


INDIAN RIVER COUNTY, FLORIDA

MEMORANDUM

TO: Members of the Development Review and Permit Process Advisory Committee

FROM: Stan Boling, AICP

 Community Development Director

DATE: September 5, 2018

SUBJECT: **Consideration of Committee Recommendation on County Stormwater Pond/Lake Design and Littoral Zone Slope Requirements**

It is requested that the Development Review and Permit Process Advisory Committee consider the following information at the Committee's meeting of September 19, 2018.

BACKGROUND

At its March 21, 2018 meeting, the Committee considered information presented by staff and discussed County littoral zone planting requirements which have been in place since March 2007. During discussion it was reported that the current (11 year old) requirements were the result of recommendations and public input from a number of stakeholders with expertise, and that in practice the current regulations provided design flexibility while yielding benefits of habitat creation, aesthetics, and water quality treatment. Staff noted that only minor changes could be made to the requirements without also changing the Comprehensive Plan which includes specific policies on providing littoral zones in new developments (see Attachment 3). During Committee discussion, concerns were expressed regarding maintenance, nuisance situations, and attracting wildlife to stormwater areas possibly containing heavy metals from road run-off (see Attachment 1).

After the March 21, 2018 meeting, Committee member Chuck Mechling met with staff (John McCoy and Roland DeBlois) and an engineer to discuss practical matters related to the County's existing littoral zone requirements. In the end, it seemed that the County had sufficient design flexibility except for one issue: the minimum slope requirement of the littoral zone planting area. The current County code requires a 10' horizontal to 1' vertical minimum slope requirement versus a flatter minimum slope requirement in the Comprehensive Plan of only 6' horizontal to 1' vertical. That difference is not a conflict but does represent a stricter code standard intentionally adopted in 2007. As stated during the Committee's June 26, 2018 follow-up discussion on the issue, the steeper 6:1 slope takes up less stormwater common area than the flatter 10:1 slope and would allow more development area for lots, allowing for more lots and reducing costs on a per lot basis. At the June 26, 2019 meeting, Committee members indicated a desire to consider the slope requirement issue at a future meeting and staff agreed to bring the matter back to the Committee (see Attachment 2).

The Committee now needs to consider making a recommendation (or not) on the County’s littoral zone slope requirements.

ANALYSIS

Littoral zone planting shelf areas need to be established at a relatively flat slope to function well, providing a good environment for shoreline and shallow wetland plantings in an environment of fluctuating water levels. According to Professor Gail Hansen (UF Department of Environmental Horticulture Center for Landscape Conservation and Ecology), water bodies that do not fluctuate greatly on average need a gentler or flatter littoral zone slope. Dr. Hansen referred staff to Collier County littoral zone standards (minimum slope of 8:1; see Attachment 4) and Pinellas County standards (4:1 minimum and 10:1 desirable). Staff’s research indicates that littoral zone minimum slope requirements vary but tend to fall between 6:1 and 10:1 (see Attachment 4). A sample of minimum littoral zone requirements or BMPs (Best Management Practices) is as follows:

Indian River County.....	10:1
Pinellas County.....	10:1 (desirable)
Collier County	8:1
Jacksonville	8:1
Lake County.....	6:1
FDOT/Water Management Districts.....	6:1
Pinellas County.....	4:1 (minimum)

Unlike other issues discussed by the Committee, the littoral zone planting slope requirement is an important practical and technical development issue but it is not a development process issue. To date, the Committee has focused its efforts on process-related issues resulting in review process streamlining and associated development regulation changes. With respect to littoral zone slope requirements, it is staff’s position that rather than making a specific technical recommendation it would be more appropriate for the Committee to identify littoral zone slope requirements as an important substantive issue needing review by stakeholders with expertise and consideration by the Board of County Commissioners. Consequently, staff believes that the Committee should recommend that the Board of County Commissioners consider initiating a review of the issue with stakeholders.

RECOMMENDATION

Staff recommends that the Committee recommend that the Board of County Commissioners direct staff to conduct an evaluation of littoral zone slope requirements with stakeholders and report back to the Board of County Commissioners.

ATTACHMENTS

1. Minutes from March 21, 2018 Committee Meeting
2. Minutes from June 26, 2018 Committee Meeting
3. Indian River County Comprehensive Plan Littoral Zone Policies
4. Littoral Zone Slope Requirements in Other Jurisdictions

Mr. Brown noted that the requirements have been through a committee at some point in time and there are many different perspectives on what works or not. Re-evaluating tree protection requirements will involve a wider group of interested parties.

Ms. Robinson requested that this issue be tabled and be brought back at a future meeting with specific examples to look at in more detail. By way of consensus the committee members agreed to bring this item back for further discussion.

b) Consideration of County Stormwater Pond/Lake Design and Littoral Zone Requirements

Mr. DeBlois explained that the littoral zone is the portion of a pond or lake that is designed to contain rooted aquatic plants and are required based on a number of public benefits, such as pollutant treatment, biological community enhancement and residential subdivision amenity aesthetics.

Mr. McCoy noted that the requirements are to make project sites look more natural and that staff will work with applicants to meet the requirements.

Mr. Mechling cited some examples of ponds that are basically square or regular in shape, but are planted so the shape is softened, and confirmed that staff always works with applicants on pond design.

Mr. Taylor shared some other examples used in the design of ponds that provide better aesthetics.

Mr. Boling stated that it could be beneficial to come up with some specific criteria to codify the flexibility used in practice.

Mr. Szpyrka suggested that the criteria should not be so restrictive that it boxes the developers into specific configurations.

Mr. Blum noted difficulties experienced in placing the ponds and the littoral zones next to home sites.

Ms. Robinson agreed that the areas are hard to maintain, especially next to home sites. She added that the lack of proper maintenance can cause issues with water quality from the ponds.

Mr. Blum advised that there are some new rules by the Saint John's Water Management District.

Mr. Boling stated that it may be worth reviewing ponds out in the field constructed under the old and newer rules as well as habitat creation, water quality and other

issues. He noted that anything more than minor changes would require a Comprehensive Plan amendment since current littoral zone standards are required in the Comprehensive Plan. An LDR change would also be required.

Ms. Robinson expressed concern with the impact of the ponds on the wildlife as they are designed to carry off heavy metals from the roads and yards that are poisonous to them.

Mr. Boling agreed that the ponds do carry hazardous chemicals, but it also provides a place for them to live as pristine habitats have disappeared over time.

Mr. Mechling stated that the committee could use some input from outside experts and information on plantings and other factors to keep down the algae blooms.

Mr. Redus suggested that there needs to be some flexibility to customize the ponds to each project.

Mr. Boling agreed that there could be some flexibility, but that there needs to be certain criteria outlined that must be met so that the staff has a standard on which to base their interpretations. Mr. Sweeney added that flexibility without some criteria would slow down the review process.

By way of consensus the committee members agreed to bring this item back for further discussion.

c) Consideration of Landscaping “Flexibility” Items

Mr. Boling provided some background information regarding a proposal to change the land development regulation for “infill plantings” and littoral zone plantings, which was proposed during the June 20, 2017, Board of County Commissioners meeting.

Mr. Mechling stated that he would like to look at the differences between the current and proposed land development regulations, as proposed in the update, as well as a cost analysis of each.

Mr. Paladin noted that he would also like to look at the cost of maintenance of items versus the initial cost under the current and proposed regulations.

Ms. Robinson expressed concern with obtaining landscaping material that is required as many of the growers had been impacted by the hurricanes.

Mr. Mechling stated that there is a shortage also because many of the communities impacted by the hurricanes had procured the existing stock and there has not been enough time for regrowth.

Mr. Boling summarized discussions included a review of a base package of inspections fees (subdivisions separate from site plan) with basic or streamlined costs for complete/responsive applications and additional costs for incomplete/unresponsive applications spelled out. He opined there were more inspections currently than there had been in the past due to bigger scaled projects and with workforce not from the area, who are responsible for the construction.

