A How–To Manual for Palm Bay Homeowners

Rain Gardening

Creating Beautiful Spaces in Your Yard That Also Help Prevent Pollution from Stormwater Runoff

The City of Palm Bay Florida
A Perfect Place to Grow

MRG Marine Resources Council

UF University of Florida IFAS Extension

Brevard County

Indian River Lagoon Program

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INTRODUCTION

What are rain gardens and why are they important?
Homeowners across the country have taken an interest in rain gardens as means of beautifying their yards while also helping to prevent stormwater runoff pollution. Rain gardens not only dress up a yard with bright colors and textures, they are designed as shallow depressions in the ground that can fill with a few inches of rain during a storm. Rather than running off your rooftop and driveway into nearby ditches and canals, storm water is temporarily contained so it slowly percolates into the ground and is filtered by the soil. Compared to a typical lawn, a rain garden allows about 30% more water to soak into the ground, which keeps potential pollutants from reaching local water bodies.

Stormwater runoff is a problem because of the many types of pollutants it picks up as it flows off rooftops, driveways and streets into local storm drains. Anything that can be dissolved or carried in storm water can flow through a storm drain and into local canals, many of which drain untreated directly into the Indian River Lagoon. Common pollutants carried in storm water include eroded soils, excess fertilizers, pesticides, grass and other yard clippings, pet waste, household chemicals, grease and oils, and other materials that get washed into or purposefully dumped into storm drains and local canals.

Since 2009, the Indian River Lagoon, which brings an economic benefit of over $3.7 billion a year to the five counties it borders, has lost approximately 60% of its seagrasses. This is a serious problem because seagrasses are the primary nursery grounds for the lagoon's commercially and recreationally important fish species as well as the invertebrates they depend on for food. Since 2012, unusual mortality has also been recorded in the lagoon's wildlife, particularly manatees, dolphins and brown pelicans. Each of these species has experienced unexpected and unexplained die-offs, especially around Brevard County where the highest seagrass losses have been reported.

Seagrass impacts are closely tied to excess nutrients that enter the lagoon as stormwater pollution. These nutrients, primarily nitrogen and phosphorus, are components of fertilizers, but are also found in detergents, leaking septic systems, pet waste and other materials. Once in the lagoon, nitrogen and phosphorus fuel algae blooms, which block sunlight from reaching seagrasses and prevent them from growing. Fish kills also commonly increase when algae blooms occur, mostly because blooms can deplete oxygen in the water.

You can make a personal contribution to keeping the Indian River Lagoon cleaner by installing a rain garden in your yard. By simply containing stormwater on your property rather than allowing it to become runoff, you will help prevent pollutants from reaching the lagoon. While one small rain garden may seem like a tiny effort, our goal is to get more people interested in planting rain gardens. Collectively, our efforts will enhance our yards; increase essential habitat for birds, butterflies and other wildlife; and help protect our Indian River Lagoon from dangerous pollutants that degrade water quality and harm wildlife.

Frequently asked questions:

Is having a rain garden important?

Yes. Planting a rain garden on your property is your personal contribution to clean water in the Indian River Lagoon. Stormwater runoff is the largest issue we face in keeping the lagoon healthy. Stormwater pollution comes from all of us, and we all need to be part of the solution.

How is a rain garden different from any other type of garden?

Rain gardens are more than just ornamental enhancements to your yard. They are designed to contain stormwater flowing off your roof and other hard surfaces. Rain garden design features a shallow depression containing soil, sand, plants and mulch. These elements all work together to filter storm water and increase the garden's permeability so that water soaks slowly into the ground instead of running off your property into nearby ditches and canals, and eventually, the Indian River Lagoon.

Does the location of my property affect my rain garden design?

Yes. The location of your property will influence your rain garden design. Location, soil type, site-specific conditions (sunny vs. shady), slope and other factors will all come into play in siting and sizing your rain garden. But don't worry! All the help you need to accomplish these tasks are right here in this manual.

Where is the best place to put my rain garden?

In a location where it will receive water from impervious (non-pourous, impenetrable) surfaces like rooftops and pavement during rains. This could include runoff from your roof, driveway, patio, or sidewalk. To decide on the best location and size for your rain garden, you'll need to consider soil drainage properties, location of downspouts and the surface area of your roof, driveway and other impervious areas.

Will my rain garden leave standing water on my property that will become a breeding ground for mosquitoes and other pests?

No. Rain gardens are not intended to have standing water in them. They may contain water after a storm, but it gradually soaks into the ground, leaving the garden dry between rainfalls. Mosquitoes lay their eggs in standing water and require about 7 days of development before hatching occurs. Larvae also live in water before emerging as adults. Because water in a rain garden is only present for a day or two at most, it is unlikely your garden will become a breeding ground for mosquitoes and other insect pests.

Are rain gardens more expensive than regular planting beds?

They don't have to be. Costs will largely depend on how big your rain garden will be, and whether you do the work yourself or hire a landscaper. If you are a do-it-yourselfer, plant purchasing is likely to be your largest expense. Relying on family and friends for free labor, and utilizing plants that are already in your exisiting landscape can also help to keep costs down.

Does a rain garden require a lot of weed control and other maintenance?

Not really. Rain gardens will need little maintenance if properly designed and constructed. Using native plants, which typically require few additional applications of fertilizers or pesticides, will further minimize your maintenance. However, rain gardens are not maintenance-free. In its first

three years as it becomes established, your garden will require regular weeding, some supplemental watering, and replacement of any plants that do not thrive.

STEP ONE: PLANNING YOUR RAIN GARDEN

Planning your garden is perhaps the most important aspect of your project and careful planning will help ensure your rain garden is beautiful, functional and efficient.

Where do I locate my rain garden?
Rain gardens can be placed near the house to capture runoff from the rooftop, or farther out in the yard to capture runoff from the roof, lawn and driveway. Placement on a gentle slope that runs away from the house and receives water from downspouts is optimal. When considering placement of the garden, think about integrating the rain garden into other aspects of your landscaping. You may also want to visualize the view of the garden from inside the house or outdoor seating areas, and consider locations near porches or patios to maximize your enjoyment of the garden.

Rain Garden DOs	Rain Garden DON'Ts
DO place the rain garden at least ten feet away from the house so that water does not seep into your foundation.	DON'T place the rain garden over your septic system or drain field.
DO place your rain garden where it will receive full or partial sun throughout the day. Shady locations and sites near large trees will not work as well as sunny sites.	DON'T place the rain garden in any part of your yard where you already have standing water. The goal of a rain garden is to encourage water to soak into the ground. If you have wet patches in your yard, infiltration is slow in these areas.
DO place your garden where it will receive water from downspouts or where water flows away from the house. Placement on a gentle slope will make digging easiest.	DON'T locate your garden directly under a large tree. Digging will damage tree roots and may cause long-term harm.
DO determine how large an area will drain into your rain garden. Large drainage areas require larger rain gardens. Details will follow.	
DO know what kind of soil you have in the area where your rain garden will be located. Details will follow.	

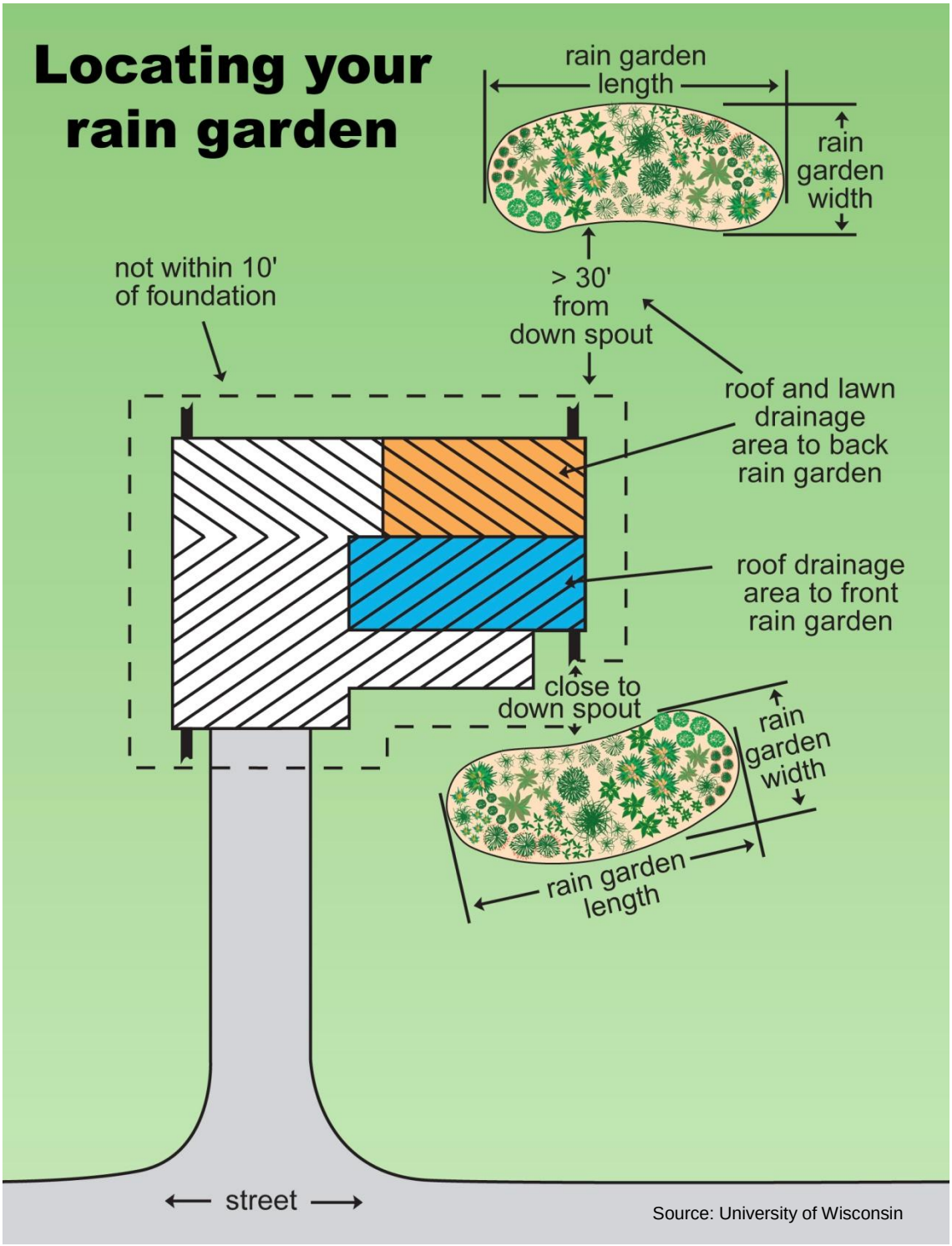


Figure 1: Factors to consider when locating your rain garden include the location of downspouts to direct water, distance from the home, and views from inside the home or from outdoor seating areas. Source: University of Wisconsin.

