# The Rotonda West Association's

# Five Year Plan for the Canal System

Adopted: November, 2010

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## Section 1.0 Introduction

Rotonda West was created in 1970 as a planned community. Its circular structure contains over 5,400 acres with 8,000 building lots and 30 plus miles of canals consisting of a river, creeks and fingers. While originally created as a water containment and drainage system for the community the canals have become an integral component of life in Rotonda. Residents consider the canals an asset to their life styles as well as to their property values. The canal system provides recreational opportunities for fishing and boating as well as providing an aesthetically pleasing environment. Fish, turtles and alligators call the canals home and water birds use the canals as part of their habitat.

The management of these canals is shared between the Rotonda West Association, Inc. (RWA) and the county. Rules, regulations and policies governing the canals originate from regulatory agencies including the Environmental Protection Agency (EPA)*[1], South West Florida Water Management District (SWFWMD)*, Charlotte County and the Rotonda West Association, Inc. Governing Documents*.

The RWA's Mission Statement states its role is "to protect the property interests of its members; to enhance living in the community; to plan for the future in its role as a community association." In fulfilling the Mission Statement the RWA's Board of Directors formed the Aquatics and Canal System advisory committee to directly deal with the canals to the extent that existing rules, regulations and policies permit and to make recommendations to the RWA Board for action.

A major responsibility of the Aquatics and Canal System Committee is to develop a 5 Year Plan. The plan will be submitted to the RWA board for approval and will be updated yearly. The purpose of the plan is to define the issues and the associated tasks required to maintain the canal's infrastructure as a healthy and functioning waterway and habitat. The plan contains a budgetary structure, where necessary,

[1] A word followed by an "*" can be found in the Definitions section beginning on page 31

to carry out the associated tasks. This budget is the basis for planning and projecting RWA funding for the management of the canals within the Rotonda community. The Five Year Plan will also contain sections pertaining to Budget Summary and Year-end Summary, to give the reader a perspective on the accomplishments made to date.

The document contained herein complies with the above stated criteria.

More detailed information can be found in the appendices (beginning on page 18).

## Section 2.0 Major Issues

The major issues are divided into 8 categories that define the tasks and costs associated with maintaining the canal as a storm water management systems, an ecosystem that maintains a quality of water that adheres to the requirements of our regulatory agencies, manage an environment for wildlife habitat, providing education and supports recreational opportunities for the community.

An issue that has been in question for quite some time is defining the maintenance and responsibility for our canal system shared by the regulatory agencies and the RWA. Currently our legal representatives are meeting with the appropriate authorities to get legal definition of our liability for our canal system and give definition to our responsibility. Understanding how cost and responsibility are shared will better enable the committee to define task, schedule maintenance and budget cost associated with the canal system.

**2.0.1** RWA Board will determine the overall responsibility for maintenance and water level

## 2.1 Water Retention: Monitoring and Inspection

- Weir* 1, replaced in 2009
- Weir 2, to be replaced in 2010

**2.1.1** Replace Weir 2 during 2010 Budget: RWA Reserve Budget

- Weir 5A, to be replaced in 2010. The replacement cost of weir 5A is funded thru the Municipal Service Benefits Units (MSBU)*.
- Weir 6A, to be replaced in 2010. The replacement cost of weir 6A is funded thru the MSBU

**2.1.2** The RWA manager, at the direction of the RWA Board, will monitor the County's progress in replacing weirs 5A and 6A.

- Weir 7 (Buck Creek), is in place. It has 3 boards for water level control. Which agency has the responsibility for the control of the placement and removal of the boards and under what conditions has yet to be resolved. Budget: RWA Budget

**2.1.3** The RWA manager, will determine responsibility for water level control on Weir 7

**2.1.3.1** The county will be approached to replace the wooden boards on Weir 7 with a permanent cement cap. Budget: RWA Budget

**2.1.4** A visual inspection schedule will be developed and implemented to determine if a structural examination of the weirs is required.

- Cape Haze Dam was responsible for canal water outflow. The dam has a board, valve, and control gate for water outflow control. With the completion of weirs 5A and 6A the Cape Haze Dam will have no impact on water level retention in the canals. However, the maintenance and water level control of this structure are currently the developer‘s responsibility.

**2.1.5** Monitor the water outflow status of the Cape Haze Dam and report the status to the developer. Budget: RWA Budget

- Erosion, muck* and silt build - up contribute to the ability of our canal to contain a maximum level of water by reducing the depth of our canal. Charlotte County Public Works began construction to install fabric form concrete on all 47 locations within Rotonda West. This project will reduce the slope of the apices and decrease erosion and silt build-up in the canal. Past projects to contain erosion around the drainage pipes and swales* that direct surface water into the canal have been addressed by the *Rotonda West Street and Drainage MSBU*.

**2.1.6** Drainage pipe and swale conditions will be monitored. Problems will be referred to the *Rotonda West Street and Drainage MSBU* for

resolution. Budget: *Rotonda West Street and Drainage MSBU*

- Depth reduction by erosion, silt and muck build up that may not be the responsibility of the county or funding available thru the MSBU will become issues. Dredging may have to be implemented as a solution to this problem. The RWA will define the affected areas, identify tasks and budget the cost.

