recreational experience could also provide additional recreational opportunities.

Figure 5 Infill Islands – LimnoTech 10/2/2023

This alternative beneficially uses sediment dredged from open water areas to create vegetated islands within the lake. This option is intended to keep the sediment in the system to

[25] Wetlands Studies and Solutions, Inc. (WSSI), Lake Accotink Sustainability Plan, May 31, 2017, p. 2 (47% sediment trapping efficiency on average annually from 2011-2015). https://www.fairfaxcounty.gov/parks/sites/parks/files/assets/documents/plandev/lake-accotink/lap-sustainability-study.pdf

[26] LimnoTech Consulting, Presentation to the Lake Accotink Task Force, September 11, 2023.

[27] Arcadis Technical Memorandum, July 9, 2021, page 1. "Alternatives Analysis Report," Appendix A: Sedimentation Analysis, page 128. https://www.fairfaxcounty.gov/publicworks/sites/publicworks/files/assets/documents/projects/2021-07-29_alternative%20evaluation.pdf

the extent possible, while maintaining a lake that provides recreational and quality of life benefits to the community.

DPWES estimated that 10 acres of land would be required to store the dredge from a 41-acre lake and 4 acres for a 22-acre lake.[28] This assumes an 8ft lake depth, consistent with the full-dredge scenario, and a dredged material height of 20 feet. The actual land area required and the volume of sediment would depend on a feasibility study and "mass/balance" calculations, according to LimnoTech.

In the October 2, 2023, presentation to the Lake Accotink Task Force, LimnoTech provided several "island infill" concepts based on a 2020 bathymetry study[29]. Vegetated islands are shown toward the upper areas of the lake, where there is an existing island and heavier sediment deposits. In contrast, open water areas are closer to the marina and dam, where there are deeper pools.

In the above example, islands are created from material dredged out of the open water area, shown in hatch marks. LimnoTech stated that some islands could be created with an initial dredge and more added over time with successive maintenance dredges. The areas around the islands would not be dredged and would continue to become shallower. This presents more challenges for row boats and paddle boats that may attempt to navigate through the islands. Kayaking through the island area or designating a "water trail" feature could be viable for some time; however, it would eventually fill in without maintenance dredging, except for the natural channel(s) formed by Accotink Creek. If there are design considerations that could take advantage of natural processes to maintain kayaking pathways, that would be a more sustainable option. Jane's Island, a State Park in Crisfield, Maryland in the Chesapeake Bay, has 50 miles of trails through naturally-occurring waterways in a tidal wetland. The park maintains a canal and boat launch and no dredging has occurred since 1962, with natural flows maintaining the water channels.

[28] DPWES E-mail to subcommittee chair John Cook, 9/1/2023

[29] Arcadis Alternatives Analysis Report, Figure 1.2, based on Bathymetry conducted by Waterways Surveys & Engineering, LTD on December 09, 2020.

Figure-6. Infill Islands with "Horseshoes" - LimnoTech 10/2/2023

As shown in Figure-6. Infill Islands with "Horseshoes" - LimnoTech 10/2/2023, LimnoTech proposes constructing a few islands with the initial dredging of the open water areas, along with "horseshoe" structures that slow down the water and provide places for incoming sediment and other materials to deposit. This eventually creates new islands naturally over time.

In addition to the concepts presented by LimnoTech, the subcommittee is interested in whether more sediment could be stored at higher elevations and vegetated with grasslands and native plant species, in combination with lower-height islands designed for periodic flooding, i.e., "high wetlands." Wetlands are biodiversity "hot spots" and would greatly increase the ecological value of the lake. However, at only 2-3 feet in elevation, the Limno Tech suggested grassland would not capture all of the dredge materials, even from a smaller lake. A combination of island elevations and wetlands would allow for more dredged open water areas, for example, with deeper waters along the northeastern shoreline for fishing and boating while also providing habitat benefits in the low-lying areas.

