

**On 23 September 2009**, Gloria Eby, Dean G Barber (Seminole County Consultant), and Thomas Calhoun (SC Assistant Scientist) surveyed the aquatic plants in Mirror Lake. Hydrilla (*Hydrilla verticillata*) was observed to a depth of 6 feet, healthy and throughout the lake. The Hydrilla seems to only be expanding in the shallow zone of the lake where the water level has raised. Although Hydrilla was found at a depth of 7.5 feet, the native plant population is dominant at a depth of 6 feet to 8.5 feet, this is a beneficial increase to the lake as native submersed aquatic vegetation provides habitat for fish and helps to uptake nutrients from run-off. The submersed native species observed include stonewort (*Nitella spp*), southern naiad (*Najas guadalupensis*), bladderwort (*Utricularia foliosa & Utricularia gibba*), lemon bacopa (*Bacopa caroliniana*), eel grass (*Vallisneria americana*) and the macro algae musk grass (*Chara*).

Plantings from the May 30th event are doing well. Pickerel weed (*Pontederia chordata*) and duck potato (*Sagittaria lancifolia*) are expanding around the lake with a few losses of plants on some shorelines.

The staff gauge reading (lake elevation) at the time of the survey was 59.59 feet. Secchi reading (water clarity) was 6 feet in a depth of 9 feet. The historic Secchi readings range from 1 foot to 8 feet.

**On 4 September 2009**, Dean G Barber (Seminole County Consultant), and Thomas Calhoun (SC Assistant Scientist) surveyed the aquatic plants in Mirror Lake. Hydrilla (*Hydrilla verticillata*) was observed to a depth of 6 feet, healthy and throughout the lake. This is the most hydrilla that has been observed this summer. However, the native plant stonewort (*Nitella spp*), was found to be the dominant submersed species and found to a depth of 6 feet especially on the deep side. Other native SAV found included; coontail (*Ceratophyllum demersum*), southern naiad (*Najas guadalupensis*), bladderwort (*Utricularia foliosa*), lemon bacopa (*Bacopa caroliniana*), eel grass (*Vallisneria Americana*) and the macro algae musk grass (*Chara*).

Most of the May 30, 2009 plantings are still doing well with only a few losses and are expanding. Recent treatment on Dog fennel and Torpedo grass was successful. Also area on southeast side of lake was inspected for an access corridor.

One grass carp was seen. The staff gauge reading at the time of the survey was 59.75 feet which was up from the last month reading of 59.29. Secchi reading (water clarity) was 5.9 feet in a depth of 9 feet. The historic Secchi readings range from 1 foot to 8 feet.

**On 2 July 2009**, Dean G Barber (Seminole County [SC] Consultant), and Thomas Calhoun (SC Assistant Biologist) surveyed the aquatic plants in Mirror Lake. Hydrilla (*Hydrilla verticillata*) plant was observed sparsely throughout the entire lake. Total population was less than 0.3 acres, however, the plant was healthy and the most seen since last summer. Native submersed aquatic vegetation (SAV) observed: coontail (*Ceratophyllum demersum*), two bladderwort (*Utricularia inflata & foliosa*), two bacopa's (*Bacopa caroliniana & monnieri*), southern naiad (*Najas guadalupensis*), red ludwigia (*Ludwigia repens*), Muskgrass (*Chara spp.*), baby tears (*Micranthemum glomeratum*), storewort (*Nitella spp*) and hair grass (*Eleocharis baldwinii*). Although all these SAV were present and expanding, but they still are not representative of the percent of the lake bottom needed to prevent hydrilla from expanding. The most abundant SAV was the bladderwort (*Utricularia foliosa*) which had increased significantly from the March 24<sup>th</sup> survey. The next most abundant SAV was hydrilla.

As previously reported, *Bacopa caroliniana* continues to be present in and but now not outside of the plant enclosure. Several healthy hydrilla plants were outside of the plant enclosure. *Bacopa* continues to be thick inside the structure.

Only two grass carp were observed, a significant reduction from previous surveys. The exotic alligator weed (*Alternanthera philoxeroides*) that the grass carp had cut or eaten the stem, then allowed to float to the surface in the southern end of the lake, had been significantly reduced from previous surveys. Some alligator weed was still present, but no grass carp were observed or heard feeding. The lake elevation was 59.35 feet. The Secchi (water quality) was 4.7 feet in 8.8 feet water depth. The historic Secchi's from 1982 to present, including 12 samples, has been 0.5 to 12.4 feet. All this information and much more is available on the Seminole County Water Atlas <http://www.seminole.wateratlas.usf.edu>.

