Stormwater Pond Management at Southwood - - Two Case Studies

By Jess Van Dyke

Van Dyke Environmental Services

For the Southwood Community Development District

July 26, 2016

Idealized portrayal of the pond at the Verandas-at-Southwood.

1. Why do stormwater ponds exist?

Initially, stormwater management in Florida was basically the practice of moving water downhill from developed property as rapidly as possible, then protecting developed lowlands from flooding. Our state's water management districts were conceived as "drainage districts" with the primary function of building and maintaining drainage canals. Cities and towns followed suit focusing solely of flood prevention. Unfortunately, this led to drainage systems that maximized local convenience and protection, without considering downstream damage. Consequently, the water quality of Florida's lakes and estuaries suffered major pollution. In time, clean water in Florida was recognized as critical for potable water, agriculture, industry and recreation. The increased awareness of stormwater quality problems by citizens and elected officials stimulated state and local governments to broaden the objectives of their stormwater programs.

During the late 1970s and early 1980s, numerous investigations were undertaken in Florida to characterize stormwater pollutant loadings and to evaluate the performance and cost-effectiveness of various stormwater management techniques. These studies demonstrated that stormwater was the primary source of pollutant loading to state surface waters. With Florida's rapid growth, the state's

ability to meet the Federal Clean Water Act's (1977) objective of "fishable and swimmable waters" was impossible without implementation of strong stormwater programs.

Unlike industrial states, the majority of pollutant's entering Florida's waters come from non-point sources that are diffuse and driven by rainfall. These pulses of stormwater most often cannot be centrally collected and treated. Runoff from developed areas contains a wide variety of pollutants, including nutrients, heavy metals, pesticides, bacteria, and sediments. Water quality scientists devised effective methods to improve water quality and reduce the volume and velocity of stormwater, called Best Management Practices. BMP's formed a "treatment train" of berms, swales, infiltration ponds, and wet detention facilities. The latter technique is the mainstay. Most pollutants are attached to particles which settle to the bottom of the quiescent pools that stormwater ponds provide. The quality of the excurrent water is, therefore, greatly improved. (http://infohouse.p2ric.org/ref/41/40259.pdf)

Today, stormwater ponds are everywhere in Florida, and the goals have broadened to aesthetics, open space, and recreational benefits. Numerous studies indicate that property values adjacent to these ponds are significantly higher compared to non-adjacent lots. However, it is important to remember that the protection of water quality is still the primary reason that these ponds exist. That is a crucial point because, if maintenance activities increase the loading of fertilizers, pesticides, and heavy metals into stormwater ponds, the primary objective of improving water quality can be lost.

2. Why are stormwater ponds maintained?

In time, it became apparent that simply building stormwater facilities, then ignoring them, was not sufficient to protect downstream water quality. Many stormwater ponds, especially private ponds, became overgrown with cattails and willow trees, pipes became clogged with sediment and vegetation, and the deposition of organic matter greatly reduced their hydraulic capacity and function. Local government recognized this problem. As part of the revision of its Environmental Management Ordinance and the implementation of its stormwater utility in 1988, the City of Tallahassee implemented a stormwater operation permit system that requires regular maintenance of stormwater systems and periodic renewal of the operating permits.

This neglected stormwater pond elsewhere is overgrown with vegetation and has lost its hydraulic function.

Each February, Steve Aaron (891-7168), the COT's Private Stormwater Pond Inspector, surveys the condition of the stormwater facilities within the Southwood Community Development District as part of the permitting process. An engineering technician, Steve focuses on the hydraulic function of the ponds and is generally quite pleased with the facilities at Southwood. Water quality assessments and biological evaluations, however, are not parts of his duties. His attention is directed toward problems with pipes, structures, and rip-rap. However, he understands the growing movement toward improving the aesthetics and natural habitat of stormwater ponds, as long as it does not impede function, as outlined in individual Operating & Management Plans (Appendicies 1 & 2).

The generic guidance by the City of Tallahassee provided in every operating permit application is as follows:

Operation and Maintenance Plan outlining the specific operating procedures including routine, intermittent and annual maintenance consisting of but not limited to: lubricating and exercising of valves and gates, if any. Cleaning of weirs and trash racks, mowing, dredging, cleaning and/or replacing filter media and underdrains (as applicable), and all other activities required to ensure that the facility performs as designed. Include possible facility adjustments and how and when they will be made. This plan should include estimates of equipment required, man hours and crew size, schedules, and an estimate of long term annual cost. Also include maintenance of wetlands or aquatic species vegetation if any exist and/or are required.

More specific guidance is provided in city's "Operation & Maintenance of Stormwater Management Facilities" report (http://www.talgov.com/growth/growth-stormwater-mgt.aspx):

a. Inspect all conveyances regularly to make sure there is no undermining, breakage, or blockages.

b. Pipes must stay free from blockages of accumulated sediment.

c. Sand filters must be kept clear of weeds at all times. Weeds must be pulled by hand to ensure the root masses are also removed and re-growth is prevented.

d. Turf vegetation within the facility must be kept at a height no greater than six (6) inches.

e. All clippings must be removed.

f. Control invasive plant species, such as Water-hyacinth, Bamboo, Kudzu, Chinese Tallow Trees and Mimosa Trees.

g. If more than 20% of the bottom surface of the facility is covered by cattails, they must be removed.

Please note that there is no requirement to eradicate all aquatic vegetation. On the contrary, the City's Stormwater Management Design Standards (Sec. 5-86) encourages the establishment of aquatic vegetation: "Planting specifications and species for stormwater management facility landscaping shall be suitable for individual pond characteristics of soil, slope, aspect, hydroperiod and microclimate and approved by the growth management biologist." On June 8, 2016, COT's Growth Management

Biologist, Rodney Cassidy (891-7158), said that he would be “all for enhancing the shorelines [at Southwood] with vegetation, as long the plantings do not adversely impact the function” of the stormwater ponds. His views mesh with Florida’s Fish & Wildlife Conservation Commission’s official position: “Aquatic plants growing in and around a pond provide many benefits. They help maintain good water quality by reducing erosion and absorbing nutrients. Plants provide cover for fish and a substrate for the colonization of minute organisms used by small fishes. Wildlife will use the shoreline vegetation for concealment and as areas to search for food.”

The Lily Pond in Giverny, France made famous by impressionist artist Claude Monet. Unkempt or beautiful?

3. What is the right amount of vegetation in and around stormwater ponds?

This is a challenging question for residential community leaders because it deals with the highly subjective area of aesthetics. Simply put, beauty is a matter of personal taste. Some community members prefer stormwater ponds that have a neat, tidy appearance, while others appreciate a more rustic, verdant look. Compromise is often required. Fortunately, there are many options in the continuum between “manicured” and “natural” that can be tailored to individual stormwater ponds (and even to parts of ponds) that do not impede the required hydraulic function. Less intensive management is optimal for water quality, fish & wildlife habitat, and cost savings. In contrast, a manicured appearance can only be accomplished by frequent mowing and regular pesticides use. Because of the reduction in revenue, there is often an institutional bias for private vendors to provide advice that discourages the natural option in favor of a more manicured look.