C. Options from Previous Lake Accotink Studies Rejected by the Subcommittee

A previous WSSI study, "Option F – Single Thread Channel with Smaller Lake,"[30] involved removing a portion of the dam to create a single-channel stream and constructing an embankment with imported fill-dirt to separate it from the flow of Accotink Creek. This was not recommended by LimnoTech when questioned during the October 2, 2023, presentation to the Task Force. Craig Taylor responded that a separate lake would be a "large stagnant body of water without circulation," resulting in algae blooms, and be very expensive to manage, as it would be groundwater-fed. LimnoTech also stated that "…under no circumstances should fill-dirt be brought in" to Lake Accotink. The subcommittee concurs that this alternative should not be considered further.

Two options for processing or reusing the sediment in the lake footprint are labeled as "Existing Island" and "Expanded Island" in the Arcadis Report. The Subcommittee does not

[30] Wetlands Studies and Solutions, Inc. (WSSI), Lake Accotink Sustainability Plan, May 31, 2017, page 13.

recommend continued consideration of these proposals. The first option ("Existing Island") would construct a permanent dewatering pad on the existing island. Equipment would be brought to the main island site on barges from the Marina after pre-dredging a pathway due to the amount of sediment in the lake. Mechanical dredging and gravity dewatering would be used, with drying agents to speed the drying process. Once dry, the material would be moved by barge and trucked elsewhere. After dredging, the containment pad and equipment would be removed, and the site left as a cleared gravel area for future dredging operations. Permanently clearing the island without revegetating it is aesthetically undesirable and does not support habitat. Islands that are planted/restored with grasslands or vegetated wetlands are a preferable outcome, with another dewatering location used for maintenance dredging.

The second option ("Expanded Island") proposed constructing a 10-acre land bridge extending north of the existing island to the shoreline. Any dewatering operation could be used with this option. However, figure 6-8 of the Arcadis Report shows three dewatering sites and an access road in what is now open water, wetlands, and forested shoreline. Arcadis proposed reopening a previously built service road from the corner of Hatteras Lane and Queensbury Avenue to access the site. In the Task Force meeting on October 2, 2023, Craig Taylor of LimnoTech said it is possible but inadvisable to place dredged material in this area. Noting that, since this plan would permanently fill in wetlands, it would likely require special permitting and some replacement of the filled-in wetland.

D. Constructing Islands

Cofferdams, turbidity curtains, perimeter stone dikes or rip-rap, geotextiles, vegetation, and erosion mats are some materials used to create islands. Managing water flow, containing sediment, and preventing erosion are primary considerations in the design and construction of islands.

Cofferdams are temporary enclosures built within a body of water to allow the construction to take place in a dry work environment. The Arcadis report stated that "Dredging in the dry was deemed infeasible." However, this was with the assumption of a full dredge rather than island creation, so this will require further clarification. If dry dredging is feasible for this purpose, then a cofferdam can be made by driving sheet piles into the ground to form a continuous wall. Sheet piles are long, interlocking steel sections that create a continuous barrier in the ground to retain earth or prevent water intrusion.

Turbidity curtains or silt barriers are placed in the water to control the dispersion of sediments. They are made of impermeable fabric and are designed to contain suspended particles, preventing them from spreading into the surrounding water.

Stone dikes or Rip-Rap may be used to create an initial containment system around the island's perimeter as a structural element to protect the slope of the island from erosion and undercutting. Stone can be barged to the site and placed by backhoe or crane.

Geotextiles, GeoTubes, and GeoGrids: Geotextiles are used for shoreline protection and erosion control. They are permeable fabrics that allow water to pass through and can be placed

over dredged materials to prevent erosion. Geotextile Tubes, in which dredge materials are pumped into large bags, can be "filled in-place and the sediment left in the geotextile tubes for bank stabilization and other land creation…"[31] GeoTubes can be placed on stream banks or islands, covered with topsoil, and planted with vegetation, creating natural barriers that enhance the ecological value of the constructed island. These are sometimes used on island perimeters but are less structurally resilient. The Arcadis report states that: "Geotextile tubes assume use of hydraulic dredging and slurry transport to the dewatering area."[32] In a full dredge scenario, 5 acres of cleared and flat-graded land is required for processing 950 cubic yards of sediment / day into GeoTubes. While Arcadis indicates that GeoTubes could be processed in place, this requires too much space within the lake area.