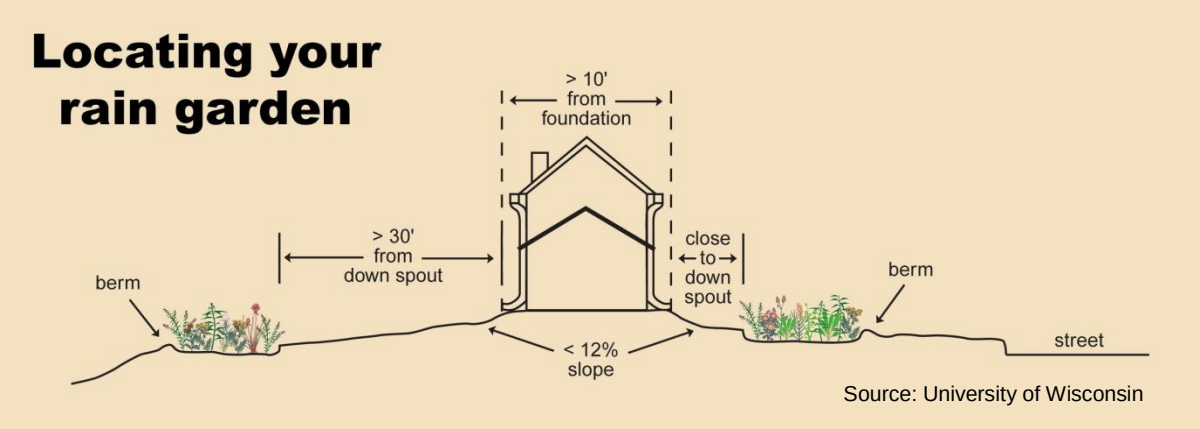


Figure 2: It is important to locate your rain garden at least ten feet from the house to prevent water from seeping into your foundation. Placement on a gentle slope that receives downspout water is optimal. Source: University of Wisconsin.

What size and shape will work best for my yard?
Most rain gardens typically range from 100 – 300 square feet in size, however, as with almost any type of garden, your final product is only limited by your imagination and budget. For practical purposes, gardens smaller than 100 square feet may be too small to capture all of your runoff and may have little plant variety. Those larger than 300 square feet will take a lot of preparation work, so digging and leveling will be more difficult, and you'll need more plants to fill the area, which will increase your costs.

There are really no hard rules for how to shape the bed for your garden, so choose a shape that pleases you and fits your design aesthetics. Crescents, teardrop, kidney and freeform shapes all work well.

Ultimately, three things determine the size of your garden: how deep your garden will be, the type of soil you will be planting in, and how much roof or lawn surface area will be draining into the garden. You will use this information to calculate how large your garden should be to capture the stormwater generated on your property.

How deep should my rain garden be?
Rain gardens are usually between 4 – 8 inches deep. Those shallower than 4 inches will not be able to capture or store all the water flowing to them, while those deeper than 8 inches may allow water to pond, which is not desirable. A deep garden also presents a safety hazard should a guest accidentally wander too near the edge.

The slope of your yard will ultimately determine how deep your garden needs to be. Follow these simple steps to calculate the slope of your yard.

Please note:
The sizing information provided in this manual is intended to achieve the goal of containing 100% of the stormwater generated on your property. Should you follow these guidelines and then decide the suggested size for your garden is not practical for your yard, it is perfectly fine to adjust the size of the garden to suit your needs. A rain garden may be up to 30% smaller and still control as much as 90% of the runoff from your property.

Once you know the slope, you may then use this information to determine how deep your rain garden needs to be:

1. At the location chosen to place your garden, pound a garden stake at the uphill end of the site, and a second stake at the downhill end approximately 15 feet apart.
2. Tie a string to the bottom of the uphill stake and run the string down to the other stake.
3. Use a string level or carpenter's level to level the string and tie it off to the downhill stake.
4. Measure the width in inches between the two stakes.
5. Measure the height in inches of the downhill stake from the ground to where the string is tied off.
6. To find the slope of your yard, which is given as a percentage, divide the height by the width. Multiply the result by 100. This number is your yard's percent slope.

Using this number, select the proper depth for your rain garden from the following options:

- If the slope is less than 4%, the garden should be 3-5 inches deep.
- If the slope is 5% – 7%, the garden should be 6-7 inches deep.
- If the slope is 8% – 12%, the garden should be 8 inches deep.

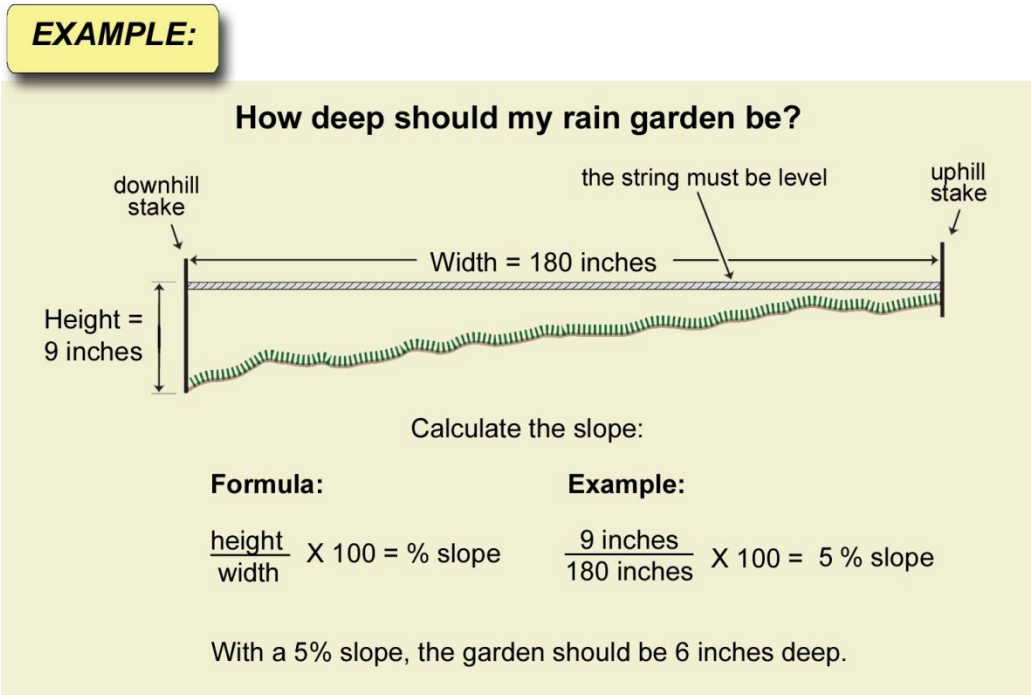


Figure 3: An example of how to calculate your yard's slope to find how deep your rain garden should be. Source: University of Wisconsin.

What type of soil is in my yard?

The type of soil in your rain garden location will determine how fast it will drain. There are three basic soil types: sand, silt, and clay. Sandy soils drain the fastest, clay soils drain the slowest. A

quick examination will help you determine your soil type. Pick up a handful of soil and rub it in your fingers. If it feels very gritty and coarse, it is primarily sand. If it feels smooth but isn't sticky, it is primarily silt. If it is sticky and clumpy, it is primarily clay. There are two very simple tests that will assist you in determining the type of soil in your garden.

Clay test:
Take a small handful of soil from the location you have chosen for your rain garden. Dampen it with a bit of water. Knead the soil in your fingers and squeeze it into a ball. If it falls apart when you release it, your soil is sandy. If it remains in a ball, work the soil between your thumb and forefinger, squeezing it upward into a ribbon of uniform thickness. Allow the ribbon to extend over your forefinger until it breaks from its own weight. If the soil forms a ribbon more than an inch long before it breaks, and feels more smooth than gritty, the soil contains a lot of clay. Clay soils are not generally well-draining, so you can expect slow drainage and perhaps ponding. Consider choosing a different location for your rain garden.

Percolation Test:
The percolation test determines how porous your soil is and will allow you to decide whether the location you've chosen will drain well. First, remove both ends of a large can. A 46-ounce juice can works well for this test. Mark a line 2 inches from the bottom end. Pound the can 2 inches deep into the soil so that the line you've marked is level with the ground surface. Pour one quart of water into the can and time how long it takes for the water to drain from the can.

- If the water drains in less than 2 minutes, your soil has excellent percolation and will offer the best conditions for planting a rain garden.
- If the water takes 2 – 8 minutes to drain, your soil is somewhat compact. This is acceptable drainage for a rain garden, but percolation will be slower than in sandy, well-draining soil.
- If the water takes longer than 8 minutes to drain, your soil is dense and poorly draining. It would be best to look for another location for your rain garden.

How large is the area draining to my rain garden?
As stated earlier, rain gardens may be placed nearer to the home, or farther out in the yard. Regardless of its proximity to your house, it is an important step to calculate approximately how much area will drain into your rain garden. The larger the area draining into the garden, the larger the garden should be to accommodate it.