Vice Chairman Paladin opined one of the problems being realized now was when a development project from 15 years past, experienced a new development being built next to the old development, changed the old development; i.e., drainage.

Chairperson Robinson asked for staff to bring back more data for clearer justification on costs for inspections.

(c) Date for September and October Meetings – Action Required

Mr. Boling confirmed this committee would not be meeting in the months of July and August. It was the consensus of the Committee members to continue regular schedule meetings beginning in September, and October; the third Wednesday morning at 9:00 a.m.

Mr. Boling stated October, 2018 was the 12 month sunset date for this committee's work, unless the Board of County Commissioners extended the date. He shared the Committee had two remaining matters to focus on in the remaining two meetings: development review fees and any final process items.

Other Matters

(a) Littoral Shelf and Lake Shape Regulations – Chuck Mechling

Mr. Mechling reported he met with John McCoy and Roland Deblois in Community Development to discuss the level of difficulty or practicality for an engineer, when planning a small 10-acre project with a storm retention concept, with the lake being required to be regular shaped, having several steps to incorporate, as well as the financial costs for those requirements.

Mr. John McCoy confirmed the LDRs required a 10-to-1 slope; wherein the comprehensive plan required a 6-to-1 slope; two variant slopes depending upon what was being reviewed. Mr. Mechling stated it appeared the County had flexibility in case-by-case projects, depending upon the size, shape and justification.

Mr. McCoy said from an LDR perspective, evaluating whether some objective language criteria could be included for lake shape, such as "including, but not limited to" would eliminate some of the back and forth reviews and provide guidance within the LDRs for design professionals.

Mr. Boling stated there was flexibility in the Code and in practice; however, it may make sense to place additional examples in the Code to communicate better. He said in reference to the slope differences, the comprehensive plan sets a minimum, with the LDRs being stricter. He continued the question was whether this committee wished to review the issue, which was not a development process issue.

Mr. Mechling stated he hoped this committee would wish to review the slope differences as it made a huge design difference, as well as a relevant cost difference.

Mr. Boling agreed to bring this issue back to the committee for discussion.

Announcement of Next Meeting

The next meeting of the Development Review and Permit Process Advisory Committee will be **Wednesday, September 19, 2018 at 9:00 a.m.** in Conference Room B1-501, Building B, 1800 27th Street, Vero Beach.

Adjournment

There being no further business, Chairperson Robinson adjourned the meeting at ~~11:08~~ 11:08 a.m.

enforcement actions, as necessary, to ensure the protection of wetlands and surface water quality.

Policy 2.7: The county shall prohibit the creation of new navigable canals or waterways connected to the Indian River Lagoon or St. Sebastian River. Excavation of any existing canal shall not be for the purpose of obtaining fill. Maintenance dredging of existing artificial navigable canals shall be the minimum necessary to accomplish the dredging purpose and shall be permitted in accordance with FDEP Rule 40C-4.051(11)(b), F.A.C., and under Section 10 of the Rivers and Harbors Act of 1899, as administered by the U.S. Army Corps of Engineers.

Policy 2.8: The county, in its land development regulations, shall require littoral zone vegetation plantings for artificially created ponds on project sites exceeding ten (10) acres in area. When littoral zones are required, the following minimum requirements shall apply:

- A minimum of 30 percent of the waterbody surface area or 21 square feet per lineal foot of shoreline, whichever is less, shall be planted with native littoral vegetation, and shall be maintained permanently as part of the waterbody;
- A minimum of one (1) tree, consisting of a native freshwater wetland species, shall be planted for every 500 square feet of littoral zone coverage;
- The water management system shall be designed to prevent siltation and eutrophication;
- A design and management plan, specifying remedial methods for correcting potential siltation, eutrophication, and/or infestation by nuisance species, shall be required;
- Consistent with Florida Administrative Code (FAC) Section 40C-42.026(4)(d), the planted littoral zone area shall consist of a 6:1 or flatter slope. ↗ repealed 10-1-2013

Policy 2.9: Consistent with Policy 4.2 of the Stormwater Management Sub-Element, the county shall, by 2012, request a formal meeting with representatives from all of the F.S. 298 Special Drainage Districts in the county to discuss the following issues: conducting comprehensive basin inventories, adopting maximum discharge limitations and pollutant load reduction goals (PLRGs), and setting level-of-service standards for water quality and flood protection.

Policy 2.10: Consistent with Policy 2.5 of the Coastal Management Element and Objective 7 of the Stormwater Management Sub-Element, the county will establish water quality level-of-service (WQLOS) standards for each drainage basin identified in the Stormwater

Policy 7.12: The county shall require littoral zone vegetation plantings for all new artificially created ponds on project sites exceeding ten (10) acres in area.

Policy 7.13: The county shall pursue grant funding to establish stormwater filtration systems on the North and South Main Relief Canals.

OBJECTIVE 8 Land Use

Through 2030, all land uses and land use densities within Indian River County will be in compliance with the Future Land Use Plan map.

Policy 8.1: The county will allow only low density land uses in areas designated as flood prone (within the 100 year floodplain) as depicted on the Future Land Use Map. The only exception is where platted subdivisions were developed prior to existing regulations.

Policy 8.2: The county will assess the drainage capability of all lands proposed for a change in land use designation and not approve land use changes where drainage service levels will not be met.

Policy 8.3: The county shall promote infill development by improving and maintaining the existing drainage facilities in the developed areas of the county.

PLAN IMPLEMENTATION

An important part of any plan is its implementation. Implementation involves execution of the plan's policies by taking actions and achieving results.

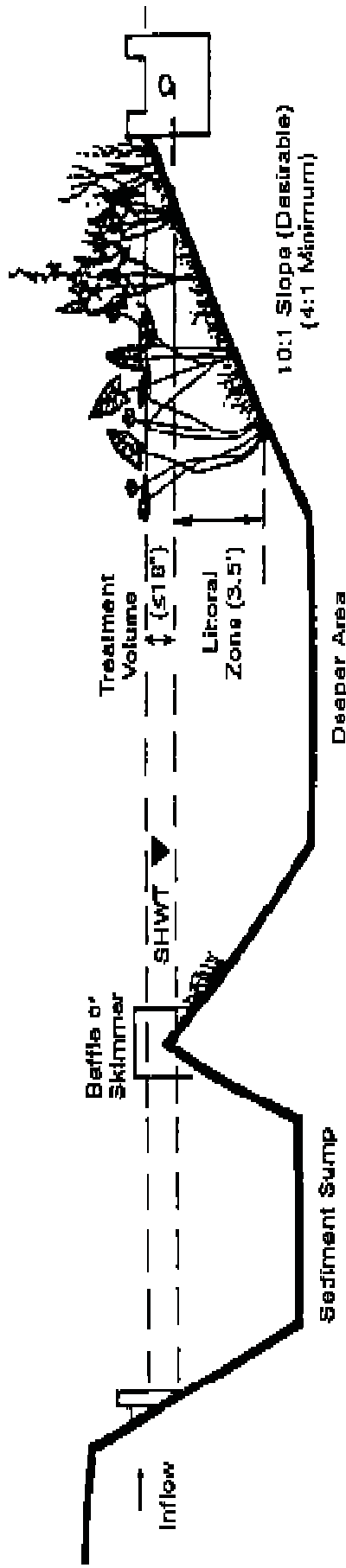
For the Stormwater Management Sub-Element, implementation involves various activities. While some of these actions will be ongoing, others are activities that will be taken by certain points in time. For each policy in this element, Table 3.E.2 identifies the type of action required, the entity or entities responsible for taking the action, the timing, and whether or not the policy necessitates a capital expenditure.