  **2.1.7** Define and monitor the areas in the canals most in need of dredging and erosion control including the Gazebo Island. Develop the budgetary implications thereof. Budget: Rotonda West Street and Drainage MSBU and/or RWA Budget

- Erosion issues caused by improper slope construction of new builds is the county's responsibility.

  **2.1.8** The RWA, or their designee, will monitor the County's enforcement of slope requirements relating to new builds.

- Street drainage and erosion of the swales are maintenance issues under the county's responsibility.

  **2.1.9** The RWA, or their designee, will monitor and report any drainage or erosion issues to the proper authorities.

- Reducing water usage through practicing water conservation and following the guide lines established by the responsible regulatory agencies will result in added water volume and thereby increasing the water retention ability of the canal system. The water in the canal is a source of irrigation for the residents and the golf courses. As the community grows and vacant lots become developed the ability of the storm water system to support the added residential build-out* and golf course irrigation requirements will further stress the need for more water. More water preservation within the system may have an impact on our Deed Restrictions to put tighter controls on the water use by residents than the regulatory agency. SWFWMD

defines the irrigation regulations and schedule for the golf courses while the County is responsible for the irrigation regulations for the residents. Both parties share the responsibility for being compliant with and adhering to the regulatory process. See Appendix #1 on page 19 for additional information.

**2.1.10** Residents are encouraged to monitor and report to RWA Management those properties that do not adhere to water usage restrictions.

- The golf courses are regulated by a SWFWMD permit that defines how much water can be withdrawn from surface water sources such as the Rotonda canals.

**2.1.11** The RWA will monitor SWFWMD's records to verify that the golf courses are compliant with their respective water permits. Budget: RWA Budget

**2.2.0 Storm Water Management and Outflow**

- The canal system was designed to function as a storm water management system to reduce flooding. The design diverts surface water into the canal by use of swales, drainage pipes, culverts and landscape slope requirements. The water is then contained within the canal using a series of weirs which control the water's outflow.

**2.2.1** Identify the organizations and/or agencies responsible for the maintenance of the canal's storm water capabilities as listed above.

**2.2.2** Monitor the storm water management capabilities of the canal and report discrepancies to the RWA Manager for remediation.

**2.3 Adherence to Canal System Design Specifications**.

Any work done to the canal system under the auspices of the RWA must be in compliance with all the rules and regulations of all the governing agencies.

**2.3.1** All work will be contracted by using qualified professionals with experience and background to complete the defined tasks.

**2.3.2** The cost of the work assumed by the RWA will be defined by tasks and budgeted by a reserve fund established as the tasks are defined.

**2.4 Control of Vegetation:** The canal system is a functioning ecosystem which provides a natural environment to support wildlife for both animals and plants. The maintenance and control of the vegetation is key to the canal's ability to provide effective water quality, appearance, water movement and recreational opportunities. A *Management Plan for Vegetation Maintenance and Control* in the Rotonda canal system will be developed and implemented.

- Research must be conducted to determine effective means of vegetation maintenance and control appropriate to the Rotonda canal system

**2.4.1** The Committee will identify and use where appropriate all available human resources including, but not limited to, professional aquatic biologists*. Budget: RWA Budget

**2.4.2** The committee will identify appropriate/inappropriate kinds of vegetation for the Rotonda canal system.

**2.4.3** The committee will identify effective vegetation maintenance processes and procedures including but not limited to mechanical*, chemical* and biological*. Budget: RWA Budget

**2.4.4** The committee will develop detailed costs for the processes and procedures identified above.

**2.4.5** The committee will compile a research report from the findings above to be used in developing the *Management Plan for Vegetation Maintenance and Control*. Budget: RWA Budget:

**2.4.6** The committee will submit the research report to the RWA Board for approval.

- Information contained in the research report will need to be converted into a *Management Plan for Vegetation Maintenance and Control*. Where appropriate, this plan needs to be the basis for the Statement of Work in future bid specifications for canal maintenance.

**2.4.7** The committee will convert research data into action steps for monitoring and/or implementation.

**2.4.7.1** Each action step will contain a specific action to be accomplished, the person(s) responsible, the beginning and ending dates, and the commensurate budgetary costs where appropriate.

**2.4.8** The committee will submit the *Management Plan for Vegetation Maintenance and Control* to the RWA Board for approval.

- Following the development and approval of The *Management Plan for Vegetation Maintenance and Control* it must be integrated with the existing maintenance contracts where appropriate.

**2.4.9** The RWA will continue with the existing contract for vegetation maintenance and control .

**2.4.10** The RWA will work with the contractor to implement the *Management Plan for Vegetation Maintenance and Control* where appropriate.

**2.4.11** When the existing contract terminates new bid specs will be

developed based on the current *Management Plan for Vegetation Maintenance and Control.*

Budget: RW Budget: As per current Contract

**2.5 Quality and Pollution Controls:** General runoff from roads, commercial and residential areas including fertilizer from lawns and golf courses is channeled into the canal system. In addition, the Rotonda Lakes area has a drain path into the canals in the White Marsh section of Pebble Beach. Buck Creek is connected to the canal system and empties into Lemon Bay. This watershed* may be a source of sewage pollution as fecal coliform bacteria have been reported there. Rotonda West is connected to a municipal sewer system; however, surrounding communities including much of Charlotte County utilize septic systems which represent potentially significant fecal pollution problems. Major storms could result in chemical and biological pollution of the canal system from storm water runoff and failed septic systems. Sewer lines that cross under the canals would present a significant problem if they fail. Runoff from adjacent watersheds can be carried into the canal system.