Current management practices at Southwood fall distinctly in the manicured camp. Mowing is utilized all the way to the shoreline of stormwater ponds. Lawn edging is used to create a rim around the ponds. Aquatic plants are treated monthly with herbicides with the goal of total elimination. While

mowing and edging have only temporary effects, the use of certain herbicides can permanently affect the sediments of stormwater ponds. Heavy metals have been identified as the most prevalent toxicants found in urban runoff with concentrations often at levels harmful to aquatic life. Among the metals detected in stormwater copper is one of the most abundant. The use of copper-based herbicides further contaminates the bottom substrate with elemental copper, which unlike other aquatic herbicides, does not biodegrade. On the contrary, copper can continue to kill benthic invertebrates long after any aquatic plant control activities have ended. Applying copper herbicides repeatedly to stormwater ponds for aesthetic reasons seems unjustified given its long term, detrimental impacts to aquatic life. (http://link.springer.com/chapter/10.1007/978-1-4419-9860-6_1)

A regularly scheduled program of cutting and trimming of grass at stormwater facilities during the growing season helps maintain a tightly knit turf and can prevent diseases, pests and the intrusion of weeds. That makes sense. However, aquatic plant control is quite different. As a rule, the use of pesticides, including herbicides, should be avoided in association with the maintenance of stormwater systems, unless a need is clearly established. At Southwood, up to fourteen stormwater ponds are treated preemptively on a monthly basis, even in the dead of winter (Appendix 3). Such intensive management seems unnecessary and excessive.

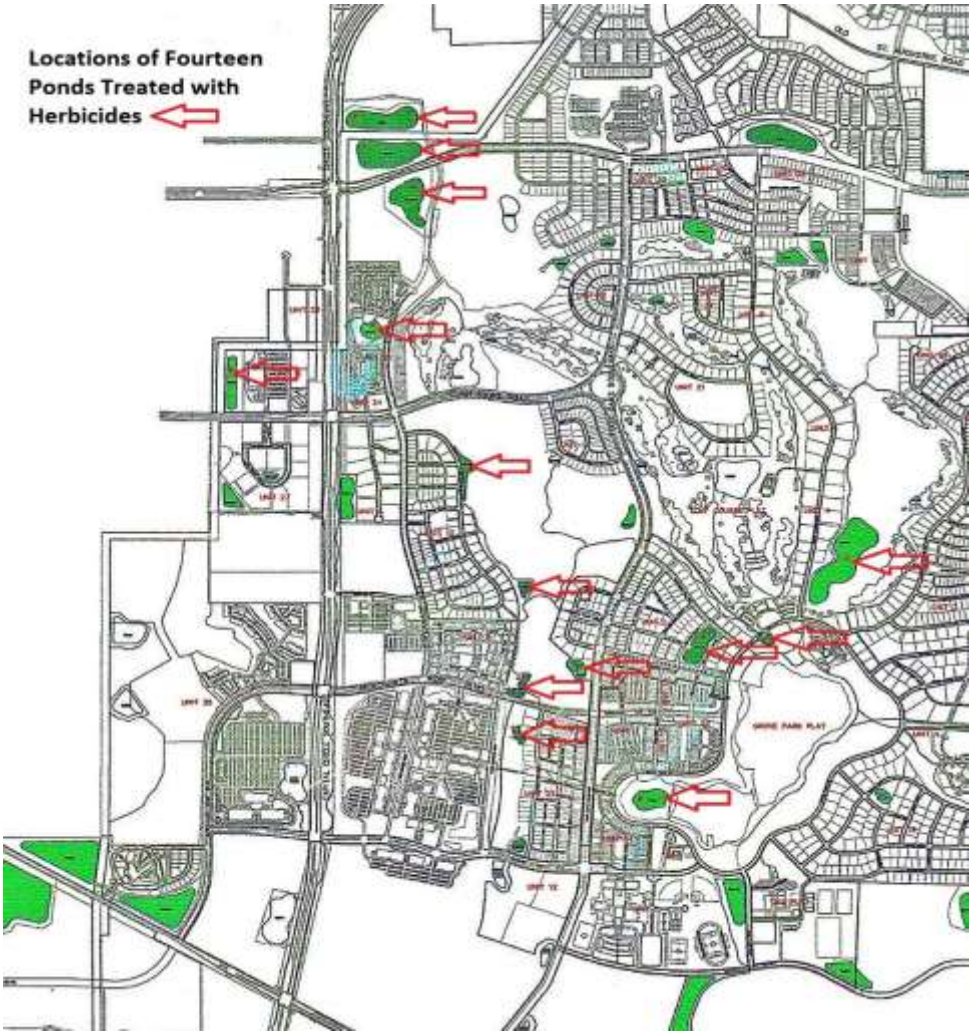


Table 1. STORMWATER PONDS TREATED AT SOUTHWOOD WITH AREA AND PERIMETER DATA

FL 130 TOWN CENTER - 2 ACRE 1500' PER
FL 040 MOSSY CREEK & GROVE DR. - 6.4 ACRE 3000' PER
FL 120 RIVERTON & GROVE PARK - 2 ACRES 1250' PER
FL 131 GROVE PARK ACROSS FROM CLUBHOUSE - .18 ACRE 375' PER
WD 240 WEST OF FOUR OAKS @ ALCOT - .4 ACRE 500' PER
WD 141 SOUTH END OF OVERLOOK DR. - .4 ACRE 570' PER
WD 160 NORTH END OF OVERLOOK DR. - .2 ACRE 314' PER
WD 140 MERCHANTS ROW ON EAST SIDE OF TWIN OAKS APTS. - .67 ACRE 910' PER
WD 235 NORTH END SUMMERTREE DR. - .36 ACRE 1000' PER
WD 162 UNIT 20 ESPLANADE WAY – 1.12 ACRE 785' PER
WD 090S - 2.5 ACRE 1660' PER
WD 090N - 4.2 ACRE 1800' PER
WD 290 - 2.8 ACRE 1880' PER
TR 230 PUBLIX – 1.8 ACRE 1600' PER

