



Figure 1. Proposed layout of the future 31-acre Hydaway Lake. Estimated time of completion is Fall 2022.



Figure 2. Current 6-acre Hydaway Lake area



Figure 3. Current 41-acre Stonehouse Lake area

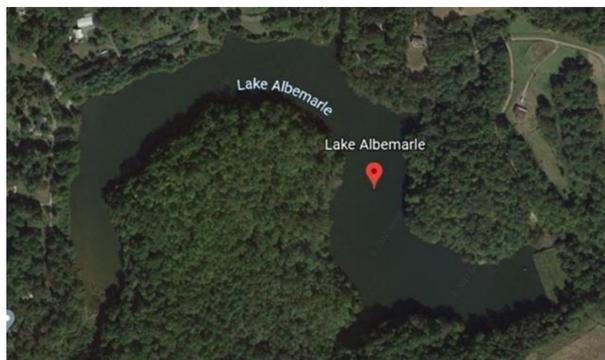


Figure 4. Current 35-acre Lake Albemarle area



Figure 5. Largemouth Bass, *Micropterus salmoides* as seen at Hydaway Lake (Beasley, D., n.d.).



Figure 6. Belted Kingfisher, *Megasceryle alcyon* as seen at Hydaway Lake (Sibley, D., n.d.).

## Introduction

Dam implementation and removal can greatly alter wetland ecosystems. Dam implementation causes a lotic system and removal does the opposite. In relation to fish, dam implementation reduces range, abundance, diversity, genetic mixing, and creates a barrier to dispersion and migration (Korris et al., 2015).

By increasing the size of the lentic environment above the dam, the avian community is often positively impacted as avian diversity and abundance increases with lake area (Paszowski & Tonn, 2000). Much research has been done investigating the impacts of dam implementation and removal, but little has been done in terms of the impacts of lake expansion via dam replacement.

## Objectives

Opossum creek has historically been a forested creek area with plenty of shade and detritus for the creek community. However, because of the Camp Hydaway lake expansion project currently underway, a large majority of the forest around opossum creek has been clear cut for construction purposes.

This study seeks to determine the effects that dam removal and replacement have on the aquatic and avian populations at Camp Hydaway Lake by comparing that location to two lakes that are of similar size to what the expanded Camp Hydaway Lake will eventually be. To compare the differences that have already occurred due to the clear cutting at Camp Hydaway, a survey of the current fish community above and below Camp Hydaway dam will be compared to historical data of the community prior to the area being clear-cut.

## Broader Impact

Conservation of wetlands has been a topic of environmental debate for decades. Our study will offer greater insight into how construction and development around and on existing wetlands influences species diversity, especially of vulnerable or rare species. Predicting how the species diversity of waterbirds and fish will change due to lake expansion can be useful for mitigating any potential effects as construction progresses, and in guiding future similar projects.

## Methods

To assess the impacts of expanding Camp Hydaway Lake from 6 to 31 acres (Liberty University), we will be surveying Camp Hydaway Lake and Albemarle Lake (35 acres) and Stonehouse Lake (41 acres) which are similar to the post-construction size of Camp Hydaway Lake

- For the avian community, the study will be focused on the waterbirds on or actively engaging with the lake.
- Fish data will be collected by electroshocking Camp Hydaway Lake upstream and downstream of the current dam, as well as at the location of the future dam and the lengths of any sunfish, crappies, and largemouth bass caught will be measured.
- Bird point count surveys will be conducted at all three locations near sunrise or sunset when waterbird activity is highest, and the surveys will last 30 minutes each (Clipp et al., 2017).
- Historical fish data for Camp Hydaway Lake collected by Liberty University and data for the other two lakes collected by the Virginia Department of Wildlife Resources will be used as well as historical bird data from the Cornell eBird database.
- Species composition between lakes will be compared using diversity indices of both the Morisita's index and Shannon Diversity Index

## Expected Results

- With an increase in lake area, there should be an increase in diversity of both fish communities and waterbird species
- The communities described at the current Hydaway Lake should be smaller or less diverse than the communities described at Lake Albemarle and Stonehouse Lake
- The communities described at Lake Albemarle and Stonehouse Lake should be similar, as the lakes are compatible in size and species occurrence
- Upstream of Hydaway Lake and downstream of Hydaway Lake should present different fish communities, as well as the new location for the dam
- The fish community is expected to change in regard to the dynamic of predators/prey species and tolerance levels
- With larger lake size, there will be an expected increase in wintering waterbirds and piscivores, while residential species and migratory birds may occur in similar numbers

Morisita's Index

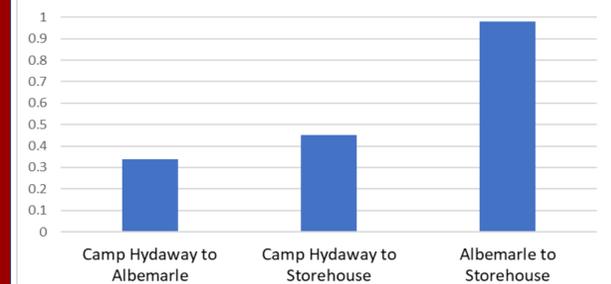


Figure 7. Demonstration of Morisita's Index completed with theoretical data

Shannon Diversity Index

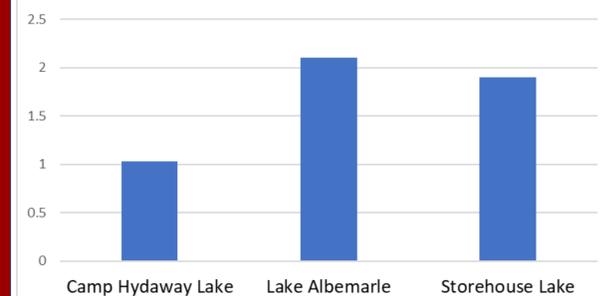


Figure 8. Demonstration of Shannon Diversity Index using theoretical data

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