To implement the Stormwater Management Sub-Element, several types of actions must be taken. These include, but are not limited to: development of new stormwater facilities, upgrading/retrofitting existing stormwater facilities, revising land development regulations and ordinances, intergovernmental coordination and execution of interlocal agreements, establishing a stormwater utility, and development and adoption of a stormwater master plan.

A Citizen's Guide to Stormwater Ponds

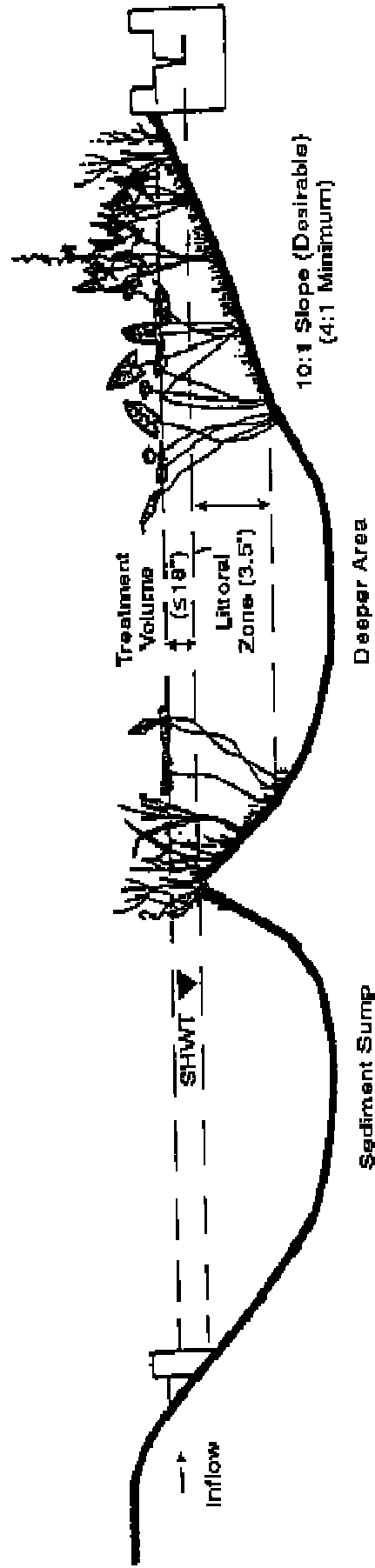
Kate Helms, Stormwater Program
Administrator, City of Largo





SHWT – Seasonal High Water Table

Outfall Structure with Bleed-Down Orifice



SHWT – Seasonal High Water Table

Outfall Structure with V-Notch Weir

Design Guidelines for County Required Littoral Shelf Planting Areas (LSPA)

STEP 1: Consult Regulations

The requirements for design, maintenance and alteration of Littoral Shelf Planting Areas (LSPAs) can be found in the Collier County Land Development Code Chapter 3, Section 3.05.10.

https://library.municode.com/HTML/13992/level2/CH3REPR_3.05.00VEREPRPR.html#CH3REPR_3.05.00VEREPRPR_3.05.07PRST#TOPTITLE

For information about regulated exotics refer to [Chapter 5B-64.011](#) of the F.A.C.

STEP 2: Determine the Hydroperiod

A hydroperiod can be defined as the number of days per year that an area of land is dry or the length of time that there is standing water at a location (Gaff et al. 2000). Hydroperiods are one of the biggest factors affecting littoral plants within a stormwater lake and should be considered whenever designing a littoral shelf planting area (LSPA).

Hydroperiod and planting elevation in a stormwater lake are interconnected. The tolerance level of different wetland plants varies. Some plants can survive in deeper water with year-round flooding. Other plants cannot survive deep water but still need some flooding. Once the hydroperiod of a lake is approximated, each plant's maximum water depth and flooding duration must be considered before determining its planting elevation.

[Table 1](#) lists the approximate hydroperiod ranges for some typical native wetland plants. The plants have been divided into 4 planting zones (Figure 1). These planting zones are determined based on a plant's maximum water depth (the maximum water depth under which a plant can survive) and flooding duration (the amount of time a plant can survive under water).

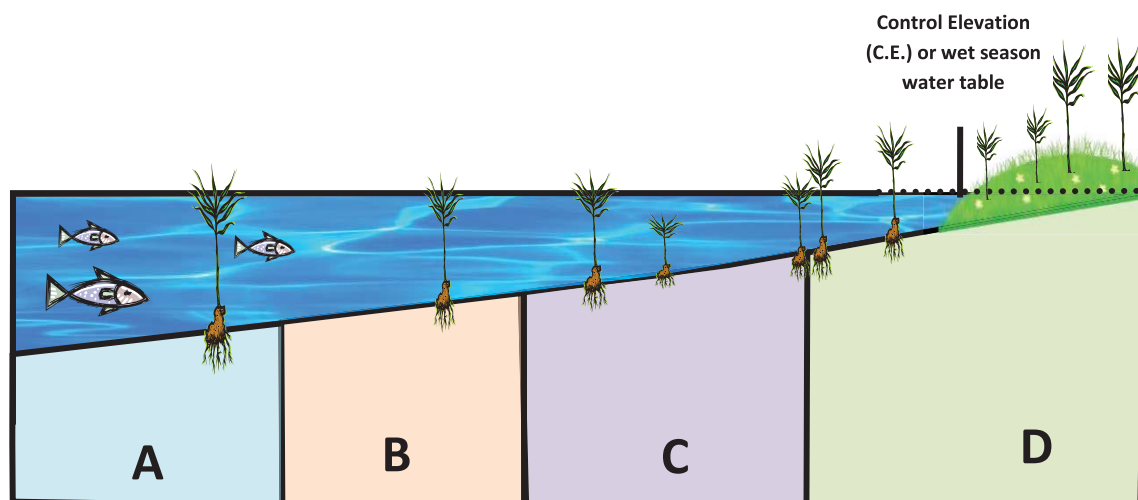


Figure 1. Planting Zones

(A) **Deep** – These plants need at least 9 –11 months of flooding per year and can survive in water that is 3 feet deep or greater.

(B) **Mid** – These plants need at least 3.5 – 8.5 months of flooding per year and can survive in water that is 2 to 3 feet deep.

(C) **Shallow** – These plants typically grow in water that is 1 to 2 feet deep and are inundated by water for at least 2.5 months annually.

(D) **Transitional** – These plants can survive in water that is 0 to 1 foot deep and do not need to be completely flooded. Some just require wet or soggy soils.

Step 3: Determine Planting Elevation

Most stormwater pond levels in Collier County fluctuate quite a bit between the wet and dry seasons. Each elevation along a shoreline has a different hydroperiod and is based on the yearly fluctuation between the **Dry Season Water Table (DSWT)** and the **Control Elevation (C.E.)**. The DSWT should be the average water elevation during the driest time of the year – typically the months of April and May. The C.E. (wet season water table) should be the average water elevation during the wettest time of the year – typically the months of September and October. Some lakes may only fluctuate by 1 foot; others may fluctuate by as much as 6 feet.

In ponds with a fluctuation of 5' or greater, plant survival can be a challenge. It is advised that only the hardiest of plant species be chosen in lakes with this type of fluctuation. This will increase the likelihood of vegetative success and higher potential for propagation. Hardy species might include: spikerush, soft rush, bulrush, alligator flag and sand cord grass.

Table 2 is an estimate of the planting elevations for the groups of plants from Table 1, according to average water level fluctuation

Table 2. Estimated Planting Elevations Based on Hydroperiod Fluctuation

Zone	2' or less fluctuation
(A) & (B)	2' or greater below C.E.
(C) & (D)	0' - 2' below C.E.

Zone	3' or greater fluctuation
(A)	3' or greater below C.E.
(B)	2'- 3' below C.E.
(C)	1'- 2' below C.E.
(D)	0' to 1' below C.E.