**On 3 June 2009**, Gloria Eby (Seminole County Senior Scientist), Marianne Pluchino (SC Senior Scientist), Dean G Barber (SC Consultant), and Thomas Calhoun (SC Assistant Scientist) surveyed the aquatic plants in Mirror Lake and did a Lake Vegetation Index (LVI). An LVI is used to assess a waterbody's health by documenting the aquatic and wetland plants in 4 of 12 random waterbody sectors. Fifty-nine plants were observed in all four sectors, 50 native plants and nine exotic plants species. Exotic's of concern are hydrilla (*Hydrilla verticillata*) only observed in 1 sector however, having the greatest potential to expand throughout the lake, torpedo grass (*Panicum repens*) which was the dominant plant in 2 sectors and co-dominant in 1 sector. Additional exotics of concern were wild taro or elephant ear (*Colocasia esculenta*), air potato (*Dioscorea bulbifera*) and creeping oxeye (*Wedelia trilobata*). All of these will continue to expand if un-checked to cover more of the shoreline and reduce native plants diversity. Exotic trees included Brazilian pepper (*Schinus terebinthifolius*), Chinese tallow (*Sapium sebiferum*) and Camphor tree (*Cinnamomum camphora*). There were 7 native submersed aquatic vegetation (SAV) including: two bladderwort (*Utricularia inflata & foliosa*), bacopa (*Bacopa monnieri*), Muskgrass (*Chara spp.*), baby tears (*Micranthemum glomeratum*), storewort (*Nitella spp*), hair grass (*Eleocharis baldwinii*), and one exotic SAV, hydrilla. None of the SAV plants were dominate in any sector. It is desirable to have a native SAV dominate in the sectors so that they can compete with non-native SAV, in this case, hydrilla, to prevent its expansion. It is possible that the previous large scale treatment of hydrilla has slowed recovery of these native SAV species. Hopefully, these native species will expand in the future, and with triploid grass carp and herbicide spot treatments, if necessary, keep hydrilla from expanding.

The Secchi (water quality) was 5.3 feet in a depth of 7 feet. The historic Secchi's from 1982 to present, including 12 samples, has been 0.5 to 12.4 feet. All this information and much more is available on the Seminole County Water Atlas <http://www.seminole.wateratlas.usf.edu>

**On March 24, 2009**, Gloria Eby (Seminole County[SC] Senior Environmental Scientist), and Dean G Barber (SC Consultant), surveyed the aquatic plants in Mirror Lake. Only one hydrilla (*Hydrilla verticillata*) plant was observed in the entire lake. Native submersed aquatic vegetation (SAV) observed: two bladderwort (*Utricularia inflata & foliosa*), two bacopa's (*Bacopa caroliniana & monnieri*), southern naiad (*Najas guadalupensis*), red ludwigia (*Ludwigia repens*), Muskgrass (*Chara spp.*), baby tears (*Micranthemum glomeratum*), storewort (*Nitella spp*) and hair grass (*Eleocharis baldwinii*). Although all these SAV were present, they

still are not very abundant representing less than 15 % of the lake's bottom. Fish and Wildlife Commission recommend more than 30 % bottom coverage of SAV. Both *B. caroliniana* & *monnieri* and hair grass were the most observed SAV. Filamentous algae was observed on several of the SAV as well as the lake bottom and the surface. However, this algae was reduced significantly from the previous survey.

As previously reported, *B. caroliniana* continues to be present in and outside of the plant enclosure that was placed in the lake several months ago to test bacopa survivability in a grass carp environment. Within the enclosure the bacopa was over 85% of the surface area. The outside population has also expanded. We also noted more of this species at new locations throughout the lake. Hopefully with continued expansion of SAV, we can introduce eelgrass (*Vallisneria Americana*) inside and outside an enclosure to test this native SAV survivability in this grass carp environment. Previous attempts to establish this native plant without an enclosure were unsuccessful.

Numerous grass carp were observed, all but one were in the southern end of the lake. They continue cutting the stems of the exotic alligator weed (*Alternanthera philoxeroides*). One was clearly about 3 feet in length, in shallow water foraging on it's side.

**On February 25, 2009**, Gloria Eby (Seminole County[SC] Senior Environmental Scientist), and Dean G Barber (SC Consultant), surveyed the aquatic plants in Mirror Lake. Only two hydrilla (*Hydrilla verticillata*) plants were observed in the entire lake. Native submersed aquatic vegetation (SAV) seen included: two bladderwort (*Utricularia inflata & foliosa*), two bacopa's (*Bacopa caroliniana & monnieri*), southern naiad (*Najas guadalupensis*), red ludwigia (*Ludwigia repens*), Muskgrass (*Chara spp.*), baby tears (*Micranthemum glomeratum*), and hair grass (*Eleocharis baldwinii*). Although these SAV were present, they still are not very abundant. Both *B. monnieri* and hair grass were the most observed SAV. Filamentous algae was observed on all SAV as well as the lake bottom and surface.

As reported on the previous survey, *B. caroliniana* continues to be present in and outside of the plant enclosure that was placed in the lake several months ago to test bacopa survivability in a grass carp environment. With continued success and additional plantings, coupled with expansion of other SAV would help stabilize the lake. With grass carp and increase SAV would be key factors in preventing the hydrilla from re-establishing.

