

BASELINE SURVEY OF AQUATIC PLANTS
LAKE MURRAY, SC
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2007 Aquatic Plant Survey Lake Murray, South Carolina

Introduction

A baseline study of submersed and emergent aquatic plants in Lake Murray was conducted from mid-September to early October this year. Nearly 1,000 sites were sampled and evaluated, and over 1,300 photographs were taken.

The purpose of the survey this year was to gather data on the vegetation in more than 975 sample areas that have been established since 1987. All the information gathered in the past 20 years has been compiled into a database that provides current as well as historical data. Due to the introduction of exotic and/or nuisance species such as Brazilian elodea, water primrose, slender naiad, hydrilla, Illinois pondweed, slender pondweed, wild taro, popcorn tree and rattlebush, dramatic changes in the aquatic plants have occurred in the past 20 years. These introductions combined with herbicide treatments, water level fluctuations and the introduction of 64,500 grass carp have resulted in a different and changeable aquatic flora.

Background

Until the mid-1980's, no major aquatic plant problems were known to occur in Lake Murray. It's highly likely that alligator weed and perhaps water primrose were common in the upper part of the lake, but the larger, lower area had little to no vegetation, other than native wetland species. These species would colonize the drawdown zone in the late summer and fall with the lowering of water levels each year. The late winter and spring rains would then usually restore the higher water levels in the reservoir.

Although not documented in reports or collections, the only known submersed plants in the lake in the 1970's were those of a type of macroscopic algae called muskgrass (*Chara*). Muskgrass at one time was somewhat prevalent in many areas of Lake Murray, growing in up to about 10 feet of water. It's readily identified by its unpleasant odor. It's quite likely that 'Stinking Creek,' located on the north side of the lake in the Chapin area, received its name from the fairly large amount of muskgrass that grew there. Other than

muskgrass, freshwater mussels were plentiful. Over the years, the mussels have been replaced by the Asian clam.

Brazilian elodea was first documented in 1985 and by that time, slender naiad, slender pondweed and southern naiad were also becoming problematic. Herbicide treatments of slender naiad were done in the Smallwood subdivision due to the large amount of plant material in shallow water and the impact to the residents. Lake users were beginning to report problems to the South Carolina Water Resources Commission (now integrated into the South Carolina Department of Natural Resources) and to the Lake Management Department of the South Carolina Electric and Gas Company. During the winter of 1986-1987, water levels only dropped to 353.7 feet. The normal drop in the winter was usually to at least down to the 352' level. After that, the aquatic plant complaints increased dramatically in 1987. Brazilian elodea and slender naiad began to 'top out,' or reach the surface of the water in many areas in the summer of 1987.

A baseline study was conducted in 1990 prior to a drawdown of Lake Murray to the 345 foot elevation to enable repairs to the intake towers at the dam. This 1990 baseline study included 140 sites as well as 33 sites surveyed in 1989, for a total of 173 sites.

The most common plant species in 1990 were Brazilian elodea, water primrose, alligator weed, slender and southern naiads, slender pondweed and two types of macroscopic algae, muskgrass (*Chara*) and stonewort (*Nitella*). Brazilian elodea was well-established in the zone from the 353-355' elevation down to the 332' elevation. All of the plants in the drawdown zone were killed by desiccation and exposure to freezing temperatures during the drawdown in 1990.

A post-drawdown survey showed that Brazilian elodea survived in the area below the drawdown zone and it began to recolonize the drawdown zone during the following growing season. Water primrose and alligator weed weren't negatively impacted by the drawdown. Instead, they showed a positive response and became established in the new habitat made available during the drawdown. This increase in water primrose problems was made known to SCE&G by lake users. Many property owners began to mow or mechanically remove the primrose, while a few used herbicides despite the strong policy

that prohibits this form of control either by individuals or by licensed applicators on Lake Murray.

While the lake levels were lowered to 345', high rainfall events occurred which scoured out silt accumulations in many of the coves. This scouring action also removed many or most of the aquatic plant propagules – seeds, rhizomes, inured root crowns, etc – with the result that submersed aquatic plant problems, especially in the upper part of the lake, decreased dramatically.

One purpose for the 1991 post-drawdown survey was to determine whether hydrilla was present in Lake Murray either at the time of the drawdown or after water levels returned to normal. Hydrilla can rapidly recover from a drawdown because of the long-lived perennating tubers that persist in the substrate and rapidly grow when conditions are favorable. Because hydrilla wasn't found in 1990 and due to the absence of hydrilla during the post-drawdown survey in 1991, a survey wasn't done in 1992.

Between 1991 and 1993, hydrilla became established in Lake Murray. Over the next decade, hydrilla literally out-competed other submersed aquatic plants and dominated much of the shoreline of the lower lake as well as shoals occurring away from the main shoreline. A drawdown to the 345 foot elevation in late 1996 provided about 3 years of control, but hydrilla rebounded during a prolonged period of drought and ultimately covered over 6,600 acres, dramatically impacting aesthetics and recreational use of the lower lake. The 64,500 grass carp stocked in Lake Murray in 2003 achieved full control of hydrilla by 2005 and this control continues. Hydrilla was not found in Lake Murray during the 2007 survey.

Results

Nearly 1,000 sites were sampled in 2007. Hydrilla and Brazilian elodea are still absent from Lake Murray. Of the other species previously found to be of concern, only 3 young plants of Illinois pondweed and one plant of slender naiad were found during the survey. However, the extended water level drawdowns done for the backup dam construction combined with the 2007 drought and the pressure from the grass carp have resulted in a dramatic change in composition of the aquatic flora of the lake.