This is a simplified table. When designing a LSPA, keep in mind that many plants and trees may fit multiple categories. Some (A) plants may survive at (B), (C), and (D) plant levels; some (B) plants may survive at (C) and (D) plant levels, and so on. Just remember that almost all of these plants will be underwater at some point during an average rainfall year.

Step 4: Select Design

If you are modifying an existing pond to meet current code or are excavating a new pond, the current littoral planting code is intended to concentrate the littoral plantings in one area of the lake – a Littoral Shelf Planting Area (Figure 2). **Keep in mind that the design figures below are examples and only original plans specific to each unique site will be accepted as part of the permit submittal.**

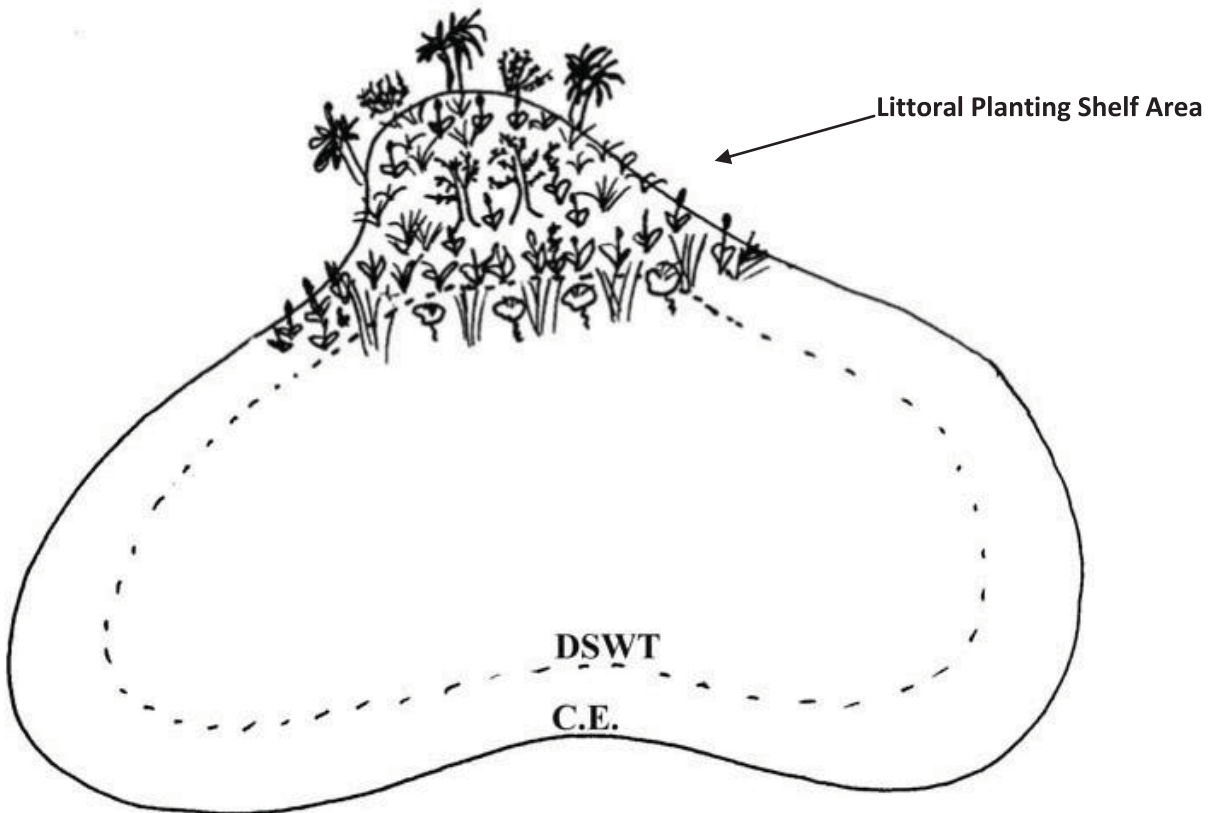


Figure 2

Each pond is different and designs can vary. Figures 3 – 8 represent possible LSPA design cross-sections. These are only suggested guides and the LSPA design should not be based solely on these figures.

