



October 2022
Arrowhead Cove Sediment Removal at Deep Creek Lake



Restoration Plan

Prepared for Maryland Environmental Service

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Maryland Environmental Service
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ABBREVIATIONS

abbreviation	Definition
DNR	Maryland Department of Natural Resources
Lake	Deep Creek Lake
SAV	submerged aquatic vegetation

1 Introduction

This Restoration Plan was developed to outline details associated with restoring upland and in-water areas impacted by construction activities associated with dredging sediment accumulated within Arrowhead Cove in Deep Creek Lake (Lake) located in Garrett County, Maryland.

The Lake was constructed in 1925 with a surface area of approximately 3,900 acres and a storage capacity of 106,000 acre-feet (WBCM 2013). Over the years following construction, significant sedimentation has occurred in the many coves of the Lake, degrading water quality and negatively impacting recreational access in some areas. Through a series of studies and evaluations, dredging of accumulated sediment within Arrowhead Cove was selected as a beneficial way to improve recreation and public access by increasing water depth in the shallow water areas of the cove. To date, a 60% Design for dredging of Arrowhead Cove has been completed and continues to be advanced to support permitting requests. Additional funding was secured to continue the project design process and resolve remaining permitting details, with a Final Design anticipated in late 2022 and construction over the winter of 2023. This report summarizes the approach to restoring the upland staging area and in-water dredging area following construction.

The preliminary design includes removal of approximately 15,000 cubic yards of sediment from the westernmost areas of the cove. Dredging will occur in the winter when water levels within the lake are lowered, the majority of the dredge area will be fully dewatered at the lowest water levels within the operating rule band, allowing regular construction equipment access to excavate the targeted sediment in the dry. Material removed will be transported to a temporary staging area constructed on the adjacent open property, stockpiled, allowed to free drain any retained water, and then transported offsite for disposal. To facilitate the dredging work, the staging area (approximately 1.35 acres) is being proposed to be constructed on both DNR and private landowner property south of Arrowhead Cove off Glendale Road. This staging area would allow for equipment access, staging of site facilities, conducting sediment dewatering and water collection, and stockpiling of sediment prior to transport of material offsite. Following completion of dredging, the staging area will be restored to preconstruction conditions.

2 Upland Restoration

The staging area located on the upland property will be impacted during the full duration of the project work and will require restoration after the project is complete. The staging area was selected to limit impacts to forested areas, wetlands, or other critical habitat areas and is comprised of primarily open mown grass field and an access route through a narrow riparian strip. The contractor will grade the existing soil to establish a generally flat working area for equipment storage and an area with a slight positive grade to promote water collection during sediment stockpiling and dewatering. Following grading, a geotextile layer and aggregate material will be placed as a working surface for construction equipment, with the disturbed area protected from runoff using silt fence and super silt fence around the perimeter. A 20-foot wide access point to the lake will be cut through existing riparian brush where an access road will be constructed using temporary construction mats – the access point was selected at a location where no trees occur along the bank.

Following construction and removal of all equipment from the lake, the access road mats will be removed and the access path regraded to original conditions. Disturbed soils will be temporarily stabilized until the spring planting season when riparian plantings can be installed. When weather is acceptable for restoration planting, a mix of riparian species selected from similar species in the area will be utilized to restore the 20-foot pathway through the riparian zone from the staging area grass field to the lake, an area of approximately 340 square feet of disturbance. Shrubs will be planted at a 2:1 mitigation ratio in clusters of 3 shrubs; based on existing area of impact, a total of 15 shrubs will be planted to restore the area. Previous forest stand delineation work also identified mixed tree species containing Silky Dogwood, Buttonbush, and Winterberry which will be planted 6' x 6 feet on center. Additional tree planting within the grass field area adjacent to the current riparian forest and brush footprint will include 20 additional trees planted near the north portion of the staging area. Trees selected for replanting are Eastern Redbud, Red Maple, Tulip Poplar, and Northern Red Oak and will be planted in 5 gallon root balls and 5 feet in height planted 15' x15' on center. Table 1 summarizes the brush and tree planting species and sizing. Maintenance of plantings will follow supplier recommendations within the plant warranty period. For a period of two years following the restoration, the County will perform annual monitoring of the restored vegetated upland area and will replant as required to ensure 75% survival of the plants installed during the restoration.

