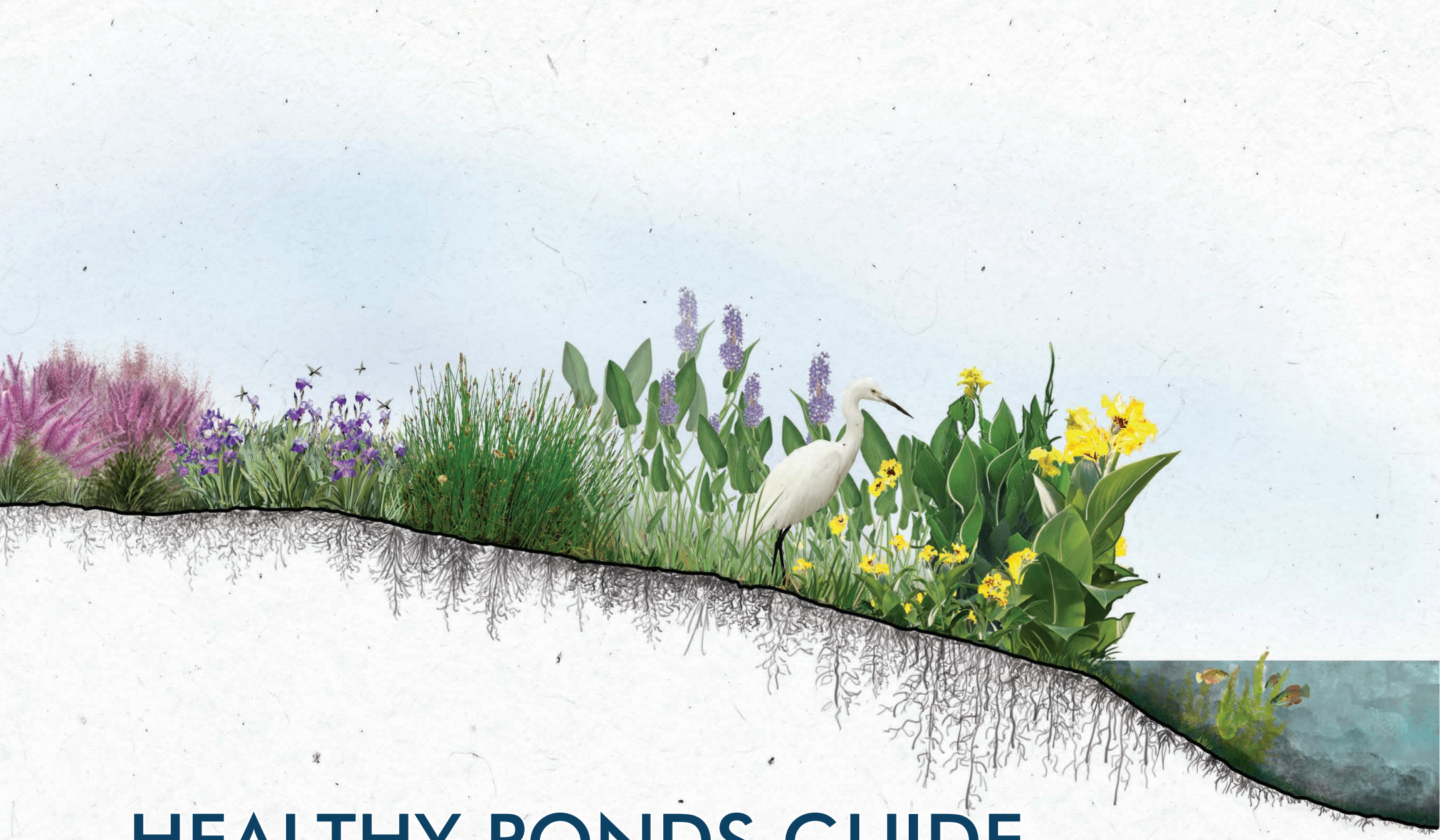

HEALTHY PONDS GUIDE

The Essential Homeowner's Guide to Establishing and Maintaining Healthy Neighborhood Stormwater Ponds In Southwest Florida

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◂ Cover | *MD. Asifur Rahman and David Shafer.*

Version 2022-12

Healthy Ponds Guide

The Healthy Ponds Guide provides a clear and concise toolbox for increasing community engagement in stormwater pond management. Property, condo, and homeowner associations (collectively referred to in this manual as HOAs) will benefit from expert step-by-step guidance on incorporating best management practices for maintaining their stormwater ponds' function to store and treat stormwater, while improving aquatic habitat for Florida's wildlife and enhancing neighborhood aesthetics.

Whether you hire landscape and pond management companies, do it yourself, or both, all homeowners and HOA leaders should understand how to keep their community's pond healthy. The following chapters step through how to assess, plan, establish, and maintain stormwater pond buffer zones and littoral zones. You'll also learn how each homeowner can help keep neighborhood ponds healthy.

The nine Chapters in this How To Guide are organized in three parts to Assess, Improve, and Protect your ponds. Each chapter ends with a Community Project Idea for engaging your community and improving your ponds together as neighbors.

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Your Watershed

As Florida continues to grow and build, managing stormwater runoff to minimize property flooding and protect water quality becomes ever more important. Most of the rain that falls on developed areas will be captured by one of Florida's 76,000+ ponds designed and built for managing stormwater. How well these stormwater ponds capture and treat polluted water depends on how well they are managed. Every property owner has a role in protecting water quality.

All Waters Are Connected

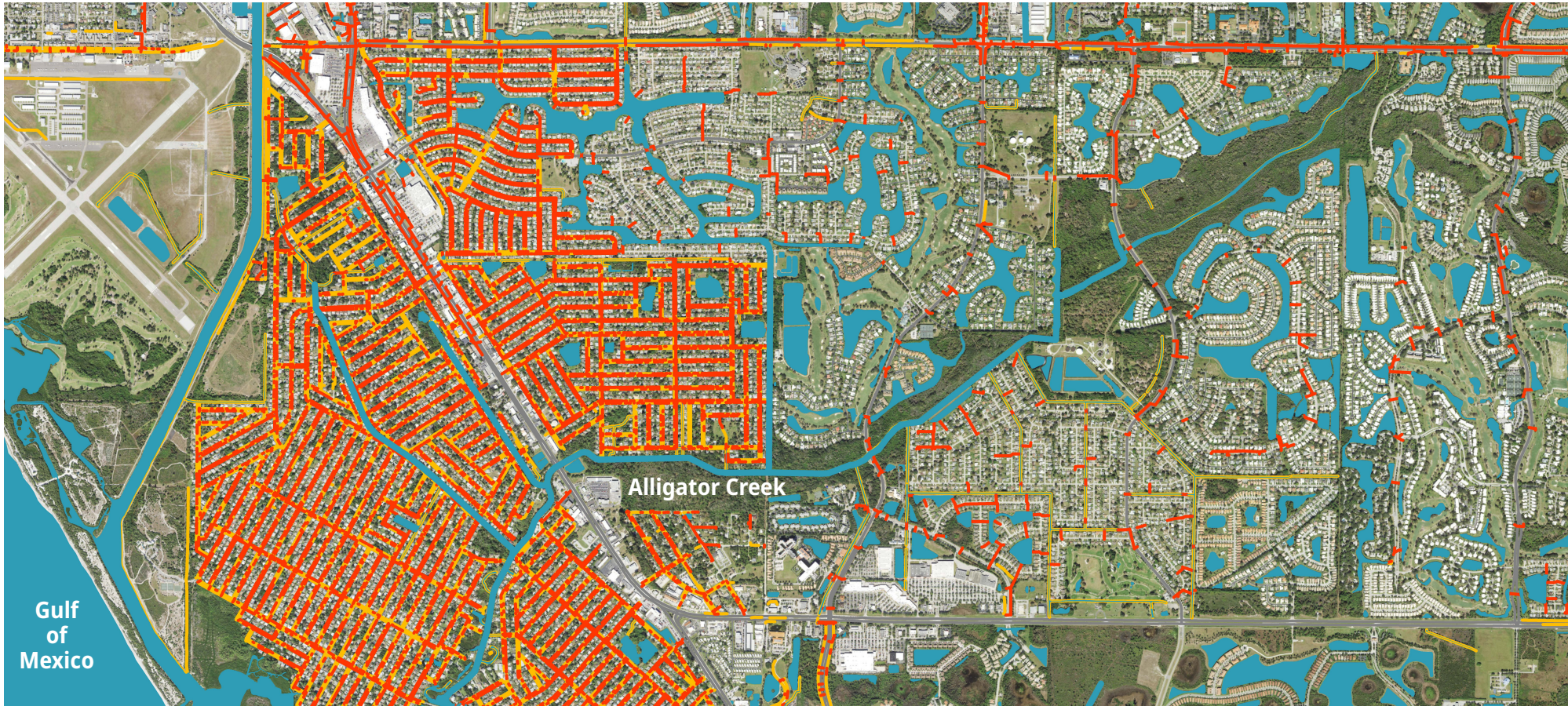
In Southwest Florida, our bays receive freshwater from canals, streams, creeks, and rivers and saltwater from the Gulf of Mexico. The estuaries created by this mix of fresh and salty water are ecologically diverse and highly productive.

In coastal watersheds, no matter how far you live from the water, you are connected to natural creeks and bays through curbs and gutters, pipes, ditches, and canals. Together these drainage systems move stormwater off land and downstream until it is finally released into our tidal creeks, bays, and the Gulf of Mexico.

Stormwater ponds are constructed to collect and hold stormwater long enough to remove many pollutants and reduce flooding before it is released downstream. Most stormwater ponds are connected to downstream waters by pipes, canals, and creeks. Even ponds not directly connected to surface waters percolate to groundwater that eventually flows underground to our creeks and bays.

Three main factors impact the quality of the water released from stormwater ponds: i) how much pollution the stormwater collects on its way to the pond, ii) the integrity of the stormwater pond itself, and iii) how the pond is managed. This Guide addresses all three factors to help reduce pollution and keep our waterways healthy.

◀ Sarasota Bay, Florida | *David Shafer.*



Stormwater is rainwater that falls and collects on hard impervious surfaces such as roofs, roads, driveways, parking lots and sidewalks. To prevent flooding, stormwater must be directed elsewhere via a network of downspouts, curbs, gutters, pipes, swales/ditches, canals, and ponds.

▲
Drainage systems connect roads, yards, and ponds to our creeks, bays, and gulf. In a neighborhood watershed, stormwater ponds are interconnected by underground pipes. Shown are connections among South Venice, Florida neighborhoods and Alligator Creek, which flows into the Gulf of Mexico.

Underground pipes
Swales
Surface waters

1 mile

Pond Anatomy

Stormwater ponds are designed to imitate natural processes for capturing and cleaning water. What appears to be "just a pond" is actually a precisely engineered and permitted water collection and treatment system with three general zones operating at specific elevations[1]. Each zone supports and protects the function of the zones below and ensures the overall integrity of the pond.

The lowest **deepwater zone** is typically designed to hold a minimum pool of water year-round. Over this permanent pool is a fluctuating pool of water that flows in, mixes with the permanent pool, and flows out of the pond after rain events. The flow of water in and out is controlled by pipes and overflow weirs positioned at the highest point of the permanent pool. Maintaining water in the permanent pool allows stormwater treatment between rain events.

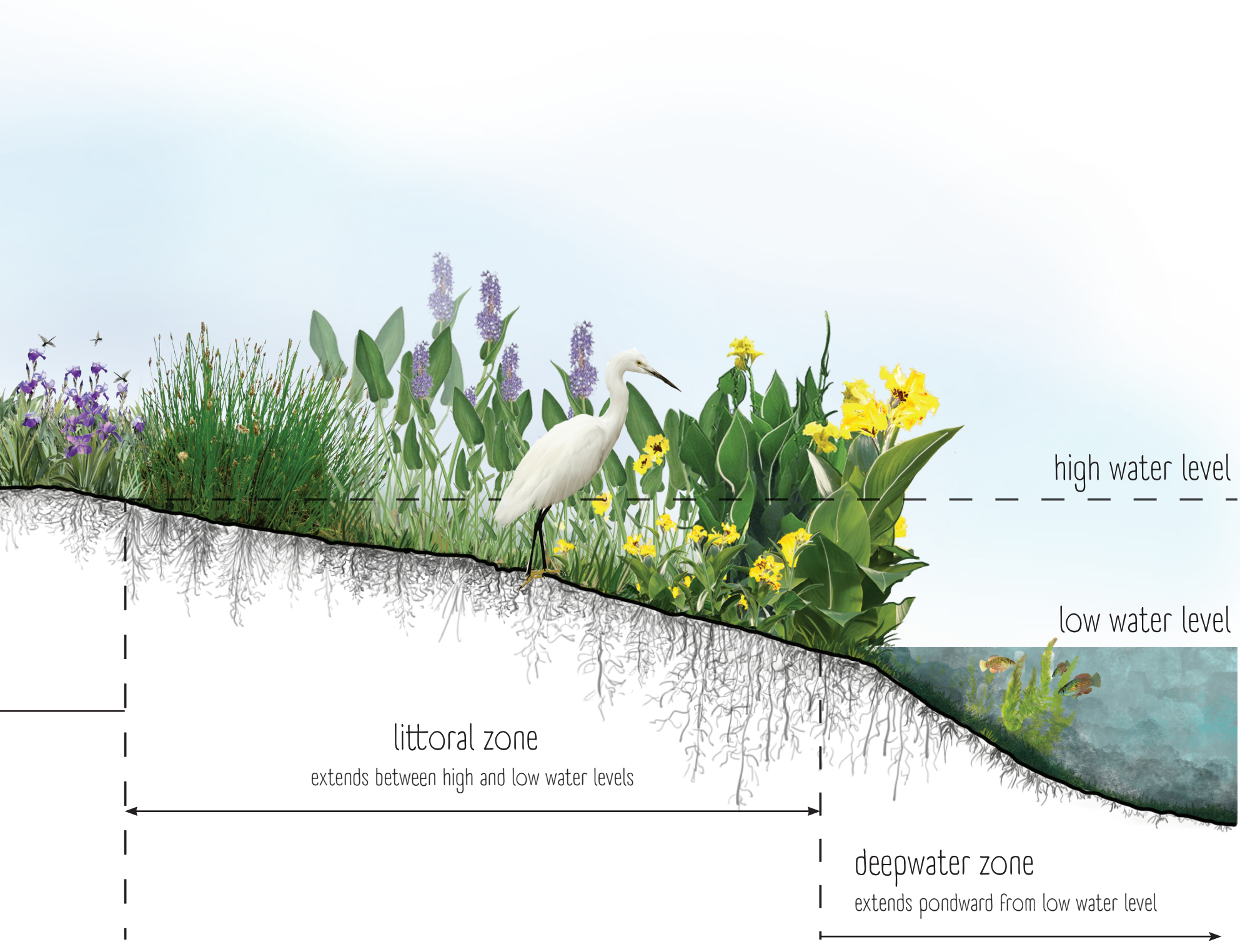
The middle **littoral zone** encompasses the entire shoreline and the shallow area of the pond—waters generally less than five feet deep where enough sunlight penetrates to support wetland and aquatic plants. Just like all Florida wetlands, this area can be fully submerged in the rainy season or dry and exposed during droughts. A littoral zone containing abundant vegetation is essential to a functioning stormwater pond. Plants hold the soil in place, preventing erosion into the pond. They also filter sediment and assimilate excess nutrients.