The ability of a body of water to support plants, fish and wildlife is defined as a trophic state. For further information see Appendix #2, page 21.

Nutrient levels including nitrogen and phosphorus must be monitored in order to determine the ecological status of the canal system. Excessive fertilizer application to residential lawns and especially golf courses results in increased nutrient levels and enhanced aquatic plant growth particularly when fertilizer is applied close to the water's edge. These excess nutrients have resulted in an abundance of aquatic plants which are a continuous concern and costly to mitigate.

While our limited data base may not suggest a significant pollution problem, it is too small to adequately define the chemical and biological properties of canal water. A well defined sampling and analysis program would establish a chemical and biological parameter base line that could be used to show that pollution did not originate in the Rotonda West

canal system but was transported into the system from outside sources. It would also enable the RWA to monitor and trend parameters to help determine how to best manage the canal system.

- An expanded water sampling and analysis plan is needed.

**2.5.1** The committee will develop a Canal Water Sampling and Analysis Plan to be presented to the RWA Board for approval and funding. See Appendix #3 on page 28 for further information.

**2.5.1.1** The water sampling and analysis plan will monitor the confluence* of the canal system with Buck Creek outlet and the Rotonda Lakes inlet for pollution (especially sewage) monthly.

**2.5.1.2** The sampling plan will measure the following parameters: Conductivity, pH, Turbidity, Dissolved Oxygen, Total Nitrogen and Phosphorus, Chlorophyll, Chloride, Fecal Coliform Bacteria, and water temperature. Other tests to consider (one analysis – not done on a recurring basis): Fats, Oils and Grease, Polychlorinated Biphenyls (PCBS), Heavy Metals (Pb, Cd, Hg)

- An education program for residents and golf course personnel will be developed to demonstrate the need for fertilizer control. Based on a Lake Watch evaluation of canal water data, lawns irrigated by canal water need no additional fertilizer since the water contains adequate levels of nitrogen and phosphorus for growth.

**2.5.2** Continue to use LAKEWATCH* and Cedar Point* data to monitor water quality.

- Canal water levels should be measured and the data stored for trending.

**2.5.3** Depth measuring gauges will be installed and monitored by the committee at the new weirs and at other locations to be determined including the main marina and Buck Creek.

Budget: RWA Budget – one time purchase/annual maintenance

**2.5.4** Rain gauges will be installed and monitored by committee at locations inside the circle to be determined, and at the Community Center. Data from these gauges will generate sufficient rainfall data on storm water runoff.

Budget: RWA Budget –one time purchase/annual maintenance

- Data from the sampling and analysis program needs to be trended.

**2.5.5** Data from the sampling program will be analyzed, combined with historical sampling data and trended to evaluate the environmental status of the canal system. The data will provide evidence that the canal is not a pollution source. This data will have increasing importance as Federal and State requirement are imposed on Charlotte County.

- Laboratory testing and cost estimates need to be determined for budgetary purposes.

**2.5.6** Cost of water samples will be determined. These figures are estimates based on prices from a local laboratory. Testing for total nitrogen, phosphorus and chlorophyll are performed by Lake Watch at no charge. A local testing laboratory recommended that the dissolved oxygen test be performed in the field with a meter. The cost of the meter ranges from $1500.00 to $2,000.00. The RWA may receive financial assistance for the purchase of the meter.

| Test | Approximate Cost |
|---|---|
| Conductivity | $10.00 |
| pH | $10.00 |
| Chloride | $15.00 |

| | |
|---|---|
| Fecal Coliform | $20.00 |
| Total Cost per Sample Point | $55.00 |
| Cost Per Sample Point Per Year | $660.00 |
| Cost Per Year for 4 Sample Points | $2,640.00 |
| Use of Lake Watch | $0.00 |
| Use of Private Laboratory | TBD |
| Multi-function meter | $1,500.00 - $2,000.00 |

Budget: RWA Budget

## 2.6 Prevention And Removal Of Debris

In order to maintain the aesthetically pleasing curb appeal that represents Rotonda West, the Prevention and Removal of Debris program was implemented. It is manned by homeowners who volunteer their time to monitor and, when necessary, remove debris they may find on roadways, empty lots and waterways. Workshops are offered for educational purposes to give the homeowners the proper tools to keep their property, and waterways clean of debris.

**2.6.1** Debris Prevention

- Education: Resident education is a necessity for keeping unwanted debris out of the canals.

**2.6.1.1.** Residents will be presented with information on the repercussions of throwing citrus, grass clippings and other organic debris into the canal through but not limited to newsletters, the RWA web site, flyers, night meetings, guest speakers and slide presentations.

**2.6.1.2.** Residents will be educated on how to keep debris out of the canals through the use of simple tools made from rakes, pool skimmers and

grapefruit pickers.