If your rain garden will be placed 10 – 30 feet from a downspout:
Nearly all the water received by the garden will be coming from your rooftop. Walk around the house and estimate what percentage of the roof feeds the downspout that will be directing water to your rain garden. Many homes have 4 downspouts, each taking about 25% of the roof's runoff.

Next, determine the approximate area of your roof by calculating your home's footprint. Use a tape measure to determine your home's length and width. Multiply these figures together to find its area. Multiply this number by the estimated percentage of the roof that will feed the rain garden. This is the roof drainage area.

If your rain garden will be placed more than 30 feet from a downspout:
If there is a significant amount of lawn uphill that will also drain into the rain garden, you should add this approximate area to the roof drainage area.

First, find the roof drainage area as just outlined. Next, find the area of the lawn that will drain into the rain garden. Stand where your rain garden will be placed and look towards the house. Identify the part of the lawn that slopes toward the rain garden. Measure the length and width of this part of the yard. Multiply length times width to find the lawn area. Add the lawn area to the roof drainage area to find the total drainage area.

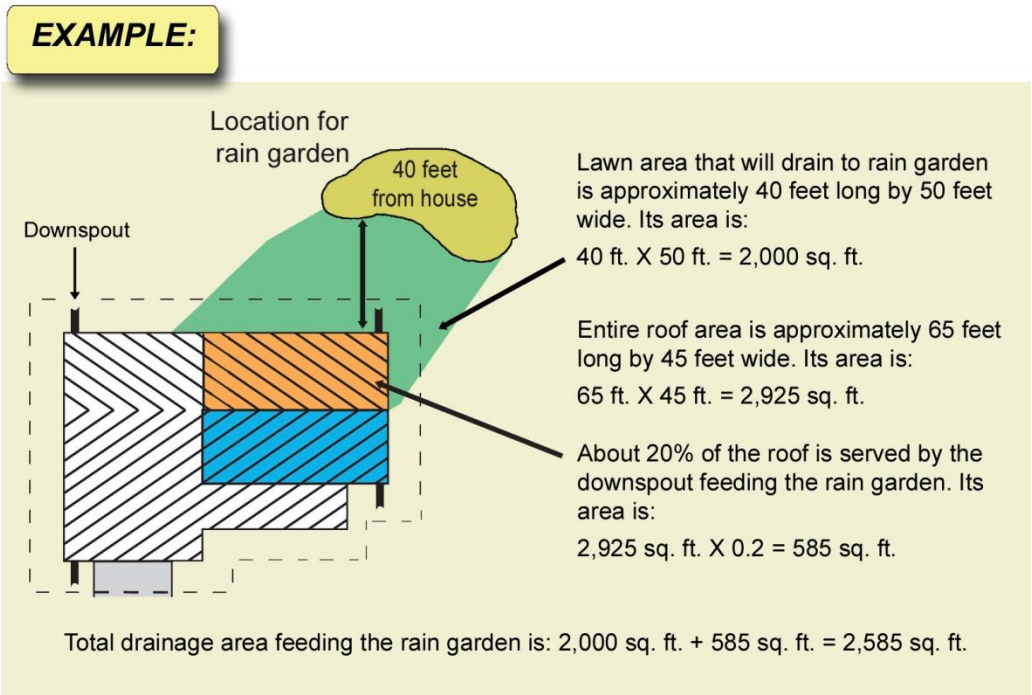


Figure 4: Calculating how large an area will drain into your rain garden. In this example, the garden is placed 40 feet from the house and has a large area of lawn draining into the garden. Both the roof drainage area and the lawn drainage area are added to find the total drainage area. If your garden will be placed 10 – 30 feet from the downspout, you need only calculate the roof drainage area. Source: University of Wisconsin.

What is the proper surface area for my rain garden?
Now that you know your yard's soil type, the approximate depth for your rain garden, and the area that will drain into it, it's now time to decide how large an area your garden should cover to accommodate all the stormwater it will collect. The tables below will help you calculate your rain garden's proper surface area. Use Table 1 if your rain garden will be placed less than 30 feet from a downspout, or Table 2 if your rain garden will be placed more than 30 feet from a downspout.

- Find the size factor appropriate for your garden's soil type and depth.

- Multiply the size factor by the drainage area. This number is the recommended area of the rain garden in square feet.
- If the recommended area for the garden is much more than 300 square feet, you may want to consider breaking the area into two smaller gardens.

Table 1: Size factors for rain gardens less than 30 feet from a downspout

	3 – 5 inches deep	6 – 7 inches deep	8 inches deep
Sandy Soil	0.19	0.15	0.08
Silty Soil	0.34	0.25	0.16
Clay Soil	0.43	0.32	0.2

Table 2: Size factors for rain gardens more than 30 feet from a downspout

	Size factor for all depths
Sandy Soil	0.03
Silty Soil	0.06
Clay Soil	0.1

EXAMPLE:

Your yard has a 5% slope, so your rain garden will be 6 inches deep.
Your soil type is sandy.
You have calculated your total drainage area to be 600 square feet.
You will place your rain garden less than 30 feet from the downspout.

Refer to Table 1 and find the size factor appropriate for these conditions. It is 0.15.

Multiply your total drainage area by the size factor to find the recommended area for your rain garden:

600 sq. ft. X 0.15 = 90 sq. ft.

Figure 5: How to use size factors to calculate how large an area your rain garden should cover.

Using surface area to determine the right dimensions for your garden

You're almost ready to start digging – just one last step to figure out! Before you begin building your rain garden, think about how the garden will capture water. Ideally, runoff will flow from a downspout and should spread evenly across the entire length of the garden. Remember that you'll have to try and make the garden as level as possible so water won't pool in any particular area or spill over the edge before it has the chance to percolate into the soil.

A good rule of thumb for this step is to plan for your rain garden to be about twice as long as it is wide. Begin by visualizing the slope of your yard. The longer side of the rain garden should face upslope. This means that the garden's top edge should be perpendicular to the slope and to the downspout that will feed it (see inset in Figure 6 below). This will allow the garden to capture as

much waster as possible. Now the challenge is to make the garden wide enough to grow a variety of plants *and* have the water spread evenly over the entire bottom of the garden.

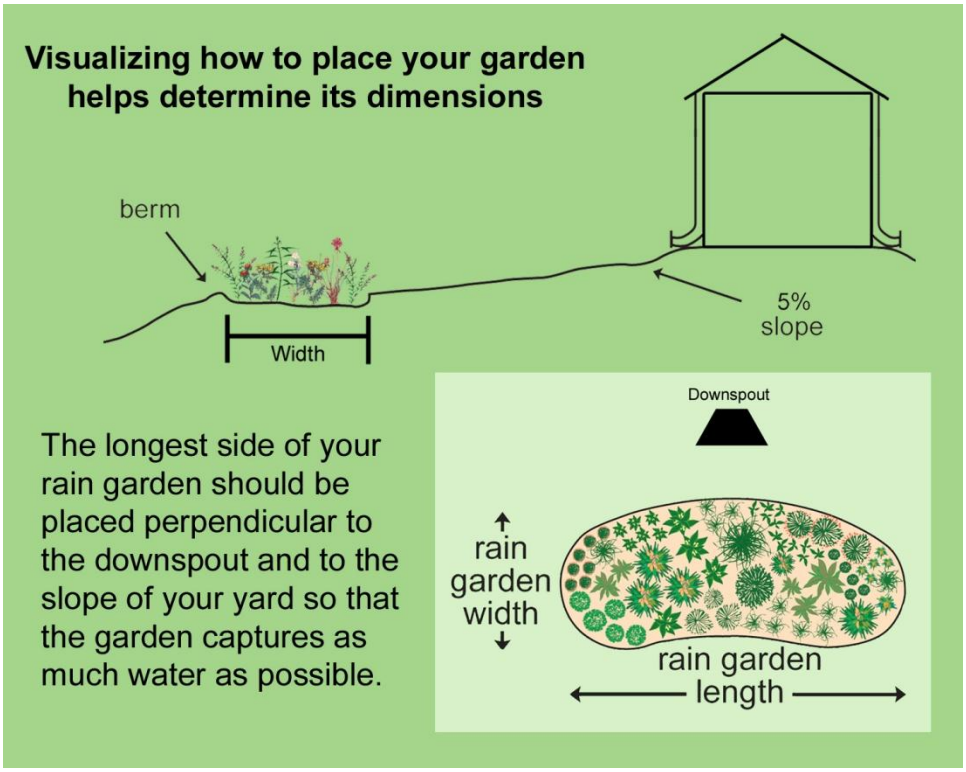


Figure 6: Thinking about how your garden will capture water will help you decide both where to place it and how big it should be. Source: University of Wisconsin.

In choosing how wide to make your garden, consider the slope of your lawn as a primary factor. Wide gardens or ones placed on steep slopes will need to be dug deeply at the high end in order to keep the bed level. Similarly, very wide gardens may need to have extra soil added to the lower end to fill the bed to the same level as the top end. A good rule of thumb is to plan for your garden to be approximately 10 feet wide. This is generally a good compromise between the effects of slope and depth. At maximum, make your rain garden no wider than about 15 feet, particularly if the slope of your yard is more than 8%.

So, using 10 feet as the baseline for the garden's width, you'll now need to calculate how long it should be. Simply use the garden's surface area and divide it by 10. In the example above, we calculated a surface area of 90 square feet. Dividing this by 10 gives us a length of 9 feet. This would make for a square-shaped or circular garden. If these shapes work for the design you had in mind, then you're ready to begin building. If, however, you want a garden somewhat longer than it is wide, you'll need to adjust your calculations a bit as in the example below:

EXAMPLE:

Your garden's surface area is approximately 90 square feet. Rule of thumb says to make your garden about 10 feet wide.

$$\text{Length} = \frac{\text{rain garden surface area}}{\text{width}} = \frac{90 \text{ sq. ft.}}{10 \text{ ft.}} = 9 \text{ ft.}$$

Here, your garden would be 9 ft. X 10 ft., suggesting a square to circular shape.

