



# 4-H FLORIDA-FRIENDLY LANDSCAPING™

## 4-H Florida-Friendly Landscaping™ Leader Guide

### Credits and Acknowledgments

#### 4-H Florida-Friendly Landscaping™ Curriculum

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### Preface

Florida-Friendly Landscaping™ (FFL) protects natural resources through water conservation, waste and nonpoint source pollution reduction, erosion prevention, and creation of wildlife-sustaining habitats by implementing science-based landscaping practices (Trenholm et al., 2009). The *4-H Florida-Friendly Landscaping™ Curriculum* fosters environmental stewardship among youth and allows them to engage in conserving water, soil, and vegetation resources from an early age.

This curriculum addresses Florida's unique environment and may be used alone or as a supplement to the 4-H Junior Master Gardener curriculum. Through the *4-H Florida-Friendly Landscaping™ Curriculum*, youth will learn the nine basic principles of FFL, including water, soil, and vegetation conservation, through landscape and gardening activities. This curriculum targets youth in grades 6 to 8 (ages 10 to 14) and contains both classroom and home activities that allow youth to understand and engage with the world around them, thereby helping them gain life skills in the areas of Head, Heart, Hands, and Health.

Written by John Pipoly, Angelina Toomey, Sarah Hensley, Esen Momol, Jennifer W. Marvin, and Kelly Perez

An Equal Opportunity Institution. 4-H is the nation's largest youth development organization. Over 230,000 members in the State of Florida help to make up the community of more than 6.5 million young people across America. 4-H is a non-formal, practical educational program for youth. Florida 4-H is the youth development program of Florida Cooperative Extension, a part of the University of Florida/IFAS.

All volunteers and instructors utilizing this resource should work with their local 4-H Extension agent to appropriately enroll youth in 4-H in order for them to experience the full benefits of the UF/IFAS Extension 4-H Youth Development program and to receive credit for completion of a 4-H project.

Each activity utilizes the Experiential Learning process (Figure 1) and the Targeting Life Skills model. Therefore, each unit contains 3 hands-on activities and integrates multiple life skills. Instructors should ensure time to complete the process through **Doing** the activity. There is an in-class activity, a self-guided home activity, and an optional activity to further explore the topic covered in the lesson. After each activity is a set of question prompts for the instructor to help youth **Reflect** on the learning experience and understand both the FFL principles taught and the life skills that the lesson is built to teach or enhance. Finally, youth will **Apply** what they have learned through the completion of each activity and the reflection about the experience. A series of pre- and post-test evaluations for each lesson are provided at the end of this guide.

Table 1. Targeted 4-H Life Skills

Head	Heart	Hands	Health
<b>Thinking</b> <ul style="list-style-type: none"> <li>• Decision-making</li> <li>• Problem-solving</li> <li>• Critical thinking</li> <li>• Learning to learn</li> </ul>	<b>Relating</b> <ul style="list-style-type: none"> <li>• Cooperation</li> <li>• Conflict resolution</li> <li>• Communication</li> </ul>	<b>Giving</b> <ul style="list-style-type: none"> <li>• Responsible citizenship</li> <li>• Contribution to group</li> <li>• Community service/volunteering</li> </ul> <b>Working</b> <ul style="list-style-type: none"> <li>• Teamwork</li> <li>• Self-motivation</li> </ul>	<b>Living</b> <ul style="list-style-type: none"> <li>• Personal safety</li> <li>• Being</li> <li>• Self-responsibility</li> </ul>
<b>Managing</b> <ul style="list-style-type: none"> <li>• Planning/organizing</li> <li>• Using resources wisely</li> <li>• Keeping records</li> </ul>			

Each lesson should take no more than 90 minutes total. Instructors will need to consider the age of the youth when planning the learning experience. The background material may be introduced and should not take more than 15 minutes. Instructors do not need to share this information in “lecture” format. Rather they may decide to utilize the knowledge as background information to reinforce and introduce throughout the provided hands-on activities and subsequent reflection on learning principles. The suggested outline below is recommended for each activity for the target age group (10–14).

- ✓ Topic introduction—15 minutes
- ✓ Experience (do the activity)—20 minutes
- ✓ Reflect & Apply—15 minutes

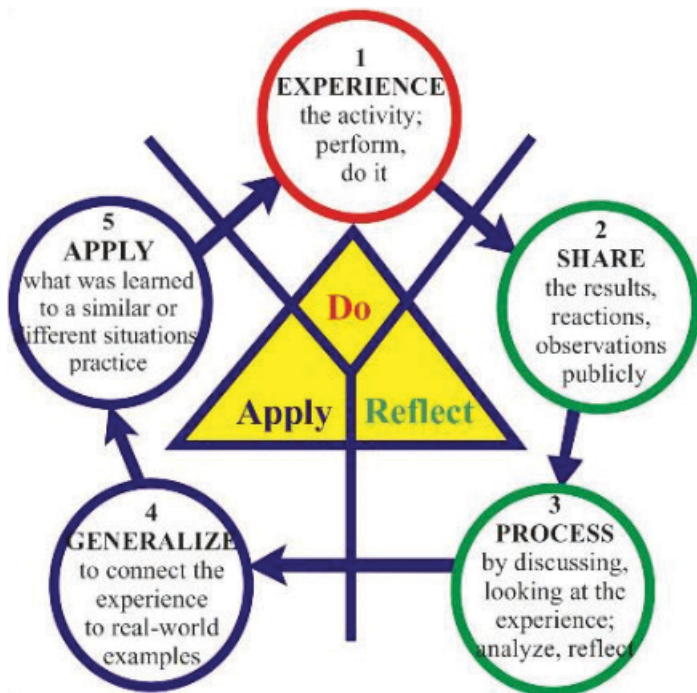


Figure 1. Experiential Learning Model from Norman & Jordan (2016).

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# *RIGHT PLANT, RIGHT PLACE*



*LANDSCAPING PRINCIPLES FOR  
FLORIDA-FRIENDLY YARDS*

## UNIT 1: Introduction & Right Plant, Right Place

### Purpose

The purpose of this unit is to help youth understand vegetation types, habitats of different plant species, and ways in which these factors influence where we may use a given species in a landscape to ensure that the landscape is sustainable, with minimum water, fertilizer, and pest control usage.

### Objectives

At the end of this unit, youth will be able to:

- Identify the following vegetation types and learn the most important species from each:
  - Mangrove
  - Beach/dune
  - Hammock
  - Freshwater wetland
- Identify and explain the four major growing zones (hardiness zones) in Florida
- Understand the criteria for *Right Plant, Right Place*:
  - Distance from ocean
  - Soil type and composition (pictures and samples)
  - Sun exposure
  - Water considerations

### Lesson

The use of colorful maps, pictures of vegetation types, and plant samples will greatly facilitate presentation of topics.

Youth will complete three activities to become:

- A plant ecologist by Placing Plants within the proper vegetation type and hardiness zone.
- A plant explorer in a Plant Scavenger Hunt and search near their homes (or other suitable location) for important plant species.
- A plant detective by observing and identifying the species in a habitat near their home.

### Learning Activities

- In-Class Activity: “Placing Plants”
- Home Activity: “Plant Placement Scavenger Hunt”
- Further Florida-Friendly Activity: “Be a Plant Detective”

### Preparation

- Review background information.
- Review lesson activities and make choices based on youth audience.
- Collect and prepare materials (maps, plant specimens, etc.) for activities.
- Provide each youth with a copy of *The Florida-Friendly Landscaping™ Guide to Plant Selection & Landscape Design (2015)*. ([https://fl.ifas.ufl.edu/media/flifasufledu/docs/FYN\\_Plant\\_Selection\\_Guide\\_2015.pdf](https://fl.ifas.ufl.edu/media/flifasufledu/docs/FYN_Plant_Selection_Guide_2015.pdf)) Note: these resources will be useful throughout the curricula. If you cannot provide a copy for each youth, print one per group, or allow youth to view this guide on a computer or projection screen. You can also find this information in the free online Plant Guide app at <https://fl.ifas.ufl.edu/plants/>.

### Background Information

#### • What is a biome and what is a plant habitat?

- ✓ A **biome** is a particular combination of plant communities with a given climate pattern, flowering or fruiting period, growth form, and dominant species.
- ✓ A plant **habitat** is a combination of soil, light, water, and other environmental factors that provide the best home for a community of species, which is what lives in the habitat. The habitat may occur in one or among several different ecosystems. Several ecosystems make up a biome.

For example, the **habitat** of the marlberry (*Ardisia escallonioides*) consists of dry to somewhat moist sandy soils over basic (coral or limestone) rocks. These conditions are found in the following Florida **biomes**: Florida Scrub, Mesic Flatwood, and

Rockland Hammock. Note that **the species has only one habitat**, found among **several ecosystems** that make up a **biome**, all of which have sandy, very well-drained soil over limestone rocks.

- **What are the four major “hardiness” (growing) zones in Florida and how are they defined?**

- ✓ The four major growing regions of Florida include the subtropical zone, the south Florida subtropical zone, the central Florida transitional area, and the northern Florida area, which is a part of the Southern Coastal Plain. These areas correspond very well to the United States Department of Agriculture’s Plant Hardiness Zones. The “hardiness of a plant” is the ability of the plant to survive days of cold weather.

**Zone 8** is defined as an area with an average annual low temperature of 10 to 20 degrees Fahrenheit. This corresponds to the portion of northern Florida that lies within the Southern Coastal Plain. It has plants that can tolerate freezing temperatures for short periods of time without dying.

**Zone 9** contains areas with an average annual low temperature of 20 to 30 degrees Fahrenheit. It corresponds to central Florida and includes some of the state’s most biodiverse areas. This region is where the temperate (4 seasons) flora of North America meets the limit of the subtropical (2 seasons) Caribbean flora, and it is home to the globally endangered Florida scrub vegetation type. Plants from this zone can tolerate some freezing temperatures but are more sensitive than those of Zone 8.

**Zone 10** consists of areas with an average annual low temperature of 30 to 40 degrees Fahrenheit. This corresponds to the subtropical portion of south Florida, which is most closely related to the Caribbean islands. Native plants in this region are mostly cold-intolerant. During a cold winter, many die-offs occur. On the other hand, many of the native species in this area are adapted to hurricanes and other storms. These plants can either easily break off small pieces and leave the most important parts behind or survive strong winds through a very low profile.

Until 2012, **Zone 11**, the subtropical zone defined by average annual temperatures of 40 degrees or higher, was present in the United States only in Hawaii, Puerto Rico, American Samoa, the Virgin Islands, and Key West. The new Hardiness Zone Map published in 2012 shows that climate change has extended that zone northward along the Atlantic Ocean shoreline all the way to Sunny Isles Beach near the city of Aventura in Miami-Dade County. These plants do not tolerate any freezing temperatures and will die if exposed to them.

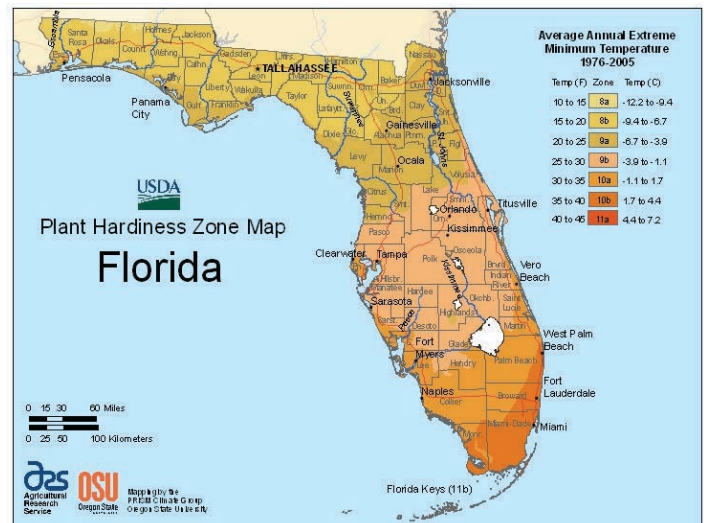


Figure 2. USDA Plant Hardiness Zone Map. Agricultural Research Service, US Department of Agriculture. Accessed on February 26, 2019 from <https://planthardiness.ars.usda.gov/>

- **What is a mangrove?**

- ✓ **Mangroves** are woody plants that grow at the land-sea interface in tropical and subtropical latitudes. These plants as well as the associated microbes, fungi, plants, and animals make up the **mangrove forest community**, or **mangal**. Mangroves have special adaptations to secrete the salt that is in seawater, and they buffer the land from storms while providing a sheltered habitat for all sorts of life at the ocean’s edge, such as shrimp, land crabs, snakes, grubworms, frogs, and other animals unique to this vegetation type.
- ✓ Mangroves have prop roots that help maintain stability despite the tides. Certain species have pneumatophores, which act like breathing tubes for each plant’s roots and help the roots obtain oxygen

above the high tide level. Each of these plants has unique water filtering systems to remove salt from the water they use to survive.

- ✓ A mangrove forest community is home to several woody species that are arranged in a definite order from water to land, as seen in Figure 6. Some of the most important species include:
  - The red mangrove (*Rhizophora mangle*)—prominent in all mangrove communities worldwide. Red mangroves are found throughout the mangrove forest community but appear most often at its margin in the estuary, where fresh and salt water mix.



Figure 3. Red Mangrove. Credit: Pinellas County Government

- ✓ The white mangrove, (*Laguncularia racemosa*)—an interesting plant with extrafloral nectaries at the base of the leaf blade, which produce sweet nectar to attract ants that defend the plant against pests. At one time, certain authors incorrectly claimed that the petiolar glands were related to salt management.
- ✓ The black mangrove (*Avicennia germinans*)—more inland than the red or white mangrove. It has the best-developed pneumatophores and is known for the copious amount of salt water it processes, often leaving the upper surface of its leaves covered in salt.



Figure 4. Black mangrove. Credit: Debbie Chayet

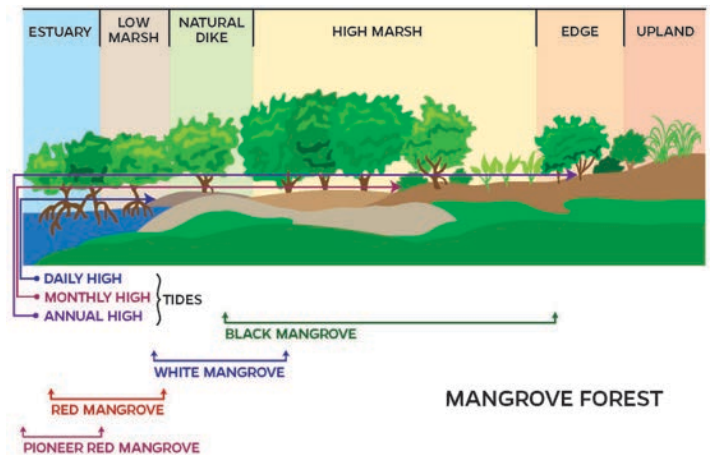


Figure 5. Mangrove forest. Credit: UF/IFAS ICS

- **What is a beach/dune? How is it defined? What are the critical plant species and what unique characteristics do they possess?**
  - ✓ A coastal beach/dune formation is an area where sand accumulates from the coastline and beach, forming a hill inland due to wind effects. The first sand hill from the beach toward the shore is called a *foredune*, *primary dune*, or *frontdune*, and it is dominated by sea oats, a grass with large roots that hold the sand together and allow further development of the dune. Behind this area, there is often an interdune with a swale, followed by a third area called a rear or *secondary dune* (Anthoni, 2000).
  - ✓ The beach/dune has a number of critical species that stabilize the dune and permit **strand** vegetation, the next environment proceeding inland, to form.

- ✓ The most important dune-stabilizing species is sea oats, *Uniola paniculata*. There are also several important vines on the beach, such as beach peanut (*Okenia hypogaea*), railroad vine (*Ipomoea pes-caprae*), puncture vine (*Tribulus cistoides*), bay bean (*Canavalia rosea*), and coinvine (*Dalbergia ecastaphyllum*).
  - ✓ BE CAREFUL around any plant that looks as though it has long hairs! The stinging nettle, *Urtica dioica* L., is very common throughout Florida, and its hair stings are painful.
- **What is a hardwood hammock? How is it defined?**
    - ✓ A **tropical hardwood hammock** is defined as a broad-leaved, evergreen forest with a well-developed canopy (Karim & Main, 2018).
    - ✓ Hammocks often form on higher ground than other adjacent vegetation types do. These forests are usually less than 50 feet tall because the regular occurrence of hurricanes and other storms frequently cause damage to the branches of the canopy.
    - ✓ The shade of the canopy allows bromeliads and other **epiphytes** (plants that grow on top of others) to do very well on the larger branches and trunks. Most soils in hammocks are rather shallow but rich in organic matter (decayed leaves, twigs, fruits, or animal matter), even if that matter is tucked between large rocks (e.g., limestone).
  - **What does the term “wetland” mean?**
    - ✓ The term **freshwater “wetlands”** describes bogs, swamps, marshes, fens, and similar areas found in flat or depressional areas between dry land and water and along the shores of rivers and lakes as well as coastlines.

[mblwhoilibrary.org/bitstream/handle/1912/64/WHOI-2000-09.pdf?sequence=3](http://mblwhoilibrary.org/bitstream/handle/1912/64/WHOI-2000-09.pdf?sequence=3)

Wetlands Protection and Restoration: <https://www.epa.gov/wetlands>

Ducks Unlimited Florida Conservation Projects: <https://www.ducks.org/florida/florida-conservation-projects>

## Unit Resources

Oceanography: Dunes and Beaches: <http://www.seafriends.org.nz/oceano/beach.htm>

The Coastal Landform System Sustainability Project: An Analysis of Activities Permitted on Coastal Landforms on Cape Cod, Massachusetts in 1999: <https://darchive.org/>



## IN-CLASS ACTIVITY: PLACING PLANTS

### Objectives

Youth will be able to:

- Understand criteria for Right Plant, Right Place.
- Identify hardiness zones of Florida (climate patterns).
- Determine the differences between various biomes.

### Life Skills

- Decision-making
- Wise use of resources
- Contribution to group
- Teamwork

### Setting

- A comfortable room with tables and chairs

### Materials Needed

- Topographical Map of Florida (Appendix A and Resource Folder) ([https://upload.wikimedia.org/wikipedia/commons/e/e9/Florida\\_topographic\\_map-en.svg](https://upload.wikimedia.org/wikipedia/commons/e/e9/Florida_topographic_map-en.svg))
- *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design* ([https://fll.ifas.ufl.edu/media/fllifasufledu/docs/FYN\\_Plant\\_Selection\\_Guide\\_2015.pdf](https://fll.ifas.ufl.edu/media/fllifasufledu/docs/FYN_Plant_Selection_Guide_2015.pdf)) or the free online FFL Plant Guide app at <https://fll.ifas.ufl.edu/plants/>
- Plant Hardiness zone map in Appendix B and on page 39 of workbook
- “Placing Plants” activity on page 2 of workbook

### Introduction

Why do you need to know where plants should go? Proper plant placement helps to make sure that plants will grow! Florida has four different climate-dependent growing regions, called hardiness zones. The “hardiness” of a plant is the ability of the plant to survive days of cold weather. A lower zone number means lower temperatures. The zone number gets higher the farther south you travel.

As a scientist, it is important for you to recognize that there are a variety of landforms in Florida, such as coastlines, dunes, rivers, and lakes, and understand that

different plants that require different conditions and climates to thrive live in these areas.

Look at a map of Florida. (The instructor should show a topographical map of Florida to the students.) What do you notice about the map’s geographic features? Can you point out any of the habitats we discussed? Then, look at the questions below. Each question describes a plant that needs to be placed properly. See if you can place plants both according to their vegetation type and hardiness zone.

### Do

- Youth will be broken into five groups and assigned the task of placing plants in their designated zones and vegetation types (mangroves, beach dune plant, pine tree, bald cypress, oak, etc.) on the map of Florida based on their descriptions.
- Youth should use their copy of *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design Guide* or the Plant Guide app (<https://fll.ifas.ufl.edu/plants/>) and write the name of the plant on the map in the area they think it would most likely be found.
- There may be more than one answer. Sometimes plants are found in more than one geographic location.