Funding for purchasing tools: Budget: RWA Budget

**2.6.1.3** Workshops and programs will be provided on how to make tools to remove debris from along the banks before it has a chance to enter the canal. Budget: RWA Budget

**2.6.1.4** Flyers that contain above steps will be developed and disseminated at future events

**2.6.1.5** A space on the Rotonda web site for Education will be established.

**2.6.2** Removal of debris

- Canal Clean-up Committee has been established to monitor and remove debris in and on the canals of Rotonda.

**2.6.2.1** A Section Captain for each section of Rotonda will be identified to coordinate volunteers willing to routinely check the banks and canals for debris.

**2.6.2.2** Debris in the water that can not be reached from shore may be removed with the assistance of the RWA boat. Section Captains may request that the RWA boat be sent to gather the debris.

Boat Maintenance Budget: RWA Budget

**2.6.2.3** The committee will continue to recruit volunteers on a Section basis to monitor both the waterways and the canal banks.

**2.6.2.4** Clean-up Committee will also co-ordinate canal debris clean-up with the other RWA debris clean-up efforts e.g. Keep Rotonda Beautiful, Beautification Committee, Women's Club, etc. who pick up the trash accumulation on the undeveloped lots and common areas. These efforts prevent such trash from eventually blowing into the canals.

**2.6.2.5** Large items of debris found in the canal are being removed under the existing Canal Maintenance contract.

**2.6.2.6** The Clean Site bonding system for builders will continue, making it mandatory for them to set aside funds for debris removal from their building site.

**2.7 Management of the Ecosystem & Wildlife Habitat** This section is dependent on sections 2.4: Control of Vegetation and 2.5: Water Quality and Pollution and 2.6: Trash Prevention. The canals' environmental health is dependent on proper vegetation, good water quality, and management of this ecosystem for a balanced wildlife habitat.

- Defining an effective fishery and wildlife habitat is paramount in the management of the ecosystem. This can be accomplished by:

**2.7.1** Working with outside experts such as the professional aquatic biologist and fishery managers. Budget: RWA Budget

**2.7.2** Educating the Aquatics Canal System committee and residents on the advice given by outside experts Budget: RWA Budget - See education budget 2.8

**2.7.2.1** Help is available from, but not limited to: County Extension agencies, University of Florida, retired biologist, SWFWMD, and Florida Fish & Wildlife, and a professional aquatics biologist.

- Develop sections of the canals for an ecosystem & wildlife habitat under the direction of professionals in this field

**2.7.3** The committee will plant and maintain common park (marina) areas with appropriate Littoral Zone* plants. Budget: RWA Budget

**2.7.4** The committee will plant native plants in a six foot strip of land adjacent

to canal in common park (marina) areas, as recommended by the County fertilizer regulations. This low maintenance or "no-mow" zone* next to the water's edge reduces the potential for fertilizer residues entering the water. Budget: RWA Budget

- Monitoring the environmental health of the canals is necessary to ensure that potential problems are identified as soon as possible.

**2.7.5** The Committee will review of Aquatics Contractor's activity logs and observe the conditions of all the canals prior to the monthly committee meeting.

**2.7.6** The Committee will collect information from residents living on or utilizing the canals for recreational purposes such as fishing, boating and bird watching.

**2.7.7** The committee will examine the canals on a regular basis to monitor the types and abundance of fish, with particular attention to fish stocked as part of a canal vegetation control program.

**2.8 Education and Publicity:** This section augments sections 2.4 Control of Vegetation, 2.5 Water Quality and Pollution Control and 2.6.1 Debris Prevention. Education on how this complex, highly impacted ecosystem functions and how it should be managed is the most important aspect of providing an environmentally healthy and ascetically pleasing waterway for the homeowners of Rotonda.

- It is most important that the members of the RWA Board, the Canal Committee and the RWA Manager study and understand how this ecosystem functions and that vendors charged with maintaining our canals continue their education to keep up to date on waterway maintenance issues.

- It is also important that the residents of the community understand the importance of protecting and maintaining the canal system and become actively involved in the process.

**2.8.1** The Canal Committee will gather information and resources:

**2.8.1.1** Review literature published by various agencies; SWFWMD, Fish & Game, County Extension offices, EPA, Florida DEP, universities, etc.

**2.8.1.2** Gather advice from experts in this field.

**2.8.1.3** A section in the current RWA library will be established for aquatics publications and information. See Appendix #4 on page 31 for media available in library

**2.8.2** The Canal Committee will provide training programs and informational sharing services through but not limited to the following:

**2.8.2.1** Special committee meetings using outside resource personnel to instruct Residents and committee on ways they can protect and enhance our waterways. Budget: RWA Budget

**2.8.2.2** The West Ways Newsletter, the RWA Library, workshops, pamphlets/flyers, RWA web site and news/media services.

Budget: RWA Budget

Appendices


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## Appendix 1.

## SECTION 2.1 WATER RETENTION

The primary function of our canal is a surface water management system, at times referred to as a "Drainage Ditch." The water overflow to the gulf is monitored by the EPA (Environmental Protection Agency) to insure we meet a water quality standard. Defining a maintenance program is the responsibility of the Rotonda West Association (RWA).

SWFWMD is the regulatory agency that decides how much water can be withdrawn from water sources for irrigation purposes. The golf course community is regulated by a permit process while the resident community is regulated by a watering restriction process.