BUT, you had in mind a garden that is longer rather than wide, so the garden's dimensions need to be adjusted:

Let's say you decide that 6 feet is enough width:

$$\text{Length} = \frac{90 \text{ sq. ft.}}{6 \text{ ft.}} = 15 \text{ ft.}$$

That's longer than what you were thinking about, so widen the garden a bit. Try 7.5 feet wide:

$$\text{Length} = \frac{90 \text{ sq. ft.}}{7.5 \text{ ft.}} = 12 \text{ ft.}$$

That seems about right!

Figure 7: An example of how to adjust your calculations to achieve a garden in the length and width to suit the design plan you have in mind. Always remember that the suggestions in this manual are intended only as guidelines, and you should feel free to keep adjusting until you find the dimensions that suit you.

STEP TWO: LET'S GET BUILDING!

First things first

Now that you have the plan for the size and location for your rain garden, it's time to get digging. However, there is one last thing to take care of before you begin. Florida law requires homeowners and contractors to call Sunshine State One Call of Florida, also commonly known as "Call before you dig" whenever they are digging in the right-of-way, easement or permitted use area of their properties. No call is required when digging outside of those areas, but property owners may be liable if they damage an underground utility. For this reason, it is best to call 811 several days before you plan to start your project. Calling will schedule representatives of local utilities to come to your home within two business days to mark, either with flags or with paint, all underground cables and pipes.

No special tools are required to install your rain garden but be sure to have a tape measure, shovels, rakes, trowels, a line or carpenter's level, wood stakes at least 2 feet long, string, a hammer, and a 6-foot long 2x4 board (Optional). It can take many hours to dig an average-sized rain garden if you work by yourself. Working with family or friends will cut the time down and be much more fun. If you are digging a large area or using a contractor to install your garden, you may want to consider renting a rotating tiller or scheduling a small backhoe to do the digging for you.

The best time of year to install your garden is from spring through summer so that the plants have a chance to become established before the winter dry season sets in. Most likely, supplemental watering will be required during the first few weeks, and again once the summer rains taper off.

To begin, use marking paint or a hose to define the footprint of the garden. If the rain garden will be installed into an existing lawn, digging can be reduced by first removing or killing the grass in the footprint for the garden. To do this in an environmentally-friendly manner, remove sod with a square shovel and transplant it to bare spots in your yard, or lay black plastic over the ground until the grass dies. It can then be tilled into the soil, or can be removed and composted.

Before you begin planting your rain garden, make sure that water from your downspout will run into the garden. You can help this process along by adding an extension to the downspout that will feed water towards your rain garden. Dig a shallow swale from the downspout to the rain garden to insure that water has a direct route to the garden. If your rain garden is located away from your house and you don't want a swale or downspout extension cutting across the lawn, run a PCV pipe underground from the downspout to the rain garden. If you use this option, be sure to make all of your calculations for a rain garden *less than* 30 feet from the house.

To help prevent soil erosion, consider using stone to line the swale and assist in spreading the water out to the entire planting bed. Stone can later be utilized later to help enhance the berm and further prevent erosion. It will also lend a neat, polished touch to your rain garden, improving its appearance.

Ready, set, DIG!

Beginning at one end of your garden, place stakes on the uphill side of the garden at about 5-foot intervals. For each uphill stake, place a corresponding downhill stake at the bottom end of the garden. Be sure pairs of stakes line up so you can tie string between them for leveling purposes as you dig.

Working in 5-foot intervals with only one string spanning the garden at a time, begin digging your garden on its uphill side. Measure down from the leveled string and dig the garden to the depth you want it to be. If you've determined that your garden needs to be 6 inches deep, dig down six inches from the top of the string on the uphill edge. If you intend to amend your soil with compost, topsoil or any other additives, dig the garden at least 2 inches deeper than suggested to accommodate these additions.

Creating a berm:
Heap up loosened soil along the outside edge of where you defined the garden's footprint to create a berm. Berms are low walls that usually lie along three sides of your garden and assist in containing captured water. If your yard has a low slope, you will be digging at about the same depth throughout the garden and will use the loosened soil to create the berm. If your slope is steeper, the uphill side of the garden will need to be dug more deeply than the downhill side. You may use some of the soil you remove uphill to level the garden downhill as shown in Figure 8. Continue digging, filling and leveling from one end of the garden to the other, moving your string along the stakes as you work.

Next, shore up the berm around the downhill edge of the rain garden and along its sides. Water captured by the garden will naturally try to run off the downhill edge of the garden. To prevent that from happening, build up the berm along this edge. The berm should be highest around the downhill edge and taper off along the sides to the uphill edge. On flatter slopes, there should be plenty of soil left over from digging to create a berm. On steeper slopes, you may have to bring additional soil in to construct the berm.

After shaping the berm into a smooth ridge approximately 1-foot across, stomp on it to compact it as much as possible. Continue to add soil, shape and stomp the berm until you have created a well-compacted berm with gently sloping sides. Taking some time to accomplish this will help insure your berm does not erode and will help seamlessly integrate the rain garden with the lawn. As a final step, to prevent the berm from eroding, lay sod, plant it with grass seed, reinforce it with stone, or plant drought-tolerant plants along the top. If seeding the berm or using plants, cover the berm with straw or an erosion-control mat until plants have a chance to mature.

Leveling the rain garden:
After you've completed digging out the rain garden, be sure to check to insure the garden is level. Rather than just estimating, it pays to do an accurate check at this point to prevent problems later. Lay a 2x4 board in the garden and seat a carpenter's level on top of it. Find any spots where the garden is not flat and level them, scraping out the high spots and filling in any low ones. Move the board to different places in the bed and try to level the surface of the bed as much as possible. When it is as level as you can make it, add any compost or other soil amendments evenly to the bed. This will improve the condition of your soil and help plants to establish themselves. Add approximately 2 inches of material and mix it into the soil in the bed. Rake the bed smooth.

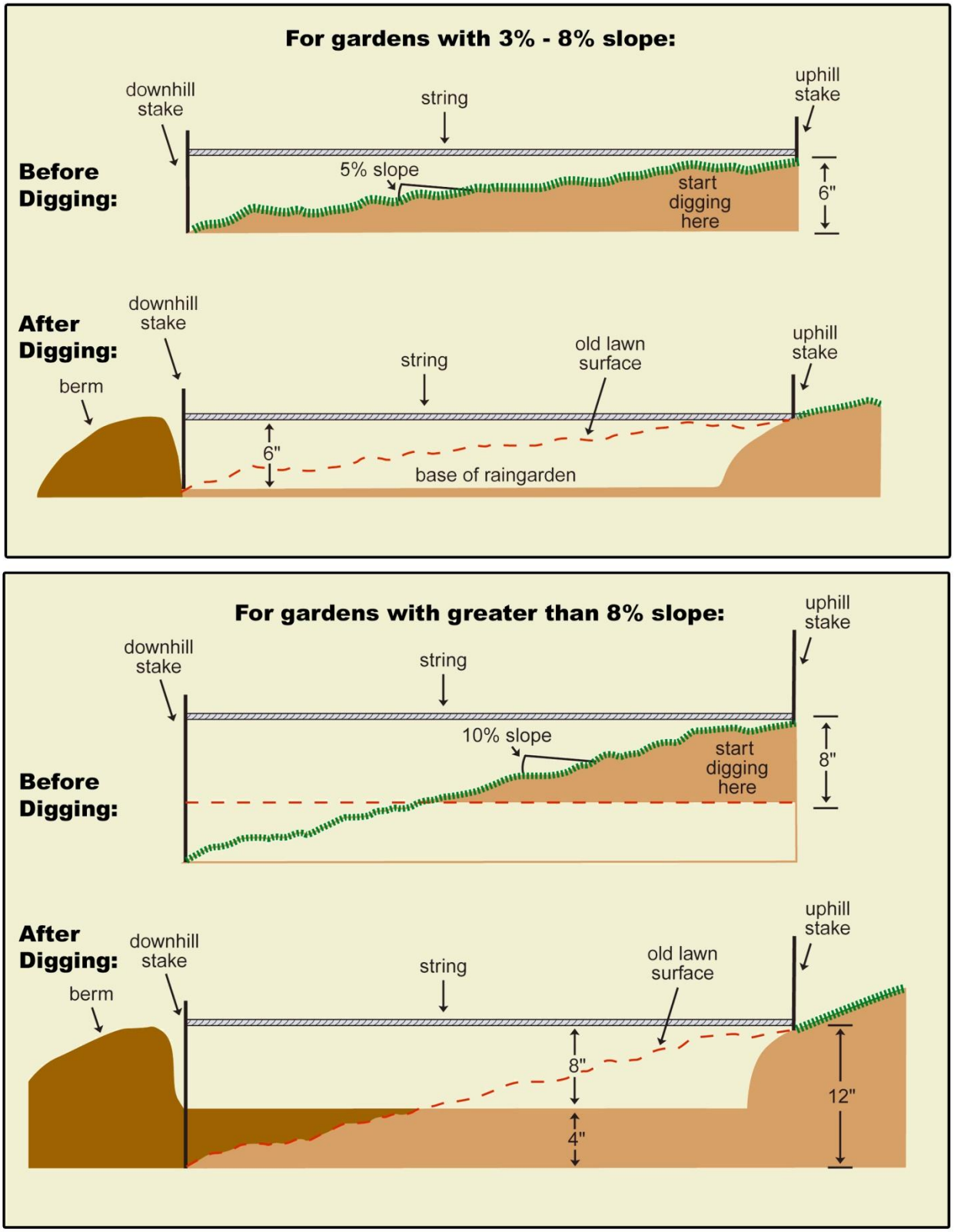


Figure 8: How to dig your rain garden if your yard has a low slope (top) or a steeper slope (bottom). Note also that steeper yards may require some backfilling on the downhill side with soil removed from the uphill side (dark brown at bottom). Source: University of Wisconsin.