### Reflect

- What does “hardiness” mean with respect to plants?
- Identify and discuss the four hardiness zones in Florida.
- What is the difference between a plant habitat and biome?
- Which biome is in the county where you live? Look around your school, home, or park. What do you notice about the vegetation types?
- What did you think about as your group was deciding where to place the plant?
- Did the map help you decide where to place each plant?
- Did your group have any disagreements? How did you make a choice?

### Apply

- Identify the hardiness zone in which you live. Travel to the nearest garden store and make a list of plants that

would thrive in your hardiness zone. To be Florida-Friendly, you could purchase, plant, observe, and care for at least one plant on your list.

- Can you share an example of another time when you worked in a group to make a decision? What worked and what did not?
- Can you think of ways to improve your decision-making process the next time you have a big decision to make? Let's share.

## HOME ACTIVITY: PLANT PLACEMENT SCAVENGER HUNT

### Objectives

Youth will be able to:

- Understand that plants live in different habitats, which are part of an ecosystem.
- Identify various plants based on a field guide.

### Life Skills

- Learning to learn
- Keeping records

### Setting

- An outdoor area to explore
- A comfortable room with tables and chairs

### Materials Needed

- *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design* ([https://ffl.ifas.ufl.edu/media/fflifasufledu/docs/FYN\\_Plant\\_Selection\\_Guide\\_2015.pdf](https://ffl.ifas.ufl.edu/media/fflifasufledu/docs/FYN_Plant_Selection_Guide_2015.pdf))
- “Plant Placement Scavenger Hunt” activity on page 4 of workbook
- Binoculars (optional)

### Introduction

You will receive a checklist of items to find around the area where you live or attend school. Use *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design* ([https://ffl.ifas.ufl.edu/media/fflifasufledu/docs/FYN\\_Plant\\_Selection\\_Guide\\_2015.pdf](https://ffl.ifas.ufl.edu/media/fflifasufledu/docs/FYN_Plant_Selection_Guide_2015.pdf)) to help you identify items on the list. Each item on the checklist can be found in *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design*. The point system is based on the number of plants that are successfully located. This activity can be competitive or noncompetitive. For competitive scavenger hunts, the individual or team with the highest point total wins.

If you live in an area where there is not a lot of vegetation, see what you can find around your school, library, or local park. Be safe and go with a buddy or parent. For instructors needing to adapt this lesson to a classroom without an outdoor area to explore, utilize magazines to cut out pictures, or conduct a web-based scavenger hunt.

### Do

- Orient youth to the checklist of species to be found and to *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design*.
- The checklist is available on page 5 of the workbook.
- Youth should go on the scavenger hunt with a parent or guardian.
- Youth will use the checklist of species to find the items around the area in which they live (or in another place, such as their school or a park). Youth can simply notate on their checklist when they find items, or they can take pictures.
- In the next class, set aside time for youth to make a decision on how “Florida-Friendly” the landscape is by completing this activity. Youth should make their decision based on the number of points calculated.

### Reflect

- What types of Florida-Friendly plants were seen most often in your scavenger hunt, the least, or not at all?
- Was it difficult to identify the plants using *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design*?
- Would you say the area you explored was a Florida-Friendly Landscape™? Why or why not?
- Discuss ways to make the landscape more Florida-Friendly or practices that homeowners and landscape professionals can make when designing a new landscape.

### Apply

- Are there plants that can only be found in the northern, central, or southern parts of Florida?
- Why do you think some plants grow in different regions? (Prompt for geography, climate, the ecosystem, etc.)
- As you searched for the plants on your list, did you find it easy or hard to record your findings?
- Are there other times when you need to focus and record ideas or information while completing a task? Prompt youth for examples and discuss how they can keep records appropriately.



# UNIT 1: Introduction and Right Plant, Right Place

## In-Class Activity: Placing Plants

You will be assigned the task of placing plants in their designated zones on the map of Florida based on their descriptions.

**Example:** “I am a red mangrove tree. I enjoy the sun and the sand and like to watch the tides change. I provide a habitat for oysters and other creatures. Where do I live?”

In small groups, become **plant ecologists** and place the plant species within the proper vegetation type/habitat and hardiness zone on the map.

Why do you need to know where plants should go? Proper plant placement helps to make sure that plants will grow! Florida has four different climate-dependent growing regions called hardiness zones. The “hardiness” of a plant is the ability of the plant to survive a given period of cold weather. A lower zone number means lower temperatures. The farther south you travel, the higher the zone number gets!

As a scientist, you have to recognize that there are a variety of landforms in Florida, such as coastlines, dunes, rivers, and lakes, and understand that different plants require different climates to thrive in these areas.

Take a look at the topographical map of Florida that is in your workbook on page 38. What do you notice about the map’s geographic features? Can you point out any of the habitats we discussed? Then, look at the questions below. Each question describes a plant that needs to be placed properly. See if you can place plants both according to their habitat and hardiness zone (map provided on page 39 of workbook). Can you identify the plants based on your current knowledge and their descriptions? Hint: Look at the photos of the plants. Their visual characteristics might help you identify their habitat and/or hardiness zone.

Find each plant on *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design* or in the Plant Guide app (<https://fl.ifas.ufl.edu/plants/>) and write the plant’s name on the map in the spot where you think it would most likely be found. Don’t worry if there is more than one answer. Sometimes, plants are found in more than one geographic location!

1. I am a Red Mangrove tree. I enjoy the sun and the sand and like to watch the tides change. I provide a habitat for oysters and other creatures. Where do I live?
2. I am a Two-Winged Silverbell. I can tolerate freezing temperatures. I live in sandy soil and can tolerate some sun but prefer shade. My bell-shaped small white flowers appear before my leaves. Where do I live?
3. I am a Cocoplum. I do not like the cold, but I do like animals. Sometimes I like the sun, but other times, I enjoy the shade. I produce a plum that is sweet to the taste, even though I really like salt. Where do I live?
4. I am a Floss-silk Tree. I grow very fast but don't like the cold. I grow in any well-drained soil, but I don't like salt. Where do I live?
5. I am a Royal Palm. I love warm weather and hate when it's cold. I don't like tons of salt. Where do I live?
6. I am a Loblolly Bay. I do best in moist areas and am not very drought tolerant. I don't like salt. I can be in the sun, but prefer partial shade. Where do I live?
7. I am a Gumbo Limbo Tree. When I grow up, I am really tall—about 40 feet! I like mostly warm, sunny weather and salt. My leaves fall off as it gets colder. Where do I live?
8. I am a Florida Maple. I like freezing temperatures and very acidic soil. I am very drought tolerant but don't like salt. Where do I live?
9. I am an Inkberry. I love the salt and dry conditions like those found in sand and loam. I do well in the heat and full sun. Where do I live?
10. I am a Fringetree. I don't mind cold weather. I will tolerate sun but prefer a little shade. I also don't mind when it gets windy but don't like salty conditions. Where do I live?

## Home Activity: Plant Placement Scavenger Hunt

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Use *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design* or the Plant Guide web app and the checklist on the next page to find plants around your home or school. Score points for each plant you find, up to the total number of possible points. This activity can be competitive or noncompetitive. For competitive scavenger hunts, the individual or team with the highest point total wins.

If you live in an area where there is not a lot of vegetation, see what you can find around your school, library, or local park. Bring your *Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design*, and be safe and go with a parent!

Plant or Item	Possible Points	Points Awarded
<b>Large Trees</b>		
Red maple (p. 32)	10	
Sand pine (p. 34)	5	
Live oak (p. 36)	5	
<b>Medium Trees</b>		
Japanese blueberry (p. 39)	10	
Crape myrtle (p. 40)	5	
Swamp bay (p. 41)	10	
<b>Small Trees</b>		
Loquat (p. 45)	10	
Olive (p. 47)	5	
Podocarpus (p. 47)	5	
<b>Large Shrubs</b>		
Agave (p. 50)	10	
Pawpaw (p. 51)	10	
Beautyberry (p. 52)	5	
<b>Small Shrubs</b>		
Aloe (p. 64)	5	
Rosemary (p. 66)	10	
<b>Vines</b>		
Trumpet creeper, trumpet vine (p. 67)	10	
Morning glory (p. 68)	5	
Passion vine (p. 69)	10	
<b>Wildlife</b>		
Butterfly	5	
Hummingbird	10	
Bird	5	
<b>Other Florida-Friendly Plants or Wildlife from Guide</b>		
	10	
	10	
	10	
	10	
	10	
<b>Point Total (out of 200)</b>		

## Further Florida-Friendly Activity

### Be a Plant Detective

In this unit you learned about habitats and types of plants that live in different places. If you would like to learn more about habitats, go with an adult and record your observations.

Become a **plant detective** and ask yourself the following questions: What do you notice about the geography? What animal life can be found there? Are any of the plants you learned about present in that habitat? If you are in a park or natural area, you may want to ask a naturalist, park staff member, or volunteer to tell you more about the type of habitat you visited.

## See Your Reflection

What was the most challenging part of this unit?

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# WATER EFFICIENTLY



**LANDSCAPING PRINCIPLES FOR  
FLORIDA-FRIENDLY YARDS**

## UNIT 2: Water Efficiently

### Purpose

The purpose of this unit is to help youth develop an understanding of the importance of efficient watering by providing information about types of water and the way in which water is distributed.

### Objectives

By completing this unit, youth will be able to:

- Identify the sources of Florida's water.
- Understand the following types of water: city, rain, well, reclaimed.
- Explain the purpose of a water management district.
- Identify types of sprinklers.

### Lesson

Youth will have opportunities through the three provided activities to:

- Become water managers and learn the importance of developing a water management plan for a water shortage due to drought.
- Learn about types of sprinklers and observe and record water levels in "Water, Water Everywhere."
- Discover the difference between residential and commercial watering practices through an Irrigation Interview.

### Learning Activities

- In-Class Activity: "Water Managers"
- Home Activity: "Water, Water Everywhere"
- Further Florida-Friendly Activity: "Irrigation Interview"

### Preparation

- Review background information.
- Review activities.
- Collect and prepare materials for activities.

### Background Information

#### • Where does Florida's water come from?

We all know that there are lakes, rivers, and the ocean, but rain is one of the best sources of water! Rain recharges *aquifers*, which are layers of porous rocks (with holes that allow water movement) under the soil that hold water. In Florida, we have several aquifers (US Geological Survey, 2000). This is an ideal resource to share with students (Appendix C and Resource Folder).

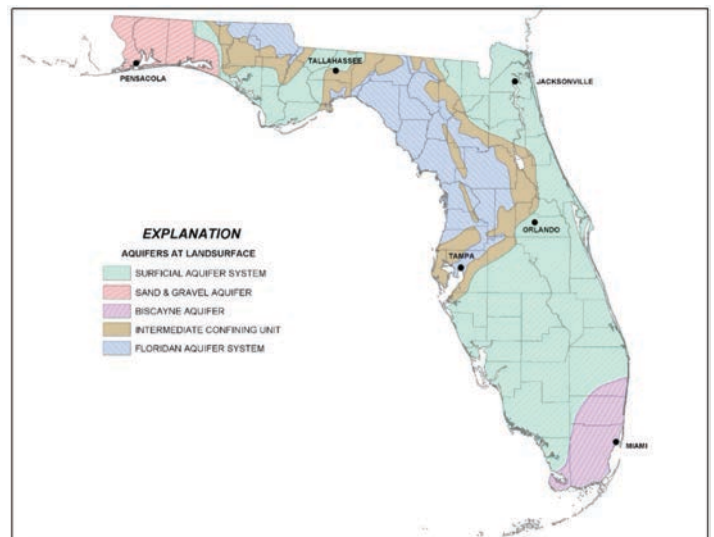


Figure 6. Florida Aquifers. (Graphic Credit: <https://fldep.dep.state.fl.us/swapp/Aquifer.asp>)

- ✓ **Sand-and-gravel aquifer:** located in the far western section of the Florida Panhandle
- ✓ **Floridan aquifer system:** runs north of Tampa along the Gulf Coast up to Tallahassee
- ✓ **Surficial aquifer system:** the largest; runs southward from the Carolinas along central Florida as well as the east coast of Florida, then southwestward to far west Monroe County
- ✓ **Biscayne aquifer:** runs south from southeast Palm Beach and southwestward through Broward and Miami-Dade Counties to southeast Monroe County

- **Types of Water**

- ✓ City water is defined as treated water delivered to you by the city in which you live or its designated water authority. Most Florida municipalities (cities, towns, etc.) inject chloramine, a more stable form of bleach, into the water to kill microbes or bacteria and add fluoride to improve the dental health of the city's residents (CDC, 2016). City water in Florida is frequently very basic (lots of calcium). If your plants only receive city water, they could eventually have difficulty absorbing nutrients.
- ✓ **Well water** is defined as water that is held underground and brought to the surface by a pipe and pump system, which draws water directly from the aquifer.
- ✓ **Rainwater** is defined as water that returns to the earth through precipitation (rain, snow, sleet, dew, hail) as a result of condensation. Review the hydrologic cycle in Figure 7 (Southwest Florida Water Management District, 2007).
- ✓ **Reclaimed water** is recycled. It consists of water that has been treated by a sewage treatment plant and is pure enough to use on landscapes, cars, clothes, and toilets, and for other purposes that do not require drinking-grade water. Reclaimed water pipes must be purple in color. We should know to **NEVER** drink water from purple pipes.

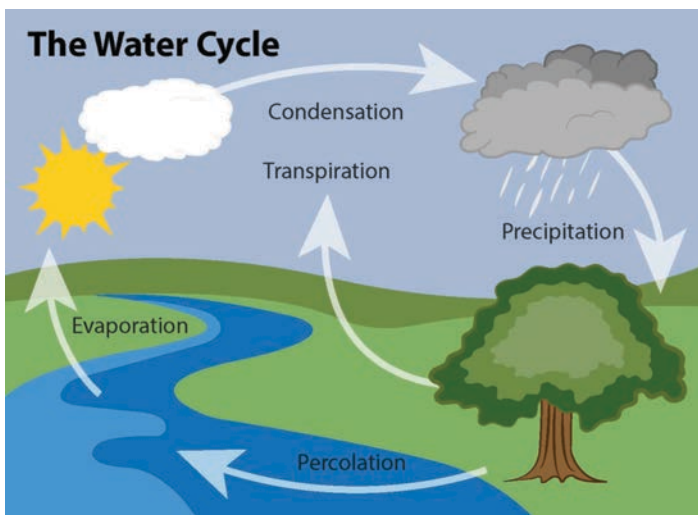


Figure 7. Hydrologic Cycle. Credit: UF/IFAS ICS

- **What is a water management district, and why does it manage the quality and quantity of water?** (UF/IFAS, 2015)
  - ✓ According to the Florida Department of Environmental Protection website (2019), "the Department of Environmental Protection is involved in managing the quality and quantity of water through its relationship with the state's five water management districts: Northwest Florida Water Management District, Suwannee River Water Management District, St. Johns River Water Management District, South Florida Water Management District, and Southwest Florida Water Management District" (Appendix B).
  - ✓ Chapter 373 of Florida statutes (law) tells water management districts to adopt rules and programs that help the Department of Environmental Protection do its job of managing water quality and quantity. One of the items for which the districts are responsible is the district water management plan (The Florida Legislature, 2010). The plan, which is updated every five years, addresses water quality, drought, and flood protection, among other issues.
  - ✓ Two of the areas for consideration are (1) the prevention of wasteful, uneconomical, impractical, or unreasonable uses of water resources, and (2) the preservation and enhancement of the water quality of the state. Each district has a governing board that works to create and update its district water management plan.
- **What does it mean to *hand water*? Why should you do it? Is this different from microirrigation? If so, how?**
  - ✓ **Hand watering** is the process of applying water with a watering can or a garden hose that has a variety of nozzles installed. Hand watering is the most effective way to get water to individual plants that might need it without watering all of the plants in the landscape.
  - ✓ **Microirrigation** is not the same as hand watering. It is a type of automated irrigation system that is designed to put water into the root zone of the plants.

- **What are the main types of sprinklers used for residences?**
  - ✓ **Sprayer** sprinklers include pop-up, ground-level, elevated, and microirrigation sprayers. These sprinklers are defined by their constant, fine spray patterns that are set by the operator for a very even distribution of water.
  - ✓ **Rotors** consist of a unit that spins and pulses in timed intervals, distributing the water in larger quantities than a sprayer each time it passes by a given area, according to the pattern that has been set by the operator. Rotors are most common for commercial lawns, agricultural crops, and golf courses, where large amounts of water are dispensed over large areas.

## Unit Resources

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Southwest Florida Water Management District: Kids  
<https://www.swfwmd.state.fl.us/residents/education/kids>

The Hydrologic Cycle Poster  
[https://www.swfwmd.state.fl.us/sites/default/files/store\\_products/hydrocycletoon.pdf](https://www.swfwmd.state.fl.us/sites/default/files/store_products/hydrocycletoon.pdf)

Florida Water Management Districts  
<https://floridadep.gov/water-policy/water-policy/content/water-management-districts>

## In-Class Activity: Water Managers

### Objectives

Youth will be able to:

- Discover how the Department of Environmental Protection manages the quality and quantity of Florida's water resources.
- Understand the purpose of the Florida water management districts as they relate to developing water management plans.

### Life Skills

- Communication
- Decision-making
- Problem-solving
- Contributing to group
- Teamwork
- Conflict resolution

### Setting

- A comfortable room with tables and chairs

### Materials Needed

- Flip chart paper
- Markers for creating their "plan"
- Map of Florida water management districts (Appendix B)

### Introduction

Florida is home to over 2.5 million acres of fresh water, which includes lakes, rivers, springs and wetlands (UF/IFAS, 2017). With all that precious water, it is important to have groups that are dedicated to protecting it. The five Florida water management districts are the Northwest Florida Water Management District, Suwannee River Water Management District, St. Johns River Water Management District, South Florida Water Management District, and Southwest Florida Water Management District (Appendix B and Resource Folder).

Chapter 373 of Florida statutes (laws) tells water management districts to adopt rules and programs that help the Department of Environmental Protection do its

job of managing water quality and quantity. One of the items for which the districts are responsible is the district water management plan (The Florida Legislature, 2010). The plan, which is updated every five years, addresses water quality, drought, and flood protection, among other issues. Two of the areas for consideration are (1) the prevention of wasteful, uneconomical, impractical, or unreasonable uses of water resources, and (2) the preservation and enhancement of the water quality of the state. Each district has a governing board that works to create and update its district water management plan.

### Do

- Divide youth into five water management district governing boards that represent each of the five water management districts.
- Youth will review a map of the water management districts to decide the water concerns that might be important or unique to their areas. Students should research the Water Management Districts' websites (Appendix B). Make sure that youth pay special attention to water needs in their areas.
- Youth will develop a visual district water management plan that shows ideas to prevent wasteful water use as well as ways to preserve water resources.
- Each group will present their plan to the entire group. Encourage other group members to question the ideas and discuss strategies during the presentation.

### Reflect

- What did you learn about water management districts?
- Why is it important for a water management district to exist?
- Do you think the water needs and uses in each area of Florida are similar or different? Why or why not?
- What types of landforms (i.e., lakes, rivers, coastlines, etc.) were in your water management district? Why is this important?
- Why do you think the Florida Department of Environmental Protection and the water management districts work together?
- What thoughts did you consider as your team chose techniques to prevent wasteful water use?

- How did you defend your decisions when you presented to the other groups?

### Apply

- How do water rules and restrictions relate to each: landscaping, gardening, agriculture, and planting?
- Discuss if new laws should be adopted at the state level for areas of concern that were common to all groups.
- How did members in your team contribute to the plan? How do group member contributions affect teams? Are there other teams that you work with?
- What skills did you learn about working with teams that you can apply to other groups you are involved in?

## Home Activity: Water, Water Everywhere

### Objectives

Youth will be able to:

- Identify different types of sprinklers and classify them by how they distribute water, how far they distribute it, and whether they are in the ground or above the ground when they are off.
- Observe and record data on landscape irrigation.