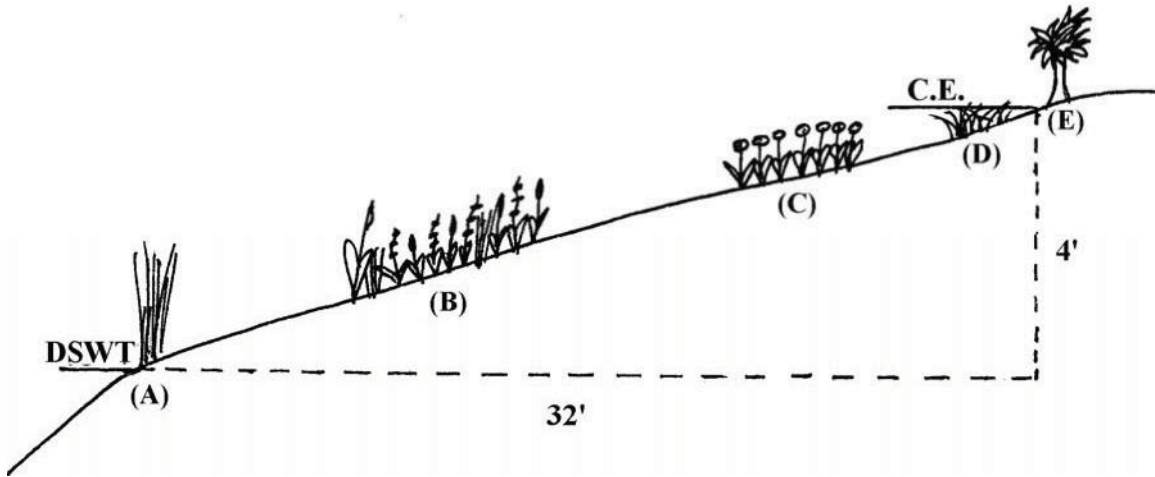


Figure 3

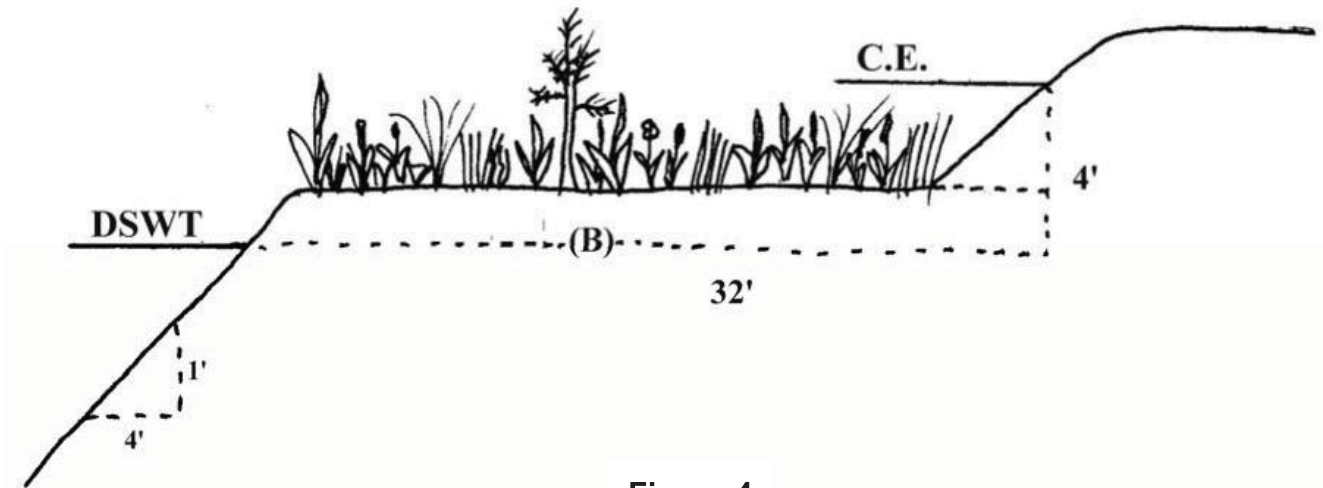


Figure 4

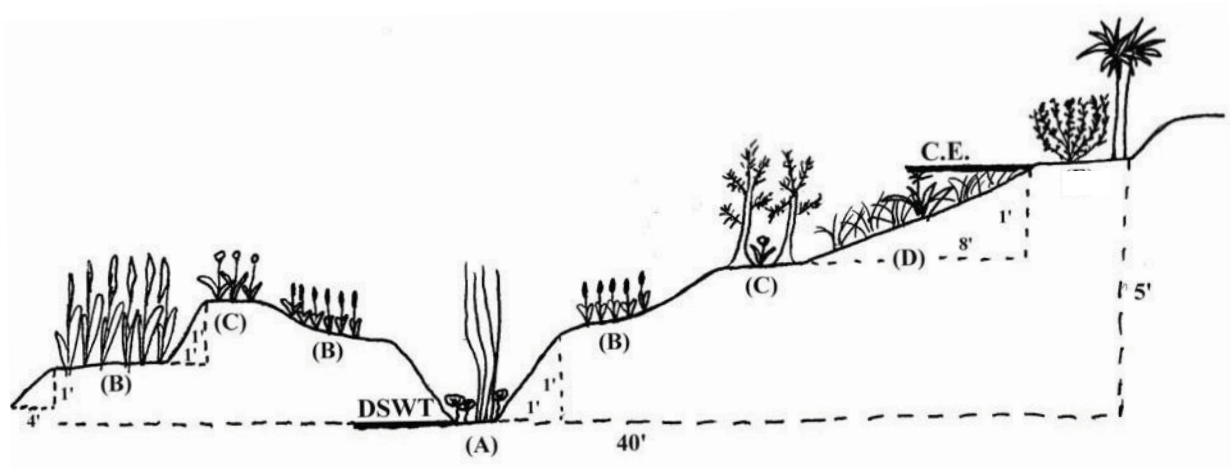


Figure 5

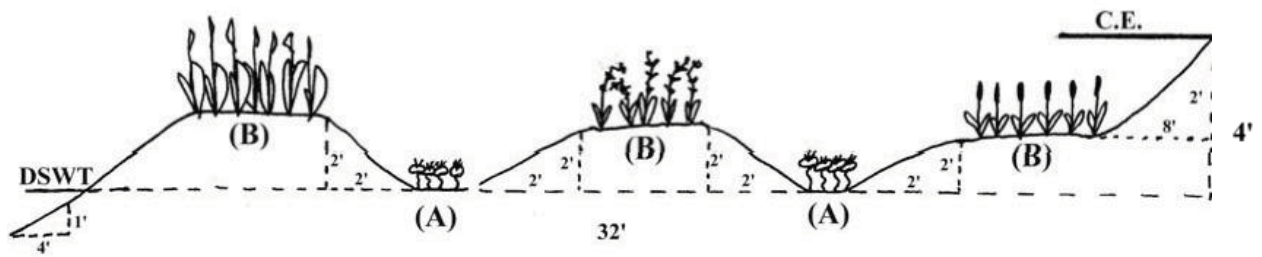


Figure 6

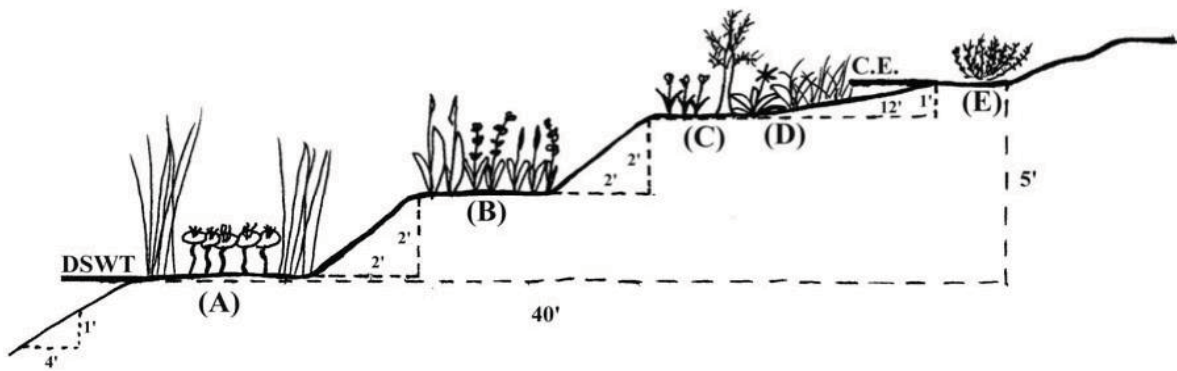


Figure 7

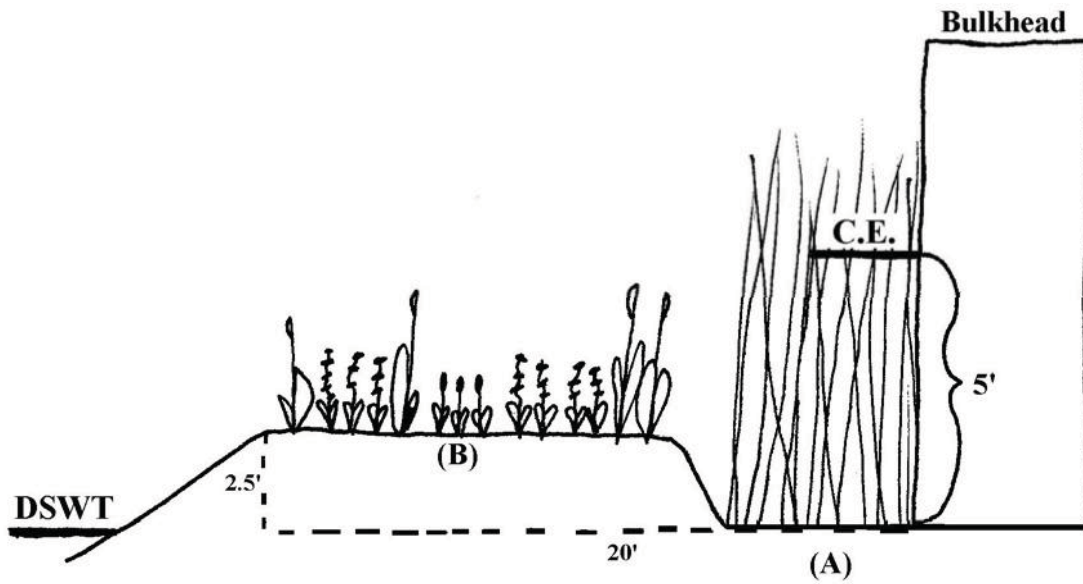


Figure 8

For retrofitting older ponds, refer to Collier County Land Development Code Chapter 3, [Section 3.05.10](#). Section C specifically outlines the requirements for existing lakes.

Historically, littoral shelves within Collier County have been planted on stormwater lake shorelines graded at a 4:1 slope (Figure 9). If your pond was in existence before 2001, you most likely have a 4:1 slope. This steep slope will limit the planting design to a thin strip of vegetation that lines the shore (Figure 10).