Pro-Tip for Water Quality: An extended dry season is part of the Florida landscape and tied to the ecology of birds and fish, so it's okay to let your pond level drop to the permanent pool during the dry season. Pumping water from the aquifer to maintain a desired pond water level is not recommended and can actually lower the water table and add to local saltwater intrusion issues.

The highest **buffer zone** is the perimeter area between the littoral zone and the surrounding landscape. Buffer zones should occupy at least three feet (ideally ten feet) of the pond perimeter to protect the shoreline from upland activities such as mowing that can cause erosion or compaction and loss of vegetation.

[1] These zones may have more specific definitions when used in a regulatory context, such as local ordinances or stormwater system permits issued by agencies.

▲
Three pond zones exist at different elevations related to water levels and work in concert to prevent erosion, filter sediment, reduce nutrients, and protect the overal integrity of the pond | *MD. Asifur Rahman and David Shafer.*


high water level
low water level
littoral zone
extends between high and low water levels
deepwater zone
extends pondward from low water level

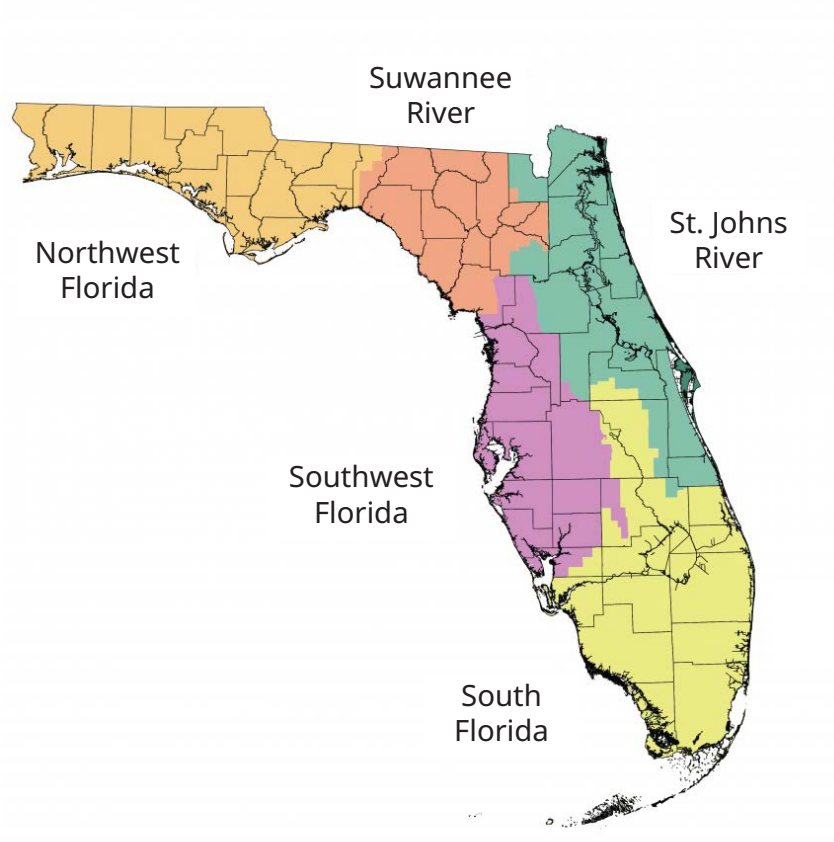
ASSESS

Chapter 1
Finding Your Pond Specs

In Florida, legal responsibility for maintaining constructed stormwater systems falls to the landowner, not the developer or regulatory agency. In planned communities, the stormwater system is usually part of the common area owned and managed by the HOA. To maintain your neighborhood stormwater system, you need to know its specifications—the system components, where they are located, and their original design configuration. This information can be obtained from the original permit and approved As-Built Plans. A copy of the permit and As-Built Plans, which show elevations, dimensions, and the construction specifications, should have been transferred to the owner from the developer and retained by the homeowner association or business.

If your pond was built after 1995, you can find the plans online by searching for your stormwater system's Environmental Resource Permit from the local Water Management District. Earlier permits may not be searchable online but are available on request from your local Water Management District office. The Permit on file for your development will also specify any regulatory inspection and reporting requirements for your stormwater system.

This chapter will help you navigate the Southwest Florida Water Management District's (SWFWMD) online records to locate and download your pond design specs and inspection requirements. If you live outside the Southwest District, contact your local Water Management District office for guidance. Once you have these specifications, you can conduct a pond assessment (Chapter 2) to see if your system is functioning as intended.



▲ Florida is served by five Water Management Districts. Southwest Florida is served by the Southwest Florida Water Management District. See Resources for a link to all Water Management Districts in Florida | *Florida Department of Environmental Protection.*

◀ Pickerel weed surrounds a pond in Sarasota, Florida | *David Shafer.*

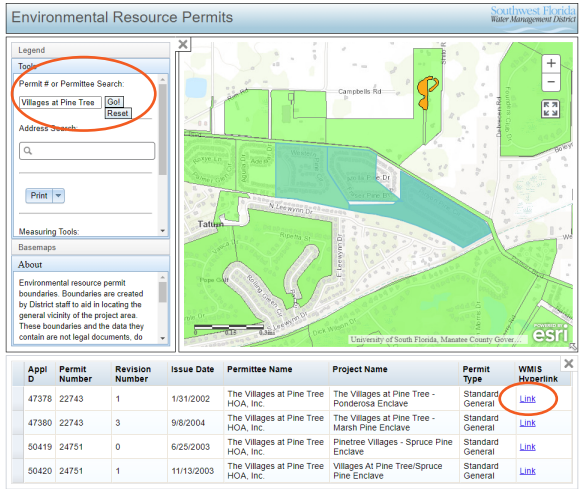
1.1. How to Find Your As-Built Plans

Find your stormwater management system permit on file with SWFWMD.

Step 1. Navigate to the SWFWMD Environmental Resource Permit page:

https://www31.swfwmd.state.fl.us/maps/pages/viewer_erp.html

Step 2. Use the map feature to find the property where the pond is located or enter the name of the community or business in the field labeled “Permit # or Permittee Search,” then click GO!



◀ Screen capture of SWFWMD’s Environmental Resource Permitting Mapping Service for Villages at Pine Tree in Sarasota County from Step 2.

Step 3. In the table at the bottom of the screen, look for the Project Name. Some developments contain multiple phases of development, each with detailed As-Built Plans. Start with Phase One and retrieve the plans for each phase.

Step 4. In the table, click on the word “Link” next to the desired Project Name.

Step 5. Navigate to the “Documents” tab in the new window and scroll through the documents until you find “Approved As-Built Plans.”

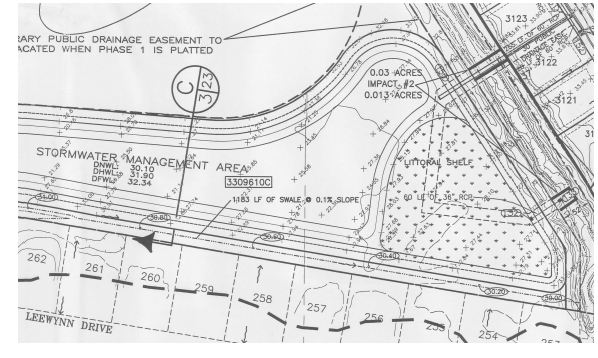
If you cannot find a permit through the Water Management District, then contact your county stormwater division.

◀ Screen capture of SWFWMD’s Water Management Information System from Step 5.

Step 6. Click on the icon to open or download this document to see your approved plans. Look for the plan sheets labeled “Drainage Plan” that show the ponds and other structures.

Notice the pond perimeter and littoral shelf are indicated. Reviewing these plan details can help you determine whether littoral zones are required features of your ponds and how large they were when built and permitted.

The plans will also show the locations of physical structures like pipes, inlets, outlets, and weirs. Locations and elevations of swales are marked with arrows to indicate the flow direction.

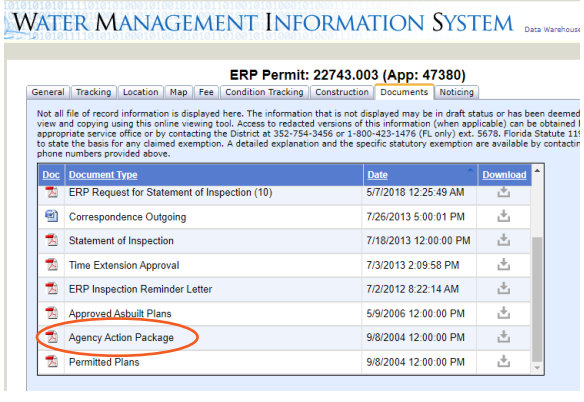


◀ Partial image of Approved As-Built Plans for Villages at Pine Tree from Step 6.

1.2. How to Find Your Pond's Inspection Requirements

Stormwater systems may have specific inspection requirements by one or more agencies to ensure proper operation and maintenance of the system. These requirements should be specified in the permit. The following is an example of how to locate the inspection requirements in the SWFWMD permit.

Step 1. Following steps from Chapter 1.1, you can navigate to the Documents page of the permit to find the Permit (or Agency Action Package) document for the development. Click on the icon to open or download the document.



◀ The stormwater management system permit, also called the "Agency Action Package", is circled in orange.

Step 2. Review the Permit document pages. If there are regular inspection requirements, the details are specified in the "Specific Conditions" section of the permit. There may also be a requirement to submit inspection reports to SWFWMD, depending on the age of the stormwater system. Inspections must be completed by a registered Professional. Call your water management district to inquire further.

Regardless of any inspection and reporting requirements, the condition of the stormwater system should be regularly compared to the As-Built conditions to ensure functionality and prevent the need for expensive remediation. In addition to these regular professional inspections, simple physical and ecological-based assessments (Chapter 2) can help you determine the health of your pond and develop a plan for improvement and repairs (Chapter 3).

1.3. Resources

Go to *www.healthyponds.org* for links to resources.

- Southwest Florida Water Management District Environmental Resource Permit Overview
- Environmental Resource Permit map viewer look-up tool
- SWFWMD Contacts: Help Desk 352-754-3456 or 1-800-423-1476 ext. 5678 (within FL); Email: *WMISHelpDesk@watermatters.org*

1.4. Community Project Idea

Work with your HOA Manager or Board of Directors to obtain your community's As-Built Plans and confirm any regulatory inspection requirements. Prepare large format (24"x36") printed versions of the plan pages that include the stormwater systems specifications (the Drainage Plan). Study them together and compare to existing conditions.

ASSESS

Chapter 2
Assessing Your Pond

As with all engineered systems, routine inspection and maintenance of a stormwater pond can ensure repairs are timely and costs and damage are minimized. Regular monitoring and assessment of the pond's ecology is also essential to improving and preserving its health. A structurally sound and healthy pond functions as a balanced ecosystem that hosts a diversity of fish and birds and provides water quality necessary to protect downstream creeks and bays. Assessments described in this chapter will help you understand what aspects of the pond need improvement and where to focus efforts to support clean water and wildlife habitat. Always carefully document your assessments and keep records.

Review Chapter 1 and check your stormwater system permit to find out if periodic inspections and reporting by a registered professional are required. The assessments presented in this chapter are not a substitute for any permit requirements.

2.1. How to Assess Pond Inlets and Outlets

Follow Table 2.1's checklist of stormwater system maintenance issues. Check each storm inlet and outlet for clogs and structural damage. Walk the pond's entire drainage area to spot where rainfall and irrigation runoff is causing erosion. Recommended maintenance actions are detailed in Chapter 6.

◂ Pond at Mira Lago, Sarasota, Florida | *David Shafer.*

Table 2.1 Pond inlet and outlet inspection issues | *Eban Bean, University of Florida.*

ISSUES	INDICATORS
Clogged inlets or outlets	Look for accumulated litter, sediment, debris, and overgrown vegetation. Note obstructions in catch basins, trench drains, curb inlets, pipes, grates, and baffles that may prevent free flow of water.
Broken inlets or outlets	Look for damage to structural components such as weirs, inlets, downspouts, curb cuts, standpipes, grates, and screens. Monitor minor damage such as dents, rust, or minor cracks for indicators of when repair or replacement is required.
Erosion or sedimentation	Look for loose or eroded sediment in the drainage area and follow the flow path upstream to identify the source, such as exposed unvegetated soil or unprotected construction sites. Note any areas with erosion more than two inches deep.

◂ Look for litter, sediment, and vegetation debris affecting pond inlets and outlets. Catching these problems before they create sedimentation and pollution in ponds, clog pipes, or cause flooding is a best practice | *David Shafer.*

2.2. How to Assess the Buffer Zone

The condition of the buffer zone is an indicator of the pond's ability to provide essential functions of bank stabilization, water quality improvement, and wildlife habitat (Table 2.2).

The Buffer Zone Scorecard ranks the health of the pond's shoreline and helps prioritize enhancement efforts. It guides a series of observations to determine whether best practices have been implemented and to what degree. The scorecard is best completed in teams of two or more to enhance discussion, consensus, and objectivity.

Over the next pages, the Healthy Pond Guide summarizes assessment criteria from the Buffer Zone Scorecard.

Buffer Zone photos | *UF/IFAS and David Shafer.*

Table 2.2. Buffer Zone inspection issues.

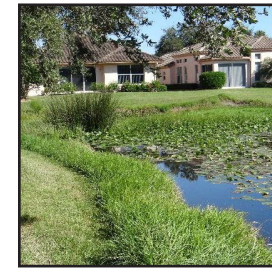
ISSUES	INDICATORS
Buffer Zone Size	Check the extent (percentage of the perimeter) and width of the buffer zone. Ideally, a vegetated buffer zone should exist around the entire pond perimeter to shield it from chemicals, landscape debris, and pet waste while providing habitat and reducing shoreline erosion.
Buffer Zone Vegetation	Check the percent vegetated coverage and type of vegetation in the buffer zone. A mowed grass buffer provides little protection, while an unmowed grass buffer provides a marginal benefit. Native plants with deep root structures enhance benefits by stabilizing the shoreline and providing cover for birds. Certain plants will also attract pollinators, butterflies, and mosquito-eating dragonflies.
Bank Stability	Check the extent of bank erosion and failure around the shoreline. Bank stabilization requires extensive plant root structures that prevent the loss of soil. Deep roots and diverse native vegetation are important for overall pond water quality.