The golf courses are provided with alternative or supplemental water sources. The source for this water is from a Water Reclamation Facility (WRF), providing reclaimed water to serve recreational/aesthetic and commercial customers. Three (3) WRF's Englewood, Rotonda and Westport are interconnected with supply lines available to the golf courses. Currently three (3) of the golf courses are connected to this resource. These courses include the Palms course located in the Pebble Beach section and the Long Marsh course located in the White Marsh and Long Meadow sections. Future plans are to increase the amount of reclaimed water to our area. The project is for the design and construction of a reclaimed water transmission line and two (2) million gallon reclaimed water storage tanks with associated booster pumping systems. This project through its completion will result in a major portion of the necessary trunk line to interconnect the Eastport WRF to the Westport WRF.

The cost of providing all the infrastructure to deliver the reclaimed water to the golf courses are shared between SWFWMD and the County, however hooking-up to the resource is at a cost to the user.

SWFWMD encourages the golf courses use reclaimed water as the primary source for irrigation. As stated in the permitting process: The Permittee shall investigate the feasibility of using the reclaimed water as a water source and submit a report describing the feasibility to the Permit Data Section, Records and Data Department by (Date per permit). Water allocations are determined by the regulatory agencies and the permittee enters a binding contract with the County to deliver the reclaimed water at a cost per gallon.

A permit number is assigned to each pie section of the Rotonda seven (7) sections that make up the circle. A list by golf course name, location and permit number follows: The Hills - Oakland Hills 20010932, The Palms - Pebble Beach 20009335, Pinemoor (West) - Pinehurst 20012335, Pinemoor (East) - Broadmoor 20012337, Long Marsh-Long Meadow, White Marsh, and Pine Valley 20011687, 20011688 and 20012969.

To review the permits and water usage allocations visit SWFWMD on the web at Watermatters.org or contact the Communications Department at 1-800 423-1476

With the completion of the reclaimed water projects and getting the golf courses to use this alternative source will provide additional water available to the canal system which would add more depth during drought conditions and contain more water during the rainy season. With the completion of our weir projects to contain and control the outflow should help stabilize our water level which will aid in the controlling of aquatic weed growth.

The management plan that is developed must include all aspects of the system, water management, irrigation, recreation and wildlife support. It must remain functional, esthetically pleasing, and protect the value of our properties.

## Appendix 2.

### TROPHIC STATE- THE ABILITY OF A WATERBODY TO SUPPORT PLANTS, FISH AND WILDLIFE

NOTE: This document was adapted from a Florida LAKEWATCH publication. It describes the ecological status of the canal system in terms of nutrient levels.

TROPHIC STATE:

Scientists developed the Trophic State Classification System to describe and organize what is known about the many varied and diverse water bodies. It's one of the more commonly used systems worldwide and is used by Florida LAKEWATCH. This system groups water bodies into one of four categories, called trophic states, based on their level of biological productivity. The names of the four trophic states, from the lowest level of biological productivity to the highest are: Oligotrophic, Mesotrophic, Eutrophic and Hypereutrophic.

Trophic means "of or relating to nutrition"
Oligo means "scant or lacking"
Meso means "mid-range"
Eu means "good or sufficient"
Hyper means "over abundant"

These classifications are based on four water chemistry parameters. Total chlorophyll, total phosphorus, total nitrogen, and water clarity. These four parameters serve as indicators of a water body's biological productivity, that is, its ability to support life. The word "indicator" is used here, because biological productivity is not something that can be measured directly.

**The Four Water Chemistry Parameters Used To Determine Trophic State**

Chlorophyll is the dominant green pigment found in most algae (the microscopic

plant-like organisms living in a water body). Chlorophyll enables algae to use sunlight to make food. In fact, most algae are so dependent upon chlorophyll pigments for survival that a measurement of the concentration of all the chlorophyll pigments found in a water sample (called total chlorophyll) can be used to estimate the amount of free floating algae in that water body. When large amounts of total chlorophyll are found in the sample, it generally means there are a lot of algae present.

Once we have an estimate of the amount of algae in a water body, we can take it a step further and use this information to estimate a trophic state. Since algae are a basic food source for many aquatic animals, their abundance is a crucial factor in how much life a water body can sustain. In general, when measurements of total chlorophyll are high (indicating lots of algae are present), the water body will be more biologically productive.

Phosphorus is another nutrient necessary for the growth of algae and aquatic plants. It's found in many forms in water body sediments and dissolved in the water. LAKEWATCH measures "total phosphorus" that includes all the various forms of phosphorus in a sample. When this nutrient is in low supply, (and all other factors necessary for plant and algae growth are present in sufficient amounts), low biological productivity can be expected. In some water bodies, phosphorus may be at a level that limits further growth of aquatic plants and/or algae. When this is true, scientists say phosphorus is the "limiting nutrient." On the other end of the trophic state scale, highly productive water bodies usually have an abundance of phosphorus.

Nitrogen is also a nutrient necessary for the growth of algae and aquatic plants. The LAKEWATCH measurement includes the sum of all forms of nitrogen called "total nitrogen." When total nitrogen is in low supply, (and other factors necessary for plant and algae growth are present in sufficient amounts), low biological productivity can be expected. Like phosphorus, nitrogen can be a limiting nutrient.