### Life Skills

- Using resources wisely
- Keeping records
- Self-responsibility

### Setting

- An outdoor area with sprinklers for irrigation
- A comfortable room with tables and chairs

### Materials Needed

- Notebook or paper for record-keeping
- Pen or pencil
- Rain gauge or shallow can
- Ruler
- “Water, Water Everywhere” handout on page 9 of workbook

### Introduction

Water is important to all life. In fact, two-thirds of the Earth’s surface is covered with it! But did you know that too much water could be a bad thing? When you water your lawn, it’s important to water it enough, but not too much. When you water too little, the grass does not form deep roots, and it does not survive in a drought. When you water too much, you wash away the nutrients from the plants, and you waste water too!

### Do

- Youth will look around the areas where they live and determine the types of sprinklers present.
- Using a rain gauge, youth will keep track of the amount of water used by an irrigation system for one week, which will be observed, recorded, and discussed.
- If youth do not have access to a rain gauge, they will be asked to use a shallow can (e.g., a tuna can) to observe and record the amount of water used when the sprinklers are turned on.
- Convert the amount of water recorded for the week into gallons. Based on the cost of water in the group’s county, determine the cost of the water used. This information can be found on a utility bill or searched for on the internet using the phrase “residential water rates” and the county’s name.

### Reflect

- What did you learn about landscape irrigation?
- How did you organize your water measurements?
- What problems or issues did you face as you collected and recorded data?
- What are the benefits of using a sprinkler that only supplies the amount of water necessary?
- Why is it important to conserve water when watering the lawn?

### Apply

- What did you learn about keeping records? Are there other situations when you can use record-keeping?
- What else do you need to learn about collecting data (like rainfall amounts) and organizing those records?

- Are there other situations when we overuse water?  
When? In what ways can we conserve water beyond irrigation of lawns?
- How can we use other resources more efficiently?
- Do you intend to respond differently in the future when you see resources being overused?



## UNIT 2: Water Efficiently

### In-Class Activity: Water Managers

Water management districts adopt rules and programs that help the Department of Environmental Protection do its job of managing water quality and quantity. Choose a water management district and study what they do. Do you think the water needs and uses in each area of Florida are similar or different? Why or why not? Create a visual plan for your chosen water management district and then explain your plan to the rest of the class.

### Water Management District Review

Which water management district did your group choose to study?

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What are the needs that are specific to the water management district?

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What are the major ideas that your groups water management plan includes?

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## Home Activity: Water, Water Everywhere

Survey the sprinklers you have in your yard. Are all the sprinkler heads the same? If they're not, classify them by how they distribute water, how far they distribute it, and whether they are in the ground or above the ground when they are off.

Keep track of the amount of water the **grass** is fed and rainfall amount for an entire week using your rain gauge or shallow tin cans. Record this information below.

### Classification of Sprinkler Heads

Number of each type:

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How far is the water projected from each type of sprinkler head?

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Length of water application in minutes for one watering event:

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Location of each type when not running (In-ground, Aboveground, or Both):

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Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Sprinkler Amount (collected from grass area)							
Rainfall Amount							

### Common Sprinkler Guide

**Left:** This is a “rotor” sprinkler. The head pops up, then spins in a circle that you determine through adjustments.

**Right:** This is a “sprayer” sprinkler called a “pop-up” sprinkler. The sprinkler head (or top of the sprinkler) pops up and down when water is turned on but does not spin or move from side to side. The shape of the spray is determined by setting a small screw on top. You might need help from an adult or groundskeeper.

Draw the most common type of sprinkler you see.



## Further Florida-Friendly Activity

### Irrigation Interview

In previous activity you learned about residential sprinklers. If you would like to learn more about irrigation practices, go with an adult to your nearest golf course and ask the greenskeeper if he or she can show you the kinds of sprinklers and timing for golf course irrigation.

You may also choose to visit a landscaped city or county park and ask the landscape supervisor how its landscape is irrigated.

Be sure to prepare yourself with a list of questions prior to interviewing the landscape professional.

### See Your Reflection

What have you learned about landscape irrigation?

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Why is it important to conserve water when watering the lawn?

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What did you learn about observing and recording data?

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# FERTILIZE APPROPRIATELY



**LANDSCAPING PRINCIPLES FOR  
FLORIDA-FRIENDLY YARDS**

## UNIT 3: Fertilize Appropriately

### Purpose

The purpose of this unit is to help youth understand how plants make their food and absorb nutrients from the soil to grow and develop. Youth will learn the basic elements of soil's physical and chemical properties. We will also discuss Florida-Friendly best practices for proper use of organic and inorganic fertilizers. Youth will also learn that there are unique soil types that are affected differently by various fertilizers.

### Objectives

Youth will be able to:

- Discuss the basic process of photosynthesis.
- Discuss pH and its effect on nutrients available to plants.
- Understand the difference between organic and inorganic fertilizers.
- Identify sand, clay, and muck.

### Lesson

Topics are presented through the use of diagrams, photos of soil horizons, and other illustrative materials.

- Have youth analyze the pH of different areas of a landscape and determine which Florida-Friendly plants would be suitable through “Plants and pH.”
- Teach youth that more fertilizer is not better by teaching them to use the recommended rates.

### Learning Activities

- In-Class Activity: “Plants and pH”
- Home Activity: “Marigold Lesson”
- Further Florida-Friendly Activity: “Dr. Dirty Soil”

### Preparation

- Review background information on fertilizers.
- Review lesson activities.
- Find areas to dig small holes.
- Get litmus paper.
- Provide information on soil textures.

- Provide resources.

### Background Information

#### • How do plants feed themselves?

Most plants are **autotrophs**. That means that they make their own food. Green plants, which are the ones you most often see, go through a process called **photosynthesis**, where energy from the sun is combined with carbon dioxide (a gas) and water to make complex sugars that feed the plant. Plants use nutrients from the soil to help in their growth and development, which we will discuss later in this chapter.

#### • What is soil?

**Soil** is composed of minerals ( $\approx 45\%$ ) and organic matter ( $\approx 5\%$ ), with a considerable amount of gas and water in the pore spaces ( $\approx 50\%$ ). Except for muck, most Florida soils contain low amounts of organic matter, creating problems with plant nutrition (Shober et al., 2019).

#### • Soil Formation

Soils are formed as the result of five factors (Figure 9): (1) parent material; (2) climate; (3) topography; (4) biological factors; and (5) time (Shober et al., 2019).

- Parent material is rock or other material that breaks down over time and is sometimes transported from another location by wind, water, or ice. In Florida, many soils formed from sandy marine sediments. Other soils formed from decaying freshwater swamp and marsh plants. Finally, in the Florida Panhandle and upland ridges, clay soils formed from materials that eroded from the Appalachian Mountains and the Southern Coastal Plain and were then transported southward by rivers.
- Climate impacts soils by weathering (breaking down) material in different ways. Freezes and thaws seen commonly in northern and central Florida work to break up the parent material, but not as much as the warm, wet conditions seen in the southern end of the peninsula, where sandy soils break down organic material rapidly, leaving little behind.

- Topography, defined as the elevation and slope of the land, influences drainage of water and erosion (if soils are exposed) and affects which native plants can grow in a given place. In low-lying areas, organic matter can accumulate and form organic soils due to poor drainage.
- Biological factors include microorganisms (bacteria, fungi, and others), plants, humans, and other animals that affect soil formation. Many burrowing animals, including owls, moles, worms, and others, mix the soil at different levels. Microorganisms work to further break down newly mixed organic matter. Natural vegetation has plants that live and die, shed leaves, and send roots into the soil, as well as seeds that germinate. These factors affect the physical arrangements of soil and its chemical properties.

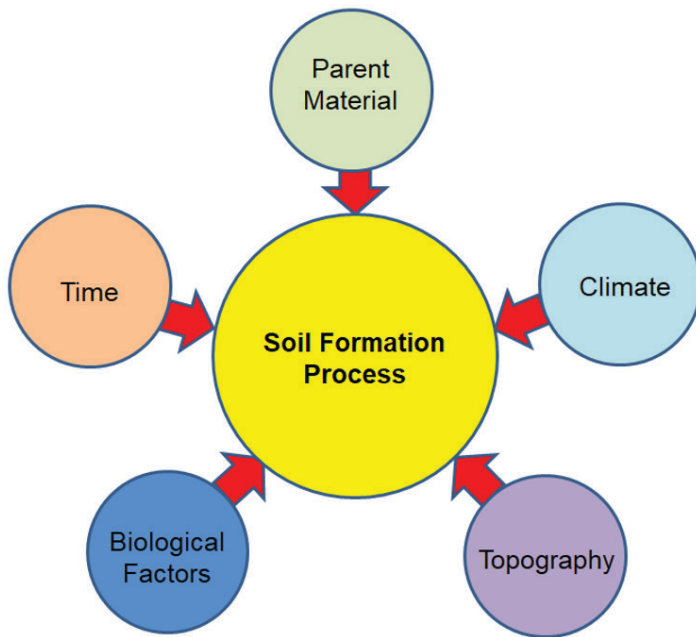


Figure 8. Soil formation process. Credit: Jennifer Marvin

- Formation of soil takes a long time and depends on the type and origin of parent materials as well as the climate and topography of a given area. Factors such as periodic flooding also plays a role. Florida has relatively young soils because the sea has flooded and receded several times. Some soils develop distinct layers, called horizons, as they form, depending on length of time and leaching of broken-down material into lower layers. A diagram of how soils form horizons is provided in Figure 10.

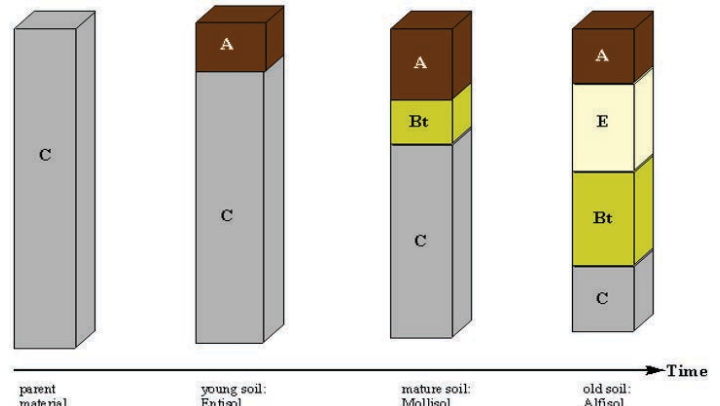


Figure 9. Example of soil development from the central United States under a forest. Credit: Grunwald (1999)



Figure 10. A Florida soil showing thick organic layer above. Credits: Mary Collins, UF/IFAS

• **Soil Physical Properties**

The main physical properties we need to learn about soil are texture, aggregation, porosity, soil drainage class, and soil nutrients.

- ✓ **Texture:** Refers to the relative proportion of sand, silt, and clay particles in the soils. A description of the size of the soil particles and their ability to hold water is as follows:
  - Sand-sized particles range from 0.5 to 2 mm in average diameter. Soils with a high percentage of sand-sized particles do not hold water well.
  - Silt-sized particles range from 0.002 to 0.5 mm in average diameter. Soils with a high percentage

of silt-sized particles hold water well when accompanied by organic material.

- Clay-sized particles average less than 0.002 mm in diameter. Soils with a high percentage of clay-sized particles hold water very well to saturation, depending on how they are managed.

Soil textures are described using terms from the **Texture Triangle** (Figure 11).

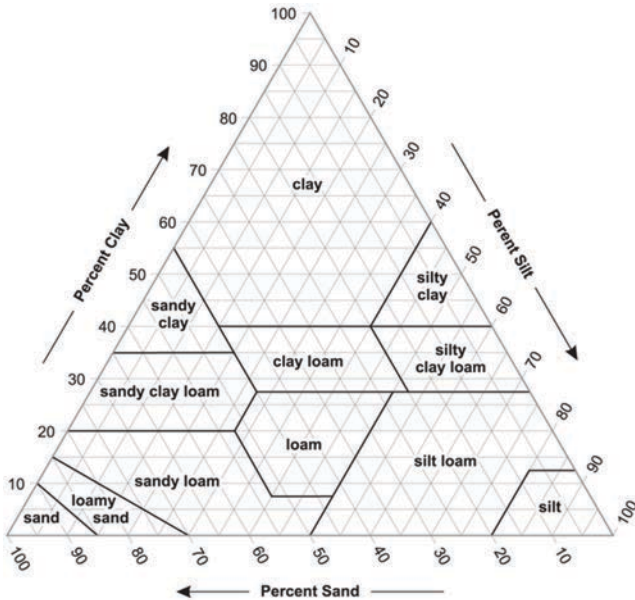


Figure 11. USDA Soil Textural Triangle ([https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2\\_054253](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054253))

✓ **Aggregation:** Movement of individual particles to form certain structural mass units called **peds**.

- Structure:
  - Granular: Particles are organized in small, round, or irregular units.
  - Blocky: Particles form nearly square blocks with widths, lengths, and heights that are approximately equal to each other.
  - Platy: Particles are arranged in platelike structures, which are often the result of compaction from heavy machinery on the soil surface. These particles form a partial “hardpan” and impede movement of water and solutes.
  - Prismatic: Soil particles are formed into peds with a long vertical axis. These typically occur in subsoils. This structure does not exist in Florida.

- Columnar: Soil particles are aggregated in a columnar shape.
- Structureless:
  - Massive: Particles have no definite structure or shape. They seem like a large rock of strongly compacted particles.
  - Single Grained: Many of Florida’s sandy soils are single grained.

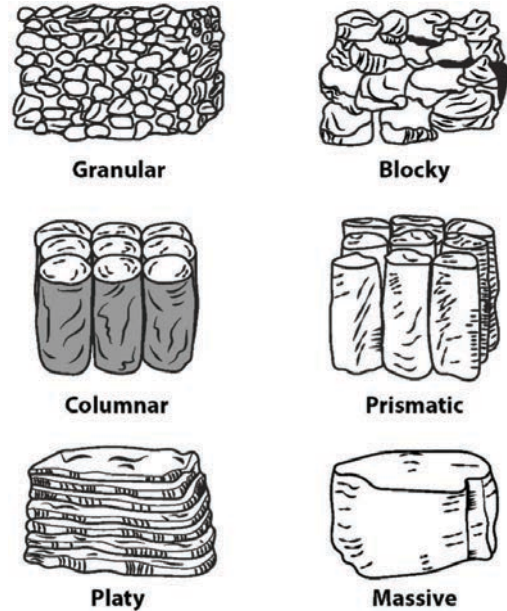


Figure 12. Common types of soil structure. Credit: UF/IFAS ICS

- ✓ **Porosity** refers to the volume (proportion or percentage) of pores in a soil sample.
- ✓ **Soil Drainage Class** describes the frequency of soil moisture and the ability to hold water.
- ✓ **Plant Nutrients.** Plants need 17 Essential Mineral Elements in order to grow properly (Table 2).

Table 2. 17 Essential Elements for Plant Growth (Hochmuth et al., 2012).

17 Essential Elements for Plant Growth			
Major Elements		Trace Elements	
Macronutrients		Micronutrients	
Carbon	C	Iron	Fe
Oxygen	O	Chlorine	Cl
Hydrogen	H	Manganese	Mn
Nitrogen	N	Copper	Cu
Phosphorus	P	Boron	B
Potassium	K	Molybdenum	Mo
Calcium	Ca	Zinc	Zn
Sulfur	S	Nickel	Ni
Magnesium	Mg		

**Macronutrients** are mineral or chemical substances that are needed by the plant in relatively large quantities. Macronutrients include *nonmineral nutrients* like carbon and oxygen, *primary nutrients*, such as nitrogen, phosphorus, and potassium, which are needed for all aspects of the plant’s growth, and *secondary macronutrients*, such as calcium, magnesium, and sulfur, which are important to a plant’s development (UF/IFAS, 2015a, 2015b).

**Micronutrients** are mineral or chemical substances that are needed by the plant in very small quantities. While deficiencies of micronutrients may not directly kill the plant, some of the deficiencies’ effects (e.g., yellowing of the leaf except along the veins, caused by a lack of iron) can weaken the plant’s resistance to other pests and diseases. In the case of palms, the lack of boron or manganese may result in a tilted top or malformed leaflets, respectively, that may eventually kill the palm (UF/IFAS, 2015a, 2015b).

• **Inorganic and Organic Fertilizers**

✓ **Inorganic fertilizers** are mined or synthesized from nonliving materials. Many inorganic fertilizers contain nutrients that are immediately available to plants (vegetable fertilizers are often quick release). Others are formulated to allow nutrients to be released over a period of time. If you use an inorganic fertilizer in your landscape, choose one with some

or all of the nutrients in slow- or controlled-release form. Plants will be able to take up the fertilizer as it is gradually released instead of the fertilizer running off the plant bed. (UF/IFAS, 2015b).

✓ **Organic fertilizers** are materials that are derived from plants and animals. One of the most common forms is manure. Animal manure can come from chickens, cows, pigs, sheep, horses, or rabbits and should always be composted prior to use in vegetable gardens to reduce risk to food safety. Keep in mind that some of these products might have a ratio of nitrogen to phosphorus that may satisfy the nitrogen requirements of the plants but create an excess of phosphorus. Excess amounts of either nitrogen or phosphorus can contribute to water pollution, so please apply the products carefully. Never use cat or dog manure or human waste—these sources pose a greater risk of disease transmission. Homemade compost, typically made of kitchen scraps or yard waste, is an excellent source of organic matter for garden soils. It usually contains small amounts of nitrogen and potassium and very little phosphorus. Both composted manure and compost also contain micronutrients (UF/IFAS, 2015b).

• **So what does pH have to do with plant nutrition?**

✓ pH (potential of hydrogen) is a measure of the acidity or alkalinity (basicity) of a solution. Soil pH has a direct effect on the uptake of minerals and other essential nutrients (Figure 13).

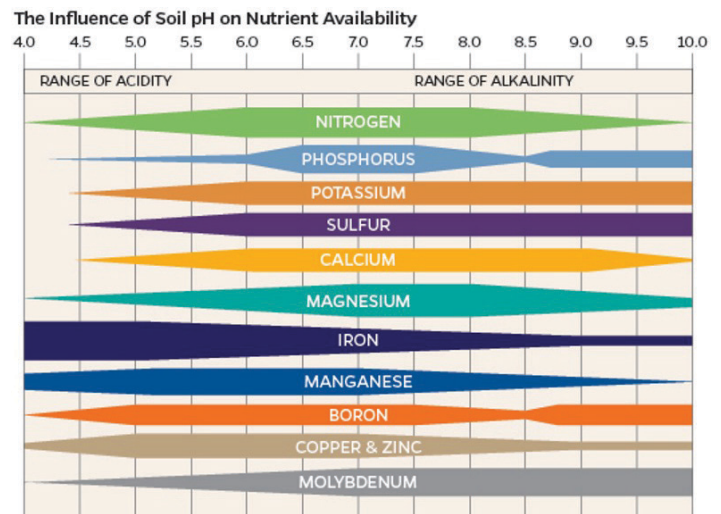


Figure 13. The Influence of Soil pH Nutrient Availability. Credits: UF/IFAS ICS

## Unit Resources

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Soil Science Society of America. Glossary of Soil Science.  
<https://www.soils.org/publications/soils-glossary>



## In-Class Activity: Plants and pH

### Objectives

Youth will be able to:

- Discover how the Department of Environmental Protection manages the quality and quantity of Florida's water resources.
- Learn how to test soil pH by taking three different soil samples.
- Learn how to keep records as they record the pH of each soil sample.
- Use the pH levels of the sites and the hardiness zone map to plan for what type of plants youth will select.

### Life Skills

- Keeping records
- Planning and organizing

### Setting

- A landscape with room to dig several small holes
- A comfortable room with tables and chairs

### Materials Needed

- Trowel
- 8–12 oz cup
- Litmus paper
- Distilled water
- Workbook page 12

### Introduction

pH (potential of hydrogen) is a measure of the acidity or alkalinity (basicity) of a solution. Soil pH has a direct effect on the uptake of minerals and other essential nutrients by a plant. If the ions are present in equal amounts, the substance should be neutral. This means that it is neither acidic nor basic. Distilled water is an example of a neutral substance, but salt, tap, and other water may be acidic or basic.