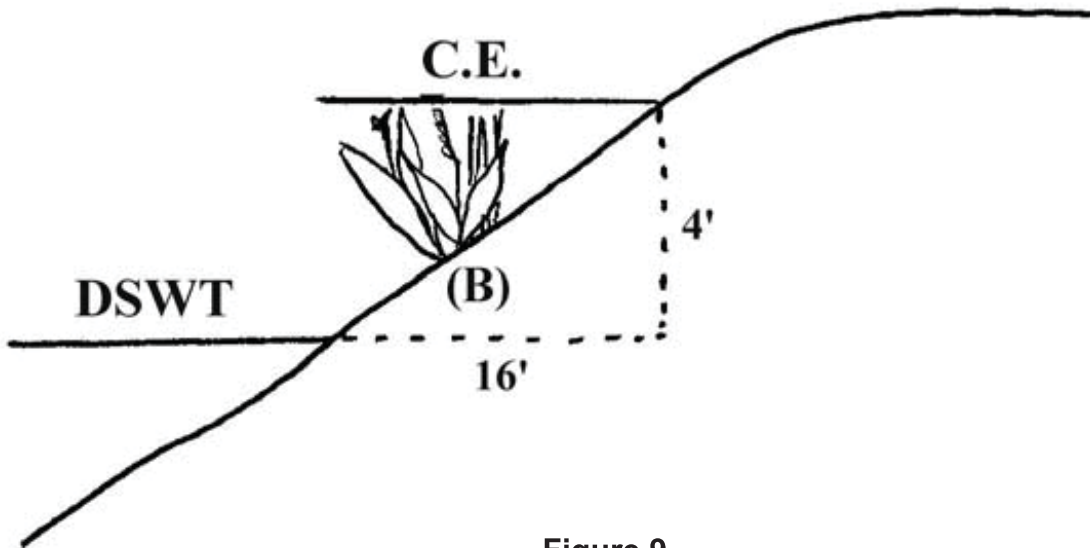


Figure 9

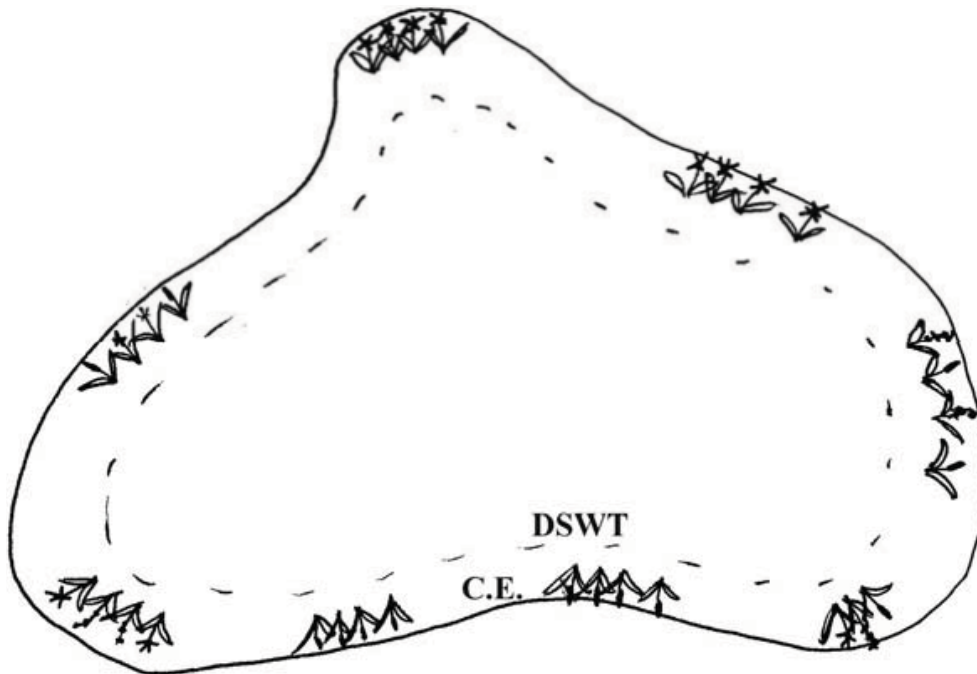


Figure 10

Current LSPA Design Requirements and Other Suggestions

- The LSPA must have an average slope of 8:1. Terraced step- downs in elevation can have a larger slope as long as flatter areas are present to create an average slope of 8:1.
- Only the surface where the LSPA is planted is required to be at an 8:1 slope. The remaining shoreline can be sloped with a maximum 4:1 slope.
- If you have a steeper (>4:1 slope) shoreline outside the LSPA, [Bacopa](#) is a good ground cover that will follow the water line. It may brown slightly during drier months, but will benefit from irrigation run-off produced by existing sprinkler systems. Bacopa should help with erosion control on steeply sloped shorelines.
- GRASS CARP AND LSPAs DO NOT MIX!!!! [Grass carp](#) will eat aquatic plants. If you already have grass carp, you may need to exclude them from the LSPA's to prevent plant damage. Consult FL Fish and Wildlife for additional information <http://myfwc.com/wildlifehabitats/invasive-plants/grass-carp/>.

Table 1: Suggested Plants for Littoral Shelf Planting Area (LSPA) and Stormwater Retention Ponds in Collier County



Proposed Elevation Below C.E. (feet)	Planting Zone	Plant type	Common Name	Scientific Name <i>spp. = multiple species within that genus</i>	Comments	Flooding at Proposed Elevation (months)	Size/height requirement	Plant Spacing maximum
0 - 1'	Transition (D)	Herbaceous	Salt grass / spike grass	<i>Distichlis spicata</i>	Brackish water only	0 - 2	12" min	36" on center
0 - 1'	Transition (D)	Herbaceous	Muhly grass	<i>Muhlenbergia capillaris</i>		0 - 2	12" min	36" on center
0 - 1'	Transition (D)	Herbaceous	Seashore paspalum	<i>Paspalum vaginatum</i>	Brackish water only	0 - 2	12" min	36" on center
0 - 1'	Transition (D)	Herbaceous	Cord grass	<i>Spartina bakeri</i>		0 - 2	12" min	36" on center
0 - 1'	Transition (D)	Herbaceous	Fakahatchee grass	<i>Tripsacum dactyloides</i>	Can grow very tall but dwarf varieties are available	0 - 2	12" min	36" on center
1 - 2'	Shallow (C)	Herbaceous	Blue maidencane	<i>Amphicarpum muhlenbergianum</i>		1 - 3	12" min	36" on center
1 - 2'	Shallow (C)	Herbaceous	Canna lily	<i>Canna flaccida</i>	Perennial accent plant	1 - 3	12" min	36" on center
1 - 2'	Shallow (C)	Woody-shrub	Button bush	<i>Cephalanthus occidentalis</i>		1 - 3	1gallon	5'
1 - 2'	Shallow (C)	Woody-tree	Buttonwood	<i>Conocarpus erectus</i>		1 - 3	3gallon/4' min	20'
1 - 2'	Shallow (C)	Herbaceous	Swamp lily	<i>Crinum americanum</i>	Accent plant blooming in summer; mix in with other herbaceous vegetation due to it spreading slowly	1 - 3	12" min	36" on center
1 - 2'	Shallow (C)	Herbaceous	Spikerush	<i>Eleocharis spp.</i>		1 - 3	12" min	36" on center
1 - 2'	Shallow (C)	Herbaceous	Horsetail	<i>Equisetum hyemale</i>	Naturalizes; food for waterfowl	1 - 3	12" min	36" on center
1 - 2'	Shallow (C)	Woody-tree	Dahoon holly	<i>Ilex cassine</i>		1 - 3	3gallon/4' min	20'