The remainder of the staging area will be completed after all sediment is removed from the project area, import materials are removed, and the majority of equipment and storage is removed from the site. The staging area footprint will be regraded to restore the lawn to preconstruction grades. The area will be seeded for grass to restore the preconstruction conditions – seeding may occur by hydroseeding or by dry seeding protected by straw mulch. Seed mixture will be selected to match existing species where feasible using turfgrass mixture and may contain a mix of Kentucky Bluegrass, Perennial Rye, or Tall Fescue following standard Maryland Standards and Specifications for Soil

Erosion and Sediment Control species mixes and application rates. Seeding is anticipated to occur in the late winter or early spring following construction activities. Care and maintenance will follow manufacturer recommendations. Refer to drawings AC3 and SC2 for additional details.

Table 1
Summary of Proposed Planting Species

Common Name	Wetland Indicator	Quantity	Size
<u>Trees:</u> Spaced on grid buffering forest			
Eastern redbud	FACU	6	5 gal./5 feet
Red maple	FACU	4	5 gal./5 feet
Tulip poplar	FACU	4	5 gal./5 feet
Northern red oak	FACU	6	5 gal./5 feet
Total:		20	
<u>Shrubs:</u> Planted in same-species clusters of 3 shrubs			
Silky dogwood	FACW	3	1 gal.
Buttonbush	FACW	6	1 gal.
Winterberry	FACW	6	1 gal.
Total:		15	

Notes:

FACU= Facultative Upland Plants

FACW= Facultative Wetland Plants

Gal=Gallon

3 Aquatic Restoration

SAV is a critical component of lake ecosystem processes. In general, SAV provide the following benefits:

- Generate food and habitat for waterfowl, fish, and invertebrates. Many components of the plant structure such as seeds, tubers, and even the leafy vegetation are a major source of food for a variety of organisms found in lakes. The leaf and stem structures of underwater grasses also provide excellent habitat and nursery sites for species such as juvenile fish and minnows.
- Release oxygen. During photosynthesis, plants utilize sunlight and water to convert carbon dioxide (CO₂) from the atmosphere into organic material that can be used by the plant. Oxygen, essential to other underwater organisms such as fish, is a byproduct of this process.
- Inhibit wave action that erodes shorelines. In healthy grass beds, dense plant structures including leaves, stems, reduce wave action and root systems hold bottom sediments in place.
- Remove sediment from the water column. Inhibiting wave action allows grasses to filter and trap sediment from the water column that would otherwise bury organisms on the bottom and cloud the water column.
- Absorb excess nutrients. During photosynthesis, plants utilize sunlight and water to convert carbon dioxide (CO₂) from the atmosphere into organic material that can be used by the plant. During photosynthesis plants require the uptake of nutrients, nitrogen and phosphorus in particular, that may fuel the growth of unwanted algae in surrounding water.

Arrowhead Cove, the site of the dredging project, has numerous SAV species. The majority of the project area for dredging the approximately 15,000 cubic yards of sediment has little to no SAV currently, and the dredging is not expected to significantly impact existing SAV beds. SAV growth in the project area is limited due to very shallow depths that are currently exposed in fall through winter when lake water levels are lowered after the recreational season through dam releases. The increased water depth due to dredging should provide increased habitat for native SAV species to survive and thrive, providing additional fish habitat.

Maryland Department of Natural Resources (DNR) implemented a Deep Creek Lake SAV monitoring program in 2010. As part of the SAV monitoring program, SAV transects were set up in various areas within the DCL. SAV transect data from Arrowhead Cove prior to 2018 found the following species: *Sagittaria*, *Najas flexilis*, *Myriophyllum* (spicatum probably), *Elodea*, *Vallisneria americana*, *Potamogeton vaseyi*, *Potamogeton pusillus* and *Hydrilla*.

In 2018, DNR began treating Arrowhead Cove with Sonar Aquatic Herbicide (https://dnr.maryland.gov/publiclands/documents/DCL_sonarsafety.pdf), an herbicide with negligible risks to humans, as part of a larger *Hydrilla* eradication program that began in 2014 after the discovery of *Hydrilla* in some of the lake's southern coves in 2013. *Hydrilla* was first identified in

Arrowhead Cove in 2017. It is hoped that dredging Arrowhead Cove will potentially remove any *Hydrilla* tubers that are in the dredging footprint and allowing for restoration with native species.

3.1 SAV Planting

The Arrowhead Cove SAV restoration effort will include two methods. The primary restoration effort will focus on transplanting native *Vallisneria* SAV into the dredged area. Transplanting *Vallisneria* has had increased success based on previous SAV restoration efforts performed by DNR. In addition to transplanting *Vallisneria*, transplanting other SAV species such as *Elodea* and *Potamogeton*, using whole plants, will be evaluated. The secondary restoration effort will include a small seed collection, processing, and reseed component to supplement transplanting whole plants.