The pH scale (potential of hydrogen) is used to determine whether a substance is an acid or a base. This graduated scale goes from 0 to 14, with 7 being neutral. This means that distilled water would have a pH of 7. Acids are

from 0 to 7, while bases are from 7 to 14. A few common examples of acids are vinegar and lemon juice. Common examples of bases are baking soda and ammonia.

Litmus paper is a special kind of paper that helps scientists determine whether a substance or mixture is an acid or base. When something is a base, it will turn the litmus paper blue. If it is an acid, it will turn the paper red. When you are mixing substances together, it is important to know that when combined with an acid, a base will become less acidic. Similarly, a base mixed with an acid will become less basic.

If a plant's soil pH is not proper for that plant, the plant's ability to grow can be negatively affected.

### Do

- Divide youth into small groups. Find an area of the yard that looks like it has enough soil to dig a small hole.
- Have youth dig a hole about 4" wide by 6" deep.
- Youth will take a trowel of dirt from the side of the hole and put it into a plastic cup. Then, they will pour distilled water into the cup. The ratio of water to dirt must be two to one. Stir water and soil mixture.
- Youth will dip the litmus paper into the water and take the reading based off the color chart of the litmus scale on the litmus paper package. Youth will record the reading in their workbooks.
- After youth record their data have them fill the holes back in with the dirt removed.
- Youth will repeat the above steps at two more locations at least 30 feet apart.

### Reflect

- Why did you use distilled water? What would happen if you used another type of water?
- Did anyone in your group get a very high or very low pH reading? What do you think caused it?
- What differences did you find between the three sites you tested?
- How would you raise or lower the pH if it's not suitable for what you want to plant?

- Do you think collecting records of soil pH is important when planning which fertilizer to use? Why is it important to choose the right fertilizer?
- What might happen if you use the wrong type of fertilizer for a particular soil?

### Apply

- How did keeping records of the three different sites help you compare each soil pH?
- Do you think soil pH changes over time, or should you always test your soil pH prior to applying fertilizer?
- Look at *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design*. What plants would you be able to grow in each of the three locations? Remember to take the cold hardiness zone into consideration.
- Why is it important to keep good records? How can good records help you stay organized?
- What are some other ideas of records you should keep when preparing to make a plan?

## Home Activity: Marigold Lesson

### Objectives

Youth will be able to:

- Discover properties of organic and inorganic fertilizers.
- Discover the differences between slow- and quick-release fertilizers.
- Determine what rate of fertilizer is best to grow plants.

### Life Skills

- Learning to learn
- Record-keeping

### Setting

- A sunny spot on a patio or in a yard that can accommodate three small pots

### Materials Needed

- Marigold plants—3 per youth (should be same size and have the same number of blooms)
- Miracle-Gro inorganic water-soluble fertilizer or some other type of water-soluble inorganic fertilizer
- 3 gallon-sized containers, two for the fertilizer and one for watering every day—may need more than one gallon to water daily
- Tap water—use the same water source throughout the experiment
- Ruler
- Workbook pages 13–14

### Introduction

More is not always better. Plants only need a certain amount of nutrients to grow. If too many nutrients are used, the plant may grow faster, require more frequent trimming, and become stressed, which makes it more susceptible to pests and diseases.

Excessive fertilization also causes problems for the environment. Fertilizer that isn't used by plants washes out of yards during rain or watering events and makes its way down storm drains and into nearby water bodies, causing problems with water quality (UF/IFAS, 2015b).

### Do

- Youth will be given 3 marigold plants approximately the same size with the same amount of flowers/buds.
- Label each of the three small pots “none,” “recommended rate,” or “3x recommended rate.”
- With an adult's help, in a 1-gallon jug of tap water, youth will mix inorganic fertilizer according to label directions. In a second 1-gallon jug of tap water, youth will mix the same fertilizer at 3x the recommended rate. The third gallon will be used for daily watering. Label each jug accordingly.
- Youth should water the “none” pot with tap water, and the “recommended rate” pot with the gallon jug with the recommended rate of fertilizer. The final pot should be watered with “3x recommended rate” fertilizer solution.
- Youth should continue watering the plants until damp with tap water daily.
- One week after the first application of fertilizer, youth will again water with the fertilizer dissolved in water. Apply fertilizer once weekly for two more weeks. Continue daily watering with tap water.
- Using the workbook page, youth will record the daily height, number of flowers/buds, color, and condition of each plant until one week after the last application of fertilizer.
- The experiment can be extended if little change is seen.

### Reflect

- Comparing the different marigold plants, what happened to the plant that got 3 times the recommended amount of fertilizer?
- Did one of the plants grow faster or produce more leaves? What else did you observe?
- What did you learn about why using different amounts of fertilizer or no fertilizer matters?
- Why do you think it is important to use the correct amount of fertilizer?

**Apply**

- Do you think gardeners/producers know why it is important not to overfertilize? Do you think other gardeners/producers are using fertilizer correctly? Why or why not?
- Based on what you've learned about different types of fertilizers, should there be restrictions on the amounts of fertilizer applied to gardens or farmland? Why or why not?



# UNIT 3 Fertilize Appropriately

## In-Class Activity: Plants and pH

Dig a hole near your classroom in the landscape with a trowel. Add a trowelful of dirt to a cup, then add two times more distilled water than dirt. Mix thoroughly. Dip the litmus paper into the water to take the pH reading. Repeat two more times in different areas a fair distance apart. What Florida-Friendly plants can live in the three locations?

	pH Reading	Ideal Plant
Hole 1		
Hole 2		
Hole 3		

## Home Activity: Learning with Marigolds

Do you know what happens when you fertilize a plant? During this activity, you will see what happens when you fertilize a plant with the recommended amount of fertilizer and what happens when you apply more fertilizer than recommended. Do you think it will grow faster?

Get three marigold plants from your leader. Water one with distilled water, one with the recommended amount of fertilizer, and the final one with 3 times the amount of fertilizer. Do this once a week for two more weeks. Water with tap water once a day until damp in between fertilizer applications. Keep a record of plant heights, number of flowers/buds, color of plants, and characteristics each day. At the end of 3 weeks, which plant do you think will be the healthiest?

Week One—Observations on Height, Blooms/Buds, and Appearance							
	Day 1— fertilizer application	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
None							
Recommended Rate							
3x Recommended Rate							

Week Two—Observations on Height, Blooms/Buds, and Appearance							
	Day 8— fertilizer application	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
None							
Recommended Rate							
3x Recommended Rate							

Week Three—Observations on Height, Blooms/Buds, and Appearance							
	Day 15—fertilizer application	Day 16	Day 17	Day 18	Day 19	Day 20	Day 21
None							
Recommended Rate							
3x Recommended Rate							

## Further Florida-Friendly Activity: Dr. Dirty Soil

Have you ever wondered what kind of soil you have? Try the activity below to determine the soil type.

Fill a clear container, such as a glass canning jar, two-thirds full of water, and add soil from anywhere in your yard until it nearly fills the jar. Add a pinch of laundry detergent (dry or liquid) to help the layers separate. Put on the lid and shake the jar to mix all ingredients together. Put the jar aside in a place where it won't be touched or moved for several days.

Over the next several days, the mixture will begin to separate into layers. The sand particles drop to the bottom because they are the largest and heaviest. The next layer is silt. The layer closest to the top is the clay layer. In fact, if your water is still murky it means that some of the clay hasn't yet settled into a layer, which is why the mixture needed to sit for several days. Organic matter will float to the top.

Next, measure the height of all three layers. Then, measure the height of each layer separately. Divide the individual layer height with the total height of all three layers. Do this for all 3 layers and multiply by 100, and you will have the percentage of each texture present in the sample.

## See Your Reflection

Explain how soils can be different.

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What did this unit teach you about fertilizing appropriately?

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## UNIT 4: Mulch

### Purpose

The purpose of this unit is to help youth (1) learn the benefits of using Florida-Friendly mulching practices around landscape plantings, and (2) identify and understand the properties of common types of mulch, as well as their relative costs and benefits.

### Objectives

Youth will be able to:

- Define “mulch.”
- List the benefits of mulch to the Florida-Friendly yard.
- Identify and differentiate among different types of inorganic and organic mulch.
- Understand the benefits and relative costs for each kind of mulch.

### Lesson

- Learn how mulch conserves moisture, cools the soil, prevents soil erosion, compaction, and weed invasion, and improves aesthetics.
- Learn about the types, origins, and benefits of mulch.
- Learn about the properties of mulch by experimenting with it inside and outside the classroom.

### Learning Activities

- In-Class Activity: “Many Mulches”
- Home Activity: “Experiment: There Is So Much to Plant”
- Further Florida-Friendly Activity: “Mulch Ado about Watering”

### Preparation

- Review background information on organic and inorganic mulch.
- Obtain four types of organic mulch and one type of inorganic mulch
- Obtain as many small plants as there are people in the class. They should all be the same species and inexpensive plants that are easy to grow. Plants can

be in 4" pots as long as they are repotted into 8" wide containers to allow for mulch coverage.

### Background Information

#### • What is mulch?

**Mulch** is any material applied to the soil surface in order to protect or improve the covered area (UF/IFAS, 2015b).

#### • What does mulch do for the soil?

Mulching (UF/IFAS, 2015b):

- ✓ Helps reduce evaporation of water from the soil surface.
- ✓ Suppresses weeds when mulch is weed-free and applied deeply enough to prevent germination.
- ✓ Maintains more uniform soil temperature.
- ✓ Improves water absorption and percolation.
- ✓ Reduces erosion.
- ✓ Adds organic material to soil as it decomposes.
- ✓ Improves appearance of planting beds.

#### • What types of mulch are available in Florida?

There are two basic types of mulch: **organic**, from a living source, and **inorganic**, from a nonliving source. Principal types of each are listed below.

#### ✓ Sources of Organic Mulches

- Pine bark: Consists of peeled-off bark, a by-product of timber harvest, mostly from loblolly and slash pines (*Pinus taeda* and *P. elliottii*). It has a dark-brown color and can come ground or in nuggets (UF/IFAS, 2015b).
- Pine straw: Consists of needles that are raked from pine plantations, then bundled and sold. Most pine straw is from the same two species of pine used for pine bark. It often knits together and becomes harder to wash away (UF/IFAS, 2015b).
- Cypress: Composed of both wood and bark and often has a shredded appearance. Cypress trees,

which grow in Florida's forested wetlands, are often harvested for making cypress wood products. Cypress mulch is sometimes made from these products' wastewood, but it can also be made from whole trees cut from wetlands. The Florida-Friendly Landscaping™ Program does not recommend the use of cypress mulch, because its origins may be difficult to determine (UF/IFAS, 2015b).

- **Eucalyptus:** Consists of bark and wood chipped or shredded specifically for the purpose of making mulch. Plantations of rose gum (*Eucalyptus grandis*) have been in Florida for many years. While this mulch's oils are great for repelling insects, these same chemicals will slow the seedling growth, so this mulch should only be used on mature plants.
- **Melaleuca:** Bark and wood are chipped, shredded, and composted (heated) to kill any seeds that might be present, because this species (*Melaleuca quinquenervia*) is one of the most invasive species in the state. Melaleuca mulch is resistant to termites and has been lauded for its chemicals that inhibit weed seed germination.

#### ✓ Sources of Inorganic Mulches

- Note that the Florida-Friendly Landscaping™ Program does not recommend the use of inorganic mulches in plants beds. Inorganic mulches can be used for paths and walkways.
- Gravel, pebbles, and crushed stone are permanent and fireproof. Disadvantages include increased solar radiation absorption, which makes them heat up and results in more water loss for the planting area. They also don't contribute to the soil's nutrient and organic matter or water-holding capacity (UF/IFAS, 2015b).
- Broken seashells are increasing in popularity throughout the state because of their availability and relatively low cost compared to gravel. They

are disadvantageous in areas where the soil pH is already high (alkaline), because the shells are composed of calcium carbonate and will further increase the pH of the bed.

## Unit Resources

UF/IFAS Extension Gardening Solutions—All About Mulch: <https://gardeningsolutions.ifas.ufl.edu/care/planting/mulch.html>

## In-Class Activity: Many Mulches

### Objectives

Youth will be able to:

- Define “mulch.”
- Identify and differentiate among different types of organic mulches.
- Explain the benefits of using mulch.

### Life Skills

- Learning to learn
- Keeping records

### Setting

- A comfortable room with tables and chairs

### Materials Needed

- Mulch samples (pine bark, pine straw, cypress, melaleuca or eucalyptus, and pebbles)
- Petri dishes or shallow containers
- Microscopes or magnifying glasses
- Pen or pencil
- “Many Mulches” workbook page (pg. 16)

### Introduction

A **mulch** is any material applied to the soil surface to protect or improve the covered area (UF/IFAS, 2015a, 2015b, 2015c).

Mulch:

- helps reduce evaporation of water from the soil surface.
- holds back weeds from growing if applied deeply enough to prevent germination.
- maintains soil temperature.
- improves water absorption and percolation.

- reduces erosion.
- adds organic material to soil as it decomposes.
- improves landscape appearance.

There are two basic types of mulch: **organic**, from a living source, and **inorganic**, from a nonliving source. In this exercise, help identify the type of mulch (organic or inorganic) and its origin/source.

### Do

- The instructor should read the descriptions of mulch in background information to youth.
- The instructor will divide the five different mulch samples into separate petri dishes or small containers. Label each sample 1–5 and ensure that each group has one of each sample number for each type of mulch. Four organic and one inorganic mulch should be used, as indicated above.
- Youth will be divided into small groups (groups should be no more than five youth so that each youth will be able to actively investigate the samples).
- Youth will investigate each type of mulch by using their senses of sight, touch, and smell to determine attributes like color, texture, and odor to determine its source (organic/inorganic) and type.
- Youth will record the descriptions of the mulch under “Many Mulches,” workbook page 16.
- If youth have difficulty identifying the source/type of mulch, feel free to provide a list of mulches for matching. Otherwise, the mulch types may be revealed at the end of the lesson.

### Reflect

- What new information did you learn about mulch from participating in this activity?
- What distinguishing characteristics did you identify in the mulch samples? How did this help you determine the source and type?
- What challenges did you face in this activity?
- As you recorded your descriptions, did you find yourself thinking more about what you found in each sample?

- Think about the different places you visit. What type of mulch do they use?

## Apply

- What was easy/hard about recording your findings?
- Why does keeping records of what we learn help us pay attention to details?
- What are other examples of records you can keep to determine the differences between two or more items?
- Travel to your local garden center. What types of mulch are being sold? Are any of them Florida-Friendly? If so, how do you know? If not, you can ask a manager to see if the store will carry more sustainable mulch, based on what you learned.
- Survey your neighborhood, school, park, or another landscaped area. What types of mulch are present? How many different types can you find? Are any of them Florida-Friendly?

## Home Activity: There Is So Much to Plant

### Objectives

Youth will be able to:

- Learn and observe the benefits of mulch.

### Life Skills

- Critical thinking
- Keeping records

### Setting

- An outdoor area that gets sun
- A comfortable room with tables and chairs

### Materials Needed

- Plants of the same species and size—basil works well (one per youth)
- 8" containers (one per youth; for example, terra cotta pots; available online or from a local garden center or nursery)
- Potting soil
- Organic mulch (keep consistent throughout experiment).
- “There Is So Much to Plant,” workbook page 17.

### Introduction

Hypothesize in this experimental activity about mulch. Mulch helps reduce evaporation of water from the soil surface; suppresses weeds when mulch is weed-free and applied deeply enough to prevent germination; maintains more uniform soil temperature; improves water absorption and percolation; reduces erosion; adds organic material to soil as it decomposes; and improves appearance of planting beds. It is important to understand how mulch helps the landscape and why experiments need to be replicable.

### Do

- Provide each student with a plant to take home. If not in an 8" pot, youth will need to re-pot their plant in an 8" size container and label it as a control or an experiment. The same potting soil should be used for each plant. Eight-inch containers are used to allow room for mulch around the plant.

- Provide youth with care instructions to take home, and have students record them on page 17 of the workbook to ensure that youth do not introduce unintentional difference besides mulch received (watering schedule, lighting, soil type, indoors/outdoors).
- Youth will be divided into two groups (control and experiment).
- Before youth receive their plants, the students will hypothesize about what will happen to the plants that receive mulch. Write the class hypothesis as an “if-then” statement (e.g., “If soil moisture is related to mulch, then the soil of my plant will be moister if it has mulch.”)
- The youth in the experimental group will receive mulch, those in the control group will not receive mulch for their plant.
- Youth will follow the conditions set forth by the instructor when determining the lighting conditions, the location of each plant, the type of soil in which it is planted, and the amount of water to provide. The plants should all receive identical treatment, with the no-mulch group acting as the control.
- Youth will be asked to record the progress of their plant daily by examining the plant itself, its height, its color, the soil moisture, and the presence of weeds for the period of time between class sessions or club meetings. Observations will be recorded on their worksheet on page 17 of the workbook.
- Observation records and plants should be brought back to the next club meeting/class session or after a specific amount of time has passed for a group discussion.

### Reflect

- Discuss the progress of your plant after one week, two weeks, and so on up till the time expired between meetings.
- Did your plant’s progress differ from that of the control/experiment group’s plants? If so, how?
- What factors were different/the same? Between control/experiment groups? Why?
- Compare records with another student. What is the same/different? Are there any trends?

- Were you surprised by anything related to this activity?

## Apply

- As you maintained records of your plant(s), did you find it easy/hard to keep up with the records?
- What other projects are you involved in that may benefit from you keeping records?
- Why do you think keeping clear and accurate records is important?
- Why is it important to keep accurate records if we intend for another scientist to replicate an experiment?

# UNIT 4 MULCH

## In-Class Activity: Many Mulches

You will learn about the different types of mulch through the senses of sight and smell. You will be asked to inspect mulch (texture, color, etc.) and identify its source.

Examine the mulches provided to you and compare and contrast the samples. Record this information below.

### A mulch:

- Is any material applied to the soil surface to protect or improve the covered area.
- Helps reduce evaporation of water from the soil surface.
- Holds back weeds from growing when mulch is weed-free and applied deeply enough to prevent germination.
- Maintains soil temperature and improves water absorption and percolation.
- Reduces erosion and improves appearance.
- Adds organic material to soil as it decomposes.

	Hypothesized Mulch Type	Visual Description (Texture, Color, etc.)	Description of Smell	Organic or Inorganic Mulch	Actual Type of Mulch
Mulch 1					
Mulch 2					
Mulch 3					
Mulch 4					
Mulch 5					

## Home Activity: There Is So Much to Plant!

Everyone will receive a potted plant. The group will be divided into an experiment group and a control group. The experiment group will receive mulch with their plant; the control group will not receive mulch. As a class, hypothesize about what will happen to the plants that receive mulch. Write your hypothesis as an “if-then” statement (i.e., If \_\_\_ is done, then \_\_\_ will happen.)

You will record the lighting conditions, the location of your plant, the type of soil in which it was planted, and the amount of water given to your plant. This information will all be given to you by your instructor. Because this is an experiment, it is important that you follow the instructions very carefully. You will be asked to record the progress of each plant by examining the plant itself (height and color), the soil moisture, and the presence of weeds for a specific period of time. Make sure to water and place your plant according to the information given by your instructor. The progress of each plant will be recorded and discussed with your entire group at a later time.

Please circle one. **My group is the control/experiment group.**

**Group hypothesis:**

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**Lighting conditions of my plant:** \_\_\_\_\_

**Location of my plant:** \_\_\_\_\_

**Soil type:** \_\_\_\_\_

**Water given:** \_\_\_\_\_

**Do results support/fail to support your class hypothesis? Why or why not?**

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Day	1	2	3	4	5	6	7
Plant Description							
Soil Moisture Description (Moist, Wet, or Dry)							
Weeds (Yes or No)							
Height and Color							



## Further Florida-Friendly Activity: Mulch Ado about Watering

You will plant three small plots (each measuring 1 sq. ft) with two plants each. Everything planted will be the same species, age, and height, with the same number of leaves. The soil in which the six plants are planted will also be identical. One plot will have no mulch, one plot will have organic mulch (eucalyptus mulch, pine mulch, or pine bark), and one plot will have inorganic mulch (stones). You will apply 1.5 gallons of water (or an appropriate amount in smaller planting areas) to each pair of plants, but then no more. Record the plants' behavior every morning and afternoon until all but one has died from lack of moisture. Remember to write down your hypothesis before doing this experiment!

