

Strategies to Encourage Adoption of Stormwater Pond Best Management Practices (BMPs) by Homeowners¹

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Introduction

Many master planned communities in Florida have man-made ponds (often referred to as lakes) that are designed to collect, store, and treat stormwater (Reckner et al., n.d.). Similar to natural water systems, stormwater ponds capture stormwater runoff, preventing non-point source (diffuse) pollution from flowing directly into streams and rivers and providing flood control (Florida Department of Environmental Protection (FDEP), 2012; Livingston & McCarron, 1990; Reckner et al., n.d.). Pollution, including fertilizers, pesticides, and pet waste, may be unintentionally introduced to these ponds through stormwater runoff within the neighborhood. Nutrients can also enter urban watersheds through atmospheric deposition (Hauxwell, Jacoby, Frazer, & Stevely, 2001) and fallen organic matter, such as leaves; however, stormwater runoff is currently considered the largest contributor to degraded water quality in Florida (FDEP, 2012). The introduction of excessive nutrients in the water may disrupt the balance of this ecosystem, which can lead to the rapid growth of algae blooms, fish kills, and adverse effects on other wildlife (Livingston & McCarron, 1990; Reckner et al., n.d.; Smart et al., 2009). Ultimately, polluted stormwater runoff can lead to increased maintenance expense and lower property values. Addressing these water quality problems after they occur can be difficult and

costly. Preventing pollutants from entering watersheds is a more effective strategy than removal through treatment.

While prevention is the more cost-effective approach than treatment after problems have developed, it requires educating residents and encouraging the adoption of non-structural Best Management Practices (BMPs) that reduce the environmental impact of landscape maintenance practices. Education about stormwater runoff and behaviors to reduce runoff pollution has been shown to increase adoption of BMPs and improve water quality (Brehm, Pasko, and Eisenhauer, 2013; Deitz, Clausen, and Filchak, 2004; Swann, 2000). University of Florida researchers have conducted surveys and focus group research with Florida homeowners that live on or near stormwater ponds in order to identify distinct audience segments for education and outreach efforts. Researchers also aimed to uncover these homeowners' perceptions of the benefits and barriers to adopting recommended BMPs. This research also found that, in many cases, homeowners purchased waterfront property at a premium and they consider these ponds to be aesthetic amenities that increase property values, enhance recreation, and provide habitat for wildlife.

1. This document is AEC552, one of a series of the Agricultural Education and Communication Department, UF/IFAS Extension. Original publication date July 2015. Visit the EDIS website at <http://edis.ifas.ufl.edu>.
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In this EDIS publication we highlight some valuable strategies for informing residents about and how to reduce nonpoint source pollution in their landscapes, and we **offer suggestions for encouraging adoption of BMPs** that will likely enhance the life span of man-made stormwater systems while preserving their ecosystem services and aesthetic benefits.

Background on Stormwater Runoff and BMPs

When it rains on an urban development, rainwater becomes stormwater runoff as it hits hard surfaces such as roofs, compacted urban soils, and roads and flows from these areas before depositing into retention ponds. In many housing developments, water flows through pipes from pond to pond. The ponds in the interconnected chain are each designed to capture rainwater and allow sediments and chemicals to settle so that plants, some types of algae, and other organisms can uptake the available nutrients and act as natural filters to improve water quality. The water in the pond will likely flow into a natural stream by design and eventually run into an estuary or other larger body of water. While stormwater runoff is the largest source of pollutants to Florida's lakes, ponds, and streams, a well maintained retention pond is adequate for capturing fertilizers and pesticides, pet waste, debris, oil, and metals (FDEP, n.d.; Livingston & McCarron, 1990). Although ponds are designed to handle small concentrations of pollutants, the system may be overwhelmed by excessive amounts, resulting in water with elevated nutrients, depleted oxygen, and noxious algae blooms. Over time, an overwhelmed pond can acquire sediment buildup, develop excessive submerged aquatic vegetation and invasive weeds, or suffer shoreline erosion.

