



Memorandum

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Date: April 24, 2015

To: Mr. Jim Ward

From: Bruce Bernard

Subject: Miromar Lakes CDD Water Bodies

Project: Miromar Lakes Project No. 14-7438

Miromar Lakes Community Development District (CDD), per the South Florida Water Management District permit, is the custodian of water quality for the seven hundred acre lake system within the CDD. The SFWMD water samplings are obtained from the southern lake weir discharge outfall to insure that the Nitrate and Phosphorus parameters are in compliance with FDEP regulations.

The CDD, in coordination with Miromar Lakes Development, has begun a quarterly testing program of the lake(s) system to compile sampling data from throughout the lake system. This data, along with previous test results obtained from Lee County between 2004 and 2009, and NPDES test results from 1992 to 2013, will be used in an analysis to produce an overall picture of lake characteristics over time. As a result of this test program, any areas of concern will be identified quickly and will lead to timely corrective action.

The lake system has evolved to the state in which it currently exists, through a goal to decrease submerged weeds which were clogging boating channels and overtaking shallow water level areas. Grass carps were introduced into the lakes system in 2012, to control the submerged vegetation, and were the corrective action previously approved by the CDD. The Florida Fish and Wildlife Conservation Commission issued the permit to introduce seven thousand (7,000) grass carps into the seven hundred acre lake system. This was based on the FWC calculation of ten carp per Lake Acre. The grass carp have been an overwhelming success from the standpoint of the removal of submerged weeds. The negative impact of this management practice is the overabundance of grass carp which are now feeding on migration plantings on the littoral shelves within the lakes.

The high removal rate of grass and other plant material caused by the overabundance of grass carp has had a negative effect on lake turbidity, color, and clarity. The natural filtration of the lake water bodies provided by the plantings and submerged vegetation has been diminished thus reducing the water clarity and color. Also with the decrease in submerged vegetation, sediment is being disturbed on the lake bed by boating traffic. Additionally, the lake banks and water bodies need to be treated with chemicals to impede invasive plant growth. These chemicals also negatively impact the lake color.

The lake chemical properties have also drawn opinions and concerns as to the overall operation of the water bodies. Testing of the lakes has been undertaken by FGCU students, the Miromar Lakes Developer and Miromar Lakes CDD. The testing results have varied as well as methods of sampling in some cases.

The FGCU testing indicated that dissolved oxygen was in good supply and oxidation reduction potential was mostly positive, which is good. The total alkalinity level is high and thus results in a high PH reading, which is



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typical for an old mine pit. The testing also showed limited nitrogen, because of excessive amounts of phosphorus found in the lake from these samples. The overall opinion of Dr. Serge Thomas of FGCU, from his e-mail dated January 14, 2105, is that the lake is well eutrophic and possible hypereutrophic, and if steps were not taken the lake might go down a similar path as Lake Trafford. Dr. Thomas's opinion is that the lake system has not been impacted to the point where there is no possibility to return to normal, because the profiles are quite good.

The Miromar CDD test results indicated a different condition of the lake system and the lake system imminent demise may have been exaggerated. Mr. Bill Kurth, the Director of Operations for Lake Masters, stated in e-mails dated January 29th and February 9, 2015, that the results of phosphorus levels within the lake system, has the lakes condition as mesotrophic not eutrophic, much less hypereutrophic. The phosphorous readings were .023 ppm which is four times below the 0.1 ppm level, where concerns arise for lakes. The nitrogen level was higher than previously reported, but still within the normal range. Mr. Kurth examined the historical data, and it indicates that total phosphorus levels have consistently declined each year since the community started, even though a spike in the levels occurred in 2013. This was due to the release of nutrient by dying submerged weeds. Except for the slight and temporary spike in levels, the lake system has actually been improving over the development's history. Continued testing by all parties will further provide additional data to monitor any fluctuations in the lake system characteristics.

The one major concern is the continued activity of the grass carp. It is now apparent that the lake areas have an abundance of grass carp, which are decimating mitigation plantings within the littoral shelf and preventing grass to grow on the lake bed. The following are observations of the littoral plant material from Lake Masters: construction has altered some of the planting areas, the area along existing Lake 5 consists of mostly Rip Rap shoreline, and all of the non-attached lakes still have their plants, except for the portion of Lake 6 that is attached to the big lake.

The area at the end of Novelli Ct. is almost devoid of its plantings, as are areas in the small canals that are part of Lake 5 and small fingers of Lake 6. Lake Masters dug up some rhizome and root mass and believe that some of it is viable littoral plant materials, with new leaves emerging in some cases. It is their opinion that when the temperature warms and the rain begins, the plant material out of the water will throw new leaves. It is Lake Masters estimate that 50 % of the plant material still exists. It is our opinion that few will recover, but that some replacement plantings will be needed to comply with the County specifications. Littoral shelf barriers will need to be constructed to protect any existing plants, plus the new planting from the grass carp. These barriers will need to be installed in areas where the water is a few feet over the shelf.