### See Your Reflection

What is mulch?

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Explain the difference between inorganic and organic mulch.

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How can mulch be beneficial?

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What did you learn about the scientific method from the mulch unit?

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Which plant lived for the longest after you stopped watering? The one planted in organic or inorganic mulch?

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# ATTRACT WILDLIFE



**LANDSCAPING PRINCIPLES FOR  
FLORIDA-FRIENDLY YARDS**

## UNIT 5: Attract Wildlife

### Purpose

The purpose of this unit is to help youth learn ways to attract migratory and native wildlife to their Florida-Friendly landscapes as well as the mutual benefits of fauna in residential areas.

### Objectives

Youth will be able to:

- Understand wildlife-friendly landscape design principles.
- Learn the ways in which wildlife benefit landscapes.
- Identify components of a layered landscape.

### Lesson

- Learn which components of a Florida-Friendly landscape are necessary to successfully attract desirable wildlife.

### Learning Activities

- In-Class Activity: “A Yard of Design Goes a Long Way”
- Home Activity: “This Feeder Is for the Birds”
- Further Florida-Friendly Activity: “Hummingbird Happiness”

### Preparation

- Review the publications that support each lesson in the Unit Resources.

### Background Information

- **What can we do in our yards to make them a better home for wildlife?**

All wildlife need the following elements in the landscape to survive and thrive:

- ✓ **Shelter:** Consisting of proper vegetation; snags (broken, dead trees); a place to rear young; and protection from weather, pets, and feral predators (cats, dogs, etc.)
- ✓ **Food:** Plants that provide nectar, foliage, and fruits to eat; feeders

- ✓ **Water:** Fresh water collected from rain, streams, or other bodies of water
- ✓ **Space:** Vertical layering of vegetation (some birds eat on the ground but nest high in the trees), territory

- **Which are the principal groups of animals we want to attract?**

- ✓ Birds
- ✓ Insect pollinators, such as butterflies, moths, bees, and wasps
- ✓ Native frogs and other amphibians
- ✓ Squirrels, bats, and other small mammals
- ✓ Note: Other wildlife that might not be as welcome, like snakes or armadillos, may come to a Florida-Friendly landscape, but the habitat is good for them, especially if you are attracting amphibians and small mammals. Although people don't like to see snakes in their landscape, they are good for keeping the rodent population under control.

- **What are the top seven tips to make your Florida-Friendly yard more wildlife-friendly?**

(UF/IFAS, 2015b)

- ✓ Provide food.
- ✓ Supply water.
- ✓ Leave snags.
- ✓ Manage pets.
- ✓ Reduce insecticide use.
- ✓ Reduce the amount of mowed lawn area.
- ✓ Increase vertical layering.

- **What type of bird feeder and bird food attract birds?**

- ✓ See *Attracting Backyard Birds: Bird Feeder Selection* at <https://edis.ifas.ufl.edu/publication/uw192>

## Unit Resources

Cornell Ornithology Laboratory's FAQ page

<http://www.birds.cornell.edu/pfw/>

[AboutBirdsandFeeding/FAQsBirdFeeding.htm](http://www.birds.cornell.edu/pfw/AboutBirdsandFeeding/FAQsBirdFeeding.htm)

Funky Nests in Funky Places

<https://celebrateurbanbirds.org/community/challenges/funky-nests-2017/>

Impacts of Free-Ranging Pets on Wildlife

<https://abcbirds.org/program/cats-indoors/cats-and-birds/>

*Landscape Elements for a Florida-Friendly Yard*

<https://edis.ifas.ufl.edu/publication/EP424>

*Hummingbirds of Florida*

<https://edis.ifas.ufl.edu/publication/UW059>

Wander Wisdom

<https://wanderwisdom.com/travel-destinations/FloridaVacationWaterBirds-Greensleeves>

Wildland-Urban Interface

[https://edis.ifas.ufl.edu/topic\\_wildland\\_urban\\_interface](https://edis.ifas.ufl.edu/topic_wildland_urban_interface)

*Helping Cavity-Nesters in Florida*

<https://edis.ifas.ufl.edu/publication/UW058>

## IN-CLASS ACTIVITY: A YARD OF DESIGN GOES A LONG WAY

### Objectives

Youth will be able to:

- Learn about the necessary components of a wildlife habitat.
- Design a landscape that will attract and sustain wildlife.
- Learn about specific habitat components for different wildlife.
- Develop an awareness of wildlife habitats.
- Understand the fauna that supports a wildlife-friendly environment.

### Life Skills

- Decision-making
- Problem-solving
- Planning/organizing

### Setting

- A comfortable room with tables and chairs

### Materials Needed

- Large pieces of construction paper or poster board
- Markers, crayons, pens, and pencils
- Magazines or photos from which to cut
- *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design* (To learn more about the benefits of Florida-Friendly plants on wildlife, review these resources on Landscaping for Florida Wildlife: [https://edis.ifas.ufl.edu/topic\\_landscaping\\_for\\_wildlife](https://edis.ifas.ufl.edu/topic_landscaping_for_wildlife))
- Map (Appendix E)
- “A Yard of Design Goes a Long Way” on page 20 of the workbook.

### Introduction

You will work within your own hardiness zone. If you want a house as a guide, tear out Appendix D. Think about mixing and matching overstory, canopy, understory, shrub, and groundcover layers with colors and plant purposes. You can do this with the symbols provided. As you choose plants, identify the benefit the plant provides

to wildlife (e.g., pollen, nectar, shade, fruit, etc.). You can design a garden with materials provided by the instructor. Once you have completed the nine units of *4-H Florida-Friendly Landscaping™*, you will be able to do this on your own.

### Do

- Divide youth into small groups.
- Youth will be asked to design a wildlife-friendly backyard for numerous types of wildlife including the following items:
  - ✓ Food
  - ✓ Water
  - ✓ Shelter
  - ✓ A place to raise young
- Youth may use the house plan and symbols in Appendix E on page 42 of the workbook as a guide.
- Youth will be given poster board or construction paper, markers, crayons, and photos to design their wildlife habitat.
- Following the activity, groups will present their designs to the class. Allow youth to ask questions of each presenting group in order to understand their design.

### Reflect

- Did any problems arise as you built your wildlife habitat?
- How did you solve your problem?
- How did your group decide what type of wildlife you wanted to attract?
- Did you make a list of each element necessary?

### Apply

- Survey your yard or another location to see if it is a wildlife attractor. Does it have all of the components we talked about?
- What can you do to attract wildlife to your yard?
- How can you use the decisions you made today to make a plan for your own yard/location?

## Home Activity: This Feeder Is for the Birds

### Objectives

- Attract wildlife to your Florida-Friendly landscape.
- Understand that a variety of birds will be attracted to the feeder.
- Learn how to create a feeding device for birds in your area.

### Life Skills

- Decision-making
- Planning/organizing

### Setting

- A comfortable room with tables and chairs
- An outdoor space to hang/place bird feeder, at home or in a public place. Be sure to ask permission prior to hanging the bird feeder.

### Materials Needed

- Pinecone
- String
- Peanut butter (or shortening if allergic to peanuts)
- Butter knife
- Shallow container a little bigger than the pinecone
- Mixed bird seed
- Bird identification guide

### Introduction

There are more than 480 species of birds in Florida. As the number of habitats decrease around the state and the number of invasive (non-native) predators increases, it becomes more important than ever to attract wildlife to our yards, schools, parks, and other outdoor locations. Birds benefit the environment by dispersing seeds, pollinating, eating insects, and providing organic fertilizer and sometimes eggs. See how many birds youth can attract to their yards (or other locations) in this activity.

### Do

- Instruct youth to brush their pinecones free of dirt. Tie each end of a string to the top of the pinecone so that it may hang. Pour some birdseed into the container. Cover pinecone with a layer of peanut butter (or shortening) and roll it in the bird seed.
- Instruct youth to consider what type of birds they want to attract.
- Explain types of food available (millets, pumpkin seeds, sunflower seeds, sesame seeds, dried kidney beans, etc.). See <https://edis.ifas.ufl.edu/publication/uw192> for help with bird feeder type, food choice, and location.
- Instruct youth to hang bird feeder with help of parents.
- Instruct youth to observe feeding habits of birds visiting the feeding station.

### Reflect

- Which types of birds visited your feeder? Did any other animals visit your feeder that weren't birds?
- As you observed how birds used your feeder, did you think about other things you could do to attract more/different birds?
- Do you enjoy trying and learning new things? Do you like doing the same things over again?

### Apply

- Choose another animal you want to attract to your yard or another area. Think about how you would plan to attract other animals.
- As you consider your plan to attract other animals, what resources do you think you'll need?
- Why is making a plan important?
- What is another situation when making a plan is important? Explain.



# Unit 5 Attract Wildlife

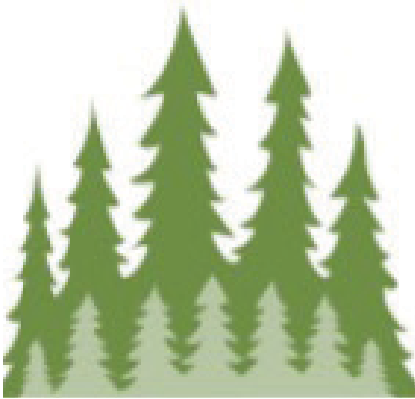
## **In-Class Activity: A Yard of Design Goes a Long Way**

You will be asked to design a wildlife-friendly backyard, based on the following items: (1) food, (2) water, (3) shelter, and (4) a place to raise young. You can use the map and symbols in Appendix E to practice and the materials brought by your instructor to design your wildlife habitat. Following this activity, each group will present its design to the class.

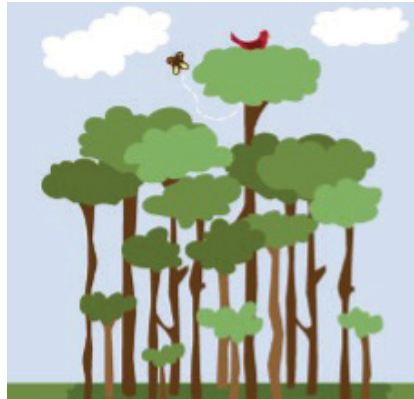
Investigate and discuss whether limiting factors (food, water, shelter) can affect wildlife population in a particular area. How do humans impact wildlife?

If you wish, using the yard design template and symbols (Appendix E, workbook page 42) practice mixing and matching overstory, canopy, understory, shrub, and groundcover layers with colors and plant purpose. Use the materials brought to your class by the instructor to design a wildlife habitat. Choose appropriate plants from *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design*, and label your layers. Identify the benefit the plant provides to wildlife (e.g., pollen, nectar, shade, fruit, etc.). Draw in other important factors that deal with shelter, food, and water like bird baths or feeders.

## Landscaping Key



OVERSTORY



CANOPY



GROUNDCOVER

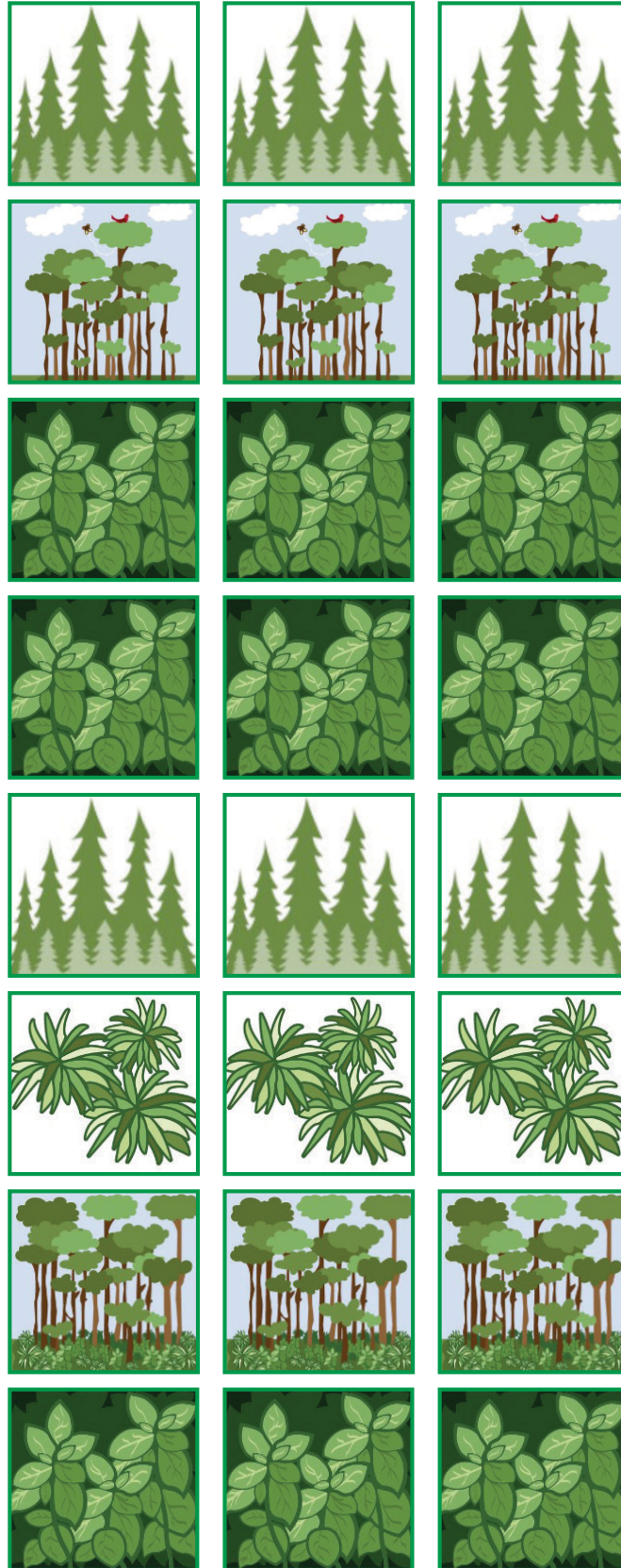


SHRUB



UNDERSTORY





**Directions:** Use these items to practice mapping out your wildlife-friendly yard. Make sure to label your plants on your final design.

## Home Activity: This Feeder Is for the Birds!

For this activity, you will assemble your own bird feeder using a pinecone, peanut butter, and birdseed. Before you put out the bird feeder, explain which local birds you expect to be attracted to your space. Observe and record the type of birds that are eating at your feeder for the next five days.

Day	1	2	3	4	5
Bird Species or Descriptions					

## Further Florida-Friendly Activity: Hummingbird Happiness

Find “Hummingbird Happiness” at home. This may also be a good group project at a school yard, park, community garden, or Extension office.

Purchase two hummingbird feeders and follow directions to set them up. One feeder will be set up on the east side of your house or another structure and the other on the west. Also, purchase plants with red, tubular, native flowers, if you do not already have these at home. Firebush (*Hamelia patens*) is a good example of a native plant with that description. One feeder will be surrounded by the plants with red tubular flowers, and the other will have none. The plants can be planted in the ground or left in pots.

Use a field journal or notebook to keep records. Measure “nectar” levels in the feeder twice a day, at 6:30 a.m. or earlier, and again between 6:30 and 7:00 p.m. Compare results between the feeders. Before placing the feeders in your yard, hypothesize whether the levels of nectar will be the same or different and provide reasons why any differences or similarities might occur. In what other ways could this hypothesis be tested?

Discuss the needs of hummingbirds as outlined in *Hummingbirds of Florida* (<https://edis.ifas.ufl.edu/publication/UW059>), and come up with a hummingbird-friendly landscape design.

## See Your Reflection

What can you do to make your yard a better home for wildlife?

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What are the main groups of animals you want to attract to your yard? Why?

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List and discuss three of the top ten tips to make your landscape more wildlife friendly.

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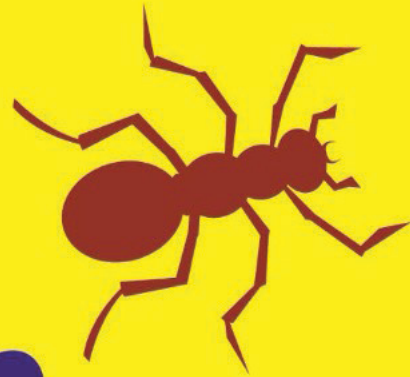


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# MANAGE YARD PESTS RESPONSIBLY



# 6



## LANDSCAPING PRINCIPLES FOR FLORIDA-FRIENDLY YARDS

## UNIT 6: Manage Yard Pests Responsibly

### Purpose

The purpose of this unit is to acquaint youth with various types of yard pests, including arthropods (insects and others). Knowledge of basic entomology (in the broadest sense) will help youth recognize the principal features of insects. “Yard pests” also include nuisance wildlife (e.g., raccoons, opossums, pigeons) and exotic invasive animals (Africanized bees, iguanas, Muscovy ducks, giant toads, etc.). However, complex details regarding invasive pest management are beyond the scope of this curriculum.

### Objectives

Youth will be able to:

- Understand basic facts about insects (insect body parts, groups, arthropods versus insects, or “bugs”).
- Identify safe and responsible methods of pest control for insects and arthropods.
- Understand the difference between beneficial bugs and yard pests.

### Lesson

- Differentiate between arthropods and insects.
- Learn how to use insecticidal soap or horticultural oil to spray insects.
- Understand there are beneficial insects and pests.

### Learning Activities

- In-Class Activity: “Is It an Insect?”
- Home Activity: “Bye-Bye Bug Blend”
- Further Florida-Friendly Activity: “Don’t Let the Bad Bugs Bite!”

### Preparation

- Review the content found in Background Information.
- Secure a room with a projector and screen.
- Review definitions of arthropod and insect and talk about the various groups of organisms.
- Laminate sets of arthropod and insect cards located in Appendix F.

- Review charts of insects, their body parts, two major life cycles, and representative groups.
- Review representative beneficial insects.
- Review information on representative “pest” insects and their control through **Integrated Pest Management** techniques.
- Review lesson activities and gather needed supplies.
- Provide samples of insecticidal soap and “horticultural oil” for viewing.

### Background Information

#### • What is an arthropod?

An **arthropod** is an invertebrate (without a spinal column) organism that has an exoskeleton (external skeleton), a segmented body, and jointed legs. This group includes insects, mites, spiders, centipedes, millipedes, shrimp, crabs, and their relatives.

#### • What is an insect?

**Insects** make up a class within the arthropods. They have a chitinous (thick and waxy) exoskeleton, a three-part body (head, thorax, and abdomen), three pairs of jointed legs, compound eyes, and two antennae. Most have two sets of wings.

What are the names of the body parts of an insect?

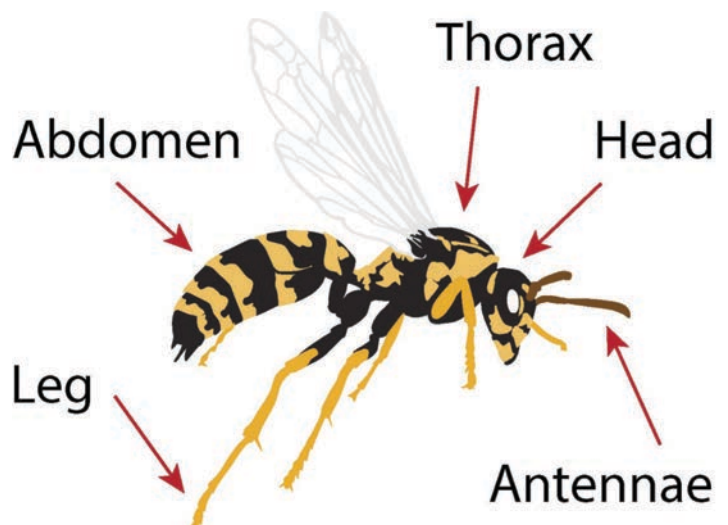


Figure 14. Insect anatomy. Credit: UF/IFAS ICS

- **What is the life cycle of an insect? How does it grow and mature?**

Insects have two different kinds of life cycles. Some undergo **incomplete metamorphosis**, in which the egg hatches, and the insect gradually develops from a **nymph** to an **adult** without stark changes.

