Restoring Native Aquatic Vegetation in Little Bear Creek Reservoir for 2007

An Annual Report to the Little Bear Creek Millennium Group, Phillip Cooper, and Alabama Wildlife & Fisheries

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February 11, 2008

GeoResources Institute Report 4004

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INTRODUCTION

The Little Bear Creek Reservoir is a 1452 acre (587 ha) impoundment located in northwestern Alabama and is managed by the Tennessee Valley Authority (TVA). Along with Bear Creek, Upper Bear Creek, and Cedar Creek Reservoirs, Little Bear Creek reservoir helps to provide flood control for northwestern Alabama. Little Bear Creek Reservoir provides recreational opportunities in the form of camping, fishing, and numerous other water related activities. Little Bear Creek Reservoir is a prime black bass fishery in northern Alabama. The remnant flooded timber that once served as habitat for the fishery is in decline and needs to be replaced with a self-renewing habitat for forage fishes and young-of-the-year bass. The best replacement for the flooded timber would be a diverse community of native aquatic plants, such as American pondweed (*Potamogeton nodosus*), and water celery (*Vallisneria americana*) (Smart et al. 1996). Currently, native vegetation in the reservoir is scarce which is problematic when trying to establish a productive fishery (Kilgore et al. 1989).

OBJECTIVES

Our objective for 2007 was to identify and successfully cultivate approved submersed aquatic plant species for habitat enhancement in Little Bear Creek Reservoir. The results of this pilot study are included in this report.

METHODS AND MATERIALS

Enclosure Study

Submersed aquatic plants were planted in 3ft (1m) diameter enclosures made of plastic mesh & re-bar. The enclosures were placed in the littoral zone in two arms of reservoir. These arms, Cooper's Branch and Trace branch are located along the northern shore of the reservoir (Figure 1). Plantings consisted of American pondweed (*Potamogeton nodosus*), leafy pondweed (*Potamogeton foliosus*), northern & southern ecotypes of water celery (*Vallisneria americana*), waterstargrass (*Heteranthera dubia*), and sago pondweed (*Stuckenia pectinata*). Plants were first planted on May 14 and 15, 2007 and again on July 26 and 27, 2007. The May planting comprised twenty-four enclosures being planted at random within the littoral zone in Cooper's Branch and Trace Branch. Each enclosure had 2 pots of each species. Plants were cultivated in the greenhouse at the R.R. Foil Experiment Station in Starkville, MS. Once established and 24 to 36 inches long, they were transplanted to Little Bear Creek Reservoir for planting. The July planting consisted of twelve enclosures per branch. Each enclosure contained 4 pots of a given species, however this trial only consisted of sago pondweed (*Stuckenia pectinata*), the northern ecotype of water celery (*Vallisneria americana*), and American pondweed (*Potamogeton nodosus*). Data were pooled and a One-way Analysis of Variance (ANOVA) was used to determine differences in species survival at a $p<0.05$ level of significance.

RESULTS

Enclosure Study – Spring Planting

All of the plants that were planted during May resulted in 100% mortality with the exception of American pondweed and southern water celery (Figure 2). Eight enclosures from Cooper's Branch and twelve enclosures in Trace Branch had surviving populations of American pondweed. One enclosure in Trace Branch had one pot of southern water celery that survived, but did not expand. The other submersed aquatic plant species; leafy pondweed, northern & southern ecotypes of water celery, water stargrass, and sago pondweed, all died in the remaining enclosures in Cooper's Branch and Trace Branch.

Enclosure Study –Summer Planting

The July planting had similar results to those in May. American pondweed survived in all of the enclosures in both Cooper's Branch and Trace Branch. However, none of the sago pondweed and northern ecotype of water celery survived (Figure 2).

DISCUSSION

Re-establishment of native aquatic plants is a technique used to restore aquatic habitats in the southeastern US (Smiley and Dibble 2006). Aquatic plant community restoration efforts have been looked at in Lake Guntersville, Alabama as well as in Oklahoma, and Texas (Dick et al. 2004, Doyle and Smart 1993). Establishment of aquatic plant communities can have positive effects on water quality as well as provide habitat and sanctuary for fish fauna (Dibble et al. 1996). Successfully cultivating submersed aquatic vegetation in Little Bear Creek has been problematic thus far with difficulties being attributed to fluctuating water levels and high water temperatures. Despite the hardships we have faced, one important thing to note about sago pondweed is that it is a tuber producing plant. Sago pondweed develops subterranean structures, called tubers, prior to and during plant senescence. Tubers provide new plants with the necessary carbohydrates needed to initiate growth in subsequent growing seasons (Hodgson 1966). Tubers may also serve as a mechanism to aid in plant survival during adverse environmental conditions. Tubers planted during this trial may have survived the times of low water as well as the times where water was absent. Assessment next year will show its survival if there is adequate water available in the planting locations.