The first stage of barrier installation has an estimated cost of \$8,000. Replanting of the littoral shelf for the coming fiscal year is estimated at \$15,000. Proposed for the next two years, are additional planting and barrier's to meet mitigation requirement benchmarks for Miromar Lakes CDD.

The reduction of the grass carp population will be needed to allow for the regrowth of the littoral shelf planting and grass beds. Miromar Lakes CDD has requested that the FWC grant a removal permit for the grass carp with a recommendation for amount of carp to removed. Once the permit has been issued, it will be up to the permit



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holder, Miromar Lakes CDD to approve a removal technique and disposal policy for the grass carp within the lake system. Some options have been provided that may be considered for this task:

1. Spear fishing- FGCU has a spear fishing club that can be utilized to help remove grass carp. This will be as an additional resource for removal, because of the small yield expected from this process.
2. Netting- there is many different styles of hoop or sweeper nets to use to remove grass carp. There is also commercial netting that can be used for this purpose. Removal will be dependent on the amount of fish net traps set and time allocation for removal of the carp.
3. Fishing Tournament- if applicable, engage a local fishing club and run a grass carp fishing tournament within the lake system for two days with prize money for amount of carp removed and total pounds of carp removed. You can also have Miromar Lakes residents, who fish the lake included in their own tournament at the same time and award same prize package for their fraction of the tournament.
4. Electric Stunning- the generating of electric current into an area of the lake to shock the grass carp. The carp will then float to the water's surface for removal by netting, while in this temporary state.
5. Water Current -using a motor and pump to create a current within the lake that the grass carp would hopefully follow. This current would lead to a designated canal where a netting or barrier would be installed to trap the carp in this area. Once this is accomplished, the carp would then need to be removed by additional netting.

An estimated amount of \$30,000 to \$45,000 dollars is anticipated for this removal process and is dependent on time resistant's for the method selected. This does not include any unforeseen costs for the disposal of the grass carp, once they are removed from the lake.

At the meeting held on April 2nd at the Miromar Lakes Clubhouse between interested parties dealing with the water bodies adjacent to this community, the topics outlined above were all discussed at length. In attendance were Serge Thomas, Win Everham and Toshi Urakawa of FGCU, Mike Elgin of Miramar Development, Bill Kurth of Lake Masters, Charlie Krebs of Hole Montes, Paul Cusmano and Bruce Bernard of CGA.

The initial discussion dealt with the grass carp removal, methods of removal, permit for grass carp removal, grass carp disposal, and location to perform this removal. The consensus of those in attendance supported removal through a spear fishing type approach by way of commercial fisherman in a selected location along with the FGCU spear fishing club participation. The other removal options were weighed but were not chosen based on the time frame required for removal, method of extermination, and lake community disruption. The disposal methods are being explored by CDD Asset Staff along with approved disposal sites. It was relayed to the group that the CDD had already begun the process of applying to the FWC for a grass carp take permit and have requested the amount of grass carp allowed to be removed from the lake system by the FWC.

FGCU (Toshi Urakawa) mentioned that a controlled area should be established in a couple of lake locations to analyze which mitigation plantings still exist, if the plants will regenerate, and what type of replacement plants should be installed. Bill Kurth of Lake Masters, mentioned that any planting should be done with material undesirable to the grass carp. Different plant and grass varieties were discussed and will be proposed for littoral shelf replanting when it occurs. Once the controlled areas have had a few months to simulate growth, there will be



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additional data generated to move forward with the next process in the work scope. The controlled areas will be provided with barriers so that the grass carp cannot encroach, once the water level rises.

The first area that will be labeled as a control location will be situated along the south side of Lake 5, east of the existing outfall. It will extend within the littoral shelf to the edge of Lake 6 along the east side of the channel. The barrier installed will consist of vinyl coated chicken wire and PVC stakes. This process will extend approximately two feet underwater at the average lake elevation along this controlled area. There will be no interruption of boating traffic during this procedure based on the location and the depth that the barrier will be installed at. Warning fencing will be utilized to identify the enclosed area to inform lake boat traffic of its existence. This will provide a large narrow confined area in which the FGCU staff will be able to monitor plant growth without grass carp interference. Mike Elgin, Miromar Lakes Developer, made a point to caution all that we can only operate within the area of Lake 5 that is maintained by Miromar Lakes CDD, and not outside those limits.

All of the options mentioned will require time, planning and coordination with the Miromar Lakes Community and Miromar Lakes Developer, FGCU, and the Miromar Lakes CDD to achieve desired results. The overall opinion of those at the April 2nd meeting was that a quarterly meeting to analyze data and review lake progress would be in order, and that the CDD website is to be utilized to post quarterly reports on the lake system analysis and progress.

Please find attached FWC take permit, different methods of grass carp removal, Lake Map showing location for carp removal.