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1 - 2'	Shallow (C)	Woody-shrub	Christmas Berry	<i>Lycium carolinianum</i>	Brackish water only	1 - 3	1gallon/ 12" min	36" on center
1 - 2'	Shallow (C)	Herbaceous	Muhly grass	<i>Muhlenbergia capillaris</i>	Colorful pink inflorescence	1 - 3	12" min	36" on center
1 - 2'	Shallow (C)	Herbaceous	Maidencane	<i>Panicum hemitomon</i>	Can be confused with torpedo grass	1 - 3	12" min	36" on center
1 - 2'	Shallow (C)	Herbaceous	Pickeralweed	<i>Pontederia cordata</i>	Accent plant blooming late summer	1 - 3	12" min	36" on center
1 - 2'	Shallow (C)	Woody-tree	Royal palm	<i>Roystonea regina</i>		1 - 3	3gallon/ 4' min	20'
1 - 2'	Shallow (C)	Herbaceous	Arrowhead	<i>Sagittaria spp.</i>		1 - 3	12" min	36" on center
2 - 3'	Mid (B)	Herbaceous	Canna lily	<i>Canna flaccida</i>	Perennial accent plant	3 - 6	12" min	36" on center
2 - 3'	Mid (B)	Herbaceous	Sawgrass	<i>Cladium jamaicense</i>		3 - 6	12" min	36" on center
2 - 3'	Mid (B)	Herbaceous	Blue flag	<i>Iris spp.</i>	Accent plant blooming in spring	3 - 6	12" min	36" on center
2 - 3'	Mid (B)	Herbaceous	Soft rush / Needle rush	<i>Juncus spp.</i>		3 - 6	12" min	36" on center
2 - 3'	Mid (B)	Woody-tree	Red (Swamp) maple	<i>Acer rubrum</i>		3 - 6	3gallon/ 4' min	20'
2 - 3'	Mid (B)	Woody-tree	Paurotis Palm	<i>Acoelorrhaphe wrightii</i>	Multi-stemmed small palm	3 - 6	3gallon/ 4' min	20'
2 - 3'	Mid (B)	Woody-tree	Cypress	<i>Taxodium spp.</i>		3 - 6	3gallon/ 4' min	20'
3' - deeper	Deep (A)	Woody- shrub	Giant Leather fern	<i>Acrosticum danaeifolium</i>		6 - 9	1gallon	5'

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Proposed Elevation Below C.E. (feet)	Planting Zone	Plant type	Common Name	Scientific Name <i>spp. = multiple species within that genus</i>	Comments	Flooding Duration at Proposed Elevation (months)	Size/height requirement	Plant Spacing maximum
3' - deeper	Deep (A)	Woody-tree	Pond apple	<i>Annona glabra</i>	May not be commercially available	6 - 9	3gallon/ 4' min	20'
3' - deeper	Deep (A)	Herbaceous	Sawgrass	<i>Cladium jamaicense</i>	Serrated leaves install in areas with minimal maintenance needed, fresh and brackish	6 - 9	12" min	36" on center
3' - deeper	Deep (A)	Woody-tree	Pop ash	<i>Fraxinus caroliniana</i>		6 - 9	3gallon/ 4' min	20'
3' - deeper	Deep (A)	Herbaceous	Spatterdock	<i>Nuphar advena</i>	Small yellow flower	6 - 9	12"	N/A
3' - deeper	Deep (A)	Herbaceous	Water lily	<i>Nymphaea spp.</i>	Showy flower	6 - 9	N/A	N/A
3' - deeper	Deep (A)	Herbaceous	Bulrushes	<i>Scirpus spp.</i>	Grows very tall can block pond view	6 - 9	12" min	36" on center
3' - deeper	Deep (A)	Herbaceous	Alligator flag	<i>Thalia geniculata</i>		6 - 9	12" min	36" on center

Reference

Gaff, H., DeAngelis, D.L., Gross, L.J., Salinas, R., and M. Shorrash. 2000.
Ecological Modeling 127:33-52.

Jacksonville Design Guidelines and Best Practices Handbook



Prepared By:



Miller Sellen Conner & Walsh

Attachment 4
Attachment 6

1.1.16 Stormwater Retention Design and Placement

Stormwater ponds are all too often designed to purely serve a functional use for a site as opposed to being integrally designed as a site amenity. The following design guidelines are focused on improving the visual quality of stormwater design systems as they relate to overall site design.

1.1.16a Wet stormwater ponds shall be designed as integral visual site amenities to a project. Sufficient pond slopes and maintenance easements shall be provided to prevent the fencing of the proposed ponds. Where absolutely necessary, due to safety concerns, the city staff reserves the right to waive this requirement (see Photo Exhibit 1.1.16a)



Photo Exhibit 1.1.16a
Pond slopes and maintenance easements are preferred to avoid pond fencing.

1.1.16b Stormwater ponds shall be designed to have the appearance of natural water bodies to the largest extent possible. Ponds shall be designed to have curvilinear perimeters and shall not be designed to be square or rectilinear in shape or appearance.

1.1.16c Wet stormwater ponds shall be designed to hold water at a controlled elevation that maintains a consistent aesthetic appearance. Ponds shall not be designed to have radical fluctuations in maintained water level.