TOTAL: 25.03 ACRES 17,144' PER

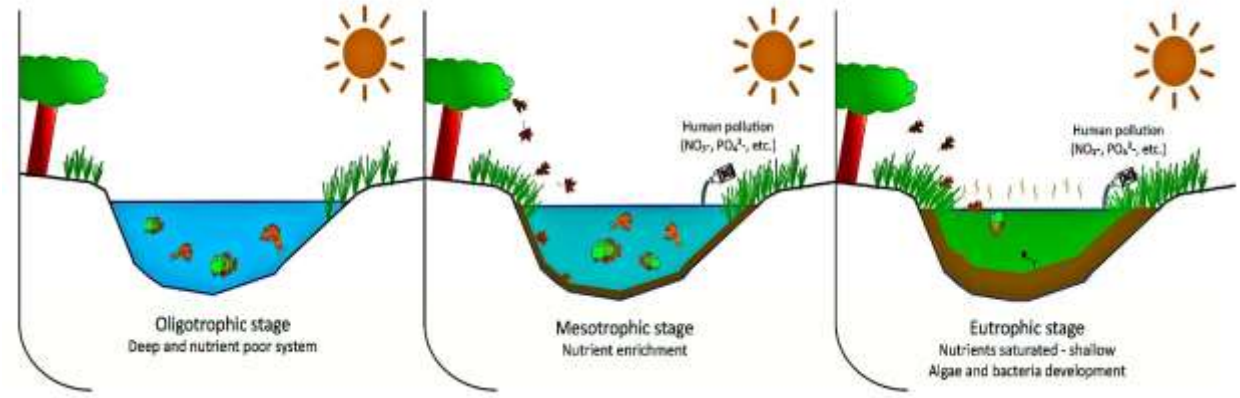
Table 2. AQUATIC HERBICIDES APPLIED TO SOUTHWOOD'S STORMWATER PONDS IN 2015

AQUA STAR (53.8% glyphosate)	2.19 gal.
ARGOS (27.9% chelated copper)	20.5 gal.
COPPER SULFATE (100% CuSO4)	32 lbs.
CLIPPER (51% flumioxazin)	7.5 lbs.
ECOMAZAPYR (27.8% imazapyr)	2 gal.
KOMEEN (22.9% chelated copper)	2.75 gal.
NAVIGATE GRANULES (27.6% 2,4-D)	51 lbs.
ROUND UP CUSTOM (53.8% Glyphosate)	0.5 gal.
TRIBUNE (37.3% diquat)	15 gal.
SONAR AS (41.7% fluridone)	44 oz.

4. Catfish Pond - - the first case study.

Catfish Pond (FL 130) is a 1.7-acre, somewhat rectangular, stormwater pond that was converted from wetland prior to 2002. It has a watershed comprised of single-family residential development, a history of well water input, and drains into the larger lobe of Central Park Lake via a 60” pipe. Catfish Pond has two aerators comprised of a shore-based compressor and bottom diffusers. Aeration systems are low maintenance and are often compared to aquarium compressors on a larger scale. They require annual maintenance and are not recommended for permanent pools less than eight feet deep.

The major problem of Catfish pond is nutrient enrichment. The plant nutrients of most concern are nitrogen and phosphorus. Nitrogen loading is a problem because it induces explosive growth of plants and algae. Nitrogen appears in surface waters as dissolved atmospheric nitrogen, nitrates, nitrites, ammonia, and organic nitrogen (e.g., proteins and amino acids). Algae and bacteria are capable of fixing, reducing, and oxidizing nitrogen through biochemical and metabolic processes. Phosphorus is a macronutrient necessary for the metabolic activity of aquatic organisms. Because much of the available phosphorus in an aquatic system becomes sequestered in the bottom sediments, it is often referred to as the “limiting nutrient” in aquatic systems. Phosphorus, not nitrogen, usually limits “eutrophication.”



Catfish Pond is "eutrophic" because of nitrogen runoff from fertilizer, phosphorus recycled from the bottom sediments, the lack of any upland vegetated buffer, and aggressive aquatic plant control. After twelve years of intensive management, there are no shoreline or submersed plants. Instead, the abundant nutrients feed a dense, unsightly mat of black filamentous algae (*Lyngbya* and *Oscillatoria*).

Filamentous algae blankets Catfish Pond (May 13, 2016).

Herbicides can control filamentous algae temporarily, but they do not address the root cause - - nutrient pollution. Fortunately, there is a way to do so, called nutrient inactivation. Since phosphorus is usually the "limiting factor" in aquatic plant growth, it is the target of inactivation. Aluminum sulfate (alum) is dispensed in carefully controlled amounts to an affected water body. The aluminum reacts with the soluble reactive phosphorus (SRP) to form aluminum phosphate which is insoluble at pH values between 3 and 9. Additionally, the aluminum undergoes hydrolysis to form aluminum hydroxide floc that clarifies the water column and adsorbs additional phosphorus. The aluminum hydroxide precipitate, and floc settle to the bottom of the lake or pond, forming a thin film over the sediment. This thin film decreases phosphorus release and recycling from bottom sediments.

Nutrient inactivation will reduce algal densities and clarify water. In severe cases, the use of an algaecide may be necessary to kill the algae prior to nutrient inactivation. The twin aeration diffusers in Catfish Pond could be used to disperse alum, making the task easy and inexpensive. Phosphorus loading to Catfish Pond has already been curtailed by the cessation of construction activity and of pumping groundwater into the pond. If phosphorus loading continues to be well managed, the benefits of nutrient inactivation could last 10 to 20 years.

Fish beds in Catfish Pond (May 13, 2016).

The extreme degree of plant management of Catfish Pond is epitomized by the fact that the shoreline is regularly edged. From a biological and water quality standpoint, such action is unnecessary and destructive. A vegetated buffer around the perimeter of this pond would help filter pollutants from adjacent properties, aide in preventing shoreline erosion, and provide for some wildlife habitat. Certain areas could be maintained for fishing access, if desired, but edging should cease, and a 3'-5' strip around the perimeter of the pond should be mowed only once a year (February), if that.

Catfish Pond (FL 130) shore after the use of an edger (May 13, 2016).

5. WD090N - - the second case study.

Stormwater Pond WD090N is a 5-acre waterbody created in 2007 north of East Orange and east of Capital Circle SE. It receives stormwater runoff from Capital Circle via a 54” pipe, excess water from WD290 via two 60” pipes, and discharges water to WD090S via three 60” pipes. Like Catfish Pond, WD090N is nutrient-rich, but that enrichment is most often expressed as planktonic algae, rather than filamentous algae. Planktonic algae are microscopic plants, suspended in the water column, which can give a pond a green hue (see above). If the density of planktonic algae becomes too great, dissolved oxygen can plummet over night or on cloudy days in late summer to the point that fish die. Because they directly compete, over control of submersed vegetation promotes planktonic algae “blooms.”

Like Catfish Pond, the vegetation in and around WD090N has been intensely managed. The shoreline is nearly devoid of emersed vegetation and no submersed vascular plants were apparent. The most obvious aquatic plants were windrowed mats of black filamentous algae. In terms of wildlife habitat, WD090N is rather barren. That is unfortunate because recent research has demonstrated that stormwater ponds contribute a great deal to biodiversity at a regional level as networks of habitat patches that also act as 'stepping stones' to facilitate the movement of species through the landscape. Without much expense or effort, WD090N could become excellent habitat for fish and wildlife. The first step would be to end the over-control of aquatic and shoreline vegetation.