The University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) recognizes *Enhancing and Protecting Water Quality, Quantity, and Supply* as one of seven high-priority initiatives for Extension work in Florida. Water is highly valued for its role in "sustaining Florida's environment and economic vitality, which are keys to a high quality of life" (UF/IFAS Extension Administration, 2013). For this reason, Extension works to promote practices that protect water resources. BMPs, like those outlined by the UF/IFAS Extension Florida-Friendly Landscaping™ program (<http://fyn.ifas.ufl.edu/materials/FYN-Handbook-v1-2012.pdf>) can help reduce nutrient runoff, fight shoreline erosion, enhance wildlife and aesthetic value, and keep backyard ponds functioning as a hybrid man-made and environmental system (see Table 1 for a list of helpful links mentioned

in this factsheet). Examples of recommended BMPs for residents and their landscape professionals include

- creating a low-maintenance buffer of at least 10 feet along water features that requires no mowing, fertilizer, or pesticide;
- following UF/IFAS recommendations for fertilizer rate, application, and timing;
- avoiding the application of fertilizer on hard surfaces like curbs, sidewalks, and roads;
- cleaning up any spilled fertilizer;
- avoiding fertilizer application before heavy rainfall;
- keeping grass clippings on lawns and off streets and sidewalks (where they wash into drains and enter ponds);
- picking up pet waste to prevent harmful bacteria and organisms from entering waterways; and
- adjusting fertilizer amount to account for the nutrients in reclaimed water if that is the source of outdoor irrigation.

Find more information about Florida-Friendly Landscaping™ at <http://fyn.ifas.ufl.edu/>.

Strategies for BMP Adoption

Needs assessments are a key step in Extension program planning and can lead to more impactful programming because they describe a target audience's needs and explain current conditions (Seevers, Graham, Gamon, & Conklin, 1997). To develop impactful Extension programming, we must understand why residents adopt or reject landscape management BMPs that can protect and improve water quality and extend the lifespan of stormwater ponds. A group of Extension researchers conducted five focus groups from July 2010 to May 2011 and an electronic survey of residents living in a large planned community in October and November of 2013. The focus groups formed the initial profile of the homeowner audience, and this was tested further with the electronic survey. Researchers used homeowner association email lists to send out a 52-item survey that was completed by 627 residents for a response rate of 18%. The findings from this research provided the framework for the following strategies to improve BMP adoption.

Important findings of the survey and focus groups included the following:

- Homeowners living on stormwater ponds paid a premium to live on "lakefront" property and want to protect their investment.

- Homeowners lacked knowledge about stormwater runoff and local landscape ordinances.
- Most research participants hired someone to maintain and apply chemicals to their yard and had little knowledge of what was being applied.
- Acceptance of plants around stormwater pond was mixed: few participants indicated they would accept or request a no-mow zone of grass along their pond shoreline, but around 1/3 of survey respondents indicated they would accept or request aquatic or shoreline plants.

Strategy 1: Improving Understanding of the Stormwater System’s Environmental Function

More than 48% of respondents indicated they either “don’t know where runoff goes” or “don’t know what runoff is.” This indicated residents do not connect runoff with their stormwater ponds or realize their personal contribution to pollution.

Because of this identified need, we recommend that Extension conduct outreach to inform residents that everyone lives in a watershed and raise awareness that landscaping behaviors have consequences. Once residents gain this basic knowledge, reminders can be used to encourage behaviors that protect stormwater systems. One method to promote citizen behavior change is to engage volunteers (youth groups, for example) to install signage or storm drain markers that provide reminders such as “Don’t Pollute—Drains to Pond;” this reinforces that the residential landscape is connected to the pond through stormdrains and can remind residents of the connection to other waterbodies in the watershed (Figure 1). Further education may inform residents of the stormwater management regulations and permits that govern their ponds, their legal responsibilities, and specific actions they can take to reduce stormwater pollution.



Figure 1. A “No Dumping—Drains to Creek” drain marker can inform or remind residents and guests of the drain’s direct connection to backyard waterways.

Credit: University of Florida IFAS Extension: Harmony, <http://www.wec.ufl.edu/extension/gc/harmony/water/waterquality.htm>

Strategy 2: Identifying Relevant Indicators for Education

Terminology and their accompanying concepts such as *stormwater runoff* and *watershed* may be too abstract and complex for people who only casually pay attention to BMP information. Choosing a physical, visible indicator can help effectively communicate and introduce somewhat abstract concepts. Pet waste and grass clippings, for example, are visible, physical objects that can make the connection between landscape maintenance behaviors and water quality impacts tangible because these objects may wash into stormwater ponds and waterways and cause problems. Below are descriptions of the impact of grass clippings and pet waste on water quality, plus examples of a “keep grass off the streets” campaign and several “scoop the poop” campaigns. These examples demonstrate the use of relevant indicators to communicate effectively with the target audience.