STEP THREE: PLANTING AND MAINTAINING YOUR RAIN GARDEN

Planting your rain garden

There is no single best way to plant a garden, but this is the fun part, so feel free to play with design, color, texture and height to create a garden that is not only working to prevent pollution, but also an attractive element of your home landscape. A listing of recommended trees, shrubs, perennials and grasses that do well in central Florida rain gardens is given in the appendices to help get your creative juices flowing.

It helps to sketch out a rough garden plan to assist in deciding where to place plants in your rain garden. As you plan, consider bloom time, mature height and spread, color and texture. To give your garden visual interest throughout the year, incorporate plants that bloom in different seasons. Plant groupings of the same species together and repeat groupings to help provide your garden with a more formal look. Try to incorporate a good variety of plants into the garden and mix ornamental grasses or small shrubs among the flowering plants you choose to create an attractive look.

We recommend that you work primarily with native plants because they are already well-adapted to Florida's environment and will need little in the way of fertilizers, pesticides or supplemental watering to keep them healthy and vibrant once they become established. We also recommend that you avoid planting any species that appear on the Florida Exotic Pest Plant Council's listing of invasive plants (visit: www.fleppc.org for a complete, current listing). You will find many of the listed species both familiar and readily available for sale in retail establishments despite their designation as invaders. To keep your yard as Florida-friendly as possible, do not purchase any plants on the FLEPPC list.

The first thing to do on planting day is to place all of the potted plants in trays and water them thoroughly. Leave the plants sitting in the water for at least an hour before planting so that the rootballs are saturated, heavy and dripping water when picked up. Once the rootballs are thoroughly wet, lay them out (while still in their containers) according to your garden plan. Make any adjustments to the design now before you begin digging the holes. Once you're satisfied with the look of your garden, it's time to start planting. Dig each hole twice as wide as the root ball, but only deep enough so that the crown of the plant is an inch above the existing grade of the soil. As you install plants, remove the pots and break up the rootball if it is full of large roots. Be sure to press down firmly on the soil around the newly planted rootball to eliminate any air pockets.

When the garden is completely planted, place a two-inch layer of mulch over the bed, being careful not to bury the crowns of your plants. Place any plant labels or decorations at this time as well.

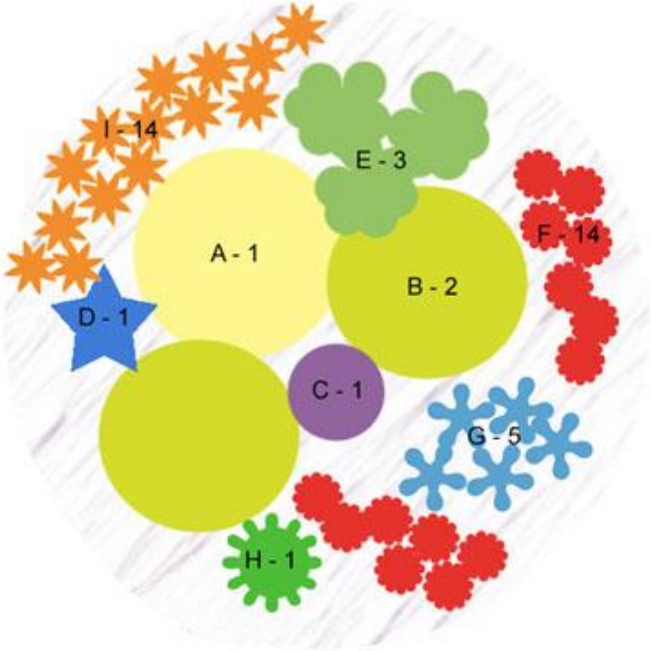
Water the rain garden immediately after planting and continue to provide water several times per week unless it rains. Most plants will thrive when they receive one inch of water each week. Be prepared to supplement rainfall with additional watering until your garden becomes established. Once plants are growing, you should only need to water during dry periods.

Maintaining your rain garden
Weeding will be a regular part of maintaining your garden. Pull weeds by hand, removing them to the root. At the end of the growing season, you may leave seed heads on your plants for winter interest or to provide food and cover for birds and small wildlife. If there are small shrubs or trees in the garden, prune as needed.

Sit Back and Enjoy!
Congratulations! You did it! You can now sit back and enjoy your rain garden as it grows. Not only have you beautified your yard, but you're also helping to reduce stormwater pollution in the Indian River Lagoon.

If you're interested in doing more, you now have enough knowledge to help others to accomplish the same thing. Please consider speaking to your friends and neighbors about the ways they can help reduce their impacts to the lagoon by installing their own rain gardens. Consider installing rain barrels to capture even more stormwater runoff from your roof. Perhaps you could organize a small group to plant a rain garden at your HOA, civic organization, church, or your child's school. We've included lots of references for you in the supplemental materials below. There are even some sample garden plans to get your creative juices flowing. Happy rain gardening!

Sample rain garden designs



Plant List
(Approx. 150 sq. ft.)

A	*Slash pine
B	*Loblolly bay
C	*Simpson's stopper
D	*Button bush
E	*Wax myrtle
F	*Frog fruit
G	*Rain lilies
H	*American beautyberry
I	*Blue-eyed grass

*Native plants

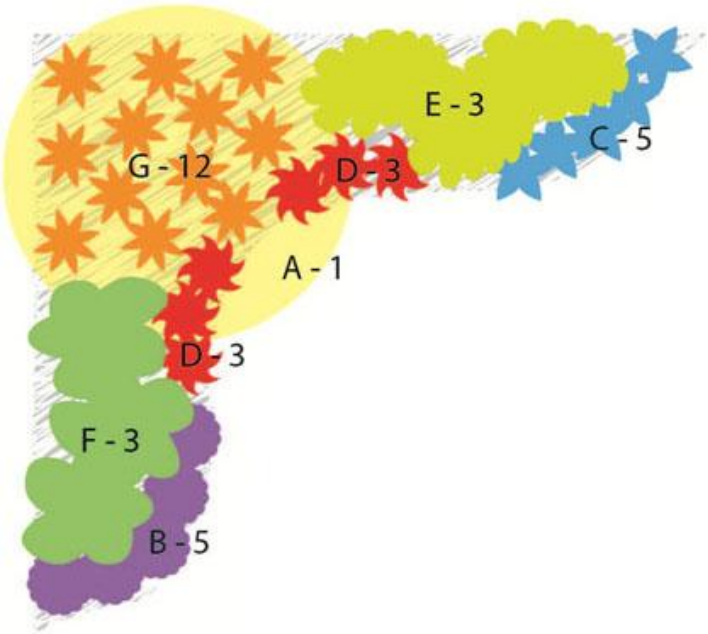
Garden plan submitted by K. Benson,
Brevard County Master Gardener

Plant List
(Approx. 150 sq. ft.)

A	*Red Maple
B	*Blue-eyed grass
C	*Sea oxeye daisy
D	*Spider lily
E	*Scarlet hibiscus
F	*Saltmarsh mallow
G	*Royal fern

*Native plants

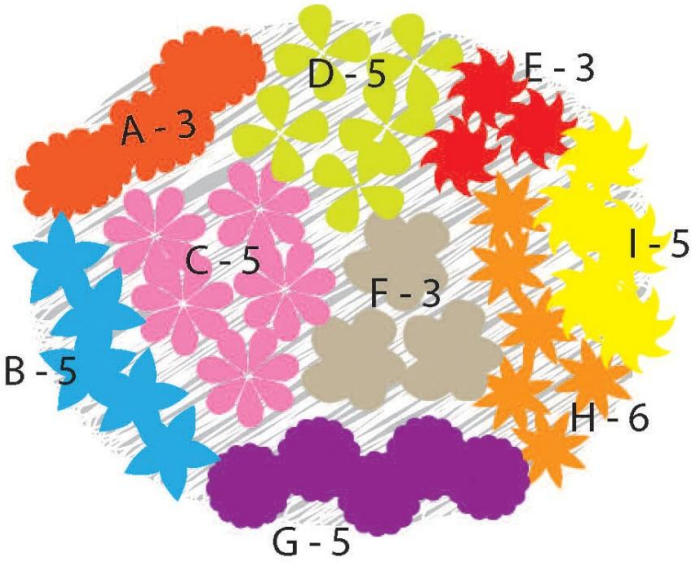
Garden plan submitted by D. Price,
Brevard County Master Gardener



Plant List
(Approx. 130 sq. ft.)

A	*Scorpiontail
B	*Rain lily
C	*Rusty lyonia
D	*Blue-eyed grass
E	*Goldenrod
F	*Swamp rose
G	*Frog fruit
H	*Bog sage
I	*Cardinal flower

*Native plants

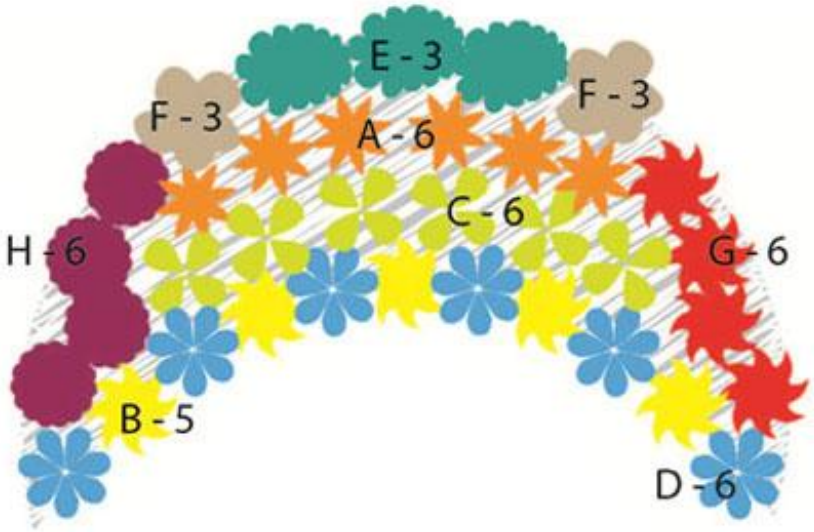


Garden plan submitted by D. Price,
Brevard County Master Gardener

Plant List
(Approx. 130 sq. ft.)