The southern shoreline of WD090N looking west (May 13, 2016).

The southern shoreline of WD090N looking east (May 13, 2016).

6. Recommendations

A. Minimize aquatic plant control.

Aquatic plant control in stormwater ponds should not be a monthly, preemptive routine but a response to a clear need, such as preventing the establishment and expansion of invasive species and/or the blocking of pipes and control structures. Based on recent observations, it is my professional opinion that the stormwater ponds at Southwood are being excessively managed. I am particularly concerned about the repetitious use of copper herbicides because copper does not biodegrade, accumulates in the bottom sediments, and can ultimately be toxic to fish and invertebrates.

It is my opinion that the routine, contract-based, aquatic plant control currently employed at Southwood is unnecessary and harmful to the ponds. The Southwood Community Development District could save money while creating a better outcome by eliminating the aquatic plant control vendor and providing clear guidance to the existing, on-site, land management company.

I believe All Pro Land Care of Tallahassee, Inc. is fully capable of furnishing all of the necessary aquatic plant control at Southwood. All Pro already has the experienced personnel and the application equipment stationed at Southwood. The judicious use glyphosate herbicides to control willows, cattails, and torpedograss would maintain the hydraulic function of the stormwater ponds. All Pro is already experienced with the use of glyphosate and could do the necessary aquatic plant control at a greatly reduced cost, in my opinion.

Aquatic herbicides are not “restricted use” pesticides and are available for use by the general public. In Florida, there is a voluntary, educational program for certification as an Aquatic Herbicide Applicator. Such licensing should be encouraged for any such applicator at Southwood, but it is not required by law. Additionally, the Florida Fish & Wildlife Conservation provides free information on aquatic plant identification and control. If necessary, private consultants are available to assist on-site.

Licensing of Aquatic Herbicide Applicators in Florida: http://edis.ifas.ufl.edu/pi011

B. Establish attractive, native, shoreline vegetation.

According to the City of Tallahassee’s Stormwater Management design Standards: “Appropriate species of aquatic plants, as approved by the growth management biologist, shall be placed so as to provide a continuous planting along 80 percent of the perimeter defining the pond's mean high water level within two years of planting” (Appendix 5). However, the stormwater ponds at Southwood are devoid of shoreline vegetation due to excessive control. That can be reversed by landscaping the shoreline of ponds with native aquatic and wetland plants. There are many native, flowering plants that would be excellent candidates for such an effort. Such desirable vegetation would filter polluted runoff, trap sediments, control the growth of nuisance vegetation, improve wildlife habitat, and make the ponds more esthetically pleasing.

C. Create and maintain vegetated buffers.

Vegetated buffers prevent erosion, trap sediment, filter runoff, and function as a floodplain during periods of high water. They also provide a strip along a shoreline which can accept sheet flow from developed areas and help to minimize the adverse effects of untreated stormwater. Creating a buffer strip is simply a matter of changing mowing and edging practices. The design and width of these vegetated buffers could be tailored to individual ponds.

D. Utilize nutrient inactivation.

Because of its small size and chronic problem with filamentous algae, Catfish Pond is an ideal candidate for nutrient inactivation. Alum could easily be injected via hoses at the base of the two aeration diffusers already in place. The results of this inexpensive procedure could last decades.

E. Minimize the use of fertilizers and insecticides on turf and landscape.

While there is little doubt that All Pro understands turf and landscape management, there is always room for improvement. All nitrate fertilizers ultimately make their way to either groundwater or surface water. To protect the ponds at Southwood, the use of fertilizers should adhere to the guidance provided by Article V. of Tallahassee's Code of General Ordinances (Appendix 6), at a minimum. As with aquatic plant control, the use of fertilizers and insecticides on turf and landscape should not be a routine but a response to a clear need. Quoting the ordinance: "Nitrogen fertilizer may not be applied to turf or landscape plants except as provided above unless a tissue deficiency has been verified by an approved test."

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850.893.4652
jessvd@aol.com

List of Experts for further information:

1. Aquatic Plant Management

Matt Phillips
Aquatic Subsection Leader
Invasive Plant Management Section
Florida Fish and Wildlife Conservation Commission
Invasive Plant Management Section - Main Office
3800 Commonwealth Blvd., MS 705
Tallahassee, FL 32399-3000
850-617-9429
Mattv.phillips@myfwc.com

Matt Phillips is an expert in all phases of lake management and aquatic plant control. He supervises a team of aquatic biologists who provide extension service statewide.

2. Stormwater Ponds

Eric Livingston, M.S.
Watershed Management Services, LLC
410 White Oak Drive
Crawfordville, FL 32327
850-926-5310
stormwater.godfather@yahoo.com

Eric Livingston spent 35 years at the Florida Department of Environmental Regulation/Protection where he was involved in the development and implementation of Florida's Stormwater Management Program. Eric's passion for excellence and his stewardship of Florida's stormwater treatment program led his stormwater colleagues to refer to him as Florida's "Stormwater Godfather."

3. Water Quality

Sean McGlynn, Ph.D.
McGlynn Laboratories, Inc.
568 Beverly Ct.
Tallahassee, FL 32301
850-570-1476
kmcglynnlabs@gmail.com

Dr. McGlynn is an environmental scientist with over 33 years of experience addressing a wide range of environmental issues. His technical expertise is in water quality and aquatic system ecology. His knowledge of the water quality of local lakes is unsurpassed.

4. Aquatic Ecology

Mark V. Hoyer, M.S.
LAKEWATCH Director, Research Programs and Services
Florida LAKEWATCH Lab
Fisheries & Aquatic Sciences
7922 NW 71st St
Gainesville, FL 32653
352-392-4817
mvhoyer@ufl.edu
http://lakewatch.ifas.ufl.edu/index.shtml

Mark Hoyer has worked extensively on the interrelationships of water chemistry, aquatic macrophyte communities, fish populations, and aquatic bird populations. His primary interest is the eutrophication of lakes and ponds.

5. Copper Herbicides

Drew Leslie, M.S.

Drew Leslie is the retired research biologist who wrote a ground-breaking report on the potential impacts of the use of copper herbicides on the aquatic environment during his long career at Florida's Department of Environmental Protection.

drewleslie@comcast.net

Aquatic Use of Copper-Based Herbicides in Florida;
http://www.ibrarian.net/navon/paper/Aquatic_Use_of_Copper_Based_Herbicides_in_Florida.pdf?paperid=1970091

APPENDIX 1.