GRASS CLIPPINGS

Grass clippings contain nutrients such as nitrogen and phosphorous that can wash into stormwater ponds through storm drains. Once in a waterbody, the clippings can release these nutrients, fuel algae growth resulting in aesthetics unacceptable to some residents, low dissolved oxygen levels, and other problems. Grass clippings should be treated like fertilizer—they should be kept on lawns and out of the stormwater system. The Alachua County Environmental Protection Department created an informative and clever social marketing campaign based on research conducted with landscape maintenance professionals. A video from the clippings campaign can be viewed online (<https://www.youtube.com/watch?v=rBg-Lyw3rwY>).



Figure 2. Grass clippings campaign outreach based on focus groups with landscape contractors in Alachua County.

Credit: Alachua County Department of Environmental Protection Department <http://www.alachuacounty.us/search/results.aspx?k=Grass%20clippings>

PET WASTE

Pet waste carries dangerous and harmful bacteria and parasites. These organisms can make stormwater ponds unsafe for recreation and dangerous to wildlife and the surrounding watershed. Properly disposing of pet waste by putting it into a bag and throwing the tied bag in the trash is an important way pet owners can protect waterways.

Although this is a simple BMP, disseminating it to pet owners and their neighbors can be difficult for many reasons. A survey by the Center for Watershed Protection (1999) of residential behavior revealed several barriers to residents disposing of their pet waste in the trash. One category of barriers was that residents were unaware of the negative impacts of pet waste. Residents indicated they thought that pet waste eventually goes away, that picking up waste was too much work, that their dog was too small to have any impact, that the waste would be a good fertilizer, or that they did not need to pick it up because it was in their own yard. Another factor that prevented adoption of the BMP was that people were not prepared with bags or a scooper to pick up the waste and put it into the trash.

To overcome these common obstacles to proper disposal of pet waste, residents must understand the problems pet waste can cause if left in the landscape. Providing bags, bag dispensers, and trash cans in strategic places can help supply residents with what they need to properly collect and dispose of their pet's waste and prevent "poolution" of their local waterways. These items (for example, a dispenser attached to the dog leash) can also serve as reminders of the appropriate way to dispose of pet waste.

There are many examples of pet waste disposal campaigns. In *Social Marketing to Protect the Environment: What Works*, McKenzie Mohr, Lee, Schultz, and Kotler (2012) detail how the city of Austin, Texas, developed, implemented, evaluated, and sustained their "scoop the poop" campaign. In Florida, the Alachua County Environmental Protection Department also developed a "scoop the poop" campaign based on social science research with residents. The research report and the marketing materials developed from the research findings are available on the ACEPD website (www.alachuacounty.us/epd) and an example poster is shown in Figure 3.

The Environmental Protection Agency also maintains a list of marketing materials from campaigns across the country, including examples relating to pet waste disposal (Environmental Protection Agency, n.d.) (Figure 4).



Figure 3. One of the "scoop the poop" posters developed by the Alachua County Environmental Protection Department
Credit: Alachua County Environmental Protection Department http://www.alachuacounty.us/depts/epd/documents/waterresources/final_pet_waste_report.pdf



Figure 4. "Eddy the trout with dog" demonstrates proper pet waste disposal.
Credit: United States Environmental Protection Agency <http://cfpub.epa.gov/npstbx/Logos.cfm>

Strategy 3: Choosing Relevant Benefits of BMPs

Eddy the Trout (depicted above in Figure 4) is an example of a program using a popular gamefish from local watersheds as a symbol of the need to change upstream behaviors. In this case, the product, or benefit, people get from picking up their pet waste is cleaner water for fish people enjoy catching. Organizations in the northwestern United States have used a similar strategy in marketing landscape management behaviors as beneficial to salmon. Kolter, Roberto, and Lee (2002) detail a “Salmon Friendly Gardening” program developed by the city of Seattle and Seattle Public Utilities that recommends six behaviors similar to those recommended by Florida-Friendly Landscaping™:

- building healthy soil with compost;
- choosing the right plant for the right place;
- using water wisely;
- using natural fertilizers and pest controls;
- directing rainwater appropriately; and
- protecting shoreline habitats.