A	*Bog sage
B	*Rain lily
C	*Yellowtop
D	*Swamp milkweed
E	*Yellow canna
F	*Scorpiontail
G	*Cardinal flower
H	False dragonhead

*Native plants

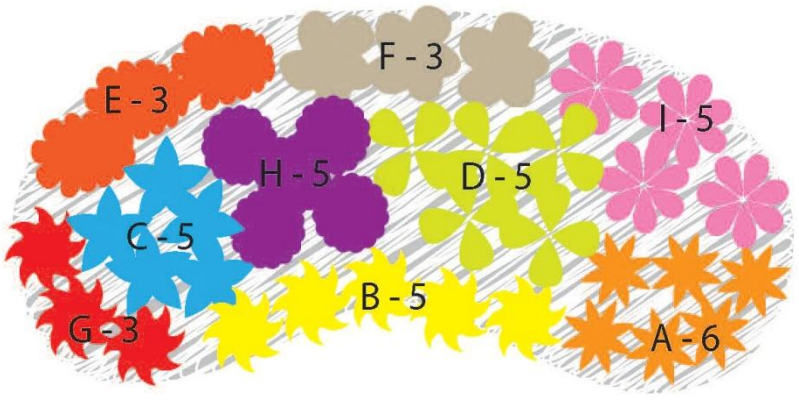


Garden plan submitted by D. Price,
Brevard County Master Gardener

Plant List
(Approx. 130 sq. ft.)

A	*Swamp sunflower
B	*Rain lily
C	*Sea oxeye daisy
D	*Yellowtop
E	*Yellow canna
F	*Blue flag iris
G	*Cardinal flower
H	False dragonhead
I	*Swamp milkweed

*Native plants

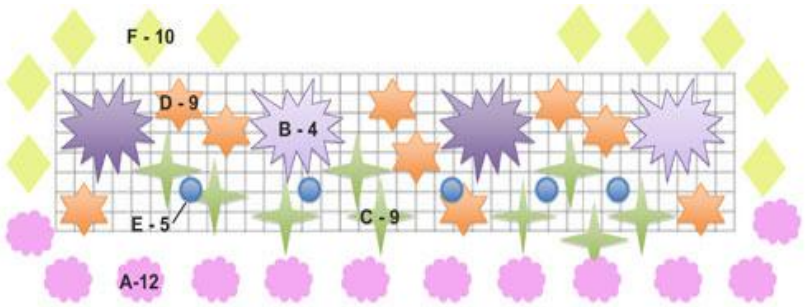


Garden plan submitted by D. Price,
Brevard County Master Gardener

Plant List
(Approx. 400 sq. ft.)

A	*Sunshine mimosa
B	*Horsemint
C	*Dune sunflower
D	*Blanketflower
E	* Tickseed
F	*Dwarf palmetto

*Native plants



Garden plan submitted by
P. Tierney, Marine Resources
Council of East Florida

Large Trees						
Common name	**Type**	**Flower Color** **Flower Season**	**Mature Height**	**Light**	**Soil Moisture**	**Wildlife Value?**
Red maple *(Acer rubrum)*	Deciduous	Red Spring, winter	60 - 75 ft.		Extended flooding - well-drained	Birds, squirrels, other mammals
Pignut hickory *(Carya glabra)*	Deciduous	Yellow Spring	50 - 65 ft.		Well-drained, occasionally wet	Squirrels, other mammals
Hackberry (sugarberry) *(Celtis laevigata)*	Deciduous	Green Spring	50 - 70 ft.		Extended flooding - well-drained	Birds, squirrels, other mammals
Loblolly bay *(Gordonia lasianthus)*	Evergreen	White, cream or gray Spring, summer	35 - 60 ft.		Extended flooding	
Sweetgum *(Liquidambar styraciflua)*	Deciduous	Yellow, green Spring	60 - 75 ft.		Extended flooding - well-drained	Birds, squirrels, other mammals
Southern magnolia *(Magnolia grandiflora)*	Evergreen	White, cream or gray Spring, summer	60 - 80 ft.		Well-drained, occasionally wet	Attracts birds
Sweetbay magnolia *(Magnolia viginiana)*	Semi-evergreen or evergreen	White, cream or gray Summer	40 - 50 ft.		Well-drained, extended flooding	Birds, squirrels, other mammals
Red mulberry *(Morus rubra)*	Deciduous	Green, yellow Spring	50 - 75 ft.		Well-drained, occasionally wet	Birds, squirrels, other mammals

Blackgum (Sourgum) *(Nyssa sylvatica var. sylvatica)*	Deciduous	White, cream or gray Spring	65 - 75 ft.		Well-drained, extended flooding	Birds, squirrels, other mammals
Swamp tupelo *(Nyssa sylvatica var. biflora)*	Deciduous	Green Spring	35 - 80 ft.		Extended flooding	Birds, bees, squirrels, other mammals
South Florida slash pine *(Pinus elliottii var. densa)*	Evergreen	Yellow Spring	50 - 75 ft.		Well-drained, occasionally wet	Squirrels, other mammals
Slash pine *(Pinus elliottii)*	Evergreen	Yellow Spring	75 - 100 ft.		Well-drained, occasionally wet	Squirrels, other mammals
Longleaf pine *(Pinus palustris)*	Evergreen	Yellow Spring	60 - 80 ft.		Well-drained	Squirrels, other mammals
Loblolly pine *(Pinus taeda)*	Evergreen	Yellow Spring	50 - 80 ft.		Well-drained,occasionally wet	Squirrels, other mammals
Sycamore *(Platanus occidentalis)*	Deciduous	Red Spring	75 - 90 ft.		Extended flooding - well-drained	
Southern red oak *(Quercus falcate)*	Deciduous	Brown Spring	60 - 80 ft.		Well-drained, occasionally wet	Squirrels, other mammals
Water oak *(Quercus nigra)*	Deciduous	Brown Spring	50 - 60 ft.		Extended flooding - well-drained	Squirrels, other mammals

Willow oak *(Quercus phellos)*	Deciduous	Brown Spring	60 - 75 ft.		Extended flooding - well-drained	Birds, squirrels, other mammals
Shumard oak *(Quercus shumardii)*	Deciduous	Brown Spring	55 - 80 ft.		Well-drained, occasionally wet	Squirrels, other mammals
Live oak *(Quercus virginiana)*	Semi-evergreen or evergreen	Brown Spring	60 - 80 ft.		Well-drained, occasionally wet	Birds, squirrels, other mammals
Bald cypress *(Taxodium distichium)*	Deciduous	Brown Spring	60 - 80 ft.		Well-drained, extended flooding	Birds, squirrels, other mammals
Pond cypress *(Taxodium ascendens)*	Deciduous	Brown Spring	50 - 60 ft.		Extended flooding, well-drained	Birds, squirrels, other mammals
Wingled elm *(Ulmus alata)*	Deciduous	Green Spring	45 - 70 ft.		Extended flooding - well-drained	
American elm *(Ulmus americana)*	Deciduous	Green Spring	70 - 90 ft.		Extended flooding - well-drained	Birds
Florida elm *(Ulmus Americana floridana)*	Deciduous	Green Spring	60 - 80 ft.		Extended flooding - well-drained	Birds
Cedar elm *(Ulmus crassifolia)*	Deciduous	Green Fall	50 - 70 ft.		Extended flooding - well-drained	

Medium Trees (25 – 50 ft.)						
Common name	**Type**	**Flower Color** **Flower Season**	**Mature Height**	**Light**	**Soil Moisture**	**Wildlife Value?**
Red Maple *(Acer rubrum)*	Deciduous	Red Spring, winter	60 - 75 ft.		Extended flooding – well drained	Birds, squirrels, other mammals
Black olive *(Bucida buceras)*	Evergreen	Greenish-yellow Spring, summer	40 - 50 ft.		Moist - well drained	
American Hornbeam *(Carpinus caroliniana)*	Deciduous	Orange to yellow Spring	20 - 30 ft.		Occasional flooding - well drained	Birds
Floss silk tree *(Chorisia speciosa)*	Evergreen	Pink, white Fall - winter	35 - 50 ft.		Occasional flooding - well drained	
Persimmon *(Diospyros virginiana)*	Deciduous	White/cream/ gray Late spring, summer	40 - 60 ft.		Extended flooding - well drained	Squirrels, other mammals
Pop Ash *(Fraxinus caroliniana)*	Deciduous	Yellow (male); green (female) Early spring	30 - 50 ft.		Extended flooding - well drained	Birds, host plant- Eastern tiger swallowtail butterflies

Loblolly Bay *(Gordonia lasianthus)*	Evergreen	White Late spring - summer	35 - 60 ft.		Extended flooding - poorly-drained	
Dahoon Holly *(Ilex cassine)*	Evergreen	White/cream/ gray Spring	20 - 30 ft.		Extended flooding - well drained	Birds, squirrels, other mammals
American Holly *(Ilex opaca)*	Evergreen	Green, white April-June	35 - 50 ft.		Extended flooding - well drained	Birds
Southern Golden Rain Tree *(Koelreuteria bipinnata)*	Deciduous	Yellow Summer	20 - 35 ft.		Occasional flooding - well drained	
Sweetbay Magnolia *(Magnolia virginiana)*	Deciduous, Evergreen - Semi-evergreen	Creamy-white June-September	40 - 50 ft.		Flood and drought tolerant	Birds, squirrels, other mammals
Swampbay *(Persea palustris)*	Evergreen	White Late spring - summer	30 - 40 ft.		Wet - Moist	Birds, squirrels, other mammals, hosts swallowtail butterfly
Blackjack oak *(Quercus marilandica)*	Deciduous	Brown Spring	15 - 45 ft.		Occasional flooding - well drained	Birds, squirrels, deer and other mammals
Bluejack Oak *(Quercus incana)*	Deciduous	Yellow Spring	30 - 35 ft.		Well drained	Birds, squirrels, deer and other mammals