SWMF Operation and Maintenance Plan

FL130

Activity	Schedule	Equipment	Crew	Man-Hours
Inspect inlets and pond area for debris. Remove debris.	Monthly or after each major rain event.	Trash Receptacle, Shovel	1	3
Mow grassed areas, Remove clippings	Bimonthly or as needed.	Lawn mower, Trash Receptacle	2	6
Maintain Landscaping. Remove excess or dead vegetation.	Bimonthly or as needed.	Trash Receptacle, Shovel	2	4
Inspect for erosion of sides slopes.	Monthly or after each major rain event.	None	1	1
Inspect and clean out underdrain filter system.	Annualy or as needed.	Hose	1	2

Estimated Annual Cost $ 3,382.00

APPENDIX 2. Operation and Maintenance Plan for WD090N

WD 90N

CAPITAL PLACE AT SOUTHWOOD

Stormwater Management System Operation
And
Maintenance Plan

General Maintenance

The system shall be kept free of grass, leaves, limbs, trash or other debris that can impede the free flow of water through the system. The following items shall be completed every 6 months:

1. Inspect inlets and swales to ensure they are free of debris. Clear as necessary.
2. All culverts should be inspected and cleaned to remove sediment and silt.

Annual General Maintenance

In addition to the General Maintenance, the system shall be thoroughly inspected at least once a year. The annual inspection should include inspection of the following items:

1. Stormwater inlets - Look for build-up of sediment and debris in the invert and clear as necessary. Check all structures for signs of cracking, chipping, leaking, or rusting. Any of these signs may indicate a potential failure. If present, contact a contractor to have the structure more thoroughly inspected and repaired or replaced if necessary.
2. Stormwater outlets – Check for excessive erosion and possible settlement of outfall structure. Make sure outlet is clear allowing for the free flow of water.

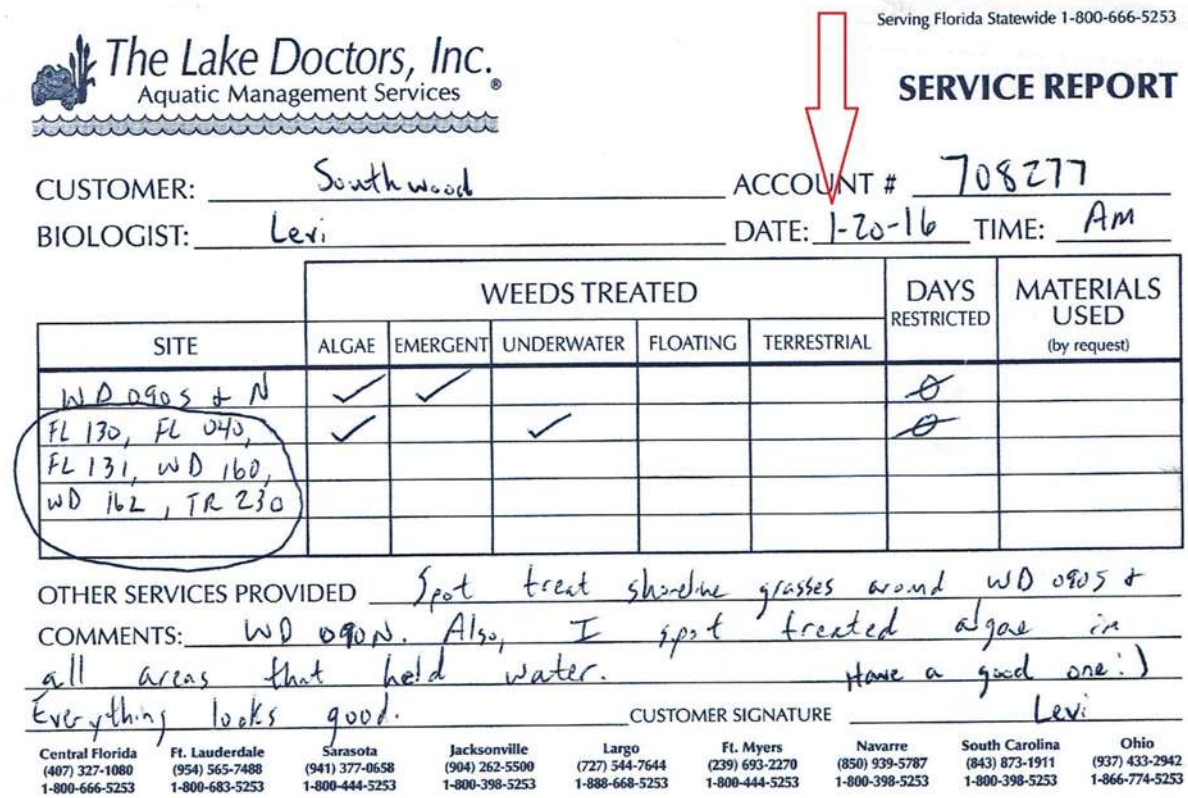
Cost and Equipment

It is anticipated that inspections will be necessary for the conveyance system. If cleaning is needed the owner will responsible for maintenance.

Major repairs to structures (asphalt, inlets, or outlets) will require that a contractor capable of performing such repairs be hired.

Maintenance and inspection cost is anticipated to be minimal, demanding 8 man-hours per year for maintenance at a cost of approximately $1,200.00. Additional cost may be incurred if repairs have to be made on the conveyance system, and may vary depending on the extent of the repairs.

APPENDIX 3.



The Lake Doctors, Inc.
Aquatic Management Services

Serving Florida Statewide 1-800-666-5253

SERVICE REPORT

CUSTOMER: Southwood ACCOUNT # 708277

BIOLOGIST: Levi DATE: 1-20-16 TIME: AM

SITE	WEEDS TREATED: ALGAE	EMERGENT	UNDERWATER	FLOATING	TERRESTRIAL	DAYS RESTRICTED	MATERIALS USED (by request)
WD 0905 & N	✓	✓				0	
FL 130, FL 040,	✓		✓			0	
FL 131, WD 160,							
WD 162, TR 230							

OTHER SERVICES PROVIDED Spot treat shoreline grasses around WD 0905 & WD 0904. Also, I spot treated algae in all areas that held water.

COMMENTS: Have a good one:) Everything looks good.

CUSTOMER SIGNATURE Levi

Central Florida	Ft. Lauderdale	Sarasota	Jacksonville	Largo	Ft. Myers	Navarre	South Carolina	Ohio
(407) 327-1080	(954) 565-7488	(941) 377-0658	(904) 262-5500	(727) 544-7644	(239) 693-2270	(850) 939-5787	(843) 873-1911	(937) 433-2942
1-800-666-5253	1-800-683-5253	1-800-444-5253	1-800-398-5253	1-888-668-5253	1-800-444-5253	1-800-398-5253	1-800-398-5253	1-866-774-5253

APPENDIX 4. Aquatic Herbicide Use in 2015.