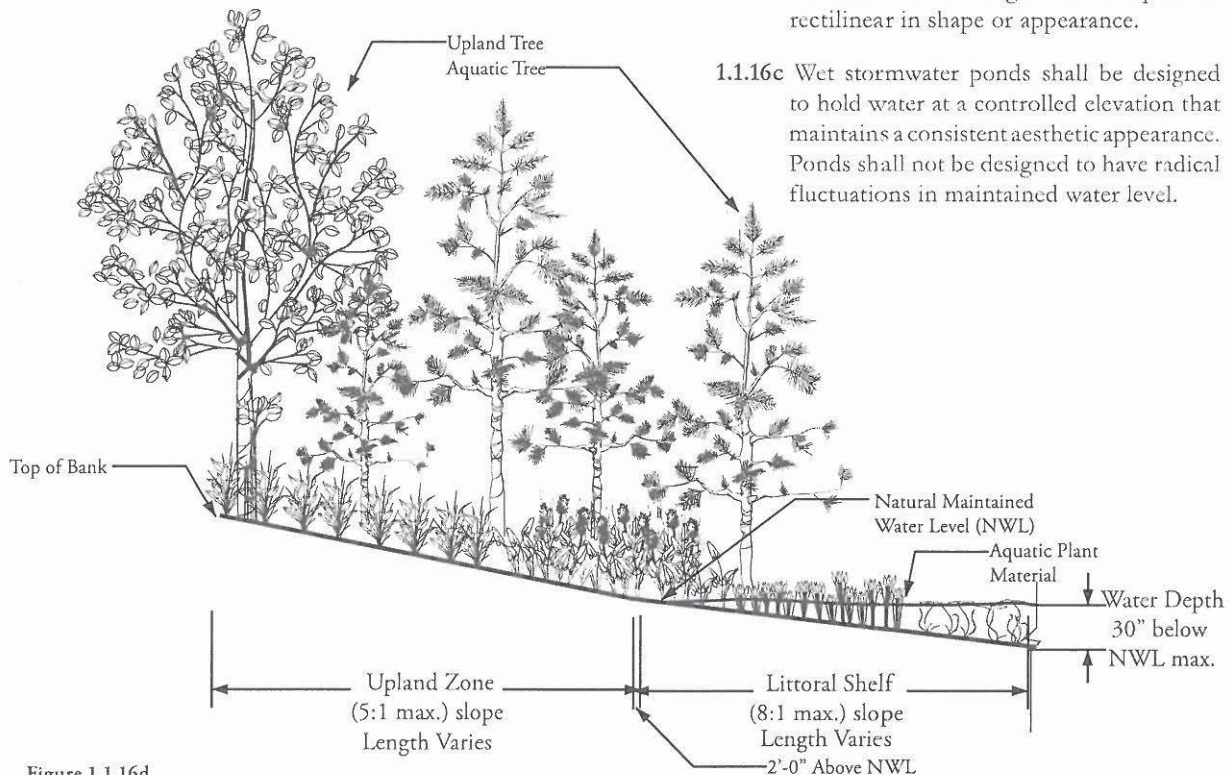


Figure 1.1.16d
Typical Wet Pond Littoral Zone Section

APPENDIX C

STORMWATER MANAGEMENT DESIGN STANDARDS LAKE COUNTY, FLORIDA

- b. The pond's water storage volume below the outlet structure's control elevation, or the low season water table, shall provide a minimum residence time of 14 days.
- c. The pond shall be designed with a littoral shelf in accordance with the following:
 - 1) The littoral zone shall be gently sloped 6:1 (horizontal: vertical) or flatter. At least 25 percent of the wet detention system surface area shall consist of a littoral zone. The percentage of littoral zone is based on the ratio of vegetated littoral zone to surface area of the pond at the control elevation. Above the outlet structure's control elevation, the steepest side slopes shall be 4:1 (horizontal: vertical).
 - 2) The pollution abatement volume should not cause the pond level to rise more than 18-inches above the control elevation unless it is demonstrated that the littoral zone vegetation can survive at greater depths.
 - 3) Eighty percent coverage of the littoral zone by suitable aquatic plants is required within the first twenty-four months of completion of the system.
 - 4) To meet the 80% coverage requirement, planting of the littoral zone is recommended. As an alternative, portions of the littoral zone may be established by placement of wetland top soils (at least a four inch depth) containing a seed source of desirable native plants. When utilizing this alternative, the littoral zone must be stabilized by mulching or other means and at least the portion of the littoral zone within 25 feet of the inlet and outlet structures must be planted.
- d. In lieu of the requirements in Part V.D.(2)c. above, the applicant may provide either of the following:
 - 1) At least fifty percent additional permanent pool volume over that specified in paragraph (b), above; or
 - 2) Pre-treatment of the stormwater pursuant to paragraph A.(1) and A.(2) of the Pollution Abatement Section.
- e. Be designed so the flow path through the pond has an average length to width ratio of at least 2:1. The alignment and location of inlets and outlets should be designed to maximize flow paths in the pond. If short flow paths are unavoidable, the effective flow path should be increased by adding diversion barriers such as islands, peninsulas, or baffles to the pond. Inlet structures shall be designed to dissipate the energy of water entering the pond.
- f. Be designed so that bleed down structure invert elevations are at or above the estimated post-development wet season water table elevation.

Provide for permanent maintenance easements or other acceptable legal instruments to allow for access to and maintenance of the system, including the pond, littoral zone, inlets, and outlets.

MARCH 2010 DRAFT

DEPARTMENT OF ENVIRONMENTAL PROTECTION AND
WATER MANAGEMENT DISTRICTS

ENVIRONMENTAL RESOURCE PERMIT
STORMWATER QUALITY
APPLICANT'S HANDBOOK

DESIGN REQUIREMENTS FOR
STORMWATER TREATMENT SYSTEMS IN FLORIDA

<insert effective date>



Southwest Florida
Water Management District



14.0 MANAGED AQUATIC PLANT SYSTEM (MAPS) DESIGN CRITERIA

14.1 Description

Managed Aquatic Plant Systems (MAPS) are aquatic plant-based BMPs which remove nutrients through a variety of processes related to nutrient uptake, transformation, and microbial activities. Examples of MAPS include planted littoral zones and floating wetlands. In the latter example, harvesting of the biomass is an essential process of the BMP.

Generally, wet detention systems by themselves can't achieve the required levels of nutrient removal from stormwater. In nearly all cases, a BMP treatment train will be required when using a wet detention system. Sometimes components of the BMP treatment train include source controls or pretreatment BMPs such as retention or swales to reduce either the stormwater volume or nutrient concentrations in stormwater discharged to the wet detention system. However, in many areas, high water tables and slowly percolating soils do not make infiltration practices practical or effective. Managed Aquatic Plant Systems (MAPS) can be incorporated into a wet detention BMP treatment train to provide additional treatment and nutrient removal after the wet pond has provided reduction of pollutants through settling and other mechanisms that occur within the wet pond.

14.2 Nutrient Removal Effectiveness and Credits

The stormwater treatment nutrient removal effectiveness and credits for the different types of MAPS shall be based on data obtained from monitoring of these systems in Florida. The nutrient removal credits associated with MAPS shall be calculated using the BMP Treatment Train Equations set forth in Section 1.3 of this Handbook. Table 14.1 summarizes the proposed nutrient reduction credits based on the data that is currently available. It is anticipated that more data will become available and included during the rule adoption process.

Table 14.1 Nutrient Removal Credits for MAPS

Type of MAPS	TN Removal	TP Removal
Littoral zone	10%	10%
Floating Wetland Mats or Islands	20% - 40%	20% - 40%

The applicant must provide independent scientific data based on Florida field monitoring to validate the nutrient load reduction of any MAPS proposed for use.

14.3 Littoral Zone Design Criteria

Littoral zones are an optional component of wet detention systems. The littoral zone is that portion of a wet detention pond which is designed to contain rooted aquatic plants. The littoral area is usually provided by extending and gently sloping the sides of the pond down to a maximum depth of four feet below the normal water level or control elevation. One of the difficulties of successful littoral zone establishment and maintenance is the frequent changes in water level elevations within a wet detention pond. Experience has shown that long term survival of littoral zones is best when they are not located adjacent to private lots. Consequently, littoral zones typically are located near the outfall of a wet detention pond or along areas with common ownership. Littoral zones should also be considered in other areas of the pond that have depths suitable for successful plant growth such as a shallow shelf between the inflow sumps and the rest of the pond or on a shallow shelf in the middle

of the pond, provided maintenance can be undertaken. If treatment credit is proposed for littoral zones placed adjacent to private lots, the applicant shall provide additional assurances through their legal operation and maintenance documents or through an easement that the littoral zone will be maintained as permitted.

The littoral zone is established with native aquatic plants by planting and/or the placement of wetland soils containing seeds of native aquatic plants. A specific vegetation establishment plan must be prepared for the littoral zone. The plan must consider the water elevation fluctuations of the wet detention pond and the ability of specific plants to be established. A list of recommended native plant species suitable for littoral zone planting is included in **Table 14-2**. In addition, a layer of muck soil can be incorporated into the littoral area to promote the establishment of the wetland vegetation. When placing muck, special precautions must be taken to prevent erosion and turbidity problems in the pond and at its discharge point while vegetation is becoming established in the littoral zone.

The following is a list of the design criteria for wet detention littoral zones:

- (a) The littoral zone shall be gently sloped (6H:1V or flatter). At least 30 percent of the wet detention pond surface area shall consist of a littoral zone. The percentage of littoral zone is based on the ratio of vegetated littoral zone to surface area of the pond at the control elevation.
- (b) The bleeddown volume should not cause the pond level to rise more than 18 inches above the control elevation unless the applicant affirmatively demonstrates that the littoral zone vegetation can survive at greater depths.
- (c) Within 24 months of completion of the system, 80 percent coverage of the littoral zone area by suitable aquatic plants is required with no more than 10% consisting of exotic or nuisance species such as cattails or primrose willow.
- (d) Planting of the littoral zone is recommended to meet the 80% coverage requirement. As an alternative to planting, portions of the littoral zone may be established by placement of wetland top soils (at least a four inch depth) containing a seed source of desirable native plants. When using this alternative, the littoral zone must be stabilized by mulching or other means and at least the portion of the littoral zone within 25 feet of the inlet and outlet structures must be planted.
- (e) In parts of Florida, the Channelled Apple Snail has been shown to decimate littoral zone vegetation so designers need to be aware of this problem and will be required to provide additional assurances that damage done to the vegetation will be repaired within one month.
- (f) Replanting shall be required if the percentage of vegetative cover falls below the permitted level. The native vegetation within the littoral zone shall be maintained as part of the system's operation and maintenance plan. Undesirable species such as cattail and other exotic or nuisance plants shall be controlled and removed as needed.