The Buffer Zone Scorecard

1. Buffer Zone Width: Examine the width of the buffer zone.

Optimal: Width of Buffer Zone is greater than or equal to 10 feet. **Score:** 4

Suboptimal: Width of Buffer Zone is greater than or equal to 6 feet. **Score:** 3–3.5



Marginal: Width of Buffer Zone is greater than or equal to 3 feet. **Score:** 2–2.5

Poor: Width of Buffer Zone is less than 3 feet. **Score:** 1–1.5

2. Buffer Zone Vegetative Density: Look at the amount of vegetation relative to turf grass in the buffer zone.

Optimal: More than 50% of the Buffer Zone is covered by vegetation other than turfgrass, including trees, shrubs, and plants. **Score:** 4

Suboptimal: Between 30–50% of the Buffer Zone is covered by vegetation other than turfgrass, including trees, shrubs, and plants. **Score:** 3–3.5

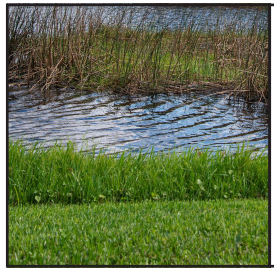
Marginal: Between 10–29% of the Buffer Zone is covered by vegetation other than turfgrass. **Score:** 2–2.5

Poor: Buffer Zone vegetation other than turfgrass is essentially absent, with less than 10% of the area including plants other than turfgrass. **Score:** 1–1.5

3. Buffer Zone Vegetation Quality: Look at the dominant plant type in the buffer.

Optimal: Buffer Zone vegetation includes native trees, shrubs, bunch grasses, native ground cover, or other native emergent plants excluding turfgrass; most plants grow to a natural height; not mowed. **Score:** 4

Suboptimal: Native bunch grasses and ground cover are the dominant plant types within the buffer zone; not mowed. **Score:** 3–3.5



Marginal: Turfgrass is the dominant plant type in the buffer zone and is allowed to grow to height of 8–12 inches; not mowed. **Score:** 2–2.5

Poor: Turfgrass is the dominant plant type in the buffer zone, is mowed to a stubble height no more than surrounding land. **Score:** 1–1.5

The Buffer Zone Scorecard

4. Bank Stability and Erosion: Examine slope of bank and amount of exposed soil and roots.

Optimal: Evidence of erosion or bank failure absent or minimal (less than 10% of bank affected); bank gently slopes to littoral zone. **Score:** 4

Suboptimal: Infrequent, small areas of erosion with drops to water no greater than 6–12 inches. **Score:** 3–3.5

Marginal: Shoreline has areas of erosion; drops to water average 1–2 feet. **Score:** 2–2.5

Poor: "Raw" areas frequent; drop to water greater than 2 feet. **Score:** 1–1.5

Compile Buffer Zone Scores

Adding scores from the four buffer zone assessments produces an overall buffer zone condition score.

Optimal (13.5–16) suggests that the pond is producing peak environmental benefits that lend to healthy and abundant wildlife, shoreline stabilization, and the removal of stormwater pollutants.

Suboptimal (10–13 points) suggests fair condition and modest improvements would likely enrich the pond ecosystem and enhance the production of environmental benefits.

Marginal (6.5–9.5 points) suggests there are many opportunities for improvement by installing a variety of Florida native plants in between homes and in other areas around the pond.

Poor (less than or equal to 6 points) suggests the need to enhance your buffer zone by installing a variety of Florida native plants.

Enhancing a pond's buffer zone has many benefits, including bank stabilization, water quality improvement, and wildlife habitat. Learn how to improve buffer zones in Chapter 4 and how to best manage them in Chapter 6.

2.3. How to Assess the Littoral Zone

The condition of the littoral area is an indicator of the pond's ability to provide the essential functions of bank stabilization, water quality improvement, and wildlife habitat (Table 2.3). The Littoral Zone Scorecard ranks the health of your pond's shallow area and helps prioritize enhancements. Not all ponds are required to have a littoral area (check your As-Built Plans (Chapter 1)), but it's a best practice to have a littoral zone sized at least 30 percent of the overall pond surface and fully vegetated with native plants. The Scorecard guides a series of observations to determine whether and to what degree best practices have been implemented. It is best completed in teams of two or more to enhance discussion, consensus, and objectivity. Use caution when approaching the pond edge to avoid wildlife encounters, especially with alligators.

Table 2.3. Littoral Zone inspection issues.

ISSUES	INDICATORS
Littoral Zone Size	Estimate the percentage of the pond area that can support plants by assessing how much of the pond bottom you can see. This shallow area is the littoral zone. It is typically less than five feet deep, allowing enough sunlight to support aquatic plants. This area softens shoreline-damaging waves and removes nutrient pollution. It provides refuge, food, and nursery habitat for aquatic animals.
Littoral Zone Vegetation Cover	Estimate the area covered by aquatic plants in the littoral zone as a percentage of the total littoral area. A healthy littoral zone has 100% of the area covered with plants growing on, under, and out of the water.
Littoral Zone Vegetation Type	Estimate the extent of invasive versus native plant coverage and number of species in the littoral zone. A higher abundance and diversity of native plants means a healthier pond. Diverse native vegetation provides optimal habitat for native fish and other aquatic life.
Overall Vegetation Cover	Check the aquatic plant coverage across the entire surface area of the pond. Experts suggest that overall plant coverage should be between 15–85% to support healthy fish populations.

◂ Littoral zone plantings create habitats for mosquito-eating dragonflies like the roseate skimmer | *Chase Bonanno.*

Native wetland and aquatic plants are beneficial in ponds because they have evolved along with wildlife in their own ecological niches, with their own checks and balances. Invasive non-native plants grow excessively to completely fill a pond, displace native plants, and impede water flow.

The Littoral Zone Scorecard

1. Littoral Zone Coverage: For this parameter, you are looking for the shallow areas that would support aquatic plants, but no plants need to be present. The actual presence of plants will be scored later.

Optimal: The shallow areas of the pond that could support aquatic plants represents at least 30% of pond area; confirmation of littoral zone or shelf is by the presence of a maintained shallow area in and around the pond. **Score:** 4

Suboptimal: Littoral Zone is less than 30% of the pond area, but more than 20%. **Score:** 3–3.5

Marginal: Littoral Zone is less than 20% of pond area; generally restricted to shoreline. **Score:** 2–2.5

Poor: No Littoral Zone or shallow water area to support aquatic plants. **Score:** 1–1.5

2. Littoral Zone Plant Abundance: Examine the amount of plant coverage, including native and non-native species. Littoral zones should be fully covered by vegetation.

Optimal: Littoral zone is fully covered with plants. **Score:** 4

Suboptimal: Littoral zone is at least 65% covered with plants. **Score:** 3–3.5

Marginal: Between 33–64% of the littoral zone is covered by plants. **Score:** 2–2.5

Poor: Less than 33% of the littoral zone contains plants. **Score:** 1–1.5

3. Littoral Zone Invasive Species Plant Abundance: Examine the coverage of invasive species in the littoral zone. If you are not familiar with Florida aquatic plants, see Resources and consult with your pond contractor or local UF/IFAS Extension office.

Optimal: No invasive plant species (emergent, floating, submersed) coverage. **Score:** 4

Sub-optimal: No more than 15% coverage by invasive plant species. **Score:** 3–3.5

Marginal: Invasive plant species coverage is greater than 15%, but less than 33%. **Score:** 2–2.5

Poor: Invasive species coverage is greater than 33%. **Score:** 1–1.5

4. Littoral Zone Native Plant Diversity: Examine the number of different plant species in the littoral zone

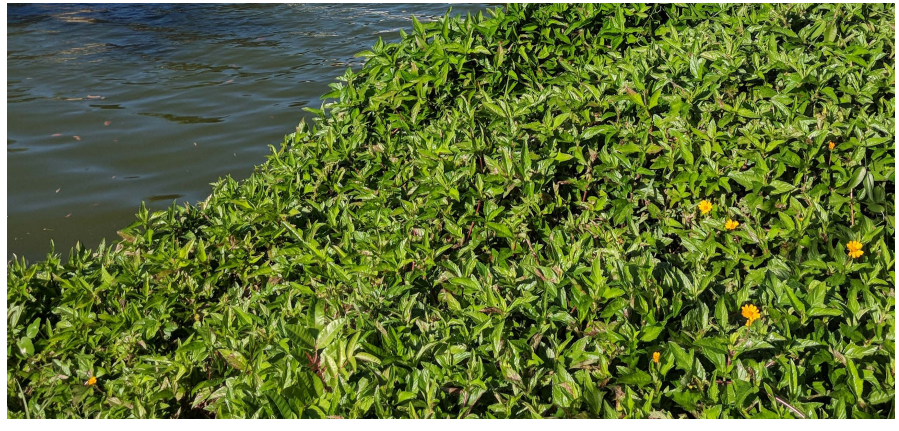
Optimal: Native vegetation (emergent, floating, submersed) includes more than 5 different species. **Score:** 4

Sub-optimal: Native vegetation (emergent, floating, submersed) includes 3–5 different species. **Score:** 3–3.5

Marginal: Native vegetation (emergent, floating, submersed) includes at least 2 different species. **Score:** 2–2.5

Poor: There is only 1 native plant species (emergent, floating, submersed). **Score:** 1–1.5

Littoral Zone photos | *UF/IFAS.*



Common invasive plants ▶ Top to bottom are alligator weed and torpedo grass *(Adobe Stock Photos)*, and wedelia *(Abbey Tyrna).*

The Littoral Zone Scorecard

5. Littoral Zone Native Species Relative Abundance: Examine the relative abundance of native plant species.

Optimal: A single native plant species does not represent more than 33% of all plant coverage. **Score:** 4

Suboptimal: A single native plant species does not represent more than 50% of all plant coverage. **Score:** 3–3.5

Marginal: A single native plant species does not represent more than 66% of all plant coverage. **Score:** 2–2.5

Poor: One native plant species represents more than 67% of all plant coverage. **Score:** 1–1.5

6. Overall Plant Coverage: Examine the entire footprint of the pond and determine how much of the pond area is covered by aquatic vegetation.

Optimal: All aquatic plants (submerged, emergent, and floating) occupy more than 30%, but less than 85%, of the total surface area of the pond. **Score:** 4

Suboptimal: All aquatic plants (submerged, emergent and floating) occupy less than 30% or more than 85% of the total surface area of the pond. **Score:** 1

Enhancing your pond's littoral zone has many benefits, including bank stabilization, water quality improvement, and wildlife habitat. Learn how to improve buffer zones in Chapter 5 and how to best manage them in Chapter 6.

Compile Littoral Zone Scores

Adding scores from the six littoral zone assessments produces an overall littoral zone condition score.

Optimal (19.5–24) suggests that the pond is producing peak environmental benefits that lend to healthy and abundant wildlife, shoreline stabilization, and the removal of stormwater pollutants.

Suboptimal (15–19 points) suggests fair condition and modest improvements would likely enrich the pond ecosystem and enhance the production of environmental benefits.

Marginal (10.5–15.5 points) suggests there are many opportunities for improvement by installing a variety of Florida native aquatic plants and reducing the impact of invasive species.

Poor (less than or equal to 10 points) suggests the need to enhance your littoral zone by installing a variety of Florida native aquatic plants and controlling invasive species.

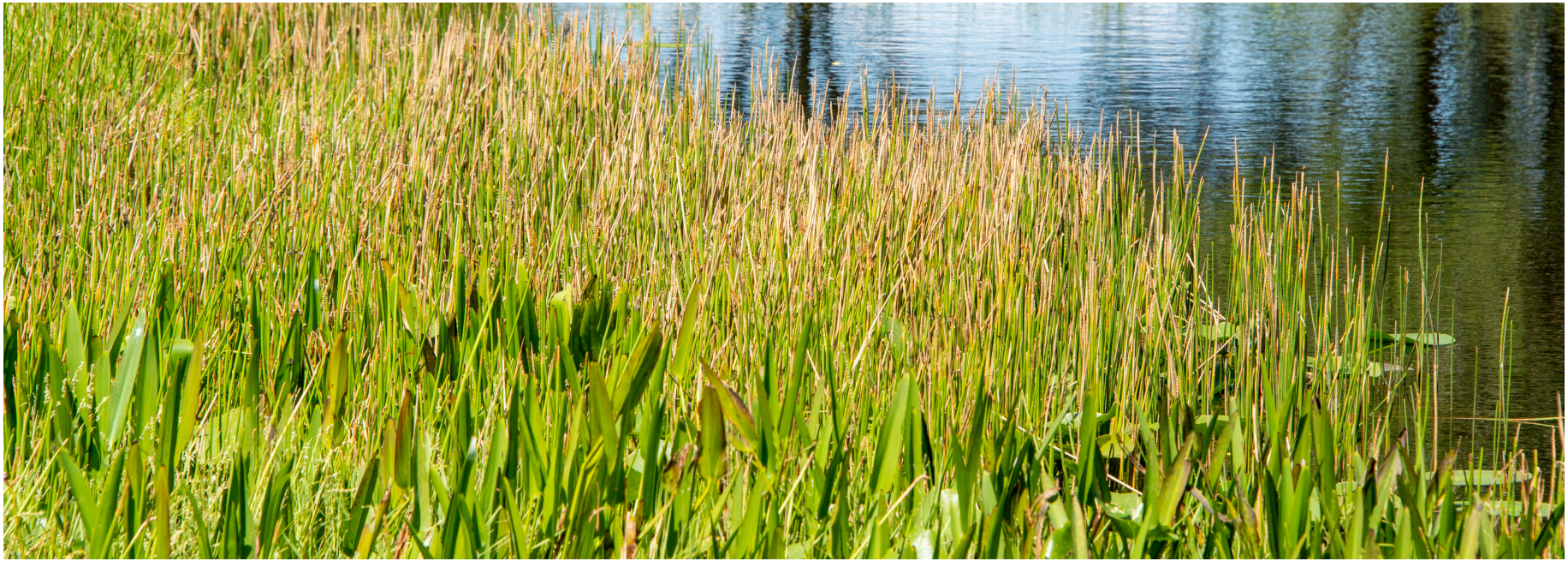
2.4. Resources

Go to *www.healthyponds.org* for links to resources.

- Buffer Zone Scorecard
- Littoral Zone Scorecard
- Photo Guide to Florida's Most Common Invasive Aquatic Plants

2.5. Community Project Idea

Walk the pond watershed examining the yards, streets, and storm drains connected to each pond. Work with your pond committee to assess the physical and ecological condition of your neighborhood stormwater system. To do this, work through the checklist and scorecards in this Chapter.



Dense stands of native plants in littoral zones reduce erosion, improve water quality, and provide habitat for fish and wildlife | *David Shafer.*

ASSESS

Chapter 3
Creating A Pond Management Plan

After you've completed your scorecards, it's time to put together a pond management plan. The plan will establish and record the community's desired outcomes and strategies for pond management and how you will communicate them to neighbors and contractors. Even the most complex plans can be simply stated so they are easy to communicate and achieve.

3.1. Healthy Pond Management Plan

The essential components of a pond management plan include establishing the goal(s), developing the objectives needed to achieve the goal(s), identifying the steps necessary to meet the objectives, and drafting an annual budget.