✓ **Incomplete Metamorphosis**

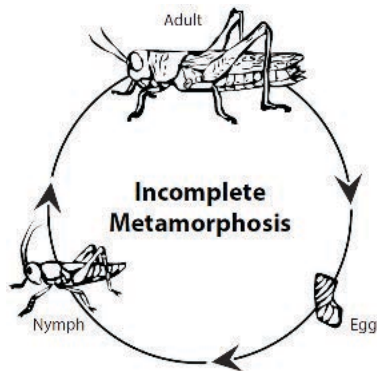


Figure 15. Incomplete metamorphosis.

- Other insects undergo more distinct changes in a process called **complete metamorphosis**. They start at the egg stage, then go into the larva and pupa stages before finally becoming adults.

✓ **Complete Metamorphosis**

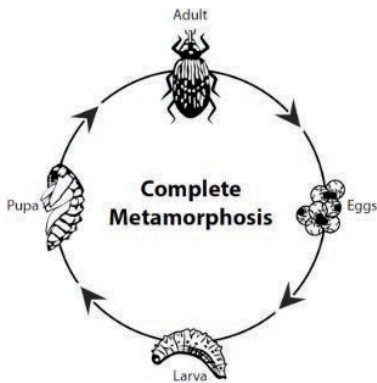










Figure 16. Complete metamorphosis.

- **What is a beneficial insect?**

✓ **Beneficial Insects** are those that serve a purpose in our backyards (see also UF/IFAS, 2015a). They include:










Table 3: Beneficial insects (photo credits as cited)

INSECT	FUNCTION	PHOTO
<b>European Honeybee</b>	Pollination	 <p>Photo Credit: David Cappaert, Bugwood.org</p>
<b>Ladybug Beetle</b>	Eats pests like aphids, mealybugs, whiteflies, and others	 <p>Photo Credit: M. E. Bartolo, Bugwood.org</p>
<b>Assassin Bug</b>	Eats harmful flies, caterpillars, beetles, and mosquitoes	 <p>Photo Credit: Whitney Cranshaw, Colorado State University, Bugwood.org</p>
<b>Ambush Bug</b>	Both adults and young are predators and feed on a variety of flying insects, like flies, caterpillars and beetles.	 <p>Photo Credit: David Cappaert, Bugwood.org</p>
<b>Praying Mantis</b>	Feeds on a variety of insects, including moths, crickets, grasshoppers, and flies. If necessary, they will eat each other.	 <p>Photo Credit: Sturgis McKeever, Georgia Southern University, Bugwood.org</p>
<b>Lacewings</b>	Lacewing larvae, sometimes called “aphid lions,” eat many small insects as they grow. Besides aphids, they eat caterpillars, butterfly eggs, small beetles, scale insects, leafhoppers, thrips, and small flies, among others.	 <p>Photo Credit: USDA ARS Photo Unit, Bugwood.org</p>  <p>Green lacewing adult. Photo Credit: Joseph Berger, Bugwood.org</p>
<b>Big-Eyed Bug</b>	Predator	 <p>Bigeyed bugs (<i>Geocoris</i> sp.) Fallen, 1814. Photo Credit: Bradley Higbee, Paramount Farming, Bugwood.org</p>

• **What is a pest?**

A pest is any plant, animal, or organism that is out of place and causing harm by attacking other organisms or using resources that other organisms need. Of all the insect species, less than 1% are pests (see also UF/IFAS, 2015a).

Table 4. Pests (photo credits as cited)

Pest	Negative Effect	Photo
<p><b>Ficus Whitefly</b></p>	<p>Attacks hedges and trees, causes leaves to fall</p>	 <p>Credit: Clemson University—USDA Cooperative Extension Slide Series, Bugwood.org</p>
<p><b>Aphids</b></p>	<p>Suck sap from plants; can defoliate or kill them</p>	 <p>Credit: David Cappaert, Bugwood.org</p>
<p><b>Gall Wasps</b></p>	<p>Leaves react to chemicals released by wasps by forming a gall</p>	 <p>Credit: Liudmyla Liudmyla/Stock/Getty Images Plus</p>
<p><b>Sri Lanka Weevil</b></p>	<p>Eats notches on leaves and roots</p>	 <p>Credit: Anyi Mazo-Vargas, University of Puerto Rico, Bugwood.org</p>
<p><b>Hornworms</b></p>	<p>Eat leaves, flowers, and buds</p>	 <p>Credit: Tomato Hornworm, Whitney Cranshaw, Colorado State University, Bugwood.org</p>  <p>Credit: Forest and Kim Starr, Starr Environmental, Bugwood.org</p>
<p><b>Mealybug</b></p>	<p>Pierces leaves and buds, drinks sap, injects with fluids; leaking sap attracts sooty mold</p>	 <p>Photo credit: John A. Weidhass, Virginia Polytechnic Institute and State University, Bugwood.org</p>
<p><b>June Beetle</b></p>	<p>Grubs eat turf roots; adults eat ornamental plants.</p>	 <p>Credit: Steven Katovich, USDA Forest Service, Bugwood.org</p>  <p>Credit: Clemson University—USDA Cooperative Extension Slide Series, Bugwood.org</p>



- **How are centipedes and millipedes different (Koehler, Pereira, & Allen, 2017)?** Centipedes and millipedes are both arthropods, but not insects.

✓ **Centipede**

- Name means “100 legs,” but actual number varies
- Body is flat
- Head has two long and jointed antennae to feel and smell
- Has two modified and venomous legs to kill prey
- Has one pair of legs per segment

✓ **Millipede**

- Name means “1,000 legs,” but no species has that many
- Body is rounded
- Head has two short and jointed antennae to feel
- Does not have venomous legs
- Has two pairs of legs per segment



Figure 17: Millipede (left) and Centipede (right). Credit: Koehler, Pereira, & Allen (2017)

- **How do you tell sowbugs and pill bugs (roly-polies) apart?** (Koehler, Pereira, & Allen, 2017) Sowbugs and pill bugs are arthropods, but not insects.

✓ **Sowbug**

- Has two tail-like projections
- Body is flat
- Cannot roll into a tight ball for protection

✓ **Pill bug (roly-polies)**

- No large tail projections
- Body is rounded
- Protects itself by rolling into a ball



Figure 18: Sow Bug (left) and Pill Bug (right). Credit: J. Castner, University of Florida, courtesy of Koehler, Pereira, & Allen (2017)

- **What is Integrated Pest Management?**

According to the Environmental Protection Agency, **Integrated Pest Management (IPM)** is the coordinated use of pest life cycle and environmental information to find the best management method (Table 5). The goal of IPM is to find the most cost-effective and sustainable methods to manage pests that pose the smallest possible threat to people, property, and the environment (EPA, 2017).

Table 5. Integrated Pest Management is accomplished through the following general methods.

METHOD	DIRECTIONS
Prevention	Buy pest-free plants; apply Right Plant, Right Place rule.
Cultural	Properly install and maintain plants so they do not become stressed.
Biological	Take care of beneficial insects (ladybugs, praying mantises, etc.). Add them to your yard if necessary and provide them with a variety of plants that will provide shelter.
Physical	Remove pests by hand. Cut off infested plant parts and put up barriers.
Chemical	Use selective pesticides and spot treat affected areas. Use horticultural oil or insecticidal soap instead of harsher pesticides whenever possible.

- **What is horticultural oil?**

**Horticultural oil** refers to a number of oily treatments made from one of the following:

- ✓ **Neem:** Purchased commercially, extracted from the seeds of the neem tree, *Azadirachta indica*.

- ✓ **Petroleum** (including paraffin) or **Vegetable**: Marketed as horticultural oil, smothers insects by blocking their spiracles.
- ✓ **Citrus**: From the skin of various citrus fruits; contains limonene, which kills insects
- ✓ **Mineral**: Purchased commercially

- **What is insecticidal soap?**

**Insecticidal soaps** are made from plant oils (cottonseed, olive, palm, or coconut) or animal fat (lard, fish oil) and are considered different from other plant oils, such as neem or citrus oils. They are made from salts in animal fats and plant oils. Insecticidal soap is more effective against soft-bodied insects and larvae than hard-shelled adults.

These soaps must be used with care because they can damage leaves, particularly those belonging to certain thin-leaved species. Plant leaves that have hairs can also suffer damage. It is always better to check by spraying a small amount to test before treating the entire plant.

## Unit Resources

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### Insect Collections

[http://extension.entm.purdue.edu/401Book/default.php?page=insect\\_anatomy](http://extension.entm.purdue.edu/401Book/default.php?page=insect_anatomy)

[http://entnemdept.ufl.edu/bug\\_club/ent-events/collecting101.shtml](http://entnemdept.ufl.edu/bug_club/ent-events/collecting101.shtml)

### Encyclopedia Smithsonian: Entomology

[http://www.si.edu/encyclopedia\\_si/nmnh/buginfo/start.htm](http://www.si.edu/encyclopedia_si/nmnh/buginfo/start.htm)

## In-Class Activity: Is It an Insect?

### Objectives

Youth will be able to:

- Differentiate between arthropods and insects.
- Learn about beneficial insects and yard pests.

### Life Skills

- Critical Thinking

### Setting

- A comfortable room with tables, chairs, and a screen and projector

### Materials Needed

- “Is It an Insect?” Power Point presentation
- Projector and screen
- “Is It an Insect?” workbook page 26
- Laminated “Is It an Insect?” relay cards (Appendix F)
- 2 buckets or boxes per group of youths, one bucket labeled “Arthropods only,” the other labeled “insects.”

### Introduction

All insects are arthropods but not all arthropods are insects. An arthropod is an invertebrate (without a spinal column) organism that has an exoskeleton (external skeleton), a segmented body, and jointed legs. This group includes insects, mites, spiders, centipedes, millipedes, shrimp, crabs, and their relatives.

Insects make up a class within the arthropods. They have a chitinous (thick and waxy) exoskeleton, a three-part body (head, thorax, and abdomen), three pairs of jointed legs, compound eyes, and two antennae. Most have two sets of wings. They also go through metamorphosis.

### Do

- Show youth the PowerPoint presentation on how to tell the difference between an insect and an arthropod. Encourage youth to take notes about insect and arthropod characteristics.
- Split youth into small groups. Put buckets at one end of the room and youth on the other.
- Give small groups laminated cards.

- At the word go, one youth will walk quickly (not run) to the buckets, deposit one card into the appropriate bucket, and then walk back to the line of youths. Then, the next youth will do the same. The game continues until all cards are used up. The winner is the first team that runs out of cards and gets all the cards in the right bin.

### Reflect

- As you recorded characteristics of insects, did the information help you decide if the bug was an insect or arthropod?
- Did you change your mind on the classification of an insect after further observation or recording of information? Why or why not?

### Apply

- What other decisions do you make where collecting data would be helpful?

## Home Activity: Bye-Bye Bug Blend

### Objectives

- Learn to manage pests responsibly through use of appropriately labeled insecticidal soap.
- Increase knowledge of experimental design by using control (no spray) and variable (spray) plants to hypothesize what will happen if the insecticidal soap is applied.

### Life Skills

- Critical thinking
- Planning/organizing
- Using resources wisely
- Keeping records

### Setting

- An outdoor area with plants
- A comfortable room with tables and chairs

### Materials Needed

- Labeled insecticidal soap
- Water for washing hands
- Pest-ridden plants
- Workbook page 26

### Introduction

Now that you know that there are good and bad bugs, it is also important to learn how to manage yard pests responsibly. To combat yard pests, you can use insecticidal soap. Use your knowledge to create an experiment about using this spray on plants in your landscape. First, hypothesize what will happen to the plant and pests when you use the spray. Remember to state your hypothesis and tell what your results “support” or “fail to support.” Second, choose two groups of plants. One will be a control group (no spray). The second will be the experimental group, which will receive treatment of insecticidal soap.

### Do

- Read directions on insecticidal soap label.
- Observe and record the number of bugs on the plant in both groups before spraying and at both three and five days after spraying.

### Reflect

- What did you find was different between control and experimental groups?
- Did collecting observations of insects on the different groups help you make a decision about how to control insects in your yard?
- Why is it important to manage yard pests responsibly?

### Apply

- How can you think about decisions you need to make based on facts?



# Unit 6 Manage Yard Pests Responsibly



## In-Class Activity: Is It an Insect?

All insects are arthropods, but not all arthropods are insects. In this activity, you will watch a presentation that teaches you how to identify whether a bug is an insect or only an arthropod.

After the presentation, you and a small team will receive cards with bugs and two buckets, one labeled “insects” and one labeled “arthropods only.” You will have a relay race to put the cards in the correct buckets. The first team to finish and get them all right wins!

## Home Activity: “Bye-Bye Bug Blend”

Now that you know the difference between good and bad bugs, it is important to learn how to manage yard pests responsibly. To combat yard pests, you use a labeled insecticidal soap.

Use your knowledge of experimental design to hypothesize what will happen to the plant and pests when you use the spray. Remember to tell what your results support or fail to support. Record this information on the worksheet.

1. Choose two different plants that are attracting an insect. One you will mark as A (test) and the other as B (control). Only apply insecticidal soap to plant A only.
2. Record the number of insects on each plant prior to applying the bug blend and each day for up to 5 days.

Hypothesis:

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Observation of Test Plant:

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Observation of Control:

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Conclusion:

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## Further Florida-Friendly Activity: Don't Let the Bad Bugs Bite!

You saw a presentation in class today filled with both “good” (beneficial) bugs and “bad” (pests) bugs. Along with your instructor, you talked about the name of each bug, whether it is good or bad, and what it does to other bugs or plants.

Next, look at page 27 in the workbook with pictures of good and bad bugs. With parent permission, take a walk in your yard to see if you can find any of these bugs. In a notebook, record which bugs you saw and in what type of habitat you saw them. Was it in the soil or on a plant?

## See Your Reflection

Describe a few of the ways arthropods differ from insects.

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What percentage of insects are actually pests? What is your reaction to this information?

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What is integrated Pest Management, and why is it important?

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What are responsible and safe methods for control of pests?

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# RECYCLE

7



**LANDSCAPING PRINCIPLES FOR  
FLORIDA-FRIENDLY YARDS**

## UNIT 7: Recycle Yard and Household Waste

### Purpose

The purpose of this unit is to teach youth about the best ways to recycle plant matter as well as other items and return them to the yard in order to enrich the organic content of soils, turf, and planting beds.

### Objectives

Youth will be able to:

- Identify ways to recycle lawn clippings, fallen leaves, and trimmings from shrub and tree pruning.
- Define “compost” and learn about the ways in which it can be made and used in order to enrich the landscape, reduce the need for fertilizer, and improve soils.

### Lesson

Present topics using handouts and pictures that show recycling practices. If available, show a compost pile to youth and discuss how composting works.

### Learning Activities

- In-Class Activity: “Choosing Compost Components”
- Home Activity: “Creating Compost”
- Further Florida-Friendly Activity: “Worm Farming for Better Gardening”

### Preparation

- Review the basic principles of composting.
- Review the steps necessary to create an inexpensive compost bin or pile and use compost in the landscape.
- Review the basic contribution of worms to the garden.
- Obtain and prepare display materials, pictures, or actual compost bins or piles.
- Help youth identify the proper elements of a compost pile and learn proper composting procedures.

### Background Information

- **What is landscape recycling, and how is it accomplished?**

Landscape or yard waste can be recycled in a variety of ways, which are outlined in the following table (Kidder, 2003).



Table 6. How to recycle waste (Kidder, 2003).

Material	Action and Practice	Advantages and Disadvantages	Equipment Needed
Fallen leaves and pine needles	Shred with lawn mower.	<b>Advantages:</b> Breaks up leaves for faster decomposition; no raking or gathering needed; nutrients and organic matter are returned directly to the soil.	Lawn mower
	Rake or collect with bagging lawn mower and use as mulch for tree and shrub beds.	<b>Advantages:</b> Leaf mulch reduces water evaporation and protects the soil from erosion and crusting; provides weed control; prevents soil from splashing on buildings and sidewalks; reduces need for purchased mulch; recycles nutrients as the leaves decompose.	Lawn rake or bagging lawn mower, cart
	Collect leaves and compost in a compost pile.	<b>Advantages:</b> Compost can be used for soil enrichment. <b>Disadvantages:</b> Composting requires work, attention to details, and a place in the landscape where the pile can be located.	Leaf-gathering tools, compost bin, (soil fork)
Grass clippings	Do not collect when mowing.	<b>Advantages:</b> No effort needed; material decomposes, and nutrients are recycled in place; no disadvantages with proper mowing and fertilization and irrigation practices; most efficient option.	None
	Collect with bagging lawn mower and use as mulch.	<b>Advantages:</b> Organic matter and nutrients are kept on the premises. <b>Disadvantages:</b> The practice removes nutrients and organic matter from the lawn; requires effort to empty the bagger; mulch may produce odor if piled too thickly.	Bagging lawn mower, cart
	Collect with bagging lawn mower and add to compost pile.	<b>Advantages:</b> Organic matter and nutrients are kept on the premises. <b>Disadvantages:</b> The practice removes nutrients and organic matter from the lawn; requires effort to empty the bagger; mulch may produce odor if piled too thickly.	Bagging lawn mower, cart, compost bin, turning fork
Shrub prunings, remains of garden plants and weeds	Break or cut into small pieces (e.g., 6–12 inches) and spread as mulch on shrub and tree beds.	<b>Advantages:</b> Nutrients and organic matter are kept on premises. <b>Disadvantages:</b> Generally, needs to be reduced to fairly small pieces to be acceptable in landscaping; requires more work than simply hauling to curb.	Pruning shears
	Shred with lawn mower, chipper, or shredder and use as mulch on beds or paths.	<b>Advantages:</b> Materials lose appearance of “trash” and look like mulch; succulent materials decompose rapidly, while woody materials decompose more slowly. <b>Disadvantages:</b> Safety precautions needed when shredding woody materials, which dull lawn mower blades.	Shredder, chipper, or lawn mower; cart
Tree limbs and woody shrub prunings	Saw into firewood lengths.	<b>Disadvantages:</b> Firewood is not needed in many parts of Florida; leafy material and smaller branches must be handled separately.	Saw, shears, cart
	Chip or shred and use as decorative mulch or for path-making.	<b>Advantages:</b> Reduces need for purchased mulch; saves cypress trees and pine bark for other uses.	Chipper or shredder, cart

### • What is compost?

Compost is the product of controlled decomposition of organic matter that has reached a point of stability so that it can be used to help plants grow (UF/IFAS, 2015b).



Figure 19. Finished compost. Credit: UF/IFAS Photo database

### Why should we compost?

Compost, consisting of decomposed organic materials, leads to the formation of humus, which is a rich, dark-colored, and stable form of organic matter that remains after most plant or animal residues have decomposed. Humus can be mixed into the soil to increase the soil's nutrient content, improve its organic content, and result in better plant growth.

Compost can (UF/IFAS, 2015a, 2015b):

- ✓ Ward off plant diseases and pests.
- ✓ Reduce or eliminate the need for chemical fertilizers.
- ✓ Promote higher yields of agricultural crops.
- ✓ Facilitate reforestation, wetlands restoration, and habitat revitalization efforts by amending contaminated, compacted, and marginal soils.
- ✓ Help soils contaminated by hazardous waste in a cost-effective way.
- ✓ Remove solids, oil, grease, and heavy metals from stormwater runoff.