While the behaviors are similar to those recommended by UF/IFAS Extension through Florida-Friendly Landscaping™, the benefit of the behaviors (in this case, helping sustain the salmon population) has been tailored to the local population. In Florida, an environmental landscaping program could emphasize how BMPs protect estuaries, benefit wildlife considered desirable by residents (such as birds), and support sea grass recovery in our bays.

Strategy 4: Capitalizing on Advertisement of Local Ordinances

Another strategy for increasing the adoption of BMPs is to “capture external opportunities,” or link recommended BMPs to recent rule changes (Kolter, Roberto, & Lee, 2002). For example, in Florida many counties and municipalities have been implementing restrictive fertilizer ordinances that encourage homeowners to reduce the chances of accidental nutrient runoff from their lawns. Many of these ordinances rely on Florida-Friendly Landscaping™ guidelines and have multiple provisions that cover grass clippings, pond edge planting, and safe fertilizer application, which are available at <http://fyn.ifas.ufl.edu/materials/FYN-Handbook-v1-2012.pdf>. The Department of Environmental Protection has developed a statewide model ordinance for fertilizer use, which is available at <http://www.dep.state.fl.us/water/nonpoint/docs/nonpoint/ffl-mo-ccr-1-09.pdf>.

Ordinances that incorporate recommended BMPs can be used as “teachable moments” for Extension because Extension can answer questions residents have about the connection between their lawns, stormwater runoff, and environmental protection.

Our survey research found that a large number of residents did not know the details of their local county ordinance, such as what nutrients are restricted (phosphorous and nitrogen, for example). This is not surprising because many studies have shown homeowners know little about the technical aspects of fertilizer application and best practices (for example, soil testing and using slow-release blends) (Carpenter & Meyer, 1999; Martini & Nelson, 2014; Varlamoff, Florkowski, Jordan, Latimer, & Braman, 2001).

Strategy 5: Helping Homeowners Who Hire Green Industry Professionals

In some homeowner associations (HOAs), the majority of homeowners may contract their yard work to landscapers or mowing professionals. Our research studied a community where most residents were retirees and 85% of households hired professionals for lawn care. A significant number of respondents (37%) were not aware that a certification was mandatory for the professionals they hired to apply fertilizer. More than half of residents (53%) also did not know to look for the certification decal (provided by their local municipality) or ask for proof of certification. We recommend providing guidelines for improving communication between homeowners and green industry professionals and raising awareness of statewide contractor BMP certification.

IMPROVING COMMUNICATION BETWEEN HOMEOWNERS AND GREEN INDUSTRY PROFESSIONALS

Focusing on the people who hire landscape professionals is an opportunity for Extension. Through educational materials and programs, Extension can promote better communication between homeowners and the landscapers they hire. Since many homeowners may not always be aware of fertilizer application rules themselves, it is important that they hire professionals who are certified to properly implement BMPs. Extension can encourage residents to ask contractors for a copy of their certification to legally apply fertilizer.

RAISING AWARENESS OF STATE-WIDE GREEN INDUSTRIES BMP CERTIFICATION

Anyone applying fertilizer for-hire is required to participate in the University of Florida's Green Industries Best Management Program (GI-BMP) class, which is a pre-requisite to obtain a statewide license. Fertilizer applicators earn the recognition of being certified when they have completed the GI-BMP training class, passed a written exam, and obtained a fertilizer license from the Florida Department of Agriculture and Consumer Services (FDACS) called a Limited Certification for Urban Landscape Commercial Fertilizer Applicator Certificate (LCFAC). In addition to the state wide LCFAC, many counties have additional ordinances that address specific needs for that county. Professionals are responsible for knowing and abiding by these regulations for each county in which they work. Learn more about the GI-BMP Training Program at http://fyn.ifas.ufl.edu/professionals/BMP_overview.htm. For more information about residential fertilizer rules and guidelines see ENH1089, *Urban Turf Fertilizer Rule for Home Lawn Fertilization* at <https://edis.ifas.ufl.edu/ep353>.