DATE	HERBICIDE	AMOUNT	POND TREATED	WEEDS TREATED
1/27/2015	KOMEEN (22.9% chelated copper)	2.5GAL	PERIMETER TREATMENT ON ALL PONDS	FILAMENTOUS ALGAE
2/18/2015	COPPER SULFATE CRYSTALS	20LBS	PERIMTER TREATMENT ON ALL PONDS	FILAMENTOUS ALGAE
2/18/2015	CLIPPER (51% flumioxazin)	.5LB	MIXED WITH COPPER SULFATE	FILAMENTOUS ALGAE, SLENDER SPIKE RUSH
3/31/2015	TRIBUNE (37.3% diquat)	2GAL	PERIMETER TREATMENT ON ALL PONDS	BLADDERWORT, SLENDER SPIKE RUSH, AND FILAMENTOUS ALGAE
3/31/2015	CLIPPER (51% flumioxazin)	1LB	MIXED WITH TRIBUNE	BLADDERWORT, SLENDER SPIKE RUSH, AND FILAMENTOUS ALGAE
4/22/2015	AQUA STAR (53.8% glyphosate)	1GAL	SHORELINE OF EACH POND	TORPEDO GRASS, CATTAILS
4/22/2015	ECOMAZAPYR (27.8% imazapyr)	1GAL	SHORELINE OF EACH POND	BROADLEAF
4/22/2015	*GROUNDED*	.5GAL	*SURFACTANT*	
5/27/2015	ARGOS (27.9% chelated copper)	2GAL	PERIMETER TREATMENT ON ALL PONDS	FILAMENTOUS ALGAE
5/27/2015	*AQUASTICKER*	10LB	*SURFACTANT*	
5/27/2015	AQUA STAR (53.8% glyphosate)	.5GAL	SPOT TREAT ALL SHORELINES	TORPEDO GRASS, CATTAILS, VARIOUS OTHER GRASSES
5/27/2015	ECOMAZAPYR (27.8% imazapyr)	.5GAL	SPOT TREAT ALL SHORELINES	BROADLEAF
5/27/2015	*GROUNDED*	.25GAL	*SURFACTANT*	
5/27/2015	CLIPPER (51% flumioxazin)	1.5LB	WD090S, WD090N, TR230	SOUTHERN NAIAD, SLENDER SPIKE RUSH
6/24/2015	ROUND UP CUSTOM (53.8% Glyphosate)	.5GAL	LOW WATER LINES OF ALL PONDS	VARIOUS GRASSES
6/24/2015	ECOMAZAPYR (27.8% imazapyr)	.25GAL	LOW WATER LINES OF ALL PONDS	BROADLEAF
6/24/2015	*GROUNDED*	.25GAL	*SURFACTANT*	
6/24/2015	SONAR AS (41.7% fluridone)	4 OZ	WD090S, WD090N,	SOUTHERN NAIAD, SLENDER SPIKE RUSH
6/24/2015	CLIPPER (51% flumioxazin)	2LB	MIXED WITH SONAR	SOUTHERN NAIAD, SLENDER SPIKE RUSH
7/29/2015	SONAR AS (41.7% fluridone)	12 OZ	TREATED PERIMETER OF ALL PONDS	BLADDERWORT, SLENDER SPIKE RUSH
8/18/2015	NAVIGATE GRANULES (27.6% 2,4-D)	50LB	PERIMETER OF ALL PONDS	SLENDER SPIKE RUSH
8/18/2015	SONAR AS (41.7% fluridone)	10 OZ	PERIMETER OF ALL PONDS	SLENDER SPIKE RUSH
9/23/2015	ARGOS (27.9% chelated copper)	2.5GAL	PERIMETER TREATMENT ON ALL PONDS	FILAMENTOUS ALGAE
9/23/2015	TRIBUNE (37.3% diquat)	2GAL	MIXED WITH ARGOS	FOR FILAMENTOUS ALGAE, SLENDER SPIKE RUSH, AND BLADDERWORT
9/23/2015	SONAR AS (41.7% fluridone)	16OZ	MIXED WITH ARGOS	FOR FILAMENTOUS ALGAE, SLENDER SPIKE RUSH, AND BLADDERWORT
10/21/2015	ARGOS (27.9% chelated copper)	3GAL	FL130, WD140	CHARA, FILAMENTOUS ALGAE
10/21/2015	TRIBUNE (37.3% diquat)	.75GAL	MIXED WITH ARGOS	CHARA, FILAMENTOUS ALGAE
10/21/2015	CLIPPER (51% flumioxazin)	.25LB	MIXED WITH ARGOS	CHARA, FILAMENTOUS ALGAE
10/21/2015	AQUA STAR (53.8% glyphosate)	.25GAL	SHORELINES OF ALL PONDS	SPOT TREAT TORPEDO GRASS AND CATTAILS
10/21/2015	ECOMAZAPYR (27.8% imazapyr)	.25GAL	SHORELINES OF ALL PONDS	SPOT TREAT BROADLEAF PLANTS
10/21/2015	*GROUNDED*	.12GAL	*SURFACTANT*	
10/21/2015	*OPTIMA*	.12GAL	*SURFACTANT*	
11/11/2015	AQUA STAR (53.8% glyphosate)	.25GAL	SHORELINE OF ALL PONDS	SPOT TREAT TORPEDO GRASS AND CATTAILS
11/11/2015	ECOMAZAPYR (27.8% imazapyr)	.25GAL	SHORELINE OF ALL PONDS	SPOT TREAT BROADLEAF
11/11/2015	*GROUNDED*	.12GAL	*SURFACTANT*	
11/11/2015	*OPTIMA*	.12GAL	*SURFACTANT*	
11/11/2015	COPPER SULFATE CRYSTALS	4LB	FL130	FILAMENTOUS ALGAE
11/11/2015	NAVIGATE GRANULES	1LB	WD141	SLENDER SPIKE RUSH
11/11/2015	SONAR AS (41.7% fluridone)	2 OZ	WD162	SLENDER SPIKE RUSH
12/16/2015	ARGOS (27.9% chelated copper)	4.5GAL	PERIMETER TREATMENT ON ALL PONDS	FILAMENTOUS ALGAE
12/16/2015	TRIBUNE (37.3% diquat)	1.5GAL	FL130, FL040, WD141, WD162	SLENDER SPIKE RUSH
12/16/2015	AQUA STAR (53.8% glyphosate)	.19GAL	ALL SHORELINES	SPOT TREAT TORPEDO GRASS, CATTAILS
12/16/2015	*AQUASTICKER*	5LB	*SURFACTANT*	
1/20/2016	ARGOS (27.9% chelated copper)	3GAL	FL 130, FL040, FL131, WD160, WD162, TR230,	FILAMENTOUS ALGAE
1/20/2016	COPPER SULFATE CRYSTALS	8LB	FL130	FILAMENTOUS ALGAE

APPENDIX 5. City of Tallahassee's Stormwater Management Design Standards (Sec. 5-86)

(f) Stormwater management facilities design standards. All stormwater systems shall be designed using the latest edition of the Florida Department of Environmental Protection's Florida Development Manual, or other methods as approved by the director, to prevent violations of state water quality standards.