Composting also offers you the following practical benefits (UF/IFAS, 2015b):

- ✓ Disposal of food and yard wastes through natural processes
- ✓ Enhancement of the soil on your property
- ✓ Release of essential elements (macro- and micronutrients) to plants
- ✓ Increase in aeration and drainage
- ✓ Increase in water-holding capacity of soils
- ✓ Creation of a favorable environment for microorganisms, earthworms, and insects, nature's "soil builders"

Composting enhances plant growth through the acceleration of the landscape's nutrient cycle, which is illustrated in Figure 20.

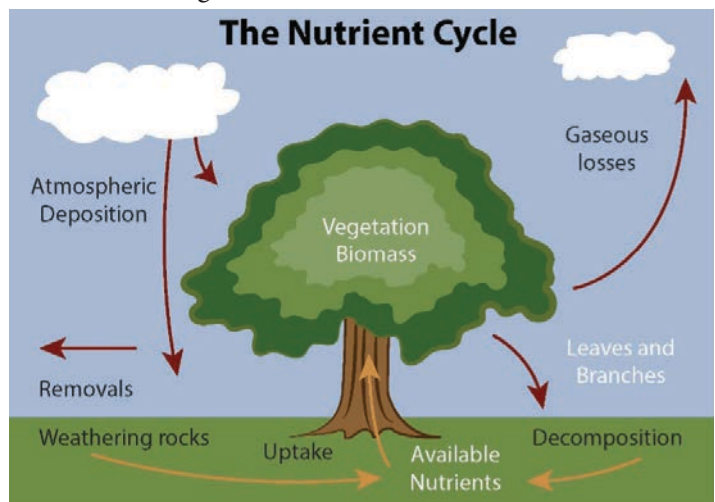


Figure 20. The nutrient cycle. Credit: UF/IFAS ICS

### • What do you need to start composting?

- ✓ A supply of organic material. If it is chopped up, it will break down more quickly.
- ✓ A sunny location to build the compost pile
- ✓ Common garden tools, such as a wheelbarrow and pitchfork
- ✓ Materials to construct an enclosure for the pile, if desired

- **Which materials should be composted?**
- The key to successful composting is to balance and layer brown (carbon-rich) and green (nitrogen-rich) materials with some air and water.

Table 7. What should be composted? (Smith & Friend, 2019; Park Brown, 2017)

Material to Compost	
Carbon (Brown)	Nitrogen (Green Elements)
Bedding, herbivorous	Bedding, herbivorous
Garden debris, dried	Blood meal
Garden debris, fresh	Bone meal
Grass clippings, dried	Coffee grounds
Hay	Feathers
Leaves	Fruit
Paper (recyclable)	Fruit peels and rinds
Peanut shells	Garden debris, fresh
Straw	Grass clippings, fresh
Dried or woody vegetables	Hair
Plant tissues	Houseplants
	Lake weeds
	Lint
	Manure
	Pumpkins
	Vegetable scraps
	Tea grounds and leaves

- **Which materials should NOT be composted?**
- Meat, bones, fats, and foods with oils should not be composted, because they attract animals and produce offensive smells. Manure from animals that eat plants (horses, cows, etc.) can be composted, but not manure from animals that eat meat (dogs, cats, etc.) because of possibility of disease.

Table 8. Which materials should NOT be composted? (Smith & Friend, 2019; Park Brown, 2017)

Do Not Compost:
Bones
Cat litter
Charcoal, briquettes, ash
Cooked food waste
Dairy products
Dish water
Fatty, oily foods
Fish scraps
Meat
Glossy colored paper (nonrecyclable)
Peanut butter
Pet and human waste
Sludge
Disease- or insect-ridden plants
Yard trimmings with chemical herbicides and pesticides

- **What type of composter should I use?**
- There are a number of structures available for those who choose the “bin” or similar method instead of the open pile (Figure 21). These structures will enable the pile to stay neat.



Figure 21. Composting structures. Credit: UF/IFAS Photo Database

- Where should I put my compost pile? (Figure 22)

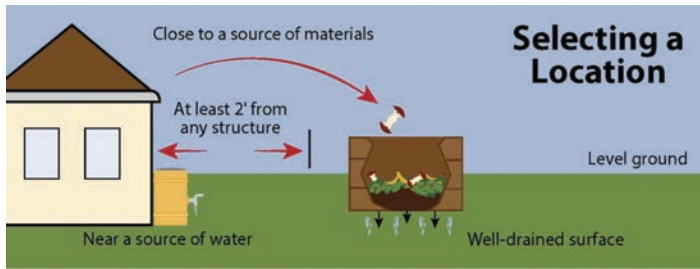


Figure 22: Selecting a location. Credit: UF/IFAS ICS

- How do I manage my compost pile?

- ✓ **Provide oxygen** (aerobic process): The microbes will need it. Foul-smelling chemicals will form under anaerobic conditions (without oxygen). You can add bulky materials and mix up the pile, turning it over as necessary.
- ✓ **Provide moisture:** Ideal moisture is between 45% and 65%, so you will need to check the pile by squeezing the compost in your hands. If the compost drips, then it should receive less water.
- ✓ **Maintain proper temperature:** The microbes in the pile will give off heat from their metabolic processes. The ideal temperature is 125°F; 130°F causes them to slow down or die. The pile's dimensions should be at least 3 × 3 × 3 ft to ensure proper heat buildup to kill weed seeds and plant pathogens.
- ✓ **Turn compost pile weekly:** This improves oxygen content and prevents formation of chemicals that will cause unpleasant odors.
- ✓ **Harvest:** Be sure to remove larger pieces with a screen and return them to the pile.

## Unit Resources

*Compost Tips for the Home Gardener:* <https://edis.ifas.ufl.edu/publication/EP323>

Composting at Home: <https://www.epa.gov/recycle/composting-home>

## In-Class Activity: Choosing Compost Components

### Objectives

Youth will be able to:

- Understand the importance of composting.
- Differentiate between appropriate compost items and items that should not be composted.

### Life Skills

- Contribution to a group effort
- Cooperation

### Setting

- A comfortable room with tables and chairs

### Materials Needed

- Magazines and newspaper ads depicting both compostable items (i.e., fruits and vegetables) and noncompostable items (pizza, bacon, hamburgers, etc.)
- One compost “bin” (small bucket or another open container) per group
- Scissors

### Introduction

Humans have an impact on the Earth. Deforestation, urbanization, erosion, and desertification can all be attributed to human activity. Because of this, it is important to give back whenever possible. This includes recycling plant matter and other appropriate items for use as compost. Composting deposits minerals into the soil and provides plants with essential elements (macro- and micronutrients) they need to thrive. In addition, composting is a natural way to dispose of food and yard wastes.

However, it is also important to know that certain things cannot be composted. Materials such as bones or pet waste can actually be harmful to the environment and local wildlife. Based on what you have learned in this unit, you will identify the items that should and should not be composted.

### Do

- Divide youth into small groups. Discuss what can and cannot be composted.
- In groups, youth will create their own “compost bin” based on what they’ve learned. Youth will cut out the appropriate and inappropriate items from magazines/newspapers provided.
- Each group will present their “compost bin” and explain why they chose or did not choose certain objects to be a part of their compost pile.

### Reflect

- What did you learn about compost?
- How are composting and recycling similar?
- Discuss items that should or should not be composted. Why should certain items never be composted?
- In your group, did you work well together?
- Did you agree on all items that went into the compost bin? Why or why not?
- Did you share responsibility for accomplishing your goal or creating a compost bin?

### Apply

- Did you experience a benefit to working with your group to create this compost bin?
- Are there other big projects or goals when working with a group would be beneficial?

## Home Activity: Creating Compost

### Objectives

Youth will be able to:

- Learn ways to recycle lawn clippings, fallen leaves, and trimmings from shrub and tree pruning.
- Use composted material.

### Life Skills

- Using resources wisely
- Keeping records
- Self-motivation

### Setting

- An outdoor area or space to locate your compost bin

### Materials Needed

- Plant matter, such as grass clippings, straw, and pine needles, and other materials, such as fur
- Bucket or bin for compost
- Thermometer
- Shovel or way to mix compost
- Notebook for keeping records

### Introduction

In the previous activity, you learned that only certain items should be composted. This time, you will make the decisions about what should or should not be composted in a real-life setting. In this activity, you will create your own compost pile/bin. You can add items in or around your home to your pile. Manage the compost properly and then, when ready, apply the compost to your Florida-Friendly landscape.

### Do

- Youth will secure a compost bucket/bin and create a compost pile.
- Be sure to ask your parent/guardian for help and permission to use a bucket or bin or to make a pile for compost.

- Take the temperature of the pile daily and record the results in a field journal or notebook. The ideal temperature should be 125 degrees Fahrenheit.
- When ready, use the compost on landscape plants. Note where you use the compost, as well as the item's/plant's reaction to composting.

### Reflect

- How was this activity different from the previous composting activity? What did you learn?
- What was the temperature of your pile? Was it too cold, too hot, or just right? Why?
- On average, how many items per day were you able to compost? Did this surprise you? Why or why not?
- Did you feel motivated to add to your compost daily? Did you need to remind yourself to be on task?
- How did you feel knowing you were responsibly and wisely recycling versus being wasteful?
- Are there other things you can do to use resources wisely?

# Unit 7 Recycle

## In-Class Activity: Choosing Compost Components

It is no secret that humans have had an impact on the Earth. Deforestation, erosion, and desertification can all be attributed to human actions. Because of this, it is important to give back whenever possible. Giving back includes recycling used plant matter and items for use as compost. Composting is a natural way to dispose of food and yard wastes while depositing minerals and essential nutrients into the soil. In this activity, you will be asked to identify which items are appropriate for composting and which are not.

**Think further:** How would you convince someone who does not believe composting is important to compost? How would you tell him or her that only certain items can be composted?

**Directions:** Use the magazines provided by your instructor. Cut out items that can and cannot be composted. Put the items that can be composted into your group's "compost" bin. Discuss both the items that were kept out and put in the compost bin.

## Home Activity: Creating Compost

In the previous activity you learned that only certain items should be composted. For this activity, create your own compost pile! Use items from in and around your home or classroom to make your compost pile at home. You will record the items used in your compost pile, take the temperature of the pile daily, and discuss the results of using the compost on plants as well as people's reactions to composting. Record your efforts in a field guide or notebook.

If you want to help others in your community, ask for the help of a trusted adult and start a compost pile as a community service project to make a landscape in need more Florida-Friendly. List the items you place in the compost bin and observe and record the decomposition process.

## Further Florida-Friendly Activity: Worm Farming for Better Gardening

Assemble a small worm farm so you can add worms to your Florida-Friendly Landscape (a process known as vermicomposting). Prior to creating your worm farms view the “Promote Global Warming” presentation (<http://www.ppt-sharing.com/ppt-presentation/vermiculture-promote-global-worming>). Learn more about vermicomposting in “Vermicomposting” (<https://sfyl.ifas.ufl.edu/lawn-and-garden/vermicomposting/>).

### See Your Reflection

Define the term “compost.”

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In addition to its definition, what did you learn about compost from this unit?

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Discuss what you learned about items that should or should not be composted. How are recycling and composting similar?

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# **REDUCE STORMWATER RUNOFF**



**LANDSCAPING PRINCIPLES FOR  
FLORIDA-FRIENDLY YARDS**

## UNIT 8: Reduce Stormwater Runoff

### Purpose

The purpose of this unit is to explain **stormwater runoff** and the critical concept of **nonpoint source pollution** to youth. Youth will learn about water conservation methods, such as rain gardens, downspout redirection, and rainwater harvesting.

### Objectives

By completing this unit, youth will:

- Define stormwater runoff and its significant contribution to nonpoint source pollution.
- Understand the importance of swales and the role of rain gardens in landscape water retention.
- Identify methods to harvest rainwater, such as rain barrels and rain chains.

### Lesson

Youth will gain a fundamental understanding of water conservation and ways to decrease both stormwater runoff and nonpoint source pollution.

- Determine what comprises stormwater runoff and how it contributes to nonpoint source pollution.
- Learn about swales and rain gardens and the ways they help retain water in the landscape.
- Create a rain chain to understand mechanisms behind capturing and storing rainwater in an aesthetically pleasing way.

### Learning Activities

- In-Class Activity: “Rain Garden”
- Home Activity: “Rain Harvester”
- Further Florida-Friendly Activity: “Runoff Ranger”

### Preparation

- Instructors will gather illustrative materials
- Instructors will divide youth into teams for the In-Class Activity

### Background Information

- **What is nonpoint source pollution?**

**Nonpoint source pollution** is the most serious problem in Florida’s bodies of water. It is defined as pollution that comes from diffuse sources and is associated with long-term effects of everyday activities. Nonpoint source pollution is primarily transported by rainfall and irrigation water through **stormwater runoff** and **leaching**. **Nonpoint source pollution** collects as water drains over large geographical areas that are collectively called a **watershed**.

Figure 23 shows how a watershed is defined as a region draining into a river, river system, or other body of water, normally as a result of some difference in elevation.

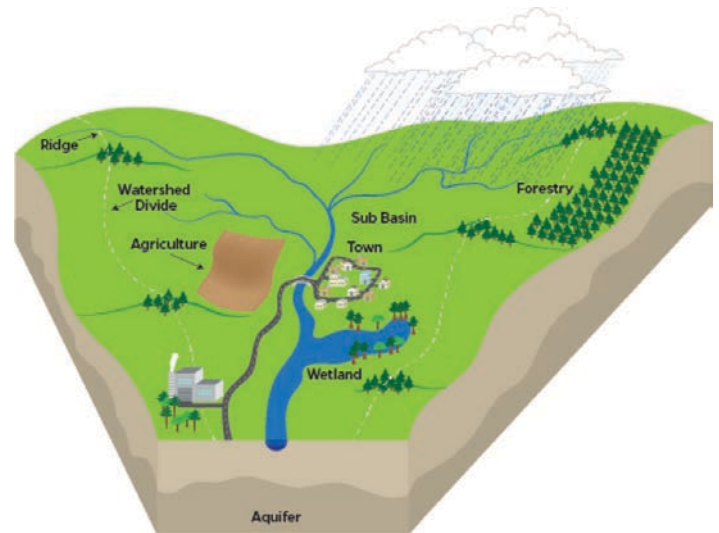


Figure 23. Watershed. Credit: ICS

- **What is stormwater runoff?**

**Stormwater runoff** occurs when rains wash off hard surfaces, such as streets, driveways, and compacted soils. Learn about the different kinds of stormwater runoff, which come from:

- ✓ Water running off roofs of buildings
- ✓ Water running from the roof into the gutters and downspouts that empty onto driveways or sidewalks

- ✓ Water running through the lawn, picking up fertilizers (if applied before the rain) as well as pet waste
- ✓ Water running over the streets, which are often filled with grass clippings that have been treated with pesticides, into unclean storm drains
- ✓ Water running over streets, which are covered in oils, grease, and other petroleum products that have leaked from motor vehicles
- ✓ Water running through large drainage pipes where various pollutants have concentrated, flushing them out into a water body, such as a canal, stream, or lake

• **What is leaching?**

**Leaching** refers to the loss of chemical nutrients that can dissolve in water and move through the soil and rock too quickly to be absorbed by the plants. This happens when we apply fertilizers too soon after it rains, and when we apply too much water to the landscape through sprinklers. Leaching of nutrients from soils, combined with stormwater runoff, account for most of the nonpoint source pollution that affects Florida’s watersheds and jeopardizes our streams, canals, lakes, rivers, and ocean beaches. Using your knowledge of soil structural types, hypothesize which soil types are most prone to leaching. Discuss.

Figure 24 shows that leaching is proportional to soil texture (particle size) and pore (space between particles) size. Chemicals will travel quickly with water through larger soils, often bypassing the plant roots, entering lower levels of the soil profile, and occasionally contaminating underground water resources.

• **What is a rain garden?**

A **rain garden** is created to catch runoff from a house roof draining across the landscape and prevent it from reaching the street (Figure 25). The elements of a rain garden include:

- ✓ Diverse combinations of flowering plants, sedges, rushes, and grasses that can survive prolonged inundation and drought

- ✓ Native plants (a good choice because they follow rainfall patterns; also consider bloom time)
- ✓ Mixed heights, shapes, and textures
- ✓ Mulch or composted yard debris and leaves
- ✓ Rocks and stones for more texture and interest (Figure 26)



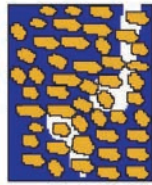






Soil Texture:	Sand	Silt	Clay
Size (mm):	0.05–2	0.002–0.05	<0.002
			
Macropores	+++	++	(+)
Medium-sized p.	++	++	++
Micropores	(+)	++	+++
Percolation:			
Leaching:			

Figure 24. Particle Sizes. Credit: UF/IFAS Department of Soil and Water Sciences (soils.ifas.ufl.edu)

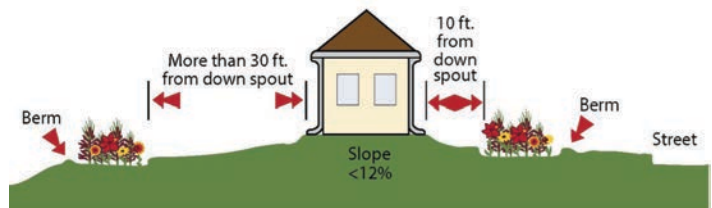


Figure 25. Rain garden locations. Credit: UF/IFAS ICS



Figure 26. Rain garden. Credit: UF/IFAS

- **How do porous surfaces help retain water in the landscape?**

**Porous pavers** are stones that can either be lined up in the soil and divided by turf or set together without concrete (Figure 27). These stones allow water to percolate into the soil instead of running into the street. Another stormwater runoff reduction method is to use gravel or porous pavers on paths throughout the landscape.



Figure 27. Pervious pavement. Credit: UF/IFAS Florida-Friendly Landscaping™ Program

- **What is a rain barrel?**

A rain barrel is a device designed to capture water from the roofs of homes, store it safely, and make it available for use in hand watering the landscape. Rain barrels come in a variety of shapes and sizes (Figure 28).



Figure 28. Rain barrel. Credit: UF/IFAS Photo database

- **What are rain chains?**

Rain chains are decorative chains connected to roofs or downspouts that give a path for water to follow so it collects in several attractive containers (Figure 29).



Figure 29. Rain chain. Photo Credit: Solidago/iStock/Getty Images Plus

## Unit Resources

### Rain Garden

<https://sfyl.ifas.ufl.edu/media/sfylifasufledu/st-johns/horticulture/pdf/Hort-6--Rain-Gardens.pdf>

UF/IFAS Gardening Solution Stormwater Runoff  
<http://gardeningsolutions.ifas.ufl.edu/care/florida-friendly-landscapes/stormwater-runoff.html>

Comprehensive Everglades Restoration Plan  
<https://www.nps.gov/ever/learn/nature/cerp.htm>

## In-Class Activity: Rain Garden

### Objectives

Youth will be able to:

- Understand why it is important to reduce stormwater runoff.
- Learn how rain gardens reduce stormwater runoff.

### Life Skills

- Problem-solving
- Planning/organizing

### Setting

- A comfortable room with tables and chairs

### Materials Needed

- Construction paper
- Markers or crayons
- Scissors
- Glue
- *Florida-Friendly Landscaping™ Plant Guide*
- Workbook page 32

### Introduction

For centuries, humans have changed the flow of water. They have built dams, drained lakes, and dug canals. Sometimes, these changes have been beneficial; at other times, they have not been so environmentally friendly. You have the power to change the flow of water in a positive way and improve the environment by reducing stormwater runoff.

Because of concerns about **nonpoint source pollution** and soil **leaching**, it is important to capture rainwater. One Florida-Friendly way to redirect the flow of rainwater is to create a rain garden. Today, your group will design a rain garden at a location in **north Florida**. Based on everything you have learned so far, design your own rain garden using construction paper, and prepare an oral presentation based on your design to share with the group. Discuss how a rain garden differs from the wildlife-attractor garden you designed in Unit 5.

### Do

- Youth will be broken up into small groups and tasked with designing their own rain garden. The instructor will provide youth with a suggested location in north Florida, the average amount of rainfall received in the location, and a list of various water-tolerant plant species (workbook page 32). Youth will use the plant list included in the activity, *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design*, and other EDIS documents to determine what those plants look like.
- Youth will create a visual display and give an oral presentation of their design.
- Designs will be discussed and critiqued by members of the other groups.