Weeping Willow *(Salix babylonica)*	Deciduous	Yellow, Spring	45 - 70 ft.		Occasional flooding - well drained	Hosts gypsy moth
Winged Elm *(Ulmus alata)*	Deciduous	Green February - April	45 - 70 ft.		Extended flooding - well drained	Birds, small mammals
Drake Elm *(Ulmus parvifolia 'Drake')*	Semi-Evergreen, Evergreen	Green Fall	35 - 45 ft.		Occasional flooding - well drained	
Chinese Evergreen Elm *(Ulmus parvifolia)*	Deciduous or Evergreen	Green Fall	40 - 50 ft.		Occasional flooding - well drained	
Small Trees (up to 25 feet)						
Common name	**Type**	**Flower Color** **Flower Season**	**Mature Height**	**Light**	**Soil Moisture**	**Wildlife Value?**
Hazel alder *(Alnus serrulata)*	Deciduous	Reddish-green Mid-late March	8 - 12 ft.		Moist	Woodcock habitat
Buttonbush *(Cephalanthus occidentalis)*	Evergreen	White June - September	12 ft.		Wet - moist	Waterfowl, mammals
Fringetree *(Chionanthus virginicus)*	Deciduous	White Spring	20 - 30 ft.		Moist – well drained	Insects, birds, small mammals

Swamp dogwood *(Cornus foemina)*	Deciduous	White Spring	10 - 15 ft.		Well-drained	Birds
Summer haw *(Crataegus flava)*	Deciduous	White Late March	20 - 30 ft.		Well-drained	Birds, squirrels, other small mammals
Dahoon holly *(Ilex cassine)*	Evergreen	White/cream/ gray	20 - 30 ft.		Moist	Birds, squirrels, other mammals
Burford holly *(Ilex cornuta 'Burfordii')*	Evergreen	White/cream/ gray Spring	15 - 25 ft.		Well-drained	Birds and bees
Gallberry *(Ilex glabra)*	Evergreen	Creamy white May	6 - 8 ft.		Moist	Birds
Yaupon holly *(Ilex vomitoria)*	Evergreen	White to cream to gray	15 - 25 ft.		Wet - moist	Birds, insects, squirrels and other small mammals
Weeping yaupon holly *(Ilex vomitoria 'Pendula')*	Evergreen	White Spring	15 - 30 ft.		Extended flooding – well drained	Birds and bees
Simpson's stopper *(Myrcianthes fragrans)*	Evergreen	White Year-round	20 - 30 ft.		Wet – well drained	Butterflies, birds

Wax Myrtle *(Myrica cerifera)*	Evergreen	Green	15 - 25 ft.		Extended flooding – well drained	Birds, squirrels, other mammals
Wild Olive *(Osmanthus americanus)*	Evergreen	White Early spring	15 - 25 ft.		Moist – well drained	Birds
Coastal Plain Willow *(Salix caroliniana)*	Deciduous	Green Early spring	30 - 35 ft.		Moist	Deer, other grazing animals
Wild Lime *(Zanthoxylum fagara)*	Evergreen	Yellow Winter-spring	4 - 10 ft.		Moist to well-drained	Birds, squirrels, other mammals. host for many butterfly species
Shrubs						
Common name	**Type**	**Flower Color** **Flower Season**	**Mature Height**	**Light**	**Soil Moisture**	**Wildlife Value?**
Swamp Milkweed *(Asclepias incarnat)*	Annual or perennial	Orange, yellow, red Spring - fall	2 – 4 ft.		Moist – well drained	Butterflies, hummingbirds
Salt-Bush *(Baccharis halimifolia)*	Perennial shrub	Whitish Fall	8 - 12 ft.		Moist	Birds, bees, butterflies, other insects
American beautyberry *(Callicarpa americana)*	Perennial shrub	Lavender-pink June - August	5 - 8 ft.		Moist	Birds

Buttonbush *(Cephalanthus occidentalis)*	Perennial shrub	White Late spring - summer	4 - 8 ft.		Moist	Butterflies
Cocoplum, tender *(Chyrsobalanus icaco)*	Perennial shrub	Greenish-white Year-round	6 - 20 ft.		Wet – well drained	Gopher tortoise, small mammals
Florida Privet *(Forestiera segregate)*	Perennial shrub	Yellow Spring and Winter	10 - 20 ft.		Wet – well drained	Birds, bees, butterflies
Scarlet Hibiscus aka swamp mallow *(Hibiscus coccineus)*	Perennial, herbaceous	Deep red flowers Late summer	4 - 8 ft.		Wet - moist	Hummingbirds
Oakleaf Hydrangia *(Hydrangea quercifolia)*	Perennial shrub	White to Pink then Tan Fall	6 - 10 ft.		Wet	
Inkberry or Gallberry *(Ilex glabra)*	Perennial, evergreen shrub	Creamy White Spring	6 - 8 ft.		Moist	Birds
Sweetspire *(Itea virginica)*	Perennial shrub, semi-evergreen	White Mid-spring	3 - 4 ft.		Wet – well drained	Butterflies
Saltmarsh Mallow *(Kosteletzkya virginica)*	Perennial, herbaceous	Pink June-Sept	3 - 6 ft.		Wet - moist	Hummingbirds, bees and butterflies

Rusty lyonia *(Lyonia ferruginea)*	Perennial, evergreen shrub	White Spring	10 - 20 ft.		Wet – well drained	Caterpillar food
Shiny lyonia aka Fetterbush *(Lyonia lucida)*	Perennial, evergreen shrub	White to pink Late winter - early spring	3 - 5 ft.		Wet	Deer, butterflies, other insects
Wax myrtle *(Myrica cerifera)*	Perennial, evergreen tree or large shrub	Green Spring	15 - 25 ft.		Wet – well drained	Birds
Myrsine *(Myrsine cubana)*	Perennial, evergreen shrub	Greenish-yellow Year-round	7 - 20 ft.		Wet - well drained	Butterflies
Swamp rose *(Rosa palustris)*	Perennial shrub	Dark rose-pink Spring - fall	6 - 12 ft.		Wet - moist	Birds, bees
Swamp azalea *(Rhododendron serrulatum)*	Perennial shrub	White May - July	15 ft.		Wet	
Swamp azalea *(Rhododendron viscosum)*	Perennial shrub	Red Spring-summer	13 - 16 ft.		Wet	
Dwarf palmetto *(Sabal minor)*	Perennial shrub	White May - June	5 – 10 ft.		Extended flooding – well drained	Birds, squirrels, other small mammals

Elderberry *(Sambucus nigra* subsp. *Canadensis)*	Deciduous shrub	White May - October	12 - 20 ft.		Well drained	Birds, squirrels, other small mammals
Walter's viburnum *(Viburnum obovatum)*	Perennial	White Spring	8 - 25 ft.		Occasional flooding – well drained	Butterflies, birds
Perennials						
Common name	**Type**	**Flower Color** **Flower Season**	**Mature Height**	**Light**	**Soil Moisture**	**Wildlife Value?**
Swamp Milkweed *(Asclepias incarnat)*	Annual or perennial	Orange, yellow, red Spring - fall	2 – 4 ft.		Moist – well drained	Butterflies, hummingbirds
Sea oxeye daisy *(Borrichia frutescens)*	Perennial	Yellow Year-round	2 - 4 ft.		Moist	Butterflies
Yellow Canna *(Canna flaccida)*	Perennial	Yellow Summer	3 - 5 ft.		Moist	
Tickseed *(Coreopsis lanceolata)*	Perennial	Yellow Spring - summer	1 – 2 ft.		Occasional flooding – well drained	Birds, bees, butterflies, hummingbirds
Yellow African Iris *(Dietes bicolor)*	Perennial	Yellow Year-round	2 - 4 ft.		Moist	