Another material used to build up land is geogrids. These are used to maximize the amount of dredge material that can be heaped and shaped into the desired island form. Grid-like materials are placed within the dredged material to reinforce it, providing structural stability, and preventing erosion. Geogrids are used to create elevation variances to support different plant species and to allow for natural water flow and drainage.

D. **Regulatory Considerations**

All State waters that are not groundwater, including wetlands, rivers/streams, and lakes/ponds, are regulated by the Virginia Water Protection (VWP) permit program in the Virginia Department of Environmental Quality (DEQ). Their goals are: No net loss of wetland acreage, no net loss of surface water functions, protect in-stream flows, and protect beneficial uses of state water.

Understanding the regulatory boundaries is a key consideration in the design of any islands within Lake Accotink. Any new landforms created will need to avoid impacts to existing wetlands near the upper reaches of the lake. LimnoTech stated that the wetland-equivalent of a grassland concept at 2-3 feet high would be much easier to approve than creating dry islands, which remove wetlands from the floodplain. A higher hill or plateau area would maximize the amount of dredged material that could be stored within the lake, so perhaps a combination of creating "net new" wetlands, along with elevated islands, could be consiered by regulators.

The Army Corps of Engineers has been using a similar strategy in the Chesapeake Bay since the state of Maryland prohibited dumping dredge material in open water in 1998. To maintain a deep channel for navigation, 42 million cubic yards of dredged material were constructed into wetlands and dry areas to maximize dredge capacity and biodiversity[33]. The once-abandoned Poplar Island is now a bird nesting habitat with guided education and visitor programs.

LimnoTech suggests the FCPA restart the Master Plan process with the community to explore the desired activities, experiences, and outcomes at Lake Accotink Park as a first step for the County to take at this time. Design and engineering for the location, size, and shape of

[31] Arcadis, p. 10
[32] Arcadis, Appendix B, p. 142
[33] Poplarislandrestoration.com; usace.army.mil "Poplar Island Recommended Plan" Chapter 6

landforms, including islands, wetlands, grasslands, and open water areas, would follow. Updating or replacing the existing Marina to include nature education space, in addition to retaining existing amenities and food sales (hot dogs, ice cream, snacks, and drinks) along with a plan for park staffing and volunteer organization support, would greatly increase the overall value of the Park for the County.

A concern from the community is that further delays in continuing the Park's Master Plan process, will narrow the options for Lake Accotink Park. Although sediment accumulation has slowed, it is essential to know how much time remains before options such as islands and open water areas are no longer feasible from a cost or construction perspective. The Master Plan process was halted years ago (in 2018) to await decisions related to dredging the lake. FCPA should restart the Master Plan process, concentrating, for now, on the numerous activities and amenities outside the Park's waterfront features. No matter the final determination of dredging, no dredging, or a hybrid, the land-based aspects of the Park will still exist and must receive planning and maintenance considerations now. It is also imperative that the County make decisions about the future of the Lake soon, as advancing time will eliminate options beneficial to the community.

E. Onsite Dredge Material Processing/Storage Locations

With a smaller lake and the reuse of dredged materials within the lake footprint, dewatering sites should be re-evaluated based on the reduced volume.

Mechanical Dredging and an Onsite "Drying Pit":

While mechanical dredging can be used in the initial creation of wetlands or islands, there are no obvious locations for onsite "drying pits" without impacting existing park amenities. Mechanical dredging uses excavation equipment mounted on a barge, with the removed sediment placed on another barge and moved to a contained area within the lake for dewatering. For long-term maintenance dredging, mechanical dredging would deposit material into trucks and remove it to another location for decanting. Lake Barcroft uses this method and requires direct access to the shoreline and a road.

Three access roads have direct access to the shoreline: Accotink Park Road and Heming Avenue, both of which access the shoreline at the Marina, and the purpose-built service road with its entrance on Hatteras Lane, which provides access to the upper end of the lake for staging equipment and materials. Decanting the spoils in the vicinity of Heming Avenue would impact the upper parking lot, the picnic facility, or the open play area, and trucks would be routed through a narrow road in a neighborhood.