Changes were noted in the emergent vegetation along the shoreline as well as in the submersed vegetation.

The grass carp have kept all submersed plants under control with the exception of stonewort, *Nitella*. Grass carp will consume plants of the macroscopic alga called muskgrass, or *Chara*. Muskgrass strongly resembles and is closely related to stonewort, or *Nitella*. However, stonewort doesn't seem to be a 'favored' food source for grass carp, so it's found along most of the shoreline of the lake in shallow water. It rarely becomes problematic, and if so, it only grows in very shallow water and in limited amounts. Wherever stonewort is found growing in a very thin layer on the bottom in shallow water, bait fish tend to congregate over it.

Another plant that is found in shallow water is spikerush, *Eleocharis acicularis*. This grass-like sedge is eaten by grass carp, so it's normally found in along the very edge of the water and in very shallow water. It also colonizes and grows well in the drawdown zone providing a 'grassy' margin throughout much of the lake.

Figure 1

Spikerush –
Eleocharis
acicularis



A significant change has occurred in the composition of the emergent aquatic species along the shoreline of the lake. Until the past few years, water primrose and alligator weed were the most commonly encountered species. Since the beginning of the prolonged drawdown, a new shrub has invaded the lake and has spread throughout the lower lake and portions of the upper lake. This shrub is rattlebush, *Sesbania punicea*,

which was introduced to the United States from South America decades ago. First found in Florida, it was relatively uncommon in the Lake Murray area of South Carolina until recently.

Rattlebush was first found in Lake Murray two years ago and is now one of the most common shrubs growing with buttonbush and willow. The flowers and seeds of rattlebush are deadly poisonous; however, it doesn't produce seed pods that appear edible.

Figure 2

Rattlebush –
Sesbania punicea

Late summer appearance showing the long brown pods and light green pinnately compound leaves in foreground. Water primrose with yellow flowers is in the background.



Until the past few years, the native herbaceous plant, water willow, *Justicia americana*, was found in only a few areas, often in association with bur-head, *Echinodorus cordifolius*. The extended drawdown has resulted in a proliferation of water willow and it's found throughout the lower and in much of the upper lake. Also, DNR personnel have planted water willow in numerous sites. From a distance, it appears similar to the upright form of water primrose; however, it has opposite leaves and small lavender flowers.

Generally, rocky shoals, natural rocky shorelines, and areas exposed to high wave energy don't support aquatic plants; however, rattlebush can establish itself in these inhospitable areas. The shorelines of coves, large and small, have a succession of plants from stonewort and spikerush in shallow water to a spikerush zone in newly exposed substrates. This spikerush zone can support native species such as yellow-eyed grass,

Xyris, *Eryngium prostratum*, bur-head, *Echinodorus cordifolius*, various sedges and grasses as well as water primrose and alligator weed.

Two additional exotic species were discovered on Lake Murray this year. The first is the popcorn or tallow tree, *Sapium sebiferum*. This small tree has been known to aggressively invade wetlands and uplands in the coastal area of South Carolina. It was found in two locations – one near Pleasure Island and another near Holland’s marina. The trees in these locations were probably planted as ornamentals. Its ability to spread and become a nuisance in the inner Piedmont is unknown, but it should be monitored. As a general rule, the tree zone wasn’t examined closely at all sample sites, so there’s a good possibility more tallow trees grow along Lake Murray.

The other introduced species is taro, *Colocasia esculenta*. Although virtually unknown in South Carolina 30 years ago, it has become established in the Savannah River swamp as well as along the shoreline and in the swamps of Lake Marion. Taro was found in one location during this survey, in the vicinity of Acapulco. Like the tallow tree, it’s likely that wild taro is established in additional areas along the shoreline of the lake.

Figure 3

Taro –
Colocasia
esculenta



A large portion of the shoreline of Lake Murray supports water primrose and in many areas, alligator weed is mixed in with the primrose beds. Areas receiving a lot of wave action tend to have low growing primrose beds. Many property owners have used various methods to control this plant with mowing and raking among the most common.

Evidence of herbicide use in various areas was noted. Deer may also provide a means of control.

One of the biggest questions remains to be answered – is hydrilla still persisting in the sediments in the form of tubers and/or hardened root crowns and will it become established again as the grazing pressure from the grass carp eases? Exclosures should be placed in strategic areas around the lake to determine whether a tuber bank exists and, if so, to determine the density of tubers and how long can they remain viable in this lake system.

Efforts to locate tubers over the years have met with limited success in Lake Murray. The substrate isn't as conducive to tuber growth as it is in many coastal plain systems. Tubers have been found, but not in the quantities expected from hydrilla. Exclosures will answer these questions and will provide valuable information for future grass carp stockings.

Summary

Documentation of the timing of introduction of new species and their spread can help determine management methods and goals as new species continue to be found in Lake Murray. Vigilance and monitoring are important because inadvertent introductions easily occur because many people don't realize how much of an impact exotic species can make. They not only disrupt various uses of lakes and result in aesthetically displeasing views and fish kills, but they can cost millions of dollars for treatment and control as well as in loss of use. Intentional introductions of species on the federal and/or state prohibited lists are considered acts punishable by law.

The aquatic flora of Lake Murray has undergone dramatic changes in the past 30 years. Twenty years of quantitative data provides valuable information on the impact of exotic species as well as the impacts of herbicide control, grass carp control and the effects of water level changes and manipulations.

Submersed aquatic plant species, particularly hydrilla, have been very effectively controlled by the grass carp stocked in Lake Murray in 2003.