Step 1. Establish the community goal(s). The overall goals adopted for any pond should be to capture stormwater and hold it long enough to remove pollutants before it moves downstream. The community's goals, at a minimum, must be to maintain the physical design conditions of the As-Built plans (Chapter 1). Beyond that, community goals to enhance water quality benefits and wildlife habitat can be guided by ecological assessments of the Buffer Zone and Littoral Zone (Chapter 2). A pond management plan may be a compromise of the community's differing views on cost, function, and aesthetics. Example of a Healthy Pond Management Goal: Pond X will maintain water quality that does not impact downstream waters, provide diverse habitats for Florida native plants and animals, and balance the aesthetics of community members.

Step 2. Develop measurable time-bound objectives. The Minimum Objective needed for any healthy pond management plan is to maintain pond health. If a pond has scored "Poor" (< 2) on any of the scorecard parameters, then additional minimum objectives can be included for that parameter to achieve a higher score the following year. For example:

• Next year, Pond X will have maintained or improved its scores on the Healthy Pond Buffer Zone and Littoral Zone Scorecards.

Other desirable objectives to reach the overall goals related to water quality, habitat, and aesthetics for Pond X are:

• Within five years, Pond X will have a healthy fish population as evidenced by angler diaries or a professional fish stock assessment.

• Within two years, Pond X will have increased the number of native birds utilizing it, as documented by residents and bird enthusiasts using Florida Lakewatch's Aquatic Bird Survey.

• Within two years, Pond X will have water quality leaving the pond that, on average, is 80% or more cleaner than the water quality entering the pond, as evidenced by water quality monitoring reports.

• Within one year, Pond X aesthetic will rank at or above average as indicated by a community satisfaction survey.

Step 3. Identify the steps needed to achieve the objectives. For example, to meet the minimum objective, the pond owners have decided to increase the abundance of plants in the littoral zone from a "Marginal" level of 50% to an "Optimal" level of 100%. They also want healthy fish stocks.

To reach the objective of maintaining or improving a score on the Littoral Zone Scorecard, we will:

• Research local grant opportunities to fund stormwater pond improvements.

• Reach out to community service providers such as the UF/IFAS Extension, local Native Plant Society, and/or County Government for help identifying plants suited for the littoral areas of Pond X.

• Get three quotes from professional companies for increasing the native plant abundance in the littoral area of Pond X. Included should be the recommended plant types and a guarantee of plant survival for a specific time period (e.g., 80% survival of plants for two months).

• Work with the maintenance contractor to ensure the plants are maintained using an Integrated Pest Management Plan (See Chapter 6.2).

◂ Pond at Mira Lago, Sarasota, Florida | *David Shafer.*

To reach the objective of creating a healthy fish population in five years, we will:

- Use the Littoral Zone Scorecard to evaluate the health of Pond X's littoral areas.
- Contract with a reputable company to provide a fish stock assessment or ask residents to report their fishing activity using Florida Lakewatch's Angler Diaries and/or pictures to track fish stocks over time.
- Seek fish stocking recommendations from Florida Fish and Wildlife Conservation Commission or UF/IFAS Extension based on recent stock assessment/Angler Diaries.
- Monitor pond water quality through monthly water sampling and testing to ensure fish have suitable living conditions. Refer to Florida Lakewatch's ABCs of Water Quality.

Table 3.1 Example of an annual budget for achieving 100% littoral plant cover and healthy fish stocks.

OBJECTIVE	ITEM OR SERVICE	POTENTIAL VENDOR	COST/ UNIT	# UNITS	TOTAL
100% Littoral plant cover	Aquatic plants	LMN Aquatic Plants	$10	300	$3,000
	Aquatic plant installation	LMN Aquatic Plants	$3,000	1	$3,000
	Plant survival insurance	LMN Aquatic Plants	$900	1	$900
Subtotal					$6,900
Healthy fish stocks	Fish stocking assessment	ABC Pond Fish Assess Co.	$500	2	$1,000
	Fish stock	XYZ Pond Fish Stock Co.	$20	100	$2,000
	Aquatic plants	LMN Aquatic Plants	$10	85	$850
Subtotal					$3,850
TOTAL					**10,750**

Pond contractors discuss progress of a shoreline restoration project at a stormwater pond in Center Gate, Sarasota, Florida | *David Shafer.*

Step 4. Estimate an annual budget for the costs of management activities. Draft an annual budget needed to complete the steps and achieve the objectives for the year. Consult with your local UF/IFAS Extension office to learn about opportunities for cost-share grants.

3.2. Choosing a Pond Contractor

Many pond owners need professional help with pond management. Like any service provider, each contractor's level of knowledge, professionalism, and commitment to healthy, sustainable practices will differ. It's important to get quotes from multiple contractors based on the needs identified in your pond management plan before deciding on a company to manage your pond(s). You may also want to review customer ratings or references and talk to other HOA customers.

• *How do managers and their field crews stay current on best practices for aquatic systems management?* Compare the types of training, certifications, and continuing education required for employees, such as the Healthy Ponds Certification offered by UF/IFAS Extension.

• *Does the company use evidence-based approaches for pond management and have research supporting their use of specific methods?*

• *Does the contractor have a diverse set of tools and approaches?* An integrated pest management approach requires a mixed group of tools for invasive species management that include biological, physical, mechanical, and chemical controls. *Do they have examples of when different tools were used to control specific species using a combination of control methods? Do they have examples of using each type of control method?*

• *What kind of scouting schedule and response time does the company have when invasive species pop up in and around the pond?* Rapid response and early detection is needed for successful invasive species management.

• *What type of integrated management plans has the contractor developed for other communities?* Ask for examples. Companies should have a management approach that reduces chemical applications in the pond to fight invasive species and algal blooms. Companies should not be contracted for just a "spray and pay service." Spraying and then leaving dead plants in the pond works against water quality improvement goals, because plants left to decay in the pond add to nutrient pollution.

• *How does the company communicate with the HOA about problems and solutions for addressing the issues? Do they provide any community education? Are they responsive to your community's pond management goals and objectives? Will they help collaboratively adjust your plan in the future based on results?*

• *If proposing aeration, does the company have valid reasons for the specific pond (e.g., dissolved oxygen profile of the water column observed in the early morning)?* If you are unsure whether aeration will support your pond management plan, consult with your local UF/IFAS Extension office.

3.3 Resources

Go to *www.healthyponds.org* for links to resources.

- Florida Lakewatch Aquatic Bird Survey
- Florida Lakewatch Angler Diaries
- Florida Lakewatch ABCs of Water Quality

3.4 Community Project Idea

Work with neighbors to draft a pond management plan to present to the Board of Directors. Receive feedback about the community's priorities for stormwater pond function, aesthetics, and costs. Revise and share with the community along with cost-share grant opportunities.

IMPROVE

Chapter 4
Enhancing the Buffer Zone

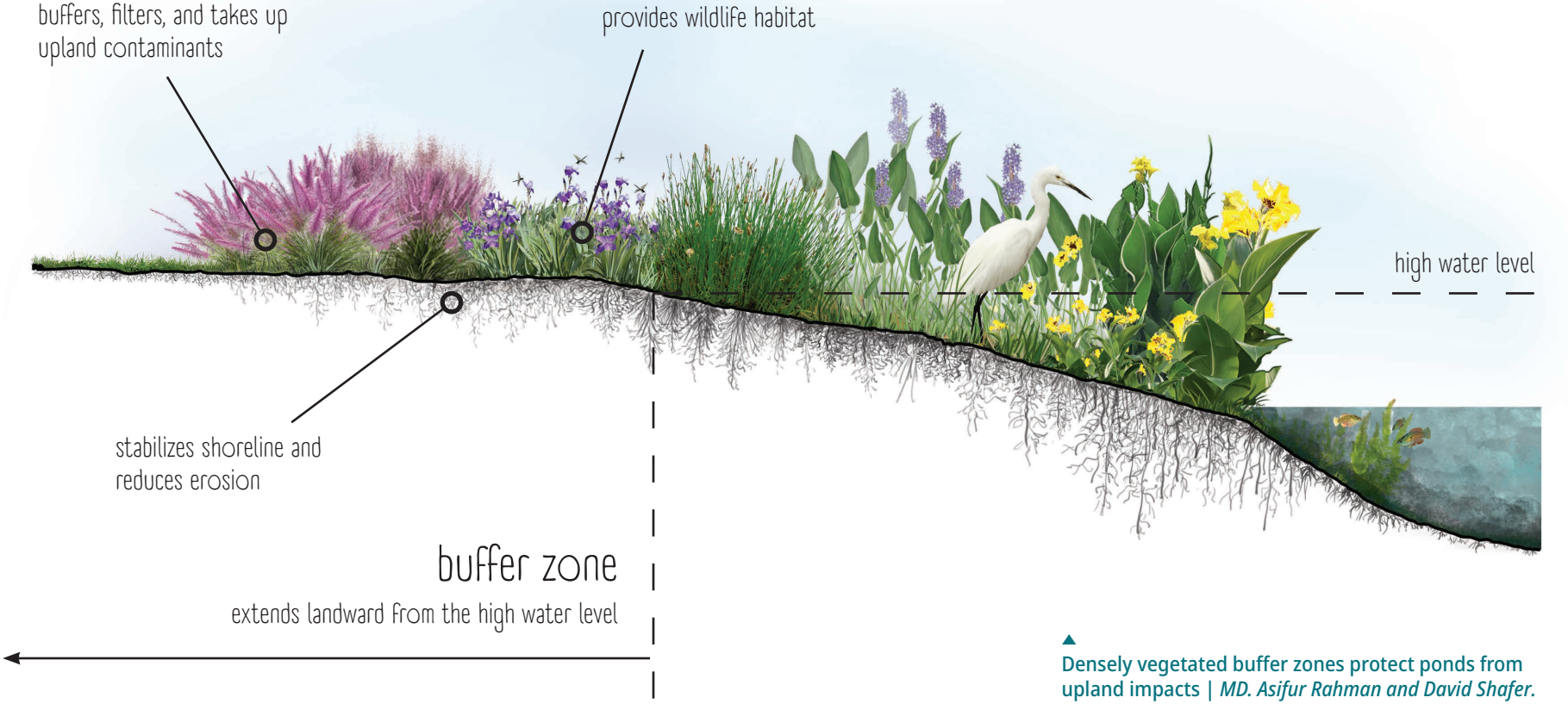
Buffer zones, also known as no-mow zones, are grassy or planted areas that physically separate the pond from upland impacts, such as mowing, fertilizing, pesticide use, pet waste, and landscape debris. Whether natural or created, buffer zones are crucial for preventing shoreline erosion[2]. A well-maintained and intact buffer zone will extend the pond's functional life, delaying or eliminating the need for costly engineered solutions. Depending on the size and characteristics of buffer zones, they can also improve pond water quality and wildlife habitat.

[2] National Research Council. 2000. Watershed management for potable water supply: Assessing the New York City strategy. National Academies Press.

4.1. How to Plan a Buffer Zone

When establishing or enhancing buffer zones for stormwater ponds, success hinges on good planning. Take these steps to ensure that your efforts match the current conditions of your ponds, and your neighbors and contractors agree with the changes and potential costs.

Step 1. Use the Buffer Zone Scorecard in Chapter 2.2. to rate the buffer zone's size, quality, and stability. A total score less than 13 suggests suboptimal conditions and interventions are necessary for your pond to achieve optimal performance. If your pond scored a "1" on Bank Stability, then mechanical shoreline restoration may be required before planting. Consult with a professional engineer.



▲ Densely vegetated buffer zones protect ponds from upland impacts | *MD. Asifur Rahman and David Shafer.*

◀ Blueflag iris | *Adobe Stock Photo.*

Step 2. Use Table 4.1 to determine and record your buffer/no-mow zone goals. Depending on existing pond conditions and budget, your first step may be establishing a "GOOD" buffer for your pond perimeter, or you may be ready to improve your buffer to "BETTER" or "BEST" condition.

Step 3. Work with your community to determine a project budget for your goals. If cost is an issue, consider a phased approach—first establish GOOD buffers with grassy no-mow zones, then make them BETTER or BEST with plantings.

Step 4. Schedule a meeting with both the landscape and pond maintenance companies to communicate your goals, project timeline, and any expected changes to their contracts. This is the time for maintenance contractors to identify any potential barriers to achieving your pond management plan goals and to state their solutions/ management strategies to ensure success. Changes to buffer zones will require changes to maintenance practices, which could increase costs and/ or require changes to current contracts.

GOOD No-mow zone around pond at Rivendell, Sarasota, Florida | *David Shafer.*

4.2. How to Establish a GOOD No-Mow Buffer Zone

Establishing a no-mow buffer zone can be as simple as changing the way your community maintains the existing turfgrass around the perimeter of your ponds.

Step 1. Allow existing turfgrass to grow to a height of 8–12 inches in a halo extending at least three feet (ideally ten feet) from the pond edge.

Step 2. Use handheld trimmers—not mowers—in the buffer zone to protect pond slopes from damage by heavy mowing machinery.

Step 3. Angle trimmers to keep grass clippings out of the pond. These little grass blades contain nutrients that fuel algae growth. Use grass clippings to feed the lawn, not the pond.

Communicating the new maintenance standard required by the community and the reasons for its adoption is essential to a healthy pond. Whether your community has a single landscape contract, multiple contracts, or homeowners who do their own lawn care, be sure to communicate regularly with all stakeholders, including homeowners, HOA board members, landscapers, and pond managers, about the importance of the no-mow buffer zone. See Chapter 4.5. for a case study in successful communication.

Table 4.1 Characteristics of a GOOD, BETTER, and BEST buffer zone and pros and cons for choosing the most suitable buffer for your current pond condition and budget.

	GOOD	BETTER	BEST
Description	A GOOD buffer primarily relies on a grass strip that is at least 3 feet wide and 8–12 inches tall. Trim the buffer using tools that keep the clippings out of the water. A GOOD buffer will secure the pond shoreline from many of the major causes of erosion by locking in the soils with plant roots and limiting compaction from heavy lawn mowers.	Sometimes the impacts of erosion that exist within a community are worse between homes due to channelization from combined roof runoff. As a result, you may consider establishing a BETTER buffer. A BETTER buffer consists of all elements of the GOOD buffer plus the installation of native bunch grasses, shrubs, and/or trees between homes, and native aquatic plants on the slope.	The BEST buffers are those that not only protect your shoreline from all the major types of erosion—saving pond owners a significant amount of money, but also support wildlife and reduce pollution. BEST buffers include: • A wider GOOD buffer with high plant diversity. • An expanded BETTER buffer that connects the native vegetation between homes and occupies at least 50% of the pond perimeter. • Includes native shrubs and trees. • Native wetland plants in the water around the perimeter of the pond.
Pros	• Combats most erosion forces. • Modest water quality improvements by extending the root zone of plants deep within the ground, locking in the sediment that contains phosphorus and other contaminants, and preventing grass clippings, which contain approximately 3% nitrogen by mass, from entering the pond. • Minimal maintenance is required. • Extends the life of the pond pushing the need for costly engineered solutions into the future.	• Deeper and thicker root systems that can tolerate periods of high water and lock in soils better than turfgrass. • Aquatic plants on the slope lock in soils reducing erosion during dry periods when the water level is low. • Increased water quality benefits compared to the GOOD buffer. • Wildlife habitat for certain types of wading birds. • Extends the life of the pond delaying the need for costly engineered solutions.	• All the pros of the BETTER buffer. • Expanded wildlife habitat for most types of aquatic birds. • Combats all major causes of erosion. • Extends the life of the pond even further than the BETTER buffer, putting off the need for costly engineered solutions. • Increase water quality benefits provided by the GOOD buffer.
Cons	• Does not protect your shoreline against all major causes of erosion. • Does not increase habitat for aquatic wildlife. • Does not remove pollution from within the pond.	• Wave action can still impact the pond shoreline. • Only modest improvement for aquatic wildlife. • More maintenance required than the GOOD buffer.	Requires the most maintenance.