Water clarity refers to the clearness or transparency of water. Water clarity is determined by using an 8 inch diameter disk, called a Secchi (pronounced SEC-ee) disk. The maximum depth at which the Secchi disk can be seen when lowered into the water is measured. Several factors can affect water clarity in the following ways: free floating algae in the water can make water bodies less clear; dissolved organic compounds (called tannins) can cause water bodies to appear reddish or brown; and suspended solids (tiny particles stirred up from the water body's bottom or washed in from the watershed) can cause the water to be less clear. Secchi measurements must be used carefully.

For water bodies in which the presence of algae is the main factor that diminishes water clarity, the Secchi disk reading can be used to form an estimate of the water body's biological productivity. In this case, when the Secchi disk reading is a small number, it would indicate high levels of algae and therefore high biological productivity. Basing an estimate of biological productivity on water clarity alone is an attractive option, because the measurement is inexpensive and simple. However, if dissolved organic compounds (tannins) or suspended solids are present in significant amounts, this method may be misleading giving the impression the water body is more biologically productive than it actually is. LAKEWATCH measures both water clarity and total chlorophyll (algae) in order to get a more realistic picture. When the amount of algae in a lake is high, the Secchi disk disappears from view at a shallow depth.

## Criteria Used To Define The Four Trophic States

The criteria for classifying lakes into trophic states are based on the four water chemistry parameters (total chlorophyll, total phosphorus, total nitrogen, and water clarity). Definitions of the four trophic states, descriptions of typical water bodies in each trophic state, and the nutrient level criteria are listed below:

Oligotrophic water bodies have the lowest level of biological productivity. A typical oligotrophic water body will have clear water, few aquatic plants, few fish, not much wildlife, and a sandy bottom.

NOTE: The unit of measurement “micrograms per liter” is abbreviated “ µg/L”

Criteria:

Total chlorophyll is less than 3 µg/L
Total phosphorus is less than 15 µg/L
Total nitrogen is less than 400 µg/L
Water clarity is greater than 13 feet

Mesotrophic water bodies have a moderate level of biological productivity. A typical Mesotrophic water body will have moderately clear water and a moderate amount of aquatic plants.

Criteria:

Total chlorophyll is between 3 and 7 µg/L
Total phosphorus is between 15 and 25 µg/L
Total nitrogen is between 400 and 600 µg/L
Water clarity is between 8 and 13 feet

Eutrophic water bodies have a high level of biological productivity. A typical eutrophic water body will have either lots of aquatic plants and clear water; or it will have few aquatic plants and less clear water. In either case, it has the potential to support lots of fish and wildlife.

Criteria:

Total chlorophyll is between 7 and 40 µg/L
Total phosphorus is between 25 and 100 µg/L
Total nitrogen is between 600 and 1500 µg/L
Water clarity is between 3 and 8 feet

Hypereutrophic water bodies have the highest level of biological productivity. A typical hypereutrophic water body will have very low water clarity, the potential for lots of fish and wildlife, and it may have an abundance of aquatic plants.

Criteria:

Total chlorophyll is greater than 40 µg/L
Total phosphorus is greater than 100 µg/L
Total nitrogen is greater than 1500 µg/L
Water clarity is less than 3 feet

You can reconcile your expectations with a water body's true potential. For example, oligotrophic water bodies are often considered better suited for swimming than for fishing or watching wildlife. Because they typically have low levels of algae, the water is clear; which is an enticing feature for swimmers. However, the same clear water contains little food and habitat for supporting abundant fish and wildlife populations.

On the other end of the trophic spectrum, eutrophic or hypereutrophic water bodies are often considered better suited for fishing and bird watching, because they typically have an abundance of food and habitat. Most swimmers, however, would not enjoy being in the less clear water, or disentangling themselves from the abundant plant growth that is generally characteristic of these highly productive water bodies.

You may be able to devise effective management strategies depending on the goals that you have chosen for your lake. Knowing your water body's trophic state can help you make an informed decision and improve your chances for success.

For example, if your water body was oligotrophic and more trophy bass were desired, it would be a mistake to merely stock more fish. There wouldn't be enough food to support them. A more effective management option might be to add nutrients to the water body, as is done by fisheries management agencies, to increase the amount of food (algae) and/or plants (habitat) in the water. In contrast, if your water body was eutrophic and you conclude that your water body has excessive vegetation, then nutrient reduction by limiting fertilizer runoff would be an appropriate response. This is the status of the Rotonda West canal

system.

The trophic state vocabulary allows us to describe a water body and its biological productivity in a single word. For example, to say a water body is oligotrophic should evoke a picture of crystal clear water, few aquatic plants, a sandy bottom, few fish, and scarce wildlife. Long term monitoring will show if the trophic state of the water body changes. People have concerns about the impact of activities on their water body such as increasing population, nearby mining, drought, flooding, fertilizer runoff or others. However, some change is normal in living systems like water bodies. How can you decide which changes are merely normal fluctuations and which are not? Many aquatic scientists view changes as being significant when they result in a water body moving from one trophic state to another. In this way the trophic state classification provides a useful yardstick for evaluating the seriousness of changes in a water body.