Strategy 6: Education to Increase Adoption of Shoreline and Aquatic Plants for Ponds

When it comes to education about BMPs, different groups of people need different information. For example, in the case of the Florida-Friendly Landscaping™ recommendation to install a buffer of diverse plants around ponds, some people may need to know why plants are important, while other people may need to know how to create a successful planting. Education about pond plantings can be divided into different types and delivered to groups depending on how likely they are to adopt plantings as a way to improve their ponds. Plants on a ponds edge can also buffer wave action, stabilize the bank, and prevent shoreline erosion.

EDUCATION ABOUT PLANT BENEFITS TO OVERCOME BARRIERS

People are more likely to accept stormwater pond plantings once they learn that plants in an around ponds can act as a barrier to prevent stormwater runoff from introducing clippings and fertilizer into ponds. Of the 62% of survey respondents who lived on a pond, 64% were unlikely or very unlikely to accept or request a no-mow zone, and 43% were unlikely or very unlikely to accept or request aquatic or shoreline plants. Educating these residents on the benefits of plants may be a good first step towards increasing beneficial vegetation.

Benefits of Pond Plants

People may be more likely to accept stormwater ponds planting once they learn plants in and around ponds can act as a barrier preventing stormwater runoff from introducing, for example, grass clippings and fertilizer into ponds. Aquatic plants absorb available nutrients in ponds, which results in improved water quality and a reduced likelihood of algae blooms (Smart et al., 2009). Plants also provide habitat for birds, fish, frogs, and beneficial insects, all of which help control mosquito populations. Plants on a ponds edge can also buffer wave action, stabilize the bank, and prevent shoreline erosion. Pond plantings can be part of the solution to many pond problems.

Barriers to Pond Plantings

Despite the benefits of shoreline and aquatic plants, residents have expressed concerns about pond plants in focus group research. Many residents

- worried plants will block or completely obstruct their water view or completely take over the area;
- feared plants will breed mosquitoes or harbor alligators, snakes, and other wildlife they considered dangerous or undesirable;
- considered the benefits of plants too uncertain to justify the cost of plantings;
- were concerned pond maintenance was not doing enough or as much as expected and would not adequately maintain new plants;
- viewed plants as part of their pond problem rather than part of the solution to algae growth, erosion, and water pollution; and
- were resistant to their lake view changing from how it looked when they purchased their property.

Understanding these and other reasons people will resist pond plantings can help those who want plants to design and implement an acceptable pond planting strategy.

EDUCATION ABOUT APPROPRIATE PLANTS AND DESIGN

Some research participants indicated they wanted more plants for their ponds. To ensure a functional and beautiful pondscape, people who are interested in pond plants need information about specific plants and pond landscape design. Residents should consult state and local laws, which may require permits or notice before planting or augmenting pond structures and waterbodies. Residents' aesthetic preferences should also be considered in the planting

design. Focus group participants in our research preferred colorful, flowering, and low plantings. Most people prefer an intentional design of plants along the shoreline with a variety of clumps of similar plants organized so that textures alternate between broad and fine leaves (Hansen & Hu, 2013). Selecting the appropriate plants must account for more than just the aesthetic concerns of residents, however. Plants that thrive in the pond's conditions and meet the water quality needs of the water body are critical. For plant recommendations that take into account planting location, plant hardiness, and aesthetic quality see ENH1215, *Florida-Friendly Plants for Stormwater Pond Shorelines* at <http://edis.ifas.ufl.edu/ep476>.

DEMONSTRATION PLANTING FOR EDUCATION

For some groups of people, an example of a functional and beautiful planting in and around a pond may be necessary for them to adopt pond plantings and empower those interested to create a good design. Residents may need to see pond plants and their benefits before accepting planting as an option for pond management. Providing demonstration areas where desirable plants can be viewed is another way to model the desired behavior and encourage its adoption. Even low-maintenance landscapes require some maintenance, however, so developing a plan for a demonstration planting should also include a maintenance plan. This maintenance plan should take state and local laws into consideration since weeding and plant removal may require a permit or notice. A poorly maintained demonstration planting is likely to discourage residents from adopting recommended changes. Workers contracted to maintain the area can be instructed and trained, or a civic group such as a garden club may volunteer to perform the occasional yet necessary maintenance, such as weeding.