4.3. How to Plant a BETTER or BEST Buffer Zone

4.3.1. Plant Selection

The mantra of any good Florida gardener is "right plant, right place." To select plants best suited to the job of enhancing your pond buffer, consider these three key factors:

1. Site suitability. Site conditions such as soil pH (alkalinity/acidity), soil texture, soil moisture, and sun exposure will help inform the choice of plants. Florida native wetland plants are good options for the sloped part of the buffer zone where plants must tolerate their roots being wet and dry during different portions of the year. Upland plants are suitable beyond the first row of plants at the top of the slope, where soils are less likely to become saturated. Contact your local UF/IFAS Extension office for information on soil pH tests.

BEST buffer zones feature native plants and trees, like this one around a pond at Stoneybrook Golf and Country Club, Sarasota, Florida | *David Shafer.*

2. Function. Consider the purpose of buffer zone plants, such as bank stabilization, pollutant removal, and wildlife benefit. Many Florida native wetland plants serve all these functions, plus they are highly resilient to Florida pests and diseases.

3. Aesthetics. A greater variety of colors, shapes, textures, and sizes can improve aesthetics, with these considerations:

• Choose perennials and evergreen plants. Perennial plants grow and mature for more than one year, while annual plants need to be replaced every year. Replacing annuals can contribute to erosion and increase costs. Evergreen plants are better than deciduous plants, which lose their leaves once a year. If deciduous plants are chosen, removing leaf litter should be included in your maintenance plan.

• Pay special attention to plant size at maturity. Be sure to space plants according to how big they will eventually grow. While trees shade and help cool pond water temperature, they should be placed far enough from the water's edge and from the pond's physical structures to accommodate their mature height and spread.

Refer to the Resources section for Florida native plant lists and guidance on selecting the right plant for the right place. Also, be sure to ask your local nurseries for a list of wetland and aquatic plants they have in stock.

Perennials and evergreens that are good for bank stabilization, pollutant removal, and wildlife habitat are excellent choices for buffer zone plants. Left to right are blue porterweed, bushy bluestem, muhlygrass, and blueflag iris. Selecting Florida native plants means that the plants are adapted to Florida's climate conditions and soils. Buffer zones should NEVER receive fertilizer applications at planting or at any time due to their proximity to the water and the risk of nutrient pollution.

▲
Buffer zone plants | *Adobe Stock Photos.*

▲ Before planting a BETTER buffer zone, consider sheet mulching the area with cardboard and pine straw or needles first | *UF/IFAS.*

4.3.2. Installation

Before installing plants, prepare the site by removing what is currently growing in the area. One of the most effective and environmentally-friendly ways to convert turfgrass into a landscaped area is sheet mulching—simply laying down a thick layer of cardboard or newspaper with a mulch covering.

Cardboard tends to be more effective as it allows moisture to pass but inhibits weed growth. You will need enough cardboard to cover your area and enough pine straw mulch to cover the cardboard. Pine straw or needles are a better choice than bark or chipped wood because they form a mat in place and are less likely to wash into the pond.

Sheet mulching around your stormwater pond should occur during the dry season to avoid soil erosion from heavy rainfall. If you have steep banks or plan to do this work at any point during the rainy season, install coconut coir mats to keep soil from eroding into your pond.

Step 1. Mow low. Use the lowest setting of your mower to sculpt the area you have designated as your buffer zone around the pond.

Step 2. Smother. Cover the ground with one layer of cardboard and wet thoroughly. Then cover the cardboard with pine straw or needles.

Step 3. Install plants. You can plant perennials at any time, though waiting for the rainy season will reduce the need for supplemental irrigation. If you are planting right away, then holes should be punched through the cardboard to install plants. Plants should be selected and positioned to grow together and shade out weeds.

Step 4. Mulch. At the time of planting, place pine straw mulch to 1–2 inches thick to suppress weed growth and retain moisture for the plants. Regular mulching should not be necessary for the buffer zone. However, mulch should be considered if the area is replanted or heavily pruned.

4.3.3. Irrigation

New plants may require several weeks to months to become established, depending on site conditions and the size of the plants at planting. Supplemental irrigation is often needed during this period, so planting the buffer zone in the rainy season is ideal, if erosion is prevented. Once established, the buffer zone will only need irrigation during times of drought. Before planting, adquate micro-irrigation should be installed for supplemental watering. Solar pumps, which pull water from the pond to allow temporary irrigation, are recommended. Consider installing soil moisture sensors to help you determine when water is needed. Refer to Chapter 6 for guidance on Buffer Zone maintenance.

4.4. Resources

Go to *www.healthyponds.org* for links to resources.

- Guide to Selection and Installation of Stormwater Pond Plants
- Stormwater pond plant selection database with details to help select suitable plants based on habitat, function, and aesthetics.
- Creating Wildlife Habitat with Native Florida Freshwater Wetland Plants
- Fact Sheet: Buffer Zones for Stormwater Ponds
- Brochure: Living on the Water's Edge
- Sheet Mulching for Weed Prevention
- DIY Drip Irrigation Step-by-Step
- DIY Micro-irrigation Installation Webinar
- Other resources may include your local UF/IFAS Extension office, your County's stormwater division, and your local Native Plant Society.

4.5. Community Project Idea

Forming a partnership with community residents and pond/landscape contractors is critical to achieving a more attractive and functional stormwater pond. When all parties work together towards a common goal, the buffer zones are more successful. If you provide education to the community on the function and purpose of these areas, including a field trip to walk the watershed, neighbors will likely become more involved in protecting the plants and wildlife they live beside. Here is how one community communicated its Board approved plan to implement a Good no-mow buffer zone around the perimeters of its five ponds:

- Sent multiple emails informing residents of the importance and future implementation of a no-mow zone around the perimeter of ponds.
- On the date of the no-mow buffer zone implementation, signs were placed around the pond to delineate the no-mow buffer zone. Signs were printed in both Spanish and English to inform mowers and residents that the area beyond the sign was off-limits to mowing.
- Signs were attached to ropes and stakes around the pond's perimeter.
- Signs remained deployed until full compliance (all lots had an established no-mow buffer zone).
- If a resident fell out of compliance (mowed the no-mow buffer zone), the signs were redeployed until the no-mow buffer zone was re-established.

Micro-irrigation delivers water close to the plant, minimizing evaporative loss and conserving water | *City of Hayward, California.*

IMPROVE

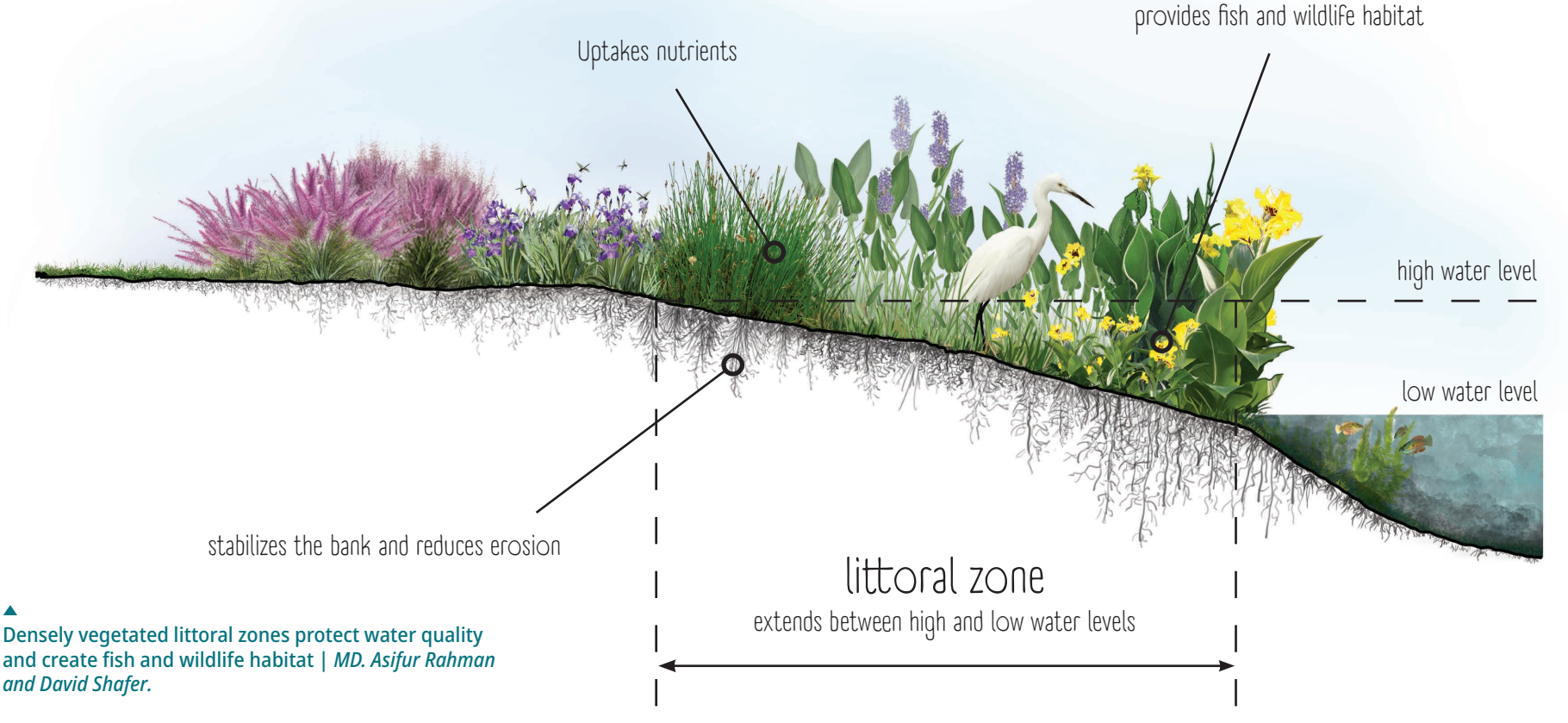
Chapter 5
Enhancing the Littoral Zone

Pollution reduction is a stormwater pond's primary environmental purpose. Vegetation helps remove and protect the pond from pollution. Over time and with poor maintenance practices, plants in this critical zone can die. Maintaining an extensive littoral zone with thriving aquatic plants is a best practice and may even be required by your permit.

5.1. How to Plan the Littoral Zone

When restoring or enhancing littoral zones in stormwater ponds, success depends on good planning. Take steps to ensure that your efforts match the current conditions of your ponds, and your neighbors and contractors agree with the changes and potential costs.

Step 1. Use the Littoral Zone Scorecard in Chapter 2.3. to rate your littoral zone's size and the extent and quality of aquatic plants. A total score less than 19 suggests suboptimal conditions and interventions are necessary for your pond to achieve optimal performance. Enhancing the littoral zone with aquatic plants extends the benefits of a GOOD buffer to a BEST buffer.



▲ Densely vegetated littoral zones protect water quality and create fish and wildlife habitat | *MD. Asifur Rahman and David Shafer.*

◀ Pickerelweed | *Adobe Stock Photo.*

Step 2. Whether you are installing the plants yourself or hiring a professional, gather additional information to help guide your planning.

- As-Built drawings (see Chapter 1.1. How to Find Your As-Built Plans for how to track down and read this document).
- Areas of concern for wave action/erosion.
- Presence of plant-eating animals such as grass carp and turtles.
- Extent of shoreline erosion.

If your pond scored a 1 on bank stability on the Buffer Zone Scorecard in Chapter 2.2, then mechanical shoreline restoration may be needed before planting. Consult with a professional engineer.

Step 3. Work with your community to determine a project budget for your goals (see Chapter 3.1). Budget for both short-term installation and long-term maintenance costs.

Step 4. Schedule a meeting with your pond maintenance company, if you have one, to communicate your goals, project timeline, and any expected changes to the contracts they work under. This is the time for maintenance contractors to identify any potential barriers to achieving your pond management plan goals and to present their solutions/ management strategies to ensure success.

5.2. How to Plant the Littoral Zone

5.2.1. Plant Selection

Aquatic and wetland plants are uniquely adapted to survive in wet environments. Because more than half of Florida was once a mosaic of wetlands, more than 100 native wetland and aquatic plants are suitable for stormwater ponds. A few factors should be considered when selecting aquatic plants for the littoral zone:

1. Site suitability. Consider water depth, mature plant height, and specific site characteristics such as wave action or presence of plant-eating animals. Water depth controls where most varieties of aquatic plants grow. Most emergent plants can only tolerate a maximum depth of two feet, and submerged plants will only grow and spread to the deepest waters where light can penetrate. Therefore, to ensure plant survival, one needs to know the water depth and water clarity in the littoral zone during the wettest part of the year (usually August and September). Refer to your Littoral Zone Scorecard and your As-Built plans for littoral zone depth.

2. Function. Aquatic plants in the littoral zone have different functions and benefits for shoreline stabilization, pollutant removal, and wildlife habitat based on whether they are emergent (sticking up out of the water), submerged (entirely under the water), or floating. Having all three types can help achieve the optimal 100% plant coverage in the littoral zone.

3. Plant Diversity. Choose at least five species for your stormwater pond. Diversity of plants is essential to the success of an established plant community and the functions of those plants. Having multiple species will also protect against the loss of any single species from insects, diseases, or other disturbances.

Different plant species flourish at different times of the year; high diversity will ensure adequate coverage and aesthetic appeal. Include at least one evergreen plant that will look good in all seasons and add to your pond's visual appeal when some plants are in their dormant period.

Refer to the Resources section for Florida native aquatic plant lists and guidance on selecting the right plant for the right place. Also, be sure to ask your local nurseries for a list of wetland and aquatic plants they have in stock.

Littoral plants have different functions and benefits for shoreline stabilization, pollutant removal, and wildlife habitat based on whether they are emergent, submerged, or floating. Left to right are duck potato, pickerel weed, golden canna, spikerush, and spatterdock.