From Lake Accotink Park Road, the locations nearby that could be used to decant the material on site would be the Marina area or the lower parking lot. The industrial park nearby could also be an option (see below for offsite locations). As with Heming Avenue, the trucks would be routed through a neighborhood when the material is eventually disposed of.

Per County staff, dredging would require construction activities to prepare locations for sediment stockpile and dredging operations, equipment staging, a pipeline to transport the slurry

to a stockpile and drying location, and periodic maintenance dredging operations. Staging of equipment and materials in the vicinity of the Marina can occur through the park and enter the park via Accotink Park Road. Some smaller loads could come from the Heming Avenue entrance, but the narrow, steep road from that area down to the Marina would likely limit the load size. Staging equipment and materials in the upper end of the lake can occur via the service road that enters the park near the intersection of Queensberry Avenue and Hatteras Lane, used during the installation of the 54-inch sanitary sewer across the lake bed in 1967. This access route may require maintenance or repair to carry loads expected during dredging operations.

Upper Settling Basin:

The upper settling basin was used in 1985 to store dredged materials from the lake permanently. One remaining "cell" of the original three is open closest to the Danbury Forest townhouses. This site is within the park boundaries and directly adjacent to the lake but at a significantly higher elevation, without direct access to the shoreline. Dredge material mechanically dredged would need to exit the park from the Marina area and be trucked to the other side of the lake via Rolling Road. Hydraulic dredging is more feasible for this location and would involve a relatively short pipeline to pump the slurry to the site for dewatering.

There are several drawbacks to this site, however, in addition to the roadway adequacy. A sinkhole is developing on the site from failing drainage. The Arcadis report states that the FCPA must repair this drainage issue, and using the basin presents an opportunity to do so. There are additional concerns that the berm may not support the weight of additional dredged materials, so this would require evaluation. There are known cultural resources in this area, as there are at the Wakefield Park locations. This site would not be desirable as a long-term dewatering and storage site, so the cost/expense for "one-and-done" dredge storage may be too high, especially as the forest has revegetated over the past decades, providing quality wildlife habitat that would again need to be reforested. The FCPA does not support the use of this site.

F. Offsite Dredge Material Processing/Storage Locations

Once a mass/balance analysis is performed to estimate sediment volumes of the various alternatives for the lake, and depending on the alternative selected, there may be a need for an offsite location to process excess sediment or for maintenance dredging. Sites outside Lake Accotink Park and pipeline routes were analyzed in the Arcadis Report in section 7.2, "Combined Dewatering Sites and Pipeline Locations," on pages 39-48.

While the subcommittee did not analyze the sites in detail, it did have these comments for consideration:

Wakefield Park Maintenance Facility:

The subcommittee has concerns that the use of the Wakefield Park maintenance facility for dredge processing would have significant negative impacts on parkland. Only one acre of the site is currently developed for the maintenance facility, while seven additional acres of healthy, mature forested parkland would be permanently cleared and graded to support dewatering operations, water treatment facilities, and truck circulation in a full-dredge scenario. An 8"

pipeline would be buried a long distance, over 12,000 linear feet, along the Gerry Connolly Cross-County Trail (CCT). This section of the CCT was asphalted in recent years with Park bond funding, so construction/reconstruction of the trail would not benefit this asset, and trees along the entire route may need to be removed to accommodate construction equipment.

Industrial Sites:

The subcommittee questions a site that was eliminated from consideration in the Arcadis report. It is located in the neighboring industrial park on Southern Drive, a thousand feet from the Lake Accotink Marina. This site is the closest location to the lake, has a fully functional road, and is zoned I-5, heavy industrial. The Arcadis report indicates a "no" decision point when land the County does not own requires significant clearing. There is no distinction between land that is forested parkland and land that could be cleared by-right for uses permitted in the Zoning Ordinance. Clearing industrial land should not be a criterion for elimination from consideration. Under a full-dredge scenario, the number of trucks traveling through the Crestwood neighborhood is excessively impacted, but this should be further evaluated in a reduced-dredge scenario.