(10) General criteria for stormwater management facility design.

a. The stormwater management facility shall be designed and constructed using predominantly non-angular, freeform, curvilinear contouring that functions to visually integrate the facility into the overall landscape design for the site to the greatest extent possible.

b. Planting specifications and species for stormwater management facility landscaping shall be suitable for individual pond characteristics of soil, slope, aspect, hydroperiod and microclimate and approved by the growth management biologist.

c. The pond area shall be the area encompassed by the pond's maximum contour line.

(11) Plant material requirements.

a. Wet detention facilities.

1. *Pond perimeter. Appropriate species of aquatic plants, as approved by the growth management biologist, shall be placed so as to provide a continuous planting along 80 percent of the perimeter defining the pond's mean high water level within two years of planting.*

2. Pond area. Planting specifications and species for stormwater management facility landscaping shall be suitable for individual pond characteristics of soil, slope, aspect, hydroperiod and microclimate, and approved by the growth management biologist.

b. Dry detention/retention facilities.

1. All swales and berms shall be sodded.

2. Appropriate species of shrubs and understory trees shall be grouped so as to provide an aesthetically pleasing appearance, as determined by the growth management biologist.

Planting specifications and species for stormwater management facility landscaping shall be suitable for individual pond characteristics of soil, slope, aspect, hydroperiod and microclimate and approved by the growth management biologist.

APPENDIX 6.

CODE OF GENERAL ORDINANCES OF THE CITY OF TALLAHASSEE, FLORIDA

ARTICLE V. - FERTILIZER USE

Sec. 9-120. - Purpose and intent.

This article regulates the proper use of fertilizers by any fertilizer applicator; requires proper training of commercial and institutional fertilizer applicators; establishes training and licensing requirements; establishes a prohibited and restricted application period; specifies allowable fertilizer application rates and methods, fertilizer-free zones, low maintenance zones, and exemptions. The article requires the use of best management practices that provide specific management guidelines to minimize negative secondary and cumulative environmental effects associated with the misuse of fertilizers. These secondary and cumulative effects have been observed in and on the city's natural and constructed stormwater and drainage conveyances, creeks, canals, springs, lakes, ponds, and other water bodies. Collectively, these water bodies are an asset critical to the environmental, recreational, cultural and economic wellbeing of the city's residents and the health of the public. Overgrowth of algae and vegetation hinder the effectiveness of flood attenuation provided by natural and constructed stormwater and drainage conveyances. Regulation of nutrients contained in fertilizer will help improve and maintain water and habitat quality.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-121. - Definitions.

The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this article, except where the context clearly indicates a different meaning:

Administrator means the city manager of the city, or his/her designee.

Application or apply means the actual physical deposit of fertilizer to turf or landscape plants.

Applicator means any person who applies fertilizer on turf and/or landscape plants in the city.

Best management practices under this article means turf and landscape practices or combination of practices based on research, field-testing, and expert review, determined to be the most effective and practicable on-location means, including economic and technological considerations, for improving water quality, conserving water supplies and protecting natural resources.

City means the corporate limits of the City of Tallahassee.

City approved best management practices training program means a training program approved by the administrator that includes at a minimum:

(1) The most current version of the "Florida Green Industries Best Management Practices for Protection of Water Resources in Florida, June 2002," as revised; and

(2) All of the provisions and requirements of this article; or

(3) An alternative training program under section 9-130.

Code enforcement officer, official, or inspector means any designated city employee or agent whose duty it is to enforce the city's codes and ordinances pursuant to article V of chapter 2.

Commercial fertilizer applicator means any person who applies fertilizer on turf and/or landscape plants in the city in exchange for money, goods, services or other valuable consideration.

Fertilize, fertilizing, or fertilization means the act of applying fertilizer to turf, specialized turf, or landscape plants.

Fertilizer means any substance or mixture of substances that contains one or more recognized plant nutrients and promotes plant growth, or controls soil acidity or alkalinity, or provides other soil enrichment, or provides other corrective measures to the soil.

Institutional fertilizer applicator means any person, other than a non-commercial, or commercial applicator (unless such definitions also apply under the circumstances), that applies fertilizer for the purpose of maintaining turf and/or landscape plants. Institutional fertilizer applicators shall include, but shall not be limited to, owners and managers of public lands, schools, parks, athletic fields, religious institutions, utilities, industrial or business sites and any residential properties maintained in condominium and/or common ownership.

Landscape plant means any native or exotic tree, shrub, or groundcover (excluding turf).

Lawn has the same definition as turf.

Low maintenance zone means an area a minimum of six feet wide adjacent to water courses which is planted and managed in order to eliminate the need for fertilization and minimize the need for watering, mowing, etc.

Non-commercial fertilizer applicator means any person other than a commercial fertilizer applicator or institutional fertilizer applicator who applies fertilizer on turf and/or landscape plants, such as an individual owner of a single-family residential unit.

Pasture means land used for livestock grazing that is managed to provide feed value.

Person means any natural person, business, corporation, limited liability company, partnership, limited partnership, association, club, organization, and/or any group of people acting as an organized entity.

Prohibited application period means the time period during which a flood watch or warning, or a tropical storm watch or warning, or a hurricane watch or warning, or a three-day cone of uncertainty is in effect for any portion of Leon County, issued by the National Weather Service, or if heavy rain is expected.

Readily available nitrogen means the water soluble fraction of formulated fertilizer determined by the sum of the percentage of nitrate and ammoniacal nitrogen plus other water soluble nitrogen and/or urea nitrogen in the guaranteed analysis section of the label.

Turf, sod, or lawn means a piece of grass-covered soil held together by the roots of the grass.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-122. - Applicability.

This article shall be applicable to and shall regulate any and all applicators of fertilizer and areas of application of fertilizer within the city, unless such applicator is specifically exempted by the terms of this article. This article shall be applicable to and shall regulate any and all application of fertilizer within the city unless otherwise provided in chapter 5 of the Tallahassee Land Development Code (LDC). In case of a conflict between the requirements of chapter 5, LDC, and this article, the provisions of chapter 5, LDC, shall prevail. This article shall be prospective only, and shall not impair any existing contracts.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-123. - Timing of fertilizer application.

No applicator shall apply fertilizers to turf and/or landscape plants during the prohibited application period.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-124. - Fertilizer content and application rates; irrigation with reclaimed wastewater.