▲
Littoral plants | duck potato, pickerel weed, golden canna, spikerush *(Adobe Stock Photos), and* spatterdock *(Flickr Paul Asman).*

Pro-Tip for Calculating Maximum Plant Depth: To determine whether your pond is a good candidate for submerged aquatic plants, calculate the depth of light penetration using a Secchi disk (available for purchase online or ask your UF/IFAS Extension office). Measure the Secchi depth (how deep you can see the disk) and multiply by 1.7. That is the maximum depth at which submerged plants can survive.

◂ Secchi disk | *USGS.*

◂ Pond professionals establish a littoral zone | *Mollie Holland.*

5.2.2. Installation

Step 1. Season matters. Smaller plants (bare root, 4-inch or 6-inch pots) should be installed before the rainy season while the shoreline sediment is moist, but water levels are not high yet. Be sure to allow an establishment period of at least three weeks before the summer's heavy rains. Larger plants (10-inch or greater pots) can be installed during the rainy season. Plants tall enough to have their leaves out of the water will be more likely to survive in the rainy season.

Step 2. Coverage matters. A healthy pond has 100 percent plant coverage in the littoral zone. Over the entire pond, between 30–85% of the total area should be occupied by plants (submerged, emergent, and floating). Coverage less than 30 percent does not improve water quality, while coverage greater than 85 percent is harmful to fish. See Chapter 2.3 for guidance on assessing the littoral zone coverage.

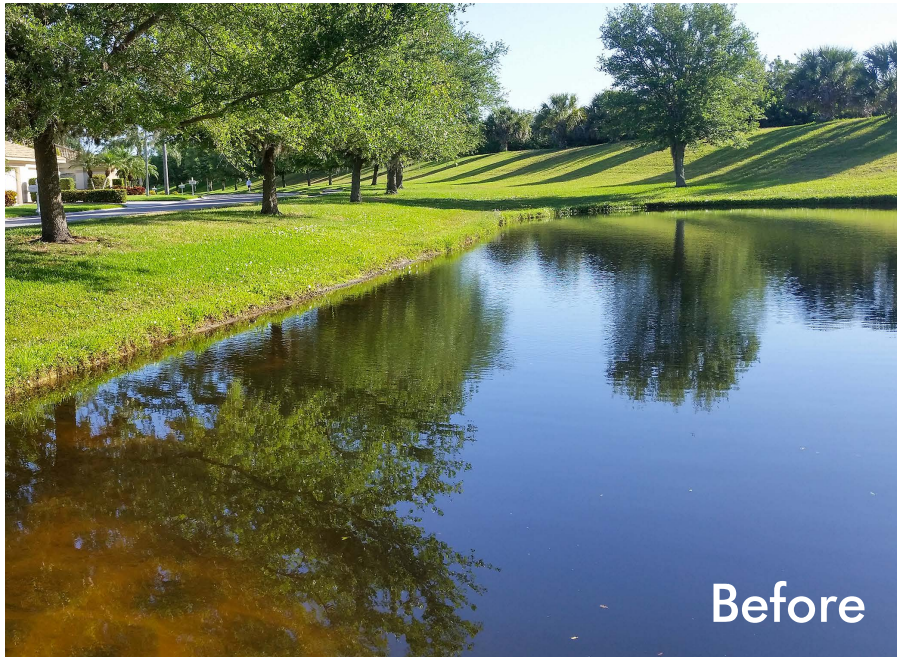
5.3. Resources

Go to *www.healthyponds.org* for links to resources.

- Guide to Selection and Installation of Stormwater Pond Plants
- Stormwater pond plants selection database with details to help select suitable plants based on habitat, function, and aesthetics
- Creating Wildlife Habitat with Native Florida Freshwater Wetland Plants
- Other resources may include your local UF/IFAS Extension office, your County's stormwater division, and your local Native Plant Society.

5.4 Community Project Idea

Organize community volunteers for a littoral planting event following the guidance described in this Chapter. Before getting started, scout out local resources for help. For example, your local UF/IFAS Extension office may be able to assist with plant selection, while a local National Estuary Program or Native Plant Society may have grant funds available for purchasing plant stock.



Before and after photos capture the dramatic transformation of a pond's littoral zone at Stoneybrook Golf and Countryclub, Sarasota, Florida. Efforts to install littoral zones are rewarded with multiple benefits of shoreline stabilization, pollutant removal, and wildlife habitat.

▲
Before and after littoral zone restoration | *Forest Crooke.*

IMPROVE

Chapter 6 Maintaining Your Pond

Maintaining your stormwater pond is mostly about maintaining the vegetation. Keep the plants healthy, and they'll do the rest! Routine maintenance involves trimming and weed control. In addition, seasonal maintenance and repair of the physical inlets and outlets is necessary as indicated by the inspection checklist detailed in Chapter 2. Long-term, sediment removal in ponds may be required to remove sediment that has accumulated over the years. The goal of maintenance and upkeep is to keep the stormwater system as close to As-Built conditions as possible.

6.1. How to Trim Vegetation

6.1.1. Grassy No-Mow Buffer Zones

If your community adopted a grassy no-mow zone to buffer your pond, then regular trimming will be necessary.

Step 1. Trim turfgrass around the perimeter of the pond to a height of 8–12 inches in a halo extending at least three feet (ideally ten feet) from pond edge.

Step 2. Keep heavy machinery such as mowers off the shoreline. Instead, use handheld landscaping tools such as articulated hedge trimmers or string trimmers.

Step 3. Ensure that landscape crews utilize techniques that reduce or prevent grass clippings from entering the pond. These little grass blades contain nutrients that fuel algae growth. Use grass clippings to feed the lawn, not the pond. Goals to reduce and, by all means possible, eliminate clipped vegetation from going into the ponds must be included in contracts and pond management plans.

Any great egret can tell you no-mow buffer zones help protect water quality and reduce damage to pond edges from mowers. Pond at Center Gate #5 | *David Shafer.*

◂ Great blue heron admires a healthy pond at Stoneybrook Golf and Country Club, Sarasota, Florida | *David Shafer.*

6.1.2. Planted Buffer and Littoral Zones

Mature plants typically do not require much maintenance. As plants age, regular maintenance to trim dead plant matter and remove dead plants from the water can support the look and the function of your pond.

In fact, removing dead plant material from the water is considered a best practice to improve water quality because nutrients and pollution taken up by the plants when they were alive are also removed.

Pro Tip for Water Quality: Fertilizer should NEVER be applied within 10 feet of any pond or other waterbody, including swales.

◂ Planting lush buffer and littoral zones creates habitats for beneficial insects, like the mosquito-eating Eastern pondhawk. Local photographer Chase Bonnano has set out to photograph every species of dragonfly in Florida. What dragonflies have you seen around your pond? | *Chase Bonanno.*

6.2. How to Control Weeds

Most plant maintenance required for a stormwater pond will be focused on the control of invasive and nuisance plant species that can cause economic and/or environmental harm. Controlling invasive and nuisance species is important for the performance and aesthetic of your stormwater pond and is often required by the stormwater system permit (Chapter 1). A general guideline is to limit invasive nuisance species to less than 15 percent of total plant coverage. In other words, of all the plants that are in and around the pond, 85 percent of them should be native Florida plants.

6.2.1. Nuisance and Invasive Vegetation

Follow these steps to successfully control invasive and nuisance plants.

Step 1. Early Detection and Rapid Response. Homeowners can assist pond managers to monitor new invasive plants. Several mobile phone applications, such as iNaturalist, Seek, or PictureThis, can help with preliminary identification of the plant. A trained field technician or UF/IFAS Extension agent can confirm the plant ID and status and advise on an evidence-based approach for removal.

Step 2. Removal. A thoughtful integrated pest management (IPM) plan (see next section) that considers the pros and cons of all management options should be drafted and agreed upon. Immediate removal and disposal using techniques specified by the IPM plan will provide for the greatest long-term success. Spraying and leaving dead plants in the pond works against water quality improvement goals, because plants left to decay in the pond add to nutrient pollution.

Step 3. Follow-up. Ongoing site monitoring will allow pond managers to evaluate success or adapt new strategies as needed.

Step 4. Triage. When invasive or nuisance species are already well-established, and resources are limited, it may be best to determine where to spend limited dollars based on a plant's potential harm. For example, Category I Prohibited Aquatic Plants are those deemed to be a danger to the ecology of Florida waters and should be prioritized for removal. Consult the Resources section for a photo guide to Florida's most invasive aquatic plants.

Invasive and nuisance plants harm the native ecology of your pond. Early detection and removal is important to management success. Left to right are hydrilla, torpedograss, water hyacinth, alligatorweed, and wedelia.

▲
Invasive and nuisance plants | water hyacinth and hydrilla (*UF/IFAS*), torpedograss *(Houston Native Praries Association of Texas),* and wedelia *(Abbey Tyrna).*

6.2.2. The Integrated Pest Management Plan

There is no silver bullet for vegetation control. If the current plan is simply to spray undesirable plants with an herbicide each month, then that plan should be reevaluated. Herbicide use is just one of the tools a manager has in the toolbox for combating invasive and nuisance vegetation. Spraying and then leaving dead plants in the pond works against water quality improvement goals, because plants left to decay in the pond add to nutrient pollution.

Successful pond management plans should include detailed descriptions of invasive and nuisance plant species found in and around the pond and a strategy for how each should be controlled via chemical, physical, mechanical, and biological controls. The strategy should consider how the targeted plant responds to treatment, as well as impacts to non-targeted plants, fish, and other aquatic organisms. The results of treatments should be monitored, and the plan should be adjusted accordingly. This strategy is often referred to as an Integrated Pest Management (IPM) plan.

Pro-Tip for Controlling Invasive Vegetation: Regular scouting in the buffer and littoral areas for invasive plants can lead to early detection and a rapid response, reducing overall use of herbicides and the potential costs of controlling invasive and nuisance plants.

If a contracted pond manager or landscaping company is in charge of maintaining your pond buffer, slope, and littoral zones, be sure they are following IPM principles. The IPM plan established for your pond should be included in your overall pond management plan (Chapter 3). For any chemical controls, consult the product's label or your local UF/IFAS Extension office before you or a contractor apply herbicides or pesticides near stormwater ponds.

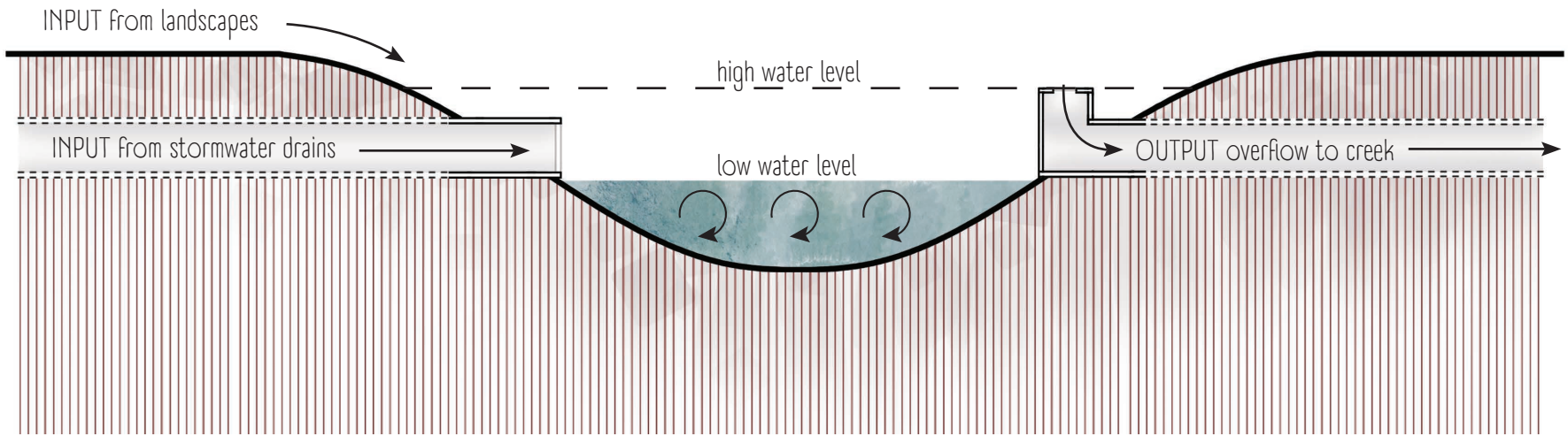
6.3. How to Maintain Physical Structures

Maintenance of the physical components of a stormwater pond is an ongoing seasonal activity. Generally, the dry winter months are a good time to repair broken inlet and outlet components since these structures will be above the water level. Clearing and removal of trash, debris, and vegetation should occur seasonally, but especially before the wet season to avoid blockages.

Table 6.1 Maintenance of physical structures | *Eban Bean, University of Florida.*

ISSUES	MAINTENANCE
Clogged inlets or outlets	Remove sediment, debris, and blockages from catch basins, trench drains, curb inlets, and pipes to maintain at least 50 precent conveyance at all times. Identify obstructions and clear them immediately.
Broken inlets or outlets	Repair or replace broken downspouts, curb cuts, standpipes, and screens as needed.
Erosion or sedimentation	Remove loose sediment and plant debris, replace dead plants and replant exposed soil.

▲ Remove sediment and debris from stormdrains before they can clog pipes, cause flooding, or create sediment and litter problems in your pond | *David Shafer.*



▲ Stormwater enters ponds indirectly and directly from many sources, mixes with water in the pond, and exits through overflow structures | *MD. Asifur Rahman and David Shafer.*

6.4. How to Maintain Pond Depth

Over the years, shoreline erosion and sedimentation from the pond watershed can accumulate in stormwater ponds, filling in the original engineered depth and reducing the holding and flow capacity of the pond. This can lead to poor water quality.

Stormwater ponds may need to be cleaned out periodically (about every 10–25 years) to keep them functioning according to their As-Built design. By implementing the Healthy Pond Guide's recommendations, you can extend the life of the pond before sediment removal is needed, while also improving water quality. Contact the engineer who certified your pond(s) or the Water Management District to inquire further about sediment removal.

6.5. Resources

Go to *www.healthyponds.org* for links to resources.

- UF/IFAS Center for Aquatic and Invasive Plants Florida Plant Directory
- Photo Guide to Florida's Most Common Invasive Aquatic Plants
- Plant Management in Florida Waters, especially Section 3 Control Methods and Section 4 Developing Management Plans
- Biology and Control of Aquatic Plants
- Efficacy of Herbicide Active Ingredients Against Aquatic Weeds
- Maintenance Checklist: Sarasota County Standard Operating Procedure: Stormwater Structural Controls Inspections & Maintenance

6.6. Community Project Idea

Organize a quarterly pond maintenance review or Neighborhood Watch program to scout your stormwater pond for dead plant material, no-mow buffer zone maintenance needs, signs of bank erosion, inspection of physical structures, and to record any new sightings of invasive and nuisance plant species.

PROTECT

Chapter 7
Managing Stormwater on Your Property

Did you know that one-inch of rainfall on a 1,500-square-foot roof generates nearly 1,000 gallons of runoff? The rapid flow of stormwater from our homes through downspouts and swales can cause pond shorelines to erode and compromise their stability—a serious and expensive maintenance issue for the pond. This Chapter provides guidance on managing the flow of stormwater to minimize these impacts.