The grass carp continues cutting the stems of the exotic alligator weed (*Alternanthera philoxeroides*) leaving the cut portion of the plant floating on the surface in the southern end of the lake. This activity is creating open water in depth of 4-5 feet.

Staff gauge was 57.6 feet, down 1.6 feet from the February 4<sup>th</sup> reading. Numerous triploid grass carp were observed.

**On December 17, 2008**, Gloria Eby (Seminole County[SC]Senior Environmental Scientist) & Dean G Barber (SC Consultant) surveyed the aquatic plants on Mirror Lake. Hydrilla (*Hydrilla verticillata*) was sparsely observed throughout the lake mostly in the southern area. No hydrilla tubers were observed.

In the southern end, fish activity was abundant, most likely triploid grass carp. It was apparent that the fish were cutting off the stems of the alligator weed (*Alternanthera philoxeroides*) leaving the cut portion of this aquatic plant floating on the surface. This was evident in an area of about an acre thick with floating alligator weed. As we sat in the canoe, not paddling, a popping sound could be heard around us, from fish close to the canoe. Neither of us have observed this behavior before. It has been documented that grass carp do tend to fragment or break off portions of aquatic plants as they eat these species, however, this plant, alligator weed, is not a plant that they normally prefer to eat. There were more than a dozen fish working this area, and judging from the area that had been impacted, numerous fish had chewed the alligator weed. We attached a movie clip of this event, the popping sounds can be heard in the background.

Native aquatic plants both re-vegetated and naturally established are expanding. This is especially true for the cord grass (*Spartina bakeri*) planted on the shore adjacent to the Barrington Apartments. The invasive cattail population, mostly in the southern portion of the lake, has been treated by the SC aquatic plant contractor. This treatment has been very successful. Hopefully, native emergent aquatic plants around the dying cattails, mostly duck potato (*Sagittaria lancifolia*), pickerelweed (*Pontederia cordata*) and spikerush (*Eleocharis cellulosa* or *E. interstincta*) will expand into the area.

Staff gauge (water elevation) was 58.2 feet. Historic average from SC Watershed Atlas (<http://www.seminole.wateratlas.usf.edu/>) is 58.29 feet (12/10/1985-10/13/2008). Secchi (water clarity) was 2.5 meters or 8.2 feet with historic average of 5.73 feet (3/9/1982-2/13/2007). The water clarity reading is a significant improvement from the historic average.

On **November 25, 2008**, Gloria Eby (Seminole County[SC]Senior Environmental Scientist) & Dean G Barber (SC Consultant) surveyed the aquatic plants on Mirror Lake. As noted in the last survey, water level has remained up, such that both the southern and northern lobe of the lake remain connected. The access corridors permitted by FWC between the lobes remain open with good circulation between the two areas. Several of the aquatic plants previously planted remain underwater, however some locations where either the plants had been moved up the bank or are naturally establishing are doing well.

The hydrilla (*Hydrilla verticillata*) that was trying to establish adjacent to the shore before T.S. Fay, has been significantly impacted possibly by grass carp and the higher water level. We noted no hydrilla tubers. Hydrilla acreage noted was 0.2 acres. Hydrilla plants were stressed, not healthy with few growth buds. Other submersed aquatic vegetation (SAV) observed were: road grass (*Eleocharis baldwinii*), and two bladderworts (*Utricularia foliosa* and *U. inflata*). These native SAV are a good sign, although there was less than 0.2 acres present. Hopefully, they will continue to expand, helping to stabilize the lake and compete with hydrilla for space.

The lilies, spatterdock (*Nuphar luteum*), fragrant water lily (*Nymphaes odorata*) and American lotus (*Nelumbo lutee*) are reduced from the higher water level, insect damage and cooler temperatures. Almost no American lotus was observed.

Two fish, thought to be grass carp were observed.

On the afternoon of **26 August 2008**, Gloria Eby and Dean G Barber surveyed the aquatic vegetation on Mirror Lake. This was after Hurricane Fay had placed several inches of rain in central FL, causing Mirror Lake to rise over a foot and connecting the two previously separated lobes of the lake. Several species of aquatic plants that had previously been vegetated along the lake's shore were underwater, especially the duck potato, pickerelweed, soft rush,

canna and eleocharis. At some of these locations, these plants might survive if the water level does go down. The cordgrass, at most of the observed sights, was high enough on the bank or was recently moved, such that most should survive. Cordgrass and the duck potato that had been planted in the NE corner of the lake was doing well. About 0.2 acres of primerose willow and torpedo grass were under water, hopefully will be impacted. *Pennisetum spp.* and *Colocasia esculenta* is expanding and needs to be managed. Lilies, mostly in the northern end of the lake, consisting of spatterdock, fragrant water lily and american lotus were reduced by high water, especially the lotus. The dog fenal, mostly along the eastern side of the lake, has expanded. Either mowing or treating the dog fenal at this time, would help reduce future populations.

No fragmented submersed plants were observed along the shoreline, however, 3 large grass carp (24 inches or greater) were seen from the canoe. This further confirms that there is an abundance of grass carp in the lake.