Finally, County leadership should approach Vulcan Industries to seek their reconsideration of hosting the processing operation at their site, with reduced space requirements.

G. Water Trails

"Water Trails" have been established throughout the United States to engage the public in education, conservation, and recreation on waterways. Most are on longer stretches of water, like the Potomac River. However, smaller examples in a lake setting have been voluntarily registered with the National Park Service, which tracks these for public benefit.[34] Establishing a water trail at Lake Accotink would require designing and constructing the islands or wetlands, or a combination, to allow for kayak passage and accounting for possible channel migration or siltation changes over time. Incorporating sustainability into the design is key to avoiding the need for maintenance dredging. Best practices for water trails include providing routine and long-term maintenance, signs or maps, education, and partnership agreements to ensure long-term commitment from the community.

VI. EVALUATION OF CRITERIA FOR MIXED OPTIONS

This evaluation considers the range of options presented in this report, focusing on a smaller lake, and retaining sediment within the park to the extent possible, with islands, wetlands, grasslands or a combination of these options.

Sustainability: Retaining dredge materials within the lake system is "high" for sustainability because it reuses the material onsite.

[34] www.nps.gov/subjects/nationaltrailsystem/national-water-trails-system.htm.

Cost: The cost of island construction requires more information for a fair comparison, but it is likely to be a high cost and would rank "medium" or "low." In terms of miles traveled, this has the least mileage due to the volume of material used onsite and the least amount of transportation/trucking. Initial and subsequent dredging would be a lower variable cost for processing and disposal, which makes up over 1/3 of the costs of a full dredge. This alternative would be ranked "high" (less cost) for transportation costs.

Ecological: From an ecological standpoint, adding wetlands to Lake Accotink's open water area would be rated as "high" as water quality would be improved, particularly as wetlands are "hot spots" for biodiversity, with 40% of all species living or breeding in wetlands. Island expansion rates lower in ecological value than wetlands in terms of environmental impact since they essentially "fill in the floodplain," which could also be more difficult from a regulatory standpoint. The sediment in the lake is not "new fill" added to the floodplain so that regulators might view it less negatively. In previous options presented by Arcadis, this option ranked "low" for the "restoration" subcategory because a permanent, cleared dewatering pad remained on the island.[35] The subcommittee envisioned restoration of in-lake islands, creating new wetlands or dry grasslands, and not permanently locating dredging operations within the lake so that vegetated islands would rank "medium." Placement of sediment in GeoTubes could be employed to restore stream banks and provide additional plantings on shorelines. This protects stream banks from wave action and bank scouring, and rates "high."

Arcadis ranked expanding islands or shorelines also as "high" for sustainability and cost (meaning it would be less cost) and "low" for park management and community categories, stating: "The island expansion would result in limiting access to the area of expansion during dredge material placement and dewatering. The island expansion would convert a portion of the lake to land, eliminating the possibility of aquatic recreation in this area."[36] Arcadis also ranked bank stabilization as "medium" for the community category because it "limits park use of the bank restoration area during restoration." As with stream restorations, there is very little expectation of access to the area during construction activities, so this rating may not be relevant to the long-term condition of the lake. Keep in mind that the restrictions to access in construction areas are temporary and should be discounted from a long-term loss of recreation opportunities. A "low" ranking for aquatic recreation with a smaller lake is valid but has the potential to be "medium" if it is designed for water trails for kayaking, for example. These areas would likely require maintenance dredging over time, along with the deeper pools.

Other environmental criteria for retaining the sediment within the lake system as islands, wetlands, grasslands, or a combination of these options are:

Water Quality - highest with wetlands, high for grasslands, and medium for islands.

Habitat – high for all scenarios designed to restore habitat to the lake.

Biodiversity - highest with wetlands, high for grasslands, and medium for islands.

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[35] Arcadis, Exhibits, Exhibit 3, Disposal Method Evaluation, page 1.