7.1. How to Maintain and Divert Downspouts

7.1.1. Downspout Inspection and Maintenance

Semi-annual inspection and maintenance of residential downspouts can ensure the flow of roof water is controlled and percolated into the ground onsite, rather than running off into the stormwater system.

Table 7.1 Maintenance of gutters and downspouts.

ISSUES	MAINTENANCE (DECEMBER and MAY)
Clogged gutters	Remove leaf litter, gravel, and vegetation.
Broken downspouts	After cleaning gutters, inspect down-spouts for cracks and breaks.
Erosion or sedimentation	Redirect downspouts into landscape beds and away from hard, impervious surfaces. Add a diffuser extension (explained below) to the downspout to slow and diffuse the flow.

7.1.2. Downspout Diversion

Downspouts located in the front of a house are commonly directed to the driveway or walkway. This stormwater flows directly to the stormwater system without being filtered and treated by the lawn or plant beds. A simple solution is to modify the open downspout with a downspout diffuser, such as a narrow, corrugated pipe, and redirect flow to your lawn or plant beds. Be sure the outlet is a few feet from the foundation of the building to reduce the exposure of the foundation to moisture. This practice reduces the potential for erosion and improves water quality by filtering stormwater through vegetation.

▲ A tale of two spouts | flooding spout *(Dreamtime Stock Photo)* and rerouted spout *(Center for Neighborhood Technology).*

◀ Vegetated swale | *David Shafer.*

Pro-Tip: Replace your downspout with a rain chain or diffuser to slow down flow and reduce erosion. A rain garden can collect downspout water, reduce erosion, and allow water to percolate into soils. Be sure to direct water away from the foundation of any building. Above are a rain chain, downspout diffuser, and rain garden.

▲ Rain chain, diffuser, and rain garden | rain chain *(rainchain.com)*, diffuser *(Amerimax Home Products)*, and rain garden *(UF/IFAS)*.

7.1.3. Rain Gardens

Low areas between homes where several downspouts come together can be hotspots for erosion. The concentrated discharge can cause erosion along the flow path, damage the pond shoreline, and release sediments into the pond. Installing a rain garden where downspout flows converge slows down stormwater and allows plants to absorb pollutants, reducing erosion and improving pond health. Rain gardens can be beautiful additions to your landscape and provide habitat for birds, butterflies, and mosquito-eating dragonflies.

Designing and installing a rain garden is a rewarding DIY project, but takes planning to ensure the size, placement, and selection of plants are matched to site conditions. Consult the Resources section for a step-by-step guide providing the tools and guidance to install and maintain a functional and beautiful Florida rain garden.

7.2. How to Manage Swales

Swales are shallow channels in the landscape that are engineered to drain, retain, and treat stormwater. Vegetated swales are one of the most effective tools to treat stormwater runoff from roadways, driveways, parking lots, and other hardened surfaces. Residential

developments often have swales constructed between homes to capture rainwater from roofs.

Drain: Swales collect and direct rainwater off property and roads to prevent flooding, conveying that stormwater to canals, ponds, streams and, ultimately, the bay. They are shallow, not deep like ditches.
Retain: Swales slow the flow of stormwater to allow water to soak into the ground en route to ponds, reducing overall stormwater discharge. They can also help recharge our aquifer.
Treat: By slowing flow, swales allow sediment and pollution to settle out of the water, so treatment is provided before the water is conveyed to a pond or other waterway.

Modifying a swale (by paving it over or filling it in) or neglecting maintenance can make drainage problems worse and impact pond health, especially if changes are happening on multiple properties throughout the neighborhood. Avoid applying pesticides or fertilizers in the swale, as these will flow with water into connected ponds.

Four common swale issues and solutions involve standing water, eroding slopes, trash, and mosquitoes (Table 7.2).

7.3. Resources

Go to *www.healthyponds.org* for links to resources.

- Guide to installing and maintaining a Florida rain garden
- Case Study: Retrofitting Coastal Neighborhoods
- Brochure: Save the Swales!
- Brochure: Sarasota County Can Benefit from Bioswales
- Florida Field Guide to Low Impact Development: Bioswales and Vegetated Swales
- Guide to conducting a soil infiltration test to determine soil compaction
- Maintenance Checklist: Sarasota County Standard Operating Procedure: Stormwater Structural Controls Inspections & Maintenance

Table 7.2 Swale inspection and maintenance.

ISSUES	MAINTENANCE SOLUTION
Standing water after 3 days of dry weather	Debris: Remove buildup of plant debris, including leaves and grass clippings. Do not pile trash, leaves, limbs, or garden debris in swales. Remove plant overgrowth and nuisance and invasive plant species. Sediment: Over time, accumulation will reduce the storage capacity of the swale and may clog the inflow and outflow. Remove and reuse sediment or place into a landscape bag for curbside pickup. Compaction: Do not park vehicles or operate heavy machinery like mowers in the swale. Take a soil core to see if compaction is a problem. Perform a soil infiltration test. If soil compaction is the problem, then actions for aerating the soils must be taken (see the Resources section).
Eroding slopes	Replant native groundcover or turfgrass on the slope where bare soil is exposed or where vegetation is not healthy. For large areas, consider using a natural burlap landscape fabric to stabilize the slope while plant plugs become established.
Trash	Pick up trash and discard before it moves downstream.
Mosquitoes	See maintenance solutions above for standing water. Add a non-toxic biological control agent such as Mosquito Dunks®, available at many garden and home improvement stores.

7.4. Community Project Idea

Publish these homeowner tips and resources in the community newsletter and on the community website to enhance best practices for stormwater management throughout the neighborhood.

PROTECT

Chapter 8
Managing Nutrient Pollution

Nutrient pollution is one of the biggest threats to the quality of our waterways and estuaries. While nutrients such as nitrogen and phosphorus are essential for plant growth and health, too much of them can be harmful. The phosphorus and nitrogen found in fertilizers contribute to pollution in water bodies. Lawn and landscape fertilizers, pet waste, landscape debris, septic and sewer leaks, reuse irrigation water, and even emissions from gas-powered lawn equipment and vehicles all contribute excess nutrients to the watershed. When carried by stormwater runoff, excess nutrients can trigger algal blooms in our waterbodies, fouling ponds, creeks, canals, and bays and killing fish and wildlife. What's worse, current stormwater pond designs permitted by the State are only about 40 percent effective at nitrogen removal and 69 percent effective at phosphorus removal . That's why pollution prevention is so important. This Chapter provides guidance to minimize three of the leading sources of nutrients in neighborhood ponds: fertilizer, reuse irrigation water, and landscape debris.

8.1. How to Fertilize Right to Protect Ponds

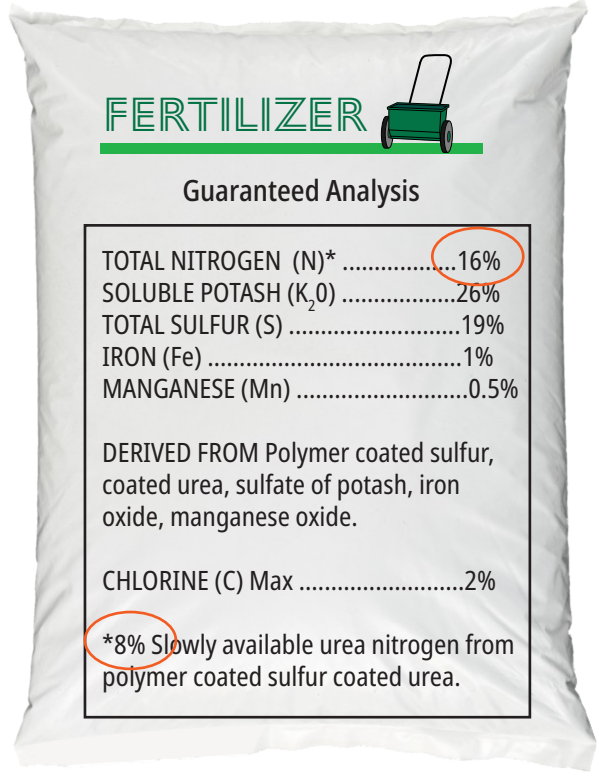
Cultivating a healthy lawn in Florida requires proper management. This means efficient use of water and proper application of fertilizer, pesticides, and herbicides. A poorly managed lawn can generate harmful erosion, chemical and nutrient pollution, and become an eyesore. Florida-Friendly Landscaping™ practices recommend replacing high-maintenance turf grass with low-maintenance, water-saving landscaped beds and groundcovers. Follow these steps to avoid making the three biggest fertilizing mistakes that waste money and pollute ponds: applying too much of the wrong type at the wrong time.

Step 1. Select the Right Type. It can be overwhelming when you walk into a garden supply store and browse the fertilizer aisle. There are so many choices! A few guidelines can help you with your selection.

Test. Test soils for nutrient deficiencies first before selecting and applying fertilizer. What you may suspect is a lack of nitrogen may be another issue. Because it is naturally abundant in Southwest Florida soils, phosphorus application is never recommended unless soil testing indicates a deficiency.

Target. Choose a fertilizer for the target plant. If you are fertilizing your lawn, choose lawn fertilizer, not vegetable or ornamental plant fertilizer, as they do not contain the correct amount of nutrients for lawns. Always avoid "weed and feed" products. These products contain both herbicide and fertilizer, and this combination renders one, or both, of the products ineffective and can harm nearby trees and shrubs.

Choose Slow-release. Read the label of the fertilizer bag that shows the guaranteed analysis—the nutrient composition of the fertilizer—and look for the percentage nitrogen that is in slow-release form. Choose only fertilizers with at least 50 percent slow-release formulas (required by some local ordinances). Slow-release formulas are longer-lasting, less likely to burn, and less likely to leach out of soils and into runoff.



◂ Calculate the percentage of nitrogen in fertilizer that is slow-release by dividing slowly released nitrogen by total nitrogen and multiplying by 100%.

In this example:
8/16 x 100% = 50%

◂ Golden canna | *Adobe Stock Photo.*

Add Organics. Consider organic products that build soil health, such as compost. While the nutrient composition of these products varies, organic products are slow-release and promote a healthy soil ecosystem that can better retain water and nutrients.

Step 2. Apply at the Right Time. Many cities and counties in Southwest Florida have ordinances governing the application of lawn and landscape fertilizer. In most locales, a summer blackout period prohibits the application of all fertilizers containing nitrogen or phosphorus between June 1 and September 30 and requires the use of at least 50 percent slow-release formulas the rest of the year. Use the map tool to find a summary of your city or county fertilizer ordinance (see the Resources section).

Common Fertilizer Use Restrictions in SW Florida

June 1–September 30

Prohibition of fertilizers contaning nitrogen or phosphorus

October 1–May 31

Use at least 50 percent slow release formulas

The best time to fertilize is when the plants are actively growing outside of the blackout period. In Southwest Florida, that time is April–May and/or October–November. Never fertilize when rain is forecasted.

Step 3. Use the Right Amount. Don't simply buy a bag and spread it around! There are techniques and simple calculations you must follow to apply the right amount of fertilizer, stay within regulatory limits, and not harm your lawn and landscape. Consult the Resources section for video instructions and calculators.

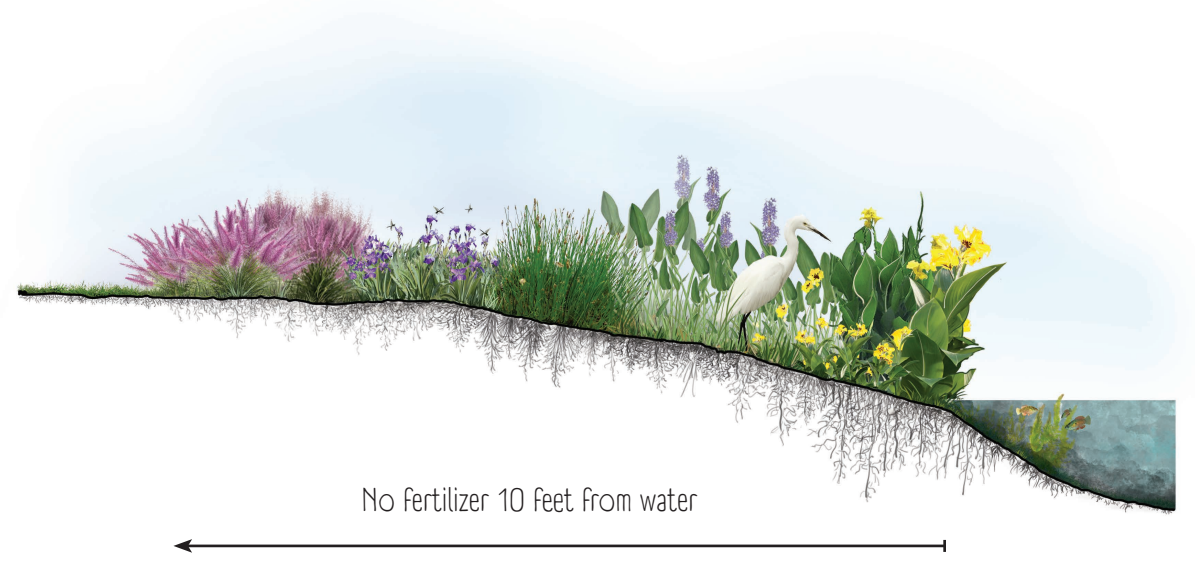
Table 8.1 Generally recommended fertilizer limits. Check the nitrogen and phosphorus limits of the fertilizer ordinance in your area using the map lookup tool (see the Resources section).

	MAX PER APPLICATION (PER 1,000 SQ FT)	MAX PER YEAR (PER 1,000 SQ FT)
Nitrogen	0.5–1.0 pound	4 pounds
Phosphorus	Not Recommended unless testing shows deficiency, then up to 0.25 pound	Not Recommended unless testing shows deficiency, then up to 0.50 pound

If you use a professional to apply fertilizer to your lawn and landscape, look for one that is Green Industries Best Management Practices certified. They have successfully completed the state-mandated training on Florida-Friendly Landscaping™ and appropriate fertilizer use to protect water quality.

They will display a certification sticker on their vehicle when required by local ordinance, or you can look up their certification. The Florida-Friendly Landscaping™ program also offers a model contract for HOAs to use to ensure their vendors are following best practices (see the Resources section).

◄ Look for the Green Industries Best Management Practices certification sticker on vehicles of certified professional fertilizer applicators.



◂ Maintain a ten foot no-fertilizer buffer zone around ponds, swales, and other waterbodies | *MD. Asifur Rahman and David Shafer.*

Use a spreader with a deflector shield to keep fertilizer out of protective buffer zones, waterways, and impervious surfaces like streets and sidewalks. ▾

Pro-Tips for Fertilizer Application:

• Never apply fertilizer within ten feet of a waterbody or swale.

• Apply the recommended amount uniformly using a calibrated push spreader with a deflector shield to keep the fertilizer on the landscape and off streets and sidewalks.