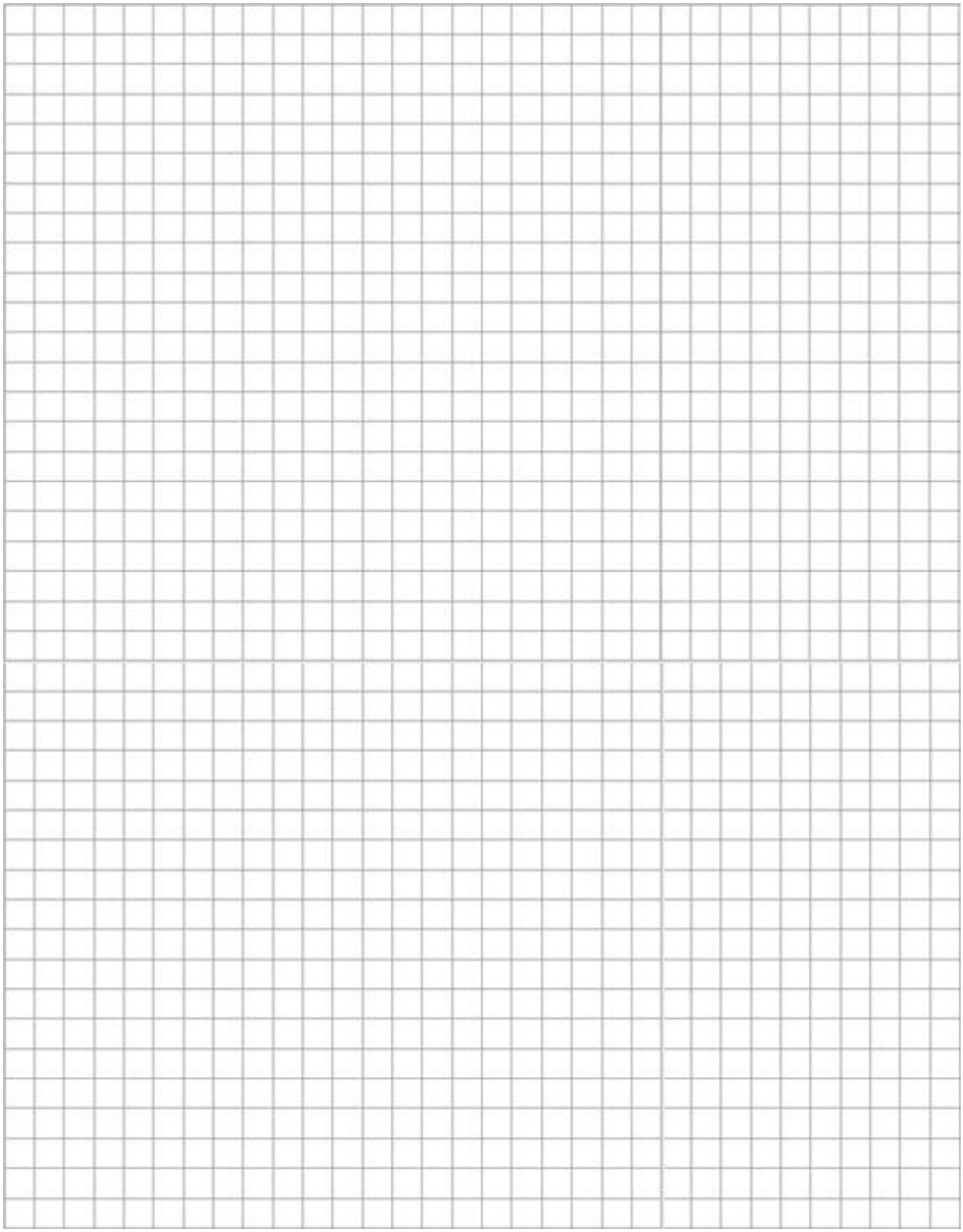
African Iris *(Dietes vegata)*	Perennial	White Year-round	2 - 6 ft.		Moist	
Yellowtop *(Flaveria linearis)*	Perennial	Yellow	2 - 4 ft.		Moist – well drained	Butterflies and bees
Swamp Sunflower (*Helianthus angustifolius)*	Perennial	Yellow Summer/ Fall	2 - 6 ft.		Moist	Butterflies
Scorpion Tail, butterfly heliotrope (*Heliotropium angiospermum)*	Perennial	White Year-round	1.5 - 3 ft.		Moist – well drained	Bees and butterflies
Spider Lily *(Hymenocallis latifolia)*	Perennial	White Year-round	1 - 3 ft.		Moist	
Blue-Flag Iris *(Iris hexagona)*	Perennial	Deep Purple	4 ft.		Moist	
Flag Iris *(Iris virginica)*	Perennial	Blue Spring	4 - 7 ft.		Moist	
Cardinal Flower *(Lobelia cardinalis)*	Perennial	Red Summer/Fall	1 - 6 ft.		Moist – well drained	Hummingbirds
Frog fruit *(Phyla nodiflora)*	Perennial	Violet, lavender, white Spring - fall	0.5 – 1 ft.		Moist – well drained	Birds, bees, butterflies

False Dragonhead *(Physostegia purpurea)*	Perennial	Purple Summer/ fall	2 - 3 ft.		Moist	Hummingbirds
False Dragonhead *(Physostegia virginiana)*	Perennial	White; rose-purple Summer/ fall	2 - 3 ft.		Moist	Butterflies and hummingbirds
Pickerel weed *(Pontederia cordata)*	Perennial	Purple Year-round	3 - 5 ft.		Wet - moist	Butterflies
Black-eyed Susan *(Rudbeckia hirta)*	Biennial	Yellow June - September	1 – 3 ft.		Occasional flooding – well drained	Birds, bees, butterflies
Duck Potato *(Sagittaria latifolia)*	Perennial	White Year-round	2 - 4 ft.		Wet - moist	
Goldenrod *(Solidago spp)*	Perennial	Yellow Fall	2 - 6 ft.		Wet – well drained	Butterflies and hummingbirds
Bog sage *(Salvia uliginosa)*	Perennial	Blue Spring-summer	3-4 ft.		Wet – well drained	Butterflies and hummingbirds
Climbing aster *(Symphyotrichum carolinianum)*	Perennial	Pink Fall	To 10 ft.		Wet - moist	Bees, butterflies

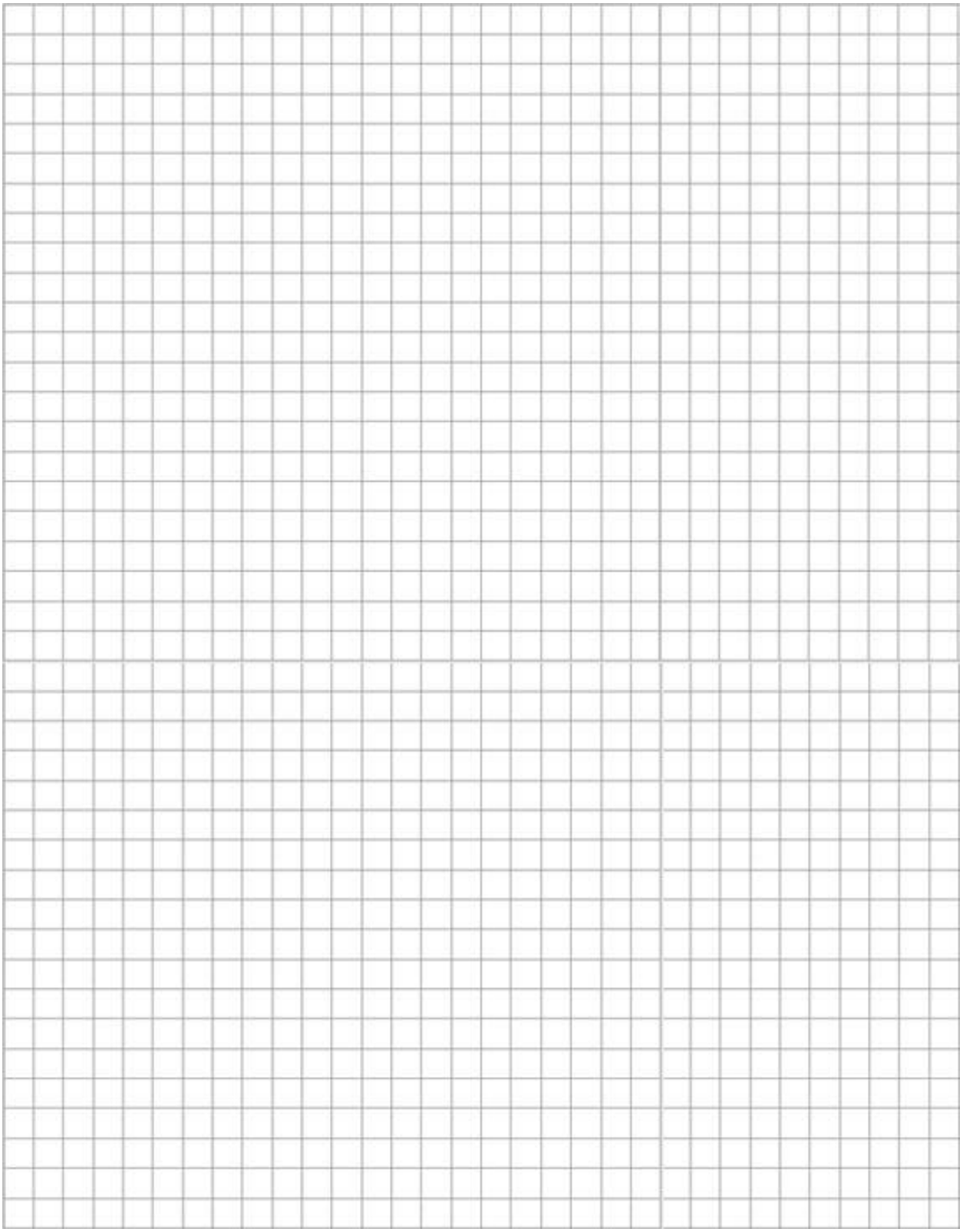
Ironweed *(Veronia gigantean)*	Perennial	Red, violet, magenta Mid-summer	3 – 6 ft.		Extended flooding – well drained	Bees, butterflies, hummingbirds
Rain lily *(Zephyranthes spp.)*	Perennial	White, yellow, red, orange, pink Summer - fall	0.5 – 1 ft.		Occasional flooding – well drained	Butterflies, bees
Ferns, Ornamental Grasses						
Cinnamon fern *(Osmunda cinnamomea)*	Fern	Non-flowering	2 - 6 ft.		Extended flooding - moist	Cover for birds
Royal fern *(Osmunda regalis)*	Fern	Non-flowering	2 – 5 ft.		Extended flooding - moist	Cover for birds
Muhly grass *(Muhlenbergia capillaris)*	Grass	Pink-purple Fall	3 – 4 ft.		Occasional flooding – well drained	Birds, bees
Blue-eyed grass *(Sisyrinchium angustifolium)*	Grass	Blue, violet Spring, summer	0.5 – 1.5 ft.		Occasional flooding – well drained	Small mammals, butterfly larvae
Sand cordgrass *(Spartina bakeri)*	Grass	Brown Spring	3- 5 ft.		Extended flooding – well drained	Butterfly larvae, small mammals

WORKSHEETS

Plot plan for your property



Your Rain Garden Design



NOTES:

CREDITS/REFERENCES

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