PUBLIC SIGNAGE FOR EDUCATION

Installing signage at a demonstration planting, planted pond, or natural pond is a way to educate visitors about a specific location. Placing signage where people are likely to see and read it can increase its impact. Signs in public areas along pond edges can highlight the water quality benefits of shoreline and aquatic plants and can inform people of BMPs (Figures 5 and 6).

EDUCATION EVENTS

Putting on education events is another way to provide information to a targeted group of people, such as homeowners in a specific community or neighborhood. Working with communities can help increase the relevance and effectiveness of the education you are trying to communicate. Working with an advisory group of residents can help make



Figure 5. A sign at Lake Seminole Park in Pinellas County, Florida, funded by the Florida Lake Management Society, highlights the importance of pond plants.

Credit: Florida Lake Management Society http://flms.net/index.php?option=com_content&view=article&id=5&Itemid=15



Figure 6. A sign near Lakewood Ranch Town Hall on Lake Uihlein describes the Florida-Friendly Landscaping™ Principle Protect the Waterfront as establishing a 10-foot “maintenance-free zone” with no fertilization or irrigation around ponds.

Credit: Emily Ott, UF/IFAS

decisions to plan and produce an event that people will want to attend. In the case of stormwater pond education, residents who serve on their HOA, especially landscaping or pond committee members, are important recruits to an event planning team.

These residents can serve as advisors who help choose things such as

- times of the year and times of the day that will work for people in their community and so are best for scheduling the event;
- ways to promote the event;

- educational messaging that will likely be well-received by residents; and
- incentives that will motivate people to attend (such as food, the opportunity to ask an expert, silent auction, raffle, pet costume party, bounce house, etc.).

Conclusion

Residents can play an important role in protecting water quality by using landscape management BMPs. Extension educators, water managers, and resident leaders are encouraged to consider the above strategies to help residents overcome barriers to adopting these BMPs. Conducting programming that relates to specific needs of the target audience is a way to achieve more impactful programming (Seevers et al., 1997). Pond problems such as pollution from fertilizer runoff can be reduced by BMPs, which include protecting the waterfront and fertilizing appropriately. These survey results helped us identify areas where resident knowledge and landscape management decisions or practices can be improved to protect pond aesthetics and water quality and lower maintenance costs. These areas represent opportunities for Extension to become involved and work to encourage practices that help to protect our water resources.