Aquatic plants play a major role in a water body's biological productivity by providing habitat for aquatic organisms and support for attached microorganisms like algae and small animals. Aquatic plant abundance also serves as an important indicator of a water body's trophic state.
Consequently, some water bodies may be classified into the wrong trophic state if the abundance of aquatic plants is not taken into account. For example, when submersed aquatic vegetation covers more than 50% of a water body's bottom, there will generally be less algae floating in the water. The resulting low chlorophyll measurements may cause some water body managers to classify a water body as having a low level of biological productivity, even though the presence of large amounts of submersed aquatic plants clearly demonstrates that it is highly productive. Unfortunately, it's expensive and time-consuming to perform a survey of aquatic plants, so these important data are often not available. In an effort to bridge the information gap, Florida LAKEWATCH staff and University of Florida students are conducting aquatic plant surveys on selected LAKEWATCH water bodies during the summer months, as funding permits. One explanation is that either the submersed plants, or perhaps the algae attached to them, use the available phosphorus in the water, depriving the free-floating algae

of this necessary nutrient.  Another explanation is that the submersed plants anchor the nutrient-rich bottom sediments (muck) in place thus buffering the action of wind, waves, and human effects depriving the free-floating algae of phosphorus contained in the mud that would otherwise be stirred up. Additionally, it's thought that algae will attach to underwater plants instead of floating in the water.

## Appendix 3.

## CANAL WATER SAMPLING PLAN

I. Routine Sampling

A. Locations

Oakland Hills End
Rebel Court
White Marsh Inlet
White Marsh Weir
Pine Valley Weir
Pine Valley End

B. Analyses

Total Nitrogen
Total Phosphorus
Chlorophyll
Clarity

C. Laboratory

Florida Lake Watch/Sample Collector.

D. Cost

Analyses are provided by Lake Watch at no cost.

II. Field Tests Performed With Meters.

A. Locations–Same as I A.

B. Analyses

Dissolved oxygen,
Conductivity

pH (Acidic or Basic)
Temperature

C. Meters Required -- To Be Determined

D. Cost–To Be Determined

D. Frequency

Monthly or as needed

III. Specialty Testing

A. Locations

Oakland Hills End
White Marsh inlet (both sides)
Pine Valley End
Buck Creek (both sides)

B. Analyses

Chloride
Fats, Oils, Grease (FOG)
Polychlorinated Bi-phenyls (PCB)
Heavy Metals (Lead, Cadmium, Mercury)

C. Laboratory – To Be Determined

D. Frequency

First Year: Twice At Six Month Intervals

Year 2 – Annually

This could change based on the results. These tests could be performed after a major storm that resulted in flooding

IV. Fecal Coliform Testing

A. Locations

Oakland Hills End
White Marsh inlet (both sides)
Pine Valley End
Buck Creek (both sides)

B. Laboratory–To Be Determined

C. Frequency

Six Times Per Year (Bi-Monthly)

D. Cost–To Be Determined

## Appendix 4.

## EDUCATION & MANAGEMENT OF ECOSYSTEM

Videos: What makes a Quality Lake

Florida Aquatic Plant Story

Aquatic Plant Identification

Books: *Florida Waters*- ( a water resources manual from Florida water management districts)

*A Beginners Guide to Water Management* – (LAKEWATCH)

*Biology and Control Aquatic Plants*- ( A best management practices handbook)

Brochures: "A Homeowners Guide to Rotonda's Canals"

Other brochures from SWFWMD and Charlotte Co.

## Appendix 5.

## DEFINITIONS

**1. Aquatic Biologist**: An individual educated with a Bachelors or Higher Degree to study micro-organisms, plants and animals living in water

**2. Biological weed control**: the use of living organisms such as insects and pathogens to keep the growth of unwanted aquatic vegetation. This may also include triploid carp, manatees and snails.

**3. Build-out**: Future development of residential and commercial vacant land.

**4. Cedar Point**: Cedar Point is part of the Charlotte Harbor Environmental Center which is a private non-profit corporation. Its mission is to offer environmental education, recreation, research and preservation land management for the greater charlotte harbor area. Cedar Point Park is the last remaining large tract (88 acres) of land on lemon bay. It is located on Placida Road, across from Lemon Bay High School.

**5. Chemical weed control**: the use of herbicides to kill or seriously interrupt the growth process of unwanted aquatic vegetation

**6. Confluence**: A place where two or more streams or bodies of water meet.

**7. EPA**: U.S. Environmental Protection Agency. The mission of EPA is to protect human health and to safeguard the natural environment -- air, water and land -- upon which life depends

**8. LAKEWATCH**: Florida LAKEWATCH is part of the University of Florida and is coordinated through the institute of food and agricultural sciences/school of forest resources and conservation fisheries and aquatic sciences. Volunteers collect water samples which are analyzed by the water chemistry laboratory. These analysis are performed at no charge and have produced a significant data

base of water chemistry parameters for many bodies of water in Florida including the Rotonda West canal system.

**9. Littoral Zone**: Part of the waterway closest to shore, that supports emergent plants and the largest and most diverse population of fish and animals.

**10. Mechanical weed control**: the use of specialized machines for removing unwanted aquatic vegetation.

**11. MSBU**: Municipal Service Benefits Units – a system used to tax certain areas of the county to fund work in those same areas i.e. streets and swales, sidewalks, rebuilding apices etc.