[36] Alternatives Analysis Report, Lake Accotink Dredging Project, Arcadis, Project # SD-000041-001, July 12, 2021, p. 14

Fisheries - highest for providing deeper pools through dredging part of the lake, benefiting fish who need a variety of water depths, especially deeper water in colder months. Also ranking high is any option allowing fish movement from below the dam, including dam removal or fish ladders. Wetlands also support fisheries by providing places for hatching, food, and protection.

Aquatic vegetation - highest with wetlands.

Dam – Low. In any scenario where more sediment is stored within the lake and an open area dredged, the life of the lake is extended, according to LimnoTech, however, the infill becomes more challenging in the future. The surface area for islands runs out and annual maintenance dredging may be necessary, which could be expensive. In addition, at some point in the future, the dam will reach the end of its service life and it will be more challenging to remove a large amount of sediment in the lake. A more detailed review of dam removal was not explored in this Subcommittee's report.

Flooding potential – Medium. Landforms within Lake Accotink would need to demonstrate to regulators it will not impact flooding, which may determine the size or extent of islands.

Aesthetic value – Mixed. Maintaining Lake Accotink as a lake, even a smaller one, provides water views that are pleasing to people, so providing areas of open water is desirable. Using the surface area for additional islands could enhance the view if planted with a variety of pollinator species that bloom throughout the growing season. These areas will attract insects and birds and provide nesting areas for birds, providing additional aesthetic value to people. The aesthetic value of the existing lake or a smaller one with islands is very subjective. When the island from a previous dredge filled in with vegetation, the community responded with mixed opinions of whether it visually enhanced the lake.

Recreation – Mixed. Maintaining Lake Accotink as a lake provides opportunities for boating, fishing, bird-watching, and photography, and provides a focal point that draws people in to walk, run, bicycle, picnic, and play games such as mini-golf and ride the carousel. A smaller open water area may reduce aquatic recreation; for example, there may not be enough room for paddleboats, but it could provide additional opportunities for kayaking.

Equity – High. Keeping as much sediment as possible within the lake without compromising the value of the lake, reduces truckloads of sediment through communities. The Lake is an attraction to many nearby communities with higher poverty levels in the County. Continuing to involve these areas to learn their perspectives on alternatives is essential.

Educational Benefit - Reaching out to the elementary school community to provide opportunities for engagement, education, and fun should be a high priority for the FCPA and FCPS with expanded school-day programs and weekend family programs at Lake Accotink Park, especially to the nearby Crestwood, Lynbrook, North Springfield, Ravensworth, Kings Park, and King's Glenn Elementary Schools.

CONCLUSIONS

These findings are not intended to be exhaustive, nor do they represent one integrated plan. They are a menu of options. However, the Subcommittee found tremendous common ground when discussing these options. They are highly compatible. Together, they represent a range of options superior to the singular, no-dredge option in every respect: sustainability, environmental, community, social, recreational, and equity. They may represent considerable cost savings to the full dredge option.

The Subcommittee specifically declined to design a singular mix of a specific smaller lake size, wetlands size and type, and grassland size and type. Each option affects the need for or ability to exercise other options. The larger the lake is, the more dredging that is required, and the less land is available for a wetland or grassland. Net loss of wetlands appears to be prohibited by applicable regulations. Different combinations of wetlands and grassland size and type have different benefits and drawbacks. The Subcommittee believes its task was to identify options. It is left for others to study the options and make the ultimate decisions.[37]

The Subcommittee does not find that DPWES's requirement of an off-line lake is supported and does find that LimnoTech's analysis of lake options seems well-supported.

Further, the Subcommittee finds that the County must move forward quickly in its decision-making process before further sedimentation in the lake negatively affects the feasibility of these options. The Subcommittee hopes the County will continue to involve the community in its ongoing assessment of the future of the Lake.

[37] Lake Accotink is considered a recreational amenity, not a stormwater facility, and this distinction seems to have been a significant driver behind the DPWES analysis. The County may be well-advised to consider whether designating the Lake as a stormwater facility would allow it to avail itself of additional resources and expand available options for the preservation of the Lake. Such an analysis is beyond the scope of our Subcommittee's work.