References

- Brehm, J. M., Pasko, D. K., Eisenhauer, B.W. (2013). Identifying key factors in homeowner's adoption of water quality best management practices. *Environmental Management*, 52, 113–122.
- Carpenter, P. J., & Meyer, M. H. (1999). Edina goes green part III: A survey of consumer lawn care knowledge and practices. *HortTechnology*, 9(3), 491–494.
- Center for Watershed Protection. (1999). A survey of residential nutrient behavior in the Chesapeake Bay. Retrieved from http://cfpub.epa.gov/npstbx/files/UNEP_all.pdf
- Dietz, M. E, Clausen, J. C., Filchak, K. K. (2004). Education and changes in residential nonpoint source pollution. *Environmental Management* 34(5), 684–690.
- Environmental Protection Agency. (n.d.) Related media campaign materials. Retrieved October 15, 2014 from <http://cfpub.epa.gov/npstbx/relatedpopup.cfm?RelatedMaterialID=89>
- Florida Department of Environmental Protection. (FDEP) (2012). Florida state of the environment—wetlands: A guide to living with Florida's wetlands. Retrieved from: <http://www.dep.state.fl.us/central/Home/SLERP/Wetlands/>
- Florida Department of Environmental Protection & the University of Florida. (2009). Florida-Friendly Landscape guidance models for ordinances, covenants, and restrictions. Retrieved from <http://www.dep.state.fl.us/water/nonpoint/docs/nonpoint/ffl-mo-ccr-1-09.pdf>
- Hansen, G. & Hu, S. (2013). Florida-friendly plants for stormwater pond shorelines. (ENH1215). Gainesville: University of Florida Institute of Food and Agricultural Sciences. Retrieved September 22, 2014, from <http://edis.ifas.ufl.edu/ep476>
- Hauxwell, J., Jacoby, C., Frazer, T. K., & Stevely, J. (2001). Nutrients and Florida's coastal waters: The links between people, increased nutrients and changes to coastal aquatic systems. (SGEB-55). Gainesville: Florida Sea Grant, University of Florida. Retrieved September 10, 2015, from <http://nsgl.gso.uri.edu/flsgp/flsgpg01010.pdf>
- Livingston, E. H., & McCarron, E. (1990). Stormwater management: A guide for Floridians. Florida Department of Environmental Regulation. Tallahassee, FL. Retrieved from: http://www.dep.state.fl.us/water/nonpoint/docs/nonpoint/Stormwater_Guide.pdf
- Martini, N. F., & Nelson, K. C. (2014). The role of knowledge in residential lawn management. *Urban Ecosystems*. DOI 10.1007/s11252-014-0415-7
- McLean, D. C., Koeser, A. K., Shober, A. L., Qin, Z., Hasing, G., & Beeson, R. C. (2014). Incorporating woody ornamentals into residential landscapes to reduce nutrient leaching (ENH1242). Gainesville: University of Florida Institute of Food and Agricultural Sciences. Retrieved September 15, 2014, from <http://edis.ifas.ufl.edu/ep503>
- McKenzie-Mohr, D., Lee, N. R., Schultz, P. W., & Kotler, P. (2012). *Social Marketing to protect the environment: What works*. Los Angeles: Sage.
- Qin, Z., Shober, A. L., Beeson, R. C., Jr., & Wiese, C. (2013) Nutrient leaching from mixed-species Florida residential landscapes. *Journal of Environmental Quality*, 42(5). doi: 10.2134/jeq2013.04.0126.
- Reckner, G. J., Batson, C., Rushton, B., Sternfels, J., Watkins, B., ... & Cox, J. (n.d.). *Stormwater ponds: A citizen's guide to their purpose and management*. Retrieved July 9, 2015,

from <http://manatee.ifas.ufl.edu/soils/PDFs/stormwater-ponds-a-citizens-guide.pdf>

Seevers, B., Graham, D., Gamon, J., & Conklin, N. (1997). Education through cooperative extension. Albany, NY: Delmar Publishers.

Smart, R. M., Dick, G. O., Snow, J. R., Honnell, D. R., Smith, D. H., & Smith, J. K. (2009). Aquatic plant control research program: Ecological effects of exotic and native aquatic vegetation. (ERDC/EL TR-09-10). US Army Corps of Engineers: Engineer Research and Development Center. Retrieved from: <http://el.ercd.usace.army.mil/elpubs/pdf/trel09-10.pdf>

Swann, C. P. (2000). A survey of nutrient behavior among residents in the Chesapeake Bay watershed. In: National conference on tools for urban water resource management and protection., (pp 230-237). Chicago, IL, United States Environmental Protection Agency.

UF/IFAS Extension Administration. (2013). Florida Extension Road Map 2013–2023. Retrieved from: <http://extadmin.ifas.ufl.edu/roadmap.shtml>

Varlamoff, S., Florkowski, W. J., Jordan, J. L., Latimer, J., & Braman, K. (2001). Georgia homeowner survey of landscape management practices. HortTechnology, 11(2), 326–331.

Table 1. Helpful Links.

Link Description	Link
Florida-Friendly Landscaping™ program handbook	http://fyn.ifas.ufl.edu/materials/FYN-Handbook-v1-2012.pdf
Florida-Friendly Landscaping™ program website	http://fyn.ifas.ufl.edu/
Alachua County Environmental Protection Department campaign video: “Keep Grass Off the Streets”	https://www.youtube.com/watch?v=rBg-Lyw3rwY
Alachua County Environmental Protection Department campaign report and marketing materials: “Dogs Can’t Flush”	www.alachuacounty.us/epd
Green Industries Best Management Program (GI-BMP) Training Program overview	http://fyn.ifas.ufl.edu/professionals/BMP_overview.htm
Residential fertilizer guidelines (ENH1089) <i>Urban Turf Fertilizer Rule for Home Lawn Fertilization</i>	https://edis.ifas.ufl.edu/ep353
Stormwater pond plant recommendations (ENH1215) <i>Florida-Friendly Plants for Stormwater Pond Shorelines</i>	http://edis.ifas.ufl.edu/ep476