• Water it in with a minimal amount of water. About one-quarter inch of water is enough to move fertilizer to the roots for best uptake.

• Always sweep up any spilled fertilizer, especially on impervious surfaces like your driveway, street, or sidewalk.

8.2. How to Manage Reclaimed Irrigation Water

Reclaimed irrigation water—the water from the purple pipes—is derived from treated wastewater. Depending on the level of treatment, it may contain high levels of nutrients. You might think of reclaimed irrigation water as "fertilizer water." In fact, reclaimed water can provide more than three pounds of nitrogen per 1,000 square feet of lawn per year with regular use. That's enough nitrogen for most Florida lawns and landscapes to thrive without additional fertilizer application.

Because of the environmental impact of nitrogen in reclaimed water, many municipalities in coastal regions and around springs are upgrading their wastewater treatment facilities to Advanced Wastewater Treatment (AWT), which removes most of the nitrogen from reuse water. Contact your city or county Utilities staff for help determining if your irrigation water is from a reclaimed source and, if so, how much nitrogen it contains.

Reclaimed irrigation water is carried from wastewater recovery facilities to communities in purple pipes | *David Shafer.*

• If your reclaimed irrigation water comes from an AWT system, it is okay to use nitrogen-based fertilizers if needed, according to the guidance above.

• If your reclaimed irrigation water is not produced by an AWT facility, then you must reduce your fertilizer application accordingly to avoid over-fertilizing and contributing to nutrient pollution.

How much should you cut back on fertilizer? In general, any irrigation water with more than six milligrams per liter (mg/L) of nitrogen provides enough fertilizer to meet lawn/landscape needs and more is not needed without a soil test indicating a deficiency. When in doubt, leave it out.

Pro Tip for Calculating Nutrients in Reclaimed Irrigation Water: Sarasota County residents can use an online calculator developed by UF/IFAS Extension Sarasota County to find out how many pounds of nitrogen are applied to your landscape from irrigation water each year (see the Resources section).

8.3. How to Manage Landscape Debris

Florida's long growing season can generate a lot of debris from routine lawn and landscape maintenance. This green waste can add to nutrient pollution in waterbodies and clog stormwater swales, drains, and inlets if not handled and disposed of properly.

Ponds are especially sensitive to excess nutrients. Ensuring that landscape management plans include the proper collection and handling of landscape debris will go a long way to protect and improve pond health.

Step 1. Trees that drop their leaves and seeds such as acorns can provide a large pulse of organic nutrients into downstream waters. Regular cleanup of fallen leaves and acorns around the pond and within the pond watershed is essential for healthy pond management.

Step 2. Grass clippings are small but mighty in number and contain nutrients that fuel algae growth. Use grass clippings to feed the lawn, not the pond. Lawn clippings, leaves, and landscape cuttings should be mulched and recycled back into the lawn or landscape or bagged for yard waste pickup. Escaped clippings should be blown back into the yard where they can decompose and provide nutrients to the soil and grass. Deliberately blowing lawn clippings or leaves into the road or storm drain or dumping palm fronds or branches into swales, creeks, canals, or ponds is a violation of local ordinance.

8.4. Resources

Go to *www.healthyponds.org* for links to resources.

- The Florida Yards and Neighborhoods Handbook
- Steps for converting a typical landscape to a Florida-friendly landscape
- Homeowner best management practices for your lawn
- Web map to find a summary of your city or county fertilizer ordinance
- Video illustrating how to calculate pounds of fertilizer to apply based upon the fertilizer formula you are using
- Fertilizer Application Calculator
- Green Industries (GI-BMP) manual (English)
- Green Industries (GI-BMP) manual and update (Spanish)
- Green Industries (GI-BMP) certified contractor lookup
- Contract template for HOAs to ensure their vendors are following best practices
- Reclaimed Water Explained
- How To Account for the Nutrients in Reclaimed Water used for Landscape Irrigation

▲ Cleaning up fallen leaves, seeds, and acorns before they run off into ponds, swales, and waterways is an easy way to reduce nutrient loading | *Mollie Holland.*

8.5. Community Project Idea

Publish these homeowner tips and resources in the community newsletter and on the community website to enhance best practices for nutrient management throughout the neighborhood.

PROTECT

Chapter 9
Managing Irrigation Systems

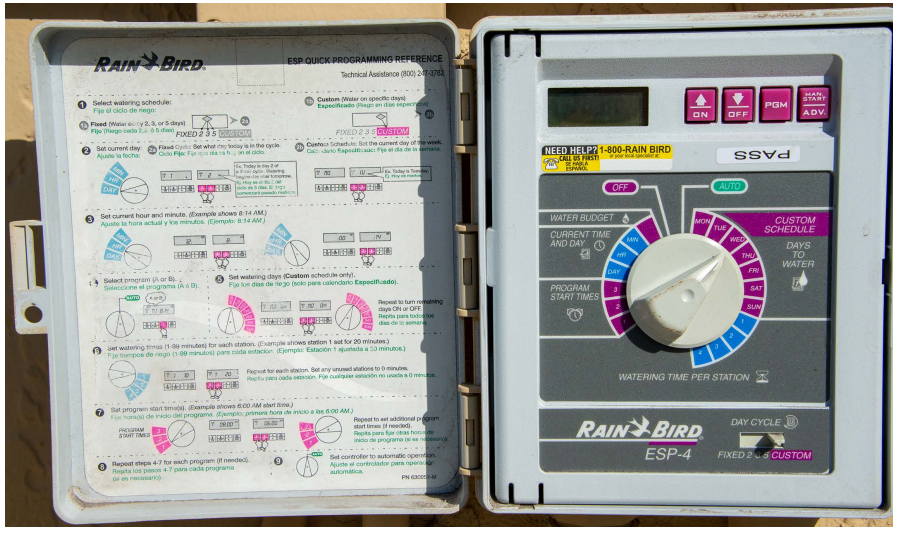
Irrigation systems often run automatically in the early morning hours when no one is awake to see them operate. So broken sprinkler systems go unnoticed and can cause shoreline erosion and excess runoff into a nearby stormwater pond. Conducting an annual inspection of your irrigation system while it is running is a best practice that can proactively identify inefficiencies, clogs, broken heads and lines, and blockages from vegetation.

9.1. How to Assess Your Irrigation System

Contact your UF/IFAS Extension office for a free irrigation evaluation. Or you can DIY following these simple steps.

Materials: landscape flags, a permanent marker, a notebook, a few empty tuna or cat food cans, and a ruler.

Step 1. Turn your automatic irrigation clock to a manual operation setting so that you can run each zone manually. For further help, consult the user manual for your irrigation clock. Working one zone at a time, compete Steps 2 and 3 for each zone beginning with Zone 1.



▲ Irrigation control box | *David Shafer.*

◀ Healthy pond with native treeline buffer zone at Stoneybrook Golf and Country Club, Sarasota, Florida | *David Shafer.*

Pro-Tip for Irrigating Landscaped Beds: Most mature landscape plants, particularly native or those adapted to the local climate, do not need supplemental irrigation. The 50–60 inches of rain we receive annually in Florida is sufficient. For landscape beds that do need irrigation, convert to low-flow drip irrigation, which uses 12 times less water than the standard sprinkler head and gives your mature landscape plants all the water they need to thrive without generating runoff.

Step 2. Turn on the zone. Walk around the zone, counting the number of heads, and taking note of:

- spray patterns that are out of the ordinary—for example, water shooting up in the air like a geyser, reduced water flow, or water blocked by grass, trees, and other plants.
- Water pooling and bubbling out of the ground at the base of the sprinkler.
- Water coming out of the sprinkler at other locations besides the head.
- Water spraying onto sidewalks or streets, or directly flowing into the stormwater pond.
- Water applied to both lawn and landscape plants in the same irrigation zone. Grass and landscape plants have very different irrigation needs—one or the other will get too much or not enough.

Whenever you find one of the problems listed above, use your permanent marker to number a landscape flag and place the flag next to the problem sprinkler. Include the flag number in your notes

describing the problem in your notebook. These notes and flags will come in handy when fixing the problem, whether you do it yourself or hire a professional.

Step 3. Calibrate the Zone to provide 0.5–0.75 inch of water per week.

(1) Set out 5–10 tuna or cat food cans in a zone at random,

(2) Manually run the zone irrigation for five minutes,

(3) Measure the depth of water in each can in inches using a ruler and calculate the average depth of water for all of your cans,

Malfunctioning or damaged irrigation systems can cause erosion, increased runoff, and high water bills | *David Shafer.*

Pro-Tip for Irrigating Lawns: Limit lawn irrigation to 0.75 inch of water per week. Florida's sandy soils cannot hold more than 0.75–1 inch of water at a time. Applying more than that will cause water to run off to the lowest point in the landscape, which typically are roadways and storm drains, and then to the stormwater pond. This runoff can carry nitrogen, phosphorus, and other pollutants and increase erosion of pond shorelines.

(4) Divide the average depth by five minutes to get the inches of water delivered per minute, and

(5) Divide your desired application (0.5 or 0.75 inches) by the inches per minute to get your new irrigation run time.
Example: average depth of 0.2 inches per can after five minutes of irrigation; 0.2/5 = 0.04 inches per minute; 0.75/0.04 = 18.75 minutes run time)

Step 4. Change your irrigation clock schedule to (1) follow all local watering day and time restrictions and (2) change the run time needed based on the results of your calibration.

Step 5. Do a quick check of your rain shut-off device to ensure it is working correctly. Florida law requires all automatic irrigation systems to have a functioning rain shut-off. Many systems use a cork-disc rain sensor employing a set of discs that expand when rainfall is absorbed. These discs deteriorate quickly and must be inspected and maintained annually. First, set the sensor to "Active" and not "Bypass." Turn on an irrigation zone within view, point a running hose at your sensor, and spray water at it for about five minutes.

If your zone continues to run, you may have a low battery or a defective sensor. Check the battery and the cork discs for signs of wear and replace them as needed, or you may need to order a replacement unit.

Step 6. Fix the problems you noted in Step 2 and 5. Contact an irrigation specialist for assistance, or if you prefer to do it yourself and need help, contact your local UF/IFAS Extension office.

9.2. Resources

Go to *www.healthyponds.org* for links to resources.

- Rain shut-off devices
- Rain barrels
- Tampa Bay Water's comprehensive guide to micro-irrigation
- DIY Drip Irrigation Step-by-Step Video
- DIY Micro-irrigation Installation Webinar
- UF/IFAS Extension Sarasota County and Manatee County offer free online courses and free irrigation system evaluations. Contact your local UF/IFAS Extension office.

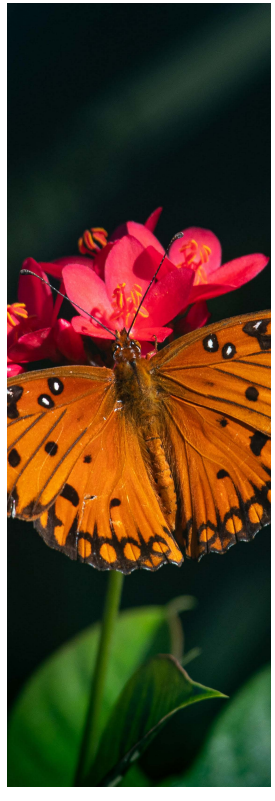
Pro-Tip for Protecting Water Quality: Reclaimed irrigation water contains nitrogen and phosphorus, the same nutrients found in lawn fertilizer. It's essential that reclaimed water users do not (1) over-irrigate and (2) they factor in these nutrients when applying fertilizer. For more information on fertilizing and reclaimed water see Chapter 8.2 How to Manage Reclaimed Irrigation Water.

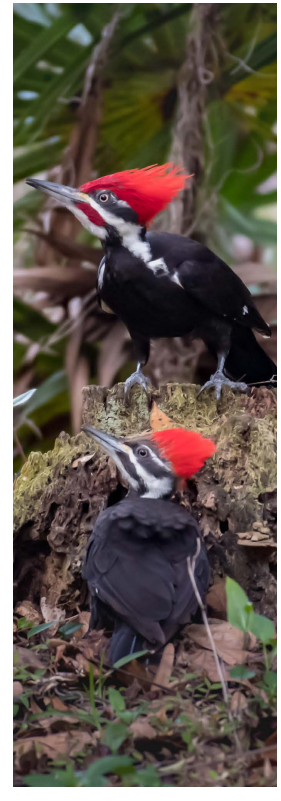
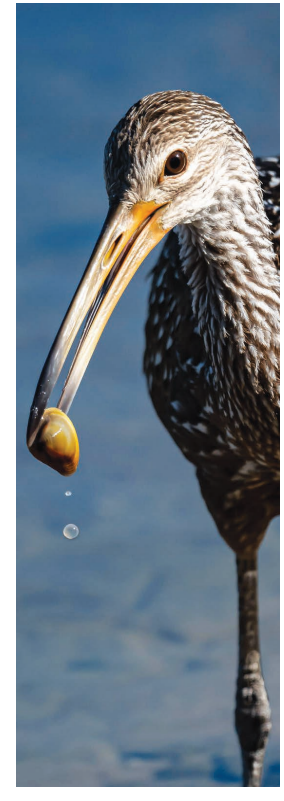
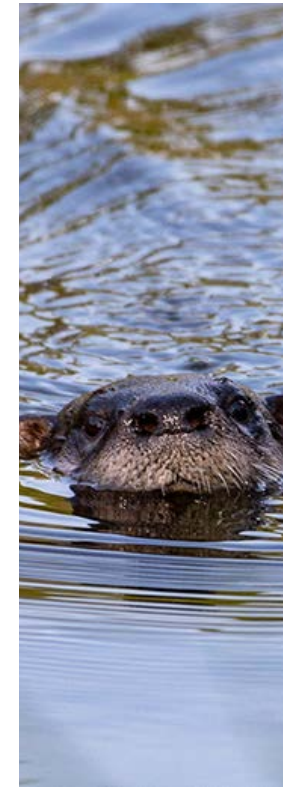
9.3. Community Project Idea

Schedule a group of neighbors for a free irrigation evaluation on the same day and see how much you can save! UF/IFAS Extension staff offer free irrigation evaluations in many counties across the state. In a large, gated community in Nokomis, Florida, nine wet irrigation checks were conducted in one month. The inspections showed that each resident could save an annual average of approximately 16,326 gallons of water per 1,000 square feet by implementing recommended changes. This reduction in reclaimed irrigation water use equated to the removal of over two pounds of nitrogen per 1,000 square feet or approximately 54 pounds annually for the nine houses, a big impact on water quality.

Back cover ▶

Pond wildlife captured in and around Rivendell, Sarasota, Florida. Left to right are Gulf fritillary, Florida cooter, pileated woodpecker, limpkin, and otter. Bob Frank moved to Florida to do wildlife photography and is impressed that he can sit in his backyard or walk through his community and do an amazing amount of photography around its ponds | *Bob Frank.*



Healthy ponds are not only valued for flood control and water quality protection, but for the spectacular Florida fish and wildlife and serenity that they invite into our daily lives.