We had success cultivating American pondweed. Of the five species approved to be planted in the Little Bear Creek Reservoir, leafy pondweed, northern and southern ecotypes of water celery, waterstargrass, and sago pondweed did not survive. Water depth plays a key role in the success of these submersed macrophytes (Chambers and Kalff 1985). The spring trial was planted in water that was too shallow, and was exposed to air once the water level dropped to mid-summer levels. With the plants being in shallow water, water temperature then becomes a significant factor impacting plant growth (Pilon and Santamaria 2002). While increased water temperatures can result in an increase in overall biomass of sago pondweed (Barko et al. 1982, van Dijk and van Vierssen 1991, van Dijk et al. 1992), they can negatively impact photosynthesis (Spencer 1986, Madsen and Adams 1989, Pilon and Santamaria 2002), tuber germination (Scheffer 1998) and shoot elongation (Spencer 1986, Madsen and Adams 1988).

Little Bear Creek has the potential to support a submersed aquatic plant community with initial success using American pondweed. This restorative effort needs to account for the failures from the past and use those to guide future plantings. For 2008, efforts might focus on planting enclosures with American pondweed as the primary species due to its successful growth in 2007, as well as monitor the previously planted enclosures for regeneration. Plantings will continue in the same style of enclosure or may be able to institute a larger enclosure with the possible use of larger enclosures that may afford the new plants more freedom to expand along the substrate.

FUTURE WORK

- Continue planting enclosures of American pondweed.
- Promote the expansion of submersed aquatic plant growth through larger enclosures in more locations throughout Little Bear Creek Reservoir, including deeper water areas.
- Continue to monitor existing, successful enclosures to assess expansion.
- Implement and assess new techniques for cultivating submersed aquatic vegetation in Little Bear Creek Reservoir.
- Assess feasibility of water willow (*Justicia americana*) cultivation on Little Bear Creek Reservoir.
- Evaluate potential enhancement of habitat for fish.

ACKNOWLEDGEMENTS

Funding was provided by the Little Bear Creek Millennium Group and Mr. Phillip Cooper. We would like to thank the Bear Creek Development Authority, Alabama Wildlife and Freshwater Fisheries for assistance. In addition, we would like to thank all of the volunteers who helped out prior to and during this study in helping us build and plant the enclosures.

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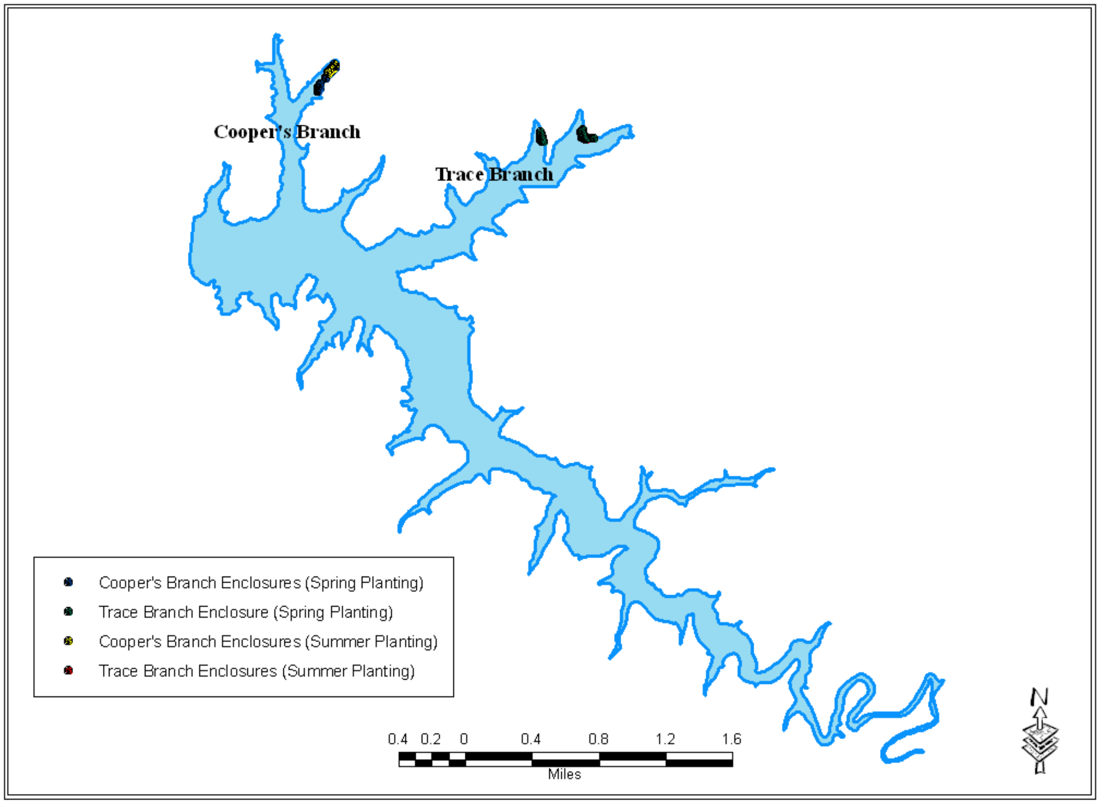