**12. Muck**: Decaying vegetation on the canal bottom.

**13. "no- mow" zone**: A six foot or larger strip of land adjacent to the canal, planted with low maintenance plants to reduce the potential for fertilizer residues entering the water.

**14. Rotonda West Association, Inc. Governing Documents**. These guidelines may be found in the RWA office in the Community Center.

**15. Swale**: A low area, acting to store divert and direct water runoff after heavy rains.

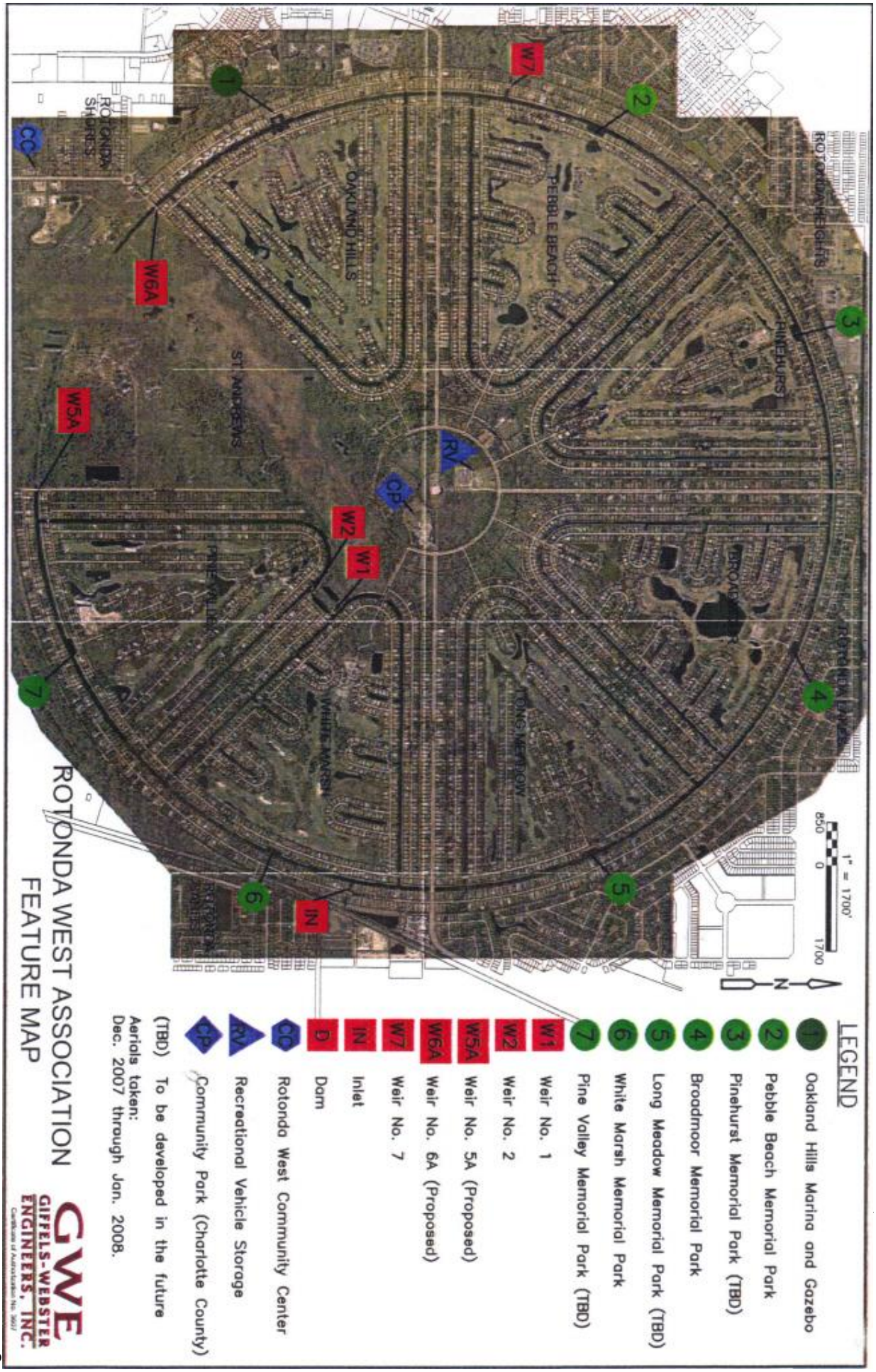
**16. SWFWMD**: The **Southwest Florida Water Management District** (District), unofficially nicknamed “Swiftmud” or **SWFWMD**, is one of five regional agencies directed by Florida state law to protect and preserve water resources. Established in 1961 the agency operates and maintains several large properties and flood protection projects, sometimes with other agencies. The District's responsibilities have expanded to include managing water supply and protecting water quality and the natural systems — rivers, lakes, wetlands and associated uplands.

**17. Watershed**: A geographical area in which water, sediment and dissolved minerals all drain into a common body of water. A watershed includes all plants,

animals and non-living components like rocks and soil.  Everything that humans do can affect the water that runs through this system.

**18. Weir**: A dam with a notch in a waterway to raise the water level and control the outflow.

**APPENDIX 6 – MAP**

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