Whole plant transplanting will occur in late spring/early summer (June and July) 2024, after dredging has been completed. Collection sites for plants and seeds under consideration will be Arrowhead Cove, McHenry Cove, and potentially other adjacent coves depending on extents and species identified during the restoration operation. Harvesting from an existing bed is a preferable method of sourcing native species compared to separate nursery facility options as they do not require additional time to acclimate to localized conditions and tend to experience fewer plant losses due to plant system shock. Plants will be collected on one day by multiple divers, stored on site, and then transplanted the next day, if possible. All required authorizations will be secured in advance of any SAV plant and/or seed harvesting and transplanting.

For reseed SAV, seed collection would be conducted in the fall (mid-late September) 2023, prior to the actual Arrowhead Cove dredging. Seeds will be processed and stored over the winter. Reseeding of the dredged area will be conducted in late June/early July 2024, post dredging. Seeds will be spread by shallow draft boat access within the cove and additional methods, such as seed bags, will be evaluated for implementation.

Approximately 1,000 plants will be collected for transplanting from existing beds within Deep Creek Lake. The SAV plants will be planted in a random pattern of founder plots that will contain a target range of 40-60 plants per plot, providing a minimum of 17 total founder plots spread across two planting areas. The proposed species for SAV planting is *Vallisneria Americana*, commonly referred to as Wild Celery, for higher rates of planting success, local plants will be sourced and replanted within the project footprints. Each founder plot will be planted in an approximate square dimension of 3.5' x 4.0'. SAV will be planted with an approximate 6 inch spacing (1.0 foot spacing may also be considered as a suitable spacing option depending on local water depths and post-dredging conditions) and will consist of multiple founder plots spaced between 12-20 feet apart. This approach was selected to achieve a larger footprint of SAV replanting given founder plots will propagate through propagules and seed dispersal in subsequent seasons. Founder plots also provide a simple application for replanting SAV that can be easily monitored and protected as needed. SAV

will be replanted in the northern and southern dredged areas adjacent to the shorelines of the cove near where existing SAV has been identified and currently existed. Most of the proposed dredge area does not currently support SAV as it is too shallow and consists of exposed mud flats during low lake water levels; extents of SAV planting were limited to elevations that would be submerged all year round following dredging. Natural SAV expansion is expected to occur in this area over time, given the additional water depth and founder SAV plantings. Refer to drawings AC3 and SC2 for additional details. Refer to drawings AC3 and SC2 for additional details.

The SAV restoration effort will be coordinated with the Maryland Department of Natural Resources, Resource Assessment Service staff.

3.2 Shallow Water Habitat

Shallow water habitat includes areas that fish and other aquatic organisms need for concealment, breeding and feeding. This can include large woody snags, boulders, rock ledges, undercut banks, overhanging vegetation, brush, and tree roots found along stream banks and in the shallow edges of lakes.

Deep Creek Lake contains many coves, which provide valuable shallow water habitat for the abundant fish species in the lake. Arrowhead Cove has experienced significant sedimentation since the lake's construction, resulting in minimal hard-structure fish habitat. Additionally, there are many times of the year, when the lake water levels are low, that the bottom is exposed and the Cove exhibits characteristics of a mud flat, rather than shallow water habitat. In addition to deepening the overall water depth of Arrowhead Cove three additional rock piles or rock clusters will be constructed for new fish habitat. These structures will be constructed near the SAV replanting areas to provide additional shallow water habitat. Each of the features will be comprised of locally sourced stone with diameters that vary with larger stone between 18" to 24" inches thick. Each pile shall be placed to diameter of 3 to 4 ft and to height of at least 3 ft. Refer to drawings AC3 and SC2 for additional details.

The dredging in Arrowhead Cove will result in increased water depth providing more consistent shallow water habitat throughout the year and fewer times of the year when the bottom is exposed, thus providing more consistent fish habitat.

Previous evaluations of the Cove found that there were several stumps in the dredging area, but no other hard structures that could be beneficial for fish protection and spawning. During the dredging operations, if stumps, boulders or other hard structures are found, efforts will be made to either leave them in place or temporarily remove them and return them to a location in Arrowhead Cove where they would not pose a hazard to navigation.

4 References

MDE 2011. *2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control*. Maryland Department of the Environment. 2011.

WBCM (Whitney Bailey Cox & Magnani, LLC), 2013. *Deep Creek Lake: A Sediment Study*. December 2013.