Figure 1. Enclosure locations on Little Bear Creek Reservoir 2007.

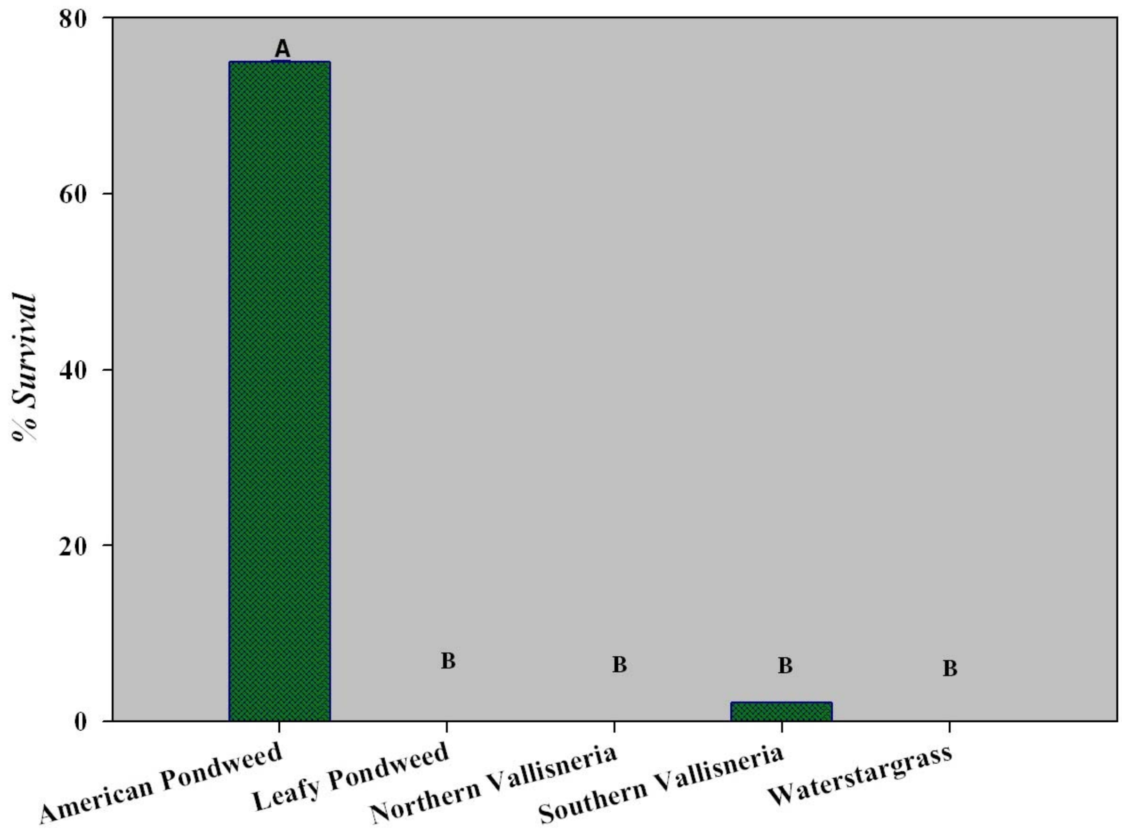

Figure 2. Percent survival of five submersed aquatic macrophytes planted in the enclosures for 2007. Mean survival is significantly different by ANOVA at the $p<0.05$ level if means have different letters.