(a) Fertilizers applied to turf and/or landscape plants within the city shall be formulated and applied in accordance with requirements and directions provided by Rule 5E-1.003(2), Florida Administrative Code, Labeling Requirements for Urban Turf. Fertilizer content in reclaimed wastewater used for irrigation shall be applied in accordance with subsection (d).

(b) Except as provided in subsection (a), fertilizers shall be applied to turf and/or landscape plants at the lowest rate necessary. Nitrogen shall not be applied at an application rate greater than 0.7 lbs of readily available nitrogen per 1000 ft2 at any one time based on the soluble fraction of formulated fertilizer, with no more that 1 lb total N per 1000 ft2 to be applied at any one time and not to exceed the annual nitrogen recommendations in the fertilization guidelines for established turfgrass lawns set forth below for convenience:

Fertilization Guidelines for Established Turfgrass Lawns within Tallahassee

Bahia grass 2-3

Bermuda grass 3-5

Centipede grass 1-2

St. Augustine grass 2-4

Zoysia grass 3-5

Species Nitrogen recommendations (lbs N/1000 ft2/year)

(c) Nitrogen fertilizer may not be applied to turf or landscape plants except as provided above unless a tissue deficiency has been verified by an approved test.

(d) The use of water from a reclaimed wastewater system must be in accordance with an approved reclaimed wastewater reuse nutrient management plan. The plan shall be approved by the city's water resources engineering division; and it shall contain, at a minimum, the frequency and volume of application, restricted periods of application (if any), application rates and required best management

practices. If fertilizer other than that contained in the reclaimed water is to be applied, the nutrient management plan shall show that the cumulative nutrient loading does not exceed those established in this article.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-125. - Impervious surfaces.

Fertilizer shall not be applied, spilled, or otherwise deposited on any impervious surfaces. Any fertilizer applied, spilled, or deposited, either intentionally or accidentally, on any impervious surface shall be immediately and completely removed to the greatest extent practicable. Fertilizer released on an impervious surface must be immediately contained and either legally applied to turf or any other legal site, or returned to the original or other appropriate container. In no case shall fertilizer be washed, swept, or blown off impervious surfaces into stormwater drains, ditches, conveyances, or water bodies.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-126. - Fertilizer free zones.

Fertilizer shall not be applied within three feet of any pond, stream, water course, lake, drainage ditch, or wetland as defined by the Florida Department of Environmental Protection (Chapter 62-340, Florida Administrative Code) or from the top of a retaining wall associated with any of these features. If more stringent City Code regulations apply, this provision does not relieve the requirement to adhere to the more stringent regulations. See chapter 5 of the Tallahassee Land Development Code. Newly planted turf and/or landscape plants may be fertilized in this zone only for the first 60-day establishment period.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-127. - Low maintenance zones.

A voluntary six-foot low maintenance zone is strongly recommended, but not mandated, from any pond, stream, water course, lake, wetland or from the top of a retaining wall associated with any of these features. A swale/berm system is recommended for installation at the landward edge of this low maintenance zone to capture and filter runoff. No mowed or cut vegetative material should be deposited or left remaining in this zone or deposited in the water. Care should be taken to prevent the over-spray of aquatic weed products in this zone. If more stringent city regulations apply, this provision does not relieve the requirement to adhere to the more stringent regulations. See chapter 5 of the Tallahassee Land Development Code.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-128. - Mode of application.

Spreader deflector shields are required when fertilizing via rotary spreaders. Deflectors must be positioned such that fertilizer granules are deflected away from all impervious surfaces, fertilizer-free zones and water bodies, including wetlands.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-129. - Exemptions.

The provisions set forth above in this article shall not apply to:

(1) Bona fide farm operations as defined in the Florida Right to Farm Act, F.S. § 823.14, provided that fertilizers are applied in accordance with the appropriate best management practices manual adopted by the state department of agriculture and consumer services, office of agricultural water policy for the crop in question.

(2) Other properties not subject to or covered under the Florida Right to Farm Act that have pastures used for grazing livestock provided that fertilizers are applied in accordance with the appropriate best management practices manual adopted by the state department of agriculture and consumer services, office of agricultural water policy for the crop in question.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-130. - Training and certification; presence on site of trained applicator during application of fertilizer.

(a) Within 180 days of the effective date of this article and every three years thereafter, all applicators of fertilizer within the city, other than private homeowners on their own property, shall abide by and successfully complete a city-approved best management practices training program as defined in this article. Upon successful completion and compliance with the requirements in this article, a certificate of completion and a certification card valid for a period of three years will be provided by the entity providing the training. Persons working as employees and under the direct and physical supervision of commercial applicators that hold a current certificate of completion and certification card shall be exempt from the requirement to complete a city-approved best management practices training program.

(b) At least one person holding a current city-approved best management practices training certificate shall be present at all times on any job site while work applying fertilizer is in progress.

(c) Homeowners, and any other applicators not otherwise required to be certified are encouraged to follow the requirements of this article as well as the recommendations of the University of Florida IFAS Florida Yards and Neighborhoods program when applying fertilizers.

(d) Persons holding a certificate of training issued in conjunction with the Florida Green Industries best management practices Program for protection of water resources in the state; or, other state approved certificate of training or, a certification issued by another local government, that includes at a minimum "Florida Green Industries Best Management Practices for Protection of Water Resources in Florida, June 2002," or newer as the basis for instruction, may obtain certification by the city after contacting the city's water resources engineering division and presenting proof of the currently active status of training as described in subsection (a), and attesting that he/she has received and read a copy of this article. The water resources engineering division may adopted policies related to this exception, and shall maintain a list of approved alternative training programs.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-131. - Enforcement.

This article shall be enforced as provided in chapter 2.

(1) It is the intent hereof that the administrative, civil, and criminal penalties imposed herein be of such amount as to ensure immediate and continued compliance with this article.

(2) Any applicator that violates the provisions of this article may be responsible for the city's costs of prosecution of any violation, including any costs to remedy or clean up any environmental condition caused by an act, which constitutes a violation of this article.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)

Sec. 9-132. - Variances.

Any applicator of fertilizer regulated by the provisions of this article may apply to the environmental variance/code board pursuant to the requirements in chapter 2 of this Code and in section 5-126, environmental variances, of the Land Development Code for a variance from the requirements of this article. In addition to the requirements in sections 2-197 and 2-198 of this Code and in section 5-126 of the Land Development Code, the applicant must submit the following information:

(1) Whether, as a result of soil or tissue content at the point of the proposed application or for other geographical, environmental or geological reasons or other circumstances, such person should not be required to adhere to the strict provisions of this article;

(2) Whether such person is able and willing to use a less strict application method or alternative materials or methods; and

(3) A plan for fertilizer application, including where the fertilizer will be applied, the frequency of application, contents of fertilizer to be applied, and period of time for which the variance is requested.

(Ord. No. 08-O-72AA, § 1, 1-28-2009)