### Reflect

- What is a rain garden? Discuss the ways your rain garden differs from the wildlife garden you designed in Unit 5.
- Why is it important to reduce stormwater runoff?
- How did your team identify possible solutions to the issue of stormwater runoff?
- Did you write down your team's design first or think through the plan first? Why or why not?
- What would you do differently next time?

### Apply

- Are there other issues/problems that you can create a plan to solve?
- Do you find it hard to break a big problem into smaller, easier tasks? Does breaking up a large problem into smaller steps make it easier to solve the problem?
- Did this activity give you any ideas about how gathering knowledge/resources is helpful to solving problems?

## Home Activity: Rain Harvester

### Objectives

Youth will be able to:

- Teach the importance of retaining water in the landscape by reducing stormwater runoff.
- Explain rainwater harvesting methods, such as **rain barrels** and **rain chains**, among others.

### Life Skills

- Communication
- Learning to learn

### Setting

- A comfortable room with tables and chairs

### Materials Needed

- A computer with internet access and multimedia presentation software
- Word processing program or paper and pen or pencil

### Introduction

In several of the previous units, you have had the opportunity to share your Florida-Friendly viewpoint with others. Now, it is time to take everything you have learned about persuasive techniques and combine it with scientific information.

### Do

- Youth will write a one-page persuasive paper that establishes and develops a controlling idea about the importance of stormwater runoff reduction.
- Use supporting arguments and detailed evidence by researching stormwater runoff on your own (on the Internet, at the library, etc.).
- Cite your sources.
- Create a multimedia presentation or a presentation board to complement your speech and present it at the next group meeting.
- Present your ideas to the group as a persuasive speech.

### Reflect

- What did you learn from this activity about communicating with others?
- Name a few ways to harvest rainwater. Did you find it easy or hard to gain new information through research?
- Was it hard to convince others to reduce stormwater runoff? Why or why not?

### Apply

- Are there other times when you need to gather or learn new information on your own?
- Do you think it is important to know how to effectively communicate new information to others through writing or sharing? Why or why not?
- How can you apply what you've learned about gathering new knowledge and sharing with others to different situations?

# Unit 8 Reduce Stormwater Runoff

## In-Class Activity: Rain Garden

One of the biggest problems in Florida is nonpoint source pollution. Nonpoint source pollution creates a large concentration of pollution in streams and lakes, which in time becomes harmful to fish, animals, and the environment. Become a landscape design artist and help reduce nonpoint source pollution and nutrient leaching by making your very own rain garden located in north Florida. Split into small groups and design your rain garden using construction paper. Then, prepare an oral presentation to share in front of your class explaining your design. Remember to communicate clearly between one another and create the best design for the scenario.

## North Florida Rain Garden Plants:

(taken from <https://sfyl.ifas.ufl.edu/media/sfylifasufledu/st-johns/horticulture/pdf/Hort-6--Rain-Gardens.pdf>)

### Perennials for North Florida Rain Gardens

- Blue Flag Iris—*Iris virginica*
- Swamp Sunflower—*Helianthus angustifolius*
- Scarlet Hibiscus—*Hibiscus coccineus*
- Stokes Aster—*Aster Laevis*
- Swamp milkweed—*Asclepias incarnata*
- Tickseed—*Coreopsis leavenworthii*
- Blue-eyed Grass—*Sisyrinchium angustifolium*
- Climbing Aster—*Aster carolinianus*
- Cinnamon Fern—*Osmunda cinnamomea*

### Shrubs for North Florida Rain Gardens

- Beautyberry—*Callicarpa americana*
- Virginia Sweetspire—*Itea virginica*
- Summersweet—*Clethra alnifolia*
- Buttonbush—*Cephalanthus occidentalis*

### Trees for North Florida Rain Gardens

- Dahoon Holly—*Ilex cassine*
- Yaupon Holly—*Ilex vomitoria*
- Sweetbay Magnolia—*Magnolia virginiana*

## Home Activity: Rain Harvester

It's time to put your writing and speaking skills to the test! Write a one-page persuasive paper that establishes and develops a controlling idea about the importance of stormwater runoff reduction. Gather detailed evidence by researching stormwater runoff on your own and develop supporting arguments to discuss the importance of stormwater runoff. Be sure to cite your sources. Finally, you will create a multimedia presentation or presentation board, along with your speech, to share at the next meeting.

## Further Florida-Friendly Activity: Runoff Ranger

Become a **Runoff Ranger** by surveying your neighborhood with an adult. Observe at least one linear mile and note the following:

1. The number and condition of storm drains
2. The number of storm drains that are blocked by debris
3. The number of storm drains that have obvious signs of pollutants
4. The distance of the storm drains to canals or other bodies of water

Record this information on a piece of notebook paper and bring to your next class or club meeting.

## See Your Reflection

Name some ways to harvest rainwater.

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What is a rain garden?

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How is a rain garden design different from that of a garden used to attract wildlife?

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Why is it important to reduce stormwater runoff?

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# PROTECT THE WATERFRONT



**LANDSCAPING PRINCIPLES FOR  
FLORIDA-FRIENDLY YARDS**

## UNIT 9: Protect the Waterfront & Conclusion

### Purpose

The purpose of this unit is to teach youth the importance of protecting waterfront borders from nonpoint source pollution and introduce the following terms: **erosion**, **riparian zone**, **littoral shelf**, and **wetlands**. There will also be a discussion of uses for submerged (submersed), floating or floating-leaved, and emergent (immersed) wetland plants.

### Objectives

Youth will be able to:

- Identify shoreline vegetation and its role in protecting the waterfront by reducing runoff.
- Recognize the importance of planting along waterways in order to enhance the value of the waterfront vegetation, attract wildlife, and reduce erosion.
- Understand erosion and its negative effects.

### Lesson

- Learn about erosion through a simulation.
- Create a complete yard design using knowledge gained from Units 1–9.

### Learning Activities

- In-Class Activity: “Erosion Simulation”
- Home Activity: “Design a Yard”
- Further Florida-Friendly Activity: “Edgy Designer”

### Preparation

- Review the 9 Principles.
- Review the steps for each of the activities.

### Background Information

#### • What is soil erosion?

**Erosion** is the negative process by which the Earth’s surface is worn away by the action of **water**, **glaciers**, **winds**, and **waves**. Erosion usually moves soils to a place away from where they were deposited. Erosion of soil on waterfronts will carry soils into water bodies and release the chemicals (fertilizers, pesticides, and other

contaminants) into them, creating other environmental problems.

#### • What is “riparian”?

**Riparian** refers to the area right next to a watercourse, such as a stream, river, canal, lake, or other body of fresh water. Riparian plants can typically tolerate occasional floods to a certain extent, and a few of them have adaptations that allow their seeds to float.

#### • What is a littoral shelf?

A **littoral shelf** is the underwater equivalent to the riparian area. It often has several more irregular flattened areas that go down too deep for any plant life to grow (Figure 30).

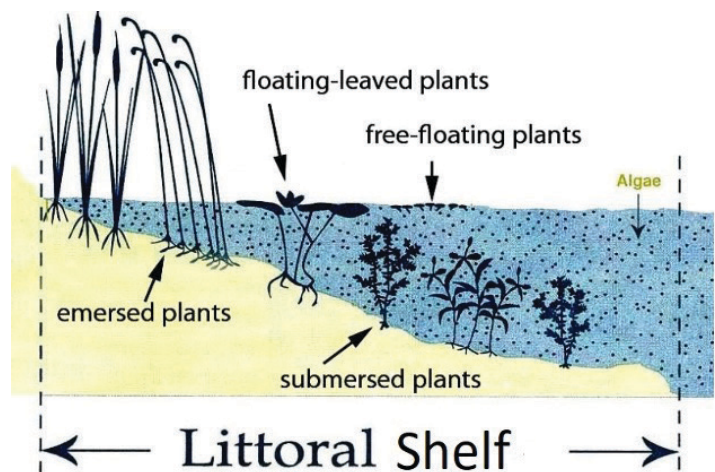


Figure 30. Littoral shelf. Credit: UF/IFAS ICS

- **Why are plants so important to have along the banks of a body of water, both above the water (riparian zone) and in the water (littoral shelf)?**
  - ✓ Waterways with suitable plant species provide habitats for fish, birds, mammals, insects and other arthropods, amphibians, and reptiles.
  - ✓ Vegetation planted on the banks and littoral shelf of a waterway drastically reduces or eliminates the need for maintenance and consequent stormwater runoff.
  - ✓ Shoreline and littoral shelf plants help prevent erosion caused by the rapid increase or decrease in water levels from storms or droughts.

- ✓ Vegetation along margins and on the littoral shelf of waterways helps balance the oxygen levels in the water while feeding the local wildlife.
- **What are the kinds of aquatic plants, and where do they grow?**
  - ✓ **Submerged (submersed) wetland plants** grow entirely underwater and cannot survive out of water. Certain species are rooted in the soil, while others are rootless.
  - ✓ **Floating or floating-leaved wetland plants** include plants with underground roots and floating leaves as well as free-floating species with roots that dangle in the water.
  - ✓ **Emergent (immersed) wetland plants** are rooted in the ground. Their lower portions grow beneath the surface, and their upper portions grow above water.

## Unit Resources

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USDA Natural Resource Conservation Service Soil Erosion Demonstration

[https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/kthru6/?cid=nrcs142p2\\_054299](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/kthru6/?cid=nrcs142p2_054299)

Aquatic and Wetland Plants in Florida

<http://plants.ifas.ufl.edu/manage/why-manage-plants/aquatic-and-wetland-plants-in-florida/>

## In-Class Activity: Erosion Simulation

### Objectives

- Learn about erosion and its negative effects.
- Understand the importance of planting along waterways in order to enhance the value of the waterfront vegetation, attract wildlife, and reduce erosion.

### Life Skills

- Using resources wisely
- Learning to learn

### Setting

- An outdoor area
- A comfortable room with tables and chairs

### Materials Needed

- An economical watering can with a large sprinkler head
- Three inexpensive paint roller trays
- A piece of sod
- Heavy topsoil with organic matter
- Sand or a soil low in organic matter

### Introduction

Youth will learn about erosion through a hands-on simulation. After participating in the simulation, youth will discuss different conservation tactics. Youth will also consider the ways they can get involved with waterfront protection to prevent erosion.

### Do

- Fill the well of the first tray with soil that is low in organic content (sand or loamy sand), the second with heavy topsoil or other soil that is high in organic content, and the third with a piece of sod.
- Place each tray on the table and flatten the soil in the well by tapping it with your hand.
- Fill the watering can.
- Have one participant hold each tray so it is at a 45° angle while the other pours water out of the watering can, creating “rain.”
- Do this simulation with each of the trays of soil.

- Note the color of the water that collects in the end of each tray. Have youth record this information in the workbook (page 35).

### Reflect

- Does the water contain substantial amounts of soil?
- Which one(s) had the most soil wash to the end of the tray?
- Which of the three—bare soil, soil with organic content, or sod—had the clearest water drain off it?
- Why do you think the tray with the sod had cleanest water?
- Do trees and shrubs help curb more runoff than lawns? Why do you think trees and shrubs help curb runoff more than a lawn?
- Are there advantages to trees/shrubs, or even grass in areas where erosion is typical? Why is this important based on the water you observed in the demonstration?

### Apply

- As you observed the soil demonstrations, what questions came to mind? A few questions that you may want to use as discussion prompts include: Why is one soil runoff less cloudy than the other? How did the plant roots keep the soil together? Will the water clean up after it sits? Why is cloudy water (that has more sediment) better or worse? (Encourage all questions from youth.)
- Why do you think asking questions about new ideas is important?
- Are there other new or big ideas you have questions about? Why is it important to ask questions?

## Home Activity: Design A Yard

### Objectives

- Synthesize knowledge learned from all 9 lessons
- Design a Florida-Friendly landscape

### Life Skills

- Problem solving
- Planning/organizing

### Setting

- A comfortable room with tables and chairs

### Materials Needed

- Appendix G in workbook page 48
- *Florida-Friendly Landscaping™ Plant Guide*

### Introduction

Youth will work alone to create a design that encompasses at least 2 principles.

### Do

- Youth will review the 9 Principles, found at [https://ffl.ifas.ufl.edu/homeowners/nine\\_principles.htm](https://ffl.ifas.ufl.edu/homeowners/nine_principles.htm).
- Youth will use Appendix G as a guide and *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design* to research and choose plants from the zone where they live to include in their landscape design.
- Instruct youth to include at least two FFL principles in their landscape design.
- Instruct youth to share their landscape design with their parents/guardians and consider any issues with their plan.
- Youth will prepare to share and explain their designs at the next meeting.

### Reflect

- As you designed your Florida-Friendly landscape, how did you decide which plants to select?
- What two FFL principles did you choose to incorporate into your plan? Why did you choose these principles?

- Did your parents/guardians help you identify possible problems with your landscape design?
- Why is it important to consider potential problems or issues before implementing a plan?

### Apply

- What is an example of a problem you see in your community where you can use Friendly- Florida Landscaping™ principles?
- When problems arise in your community can you and your friends make plans to solve them?
- What about applying other life skills you learned while participating in this project?



# Unit 9 Protect the Waterfront

## In-Class Activity: Erosion Simulation

Erosion is the negative process where the Earth's surface is worn away by water, glaciers, winds, and waves. Watch the instructor as they demonstrate a simulation of erosion. Record your observation on the worksheet.

	Sandy	Topsoil	Sod
Observations:			

## At-Home Activity: Design a Yard

Go to the Florida-Friendly Landscaping™ webpage at [https://ffl.ifas.ufl.edu/homeowners/nine\\_principles.htm](https://ffl.ifas.ufl.edu/homeowners/nine_principles.htm) and review the *Nine Principles of Florida-Friendly Landscaping™*. Then use *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design* to choose plants for the zone that you live in. Take this and everything you have learned in Units 1–9 to draw your own landscape design using the template in Appendix G. Make sure that you include at least two FFL principles in your design. You can include more if you like.

Be prepared to present your landscape design to the rest of your class at the next meeting time.

## Further Florida-Friendly Activity: Edgy Designer

Ask a trusted adult to help you design a small planting at the edge of a pond, a stream, or a small water feature. **DO NOT** work near canals.

First, work with the adult(s) to examine the shoreline, the extent to which a littoral shelf exists, and the depth of the water in the pond. Use *The Florida-Friendly Landscaping™ Guide to Plant Selection and Landscape Design* as well as regional guides for Zone 8 (<https://edis.ifas.ufl.edu/ep436>), Zone 9 (<https://edis.ifas.ufl.edu/ep437>; <https://edis.ifas.ufl.edu/ep438>) and Zone 10 (<https://edis.ifas.ufl.edu/ep439>) to identify the most appropriate submerged, floating or floating-leaved, and emergent plants that will serve to stabilize the shoreline. Please use the following guidelines:

### Designing Your Waterfront Landscape

**Determine the average water level (shoreline) fluctuations (high and low) on a yearly basis.** This is especially important in stormwater retention and detention ponds because water levels may vary dramatically.

**Measure maximum water depth in areas to be planted.** Pay special attention to the shoreline and shallow areas where most work will take place. Without proper measurements, it is hard to determine the quantity and types of plants that will be required.

**Consider increasing the size of planting zones.** Soil and rocks removed to deepen one area can be used to create shallow areas elsewhere or incorporated into landscaping around the pond. Deepening the margins around the edge of a pond can help prevent undesirable plants, such as non-native torpedograss, from invading the water.

**Develop a detailed planting plan that includes types and numbers of plants needed.** The level of detail and accuracy of your measurements will play a key role in the planting plan. For ease in planning, divide the wetland into the three major zones: shoreline (marginal plants), shallow water (emergent and submersed plants), and deep water (floating-rooted plants).

**Have a maintenance-free zone on the bank adjacent to the shoreline.** Florida-Friendly Landscaping™ recommends a zone of at least 10 feet without cutting, pesticides, and fertilizers.

## See Your Reflection

What was the most important piece of information you learned from Units 1–9?

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How has this curriculum changed your view of the environment?

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What was the most challenging part of Florida-Friendly Landscaping™?

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What have you done differently after learning about Florida-Friendly Landscaping™?

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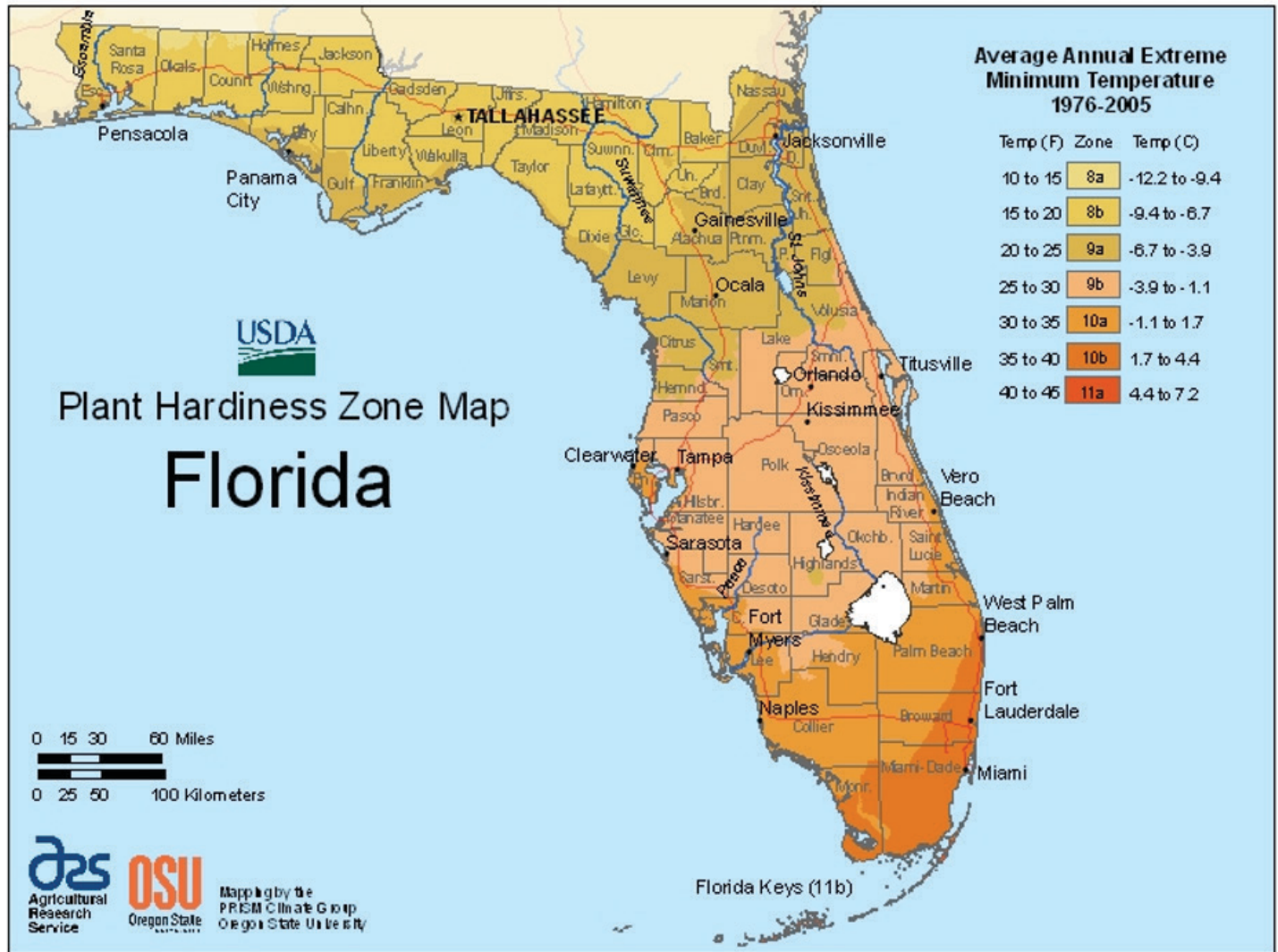


## Appendix A – Florida Topographic Map

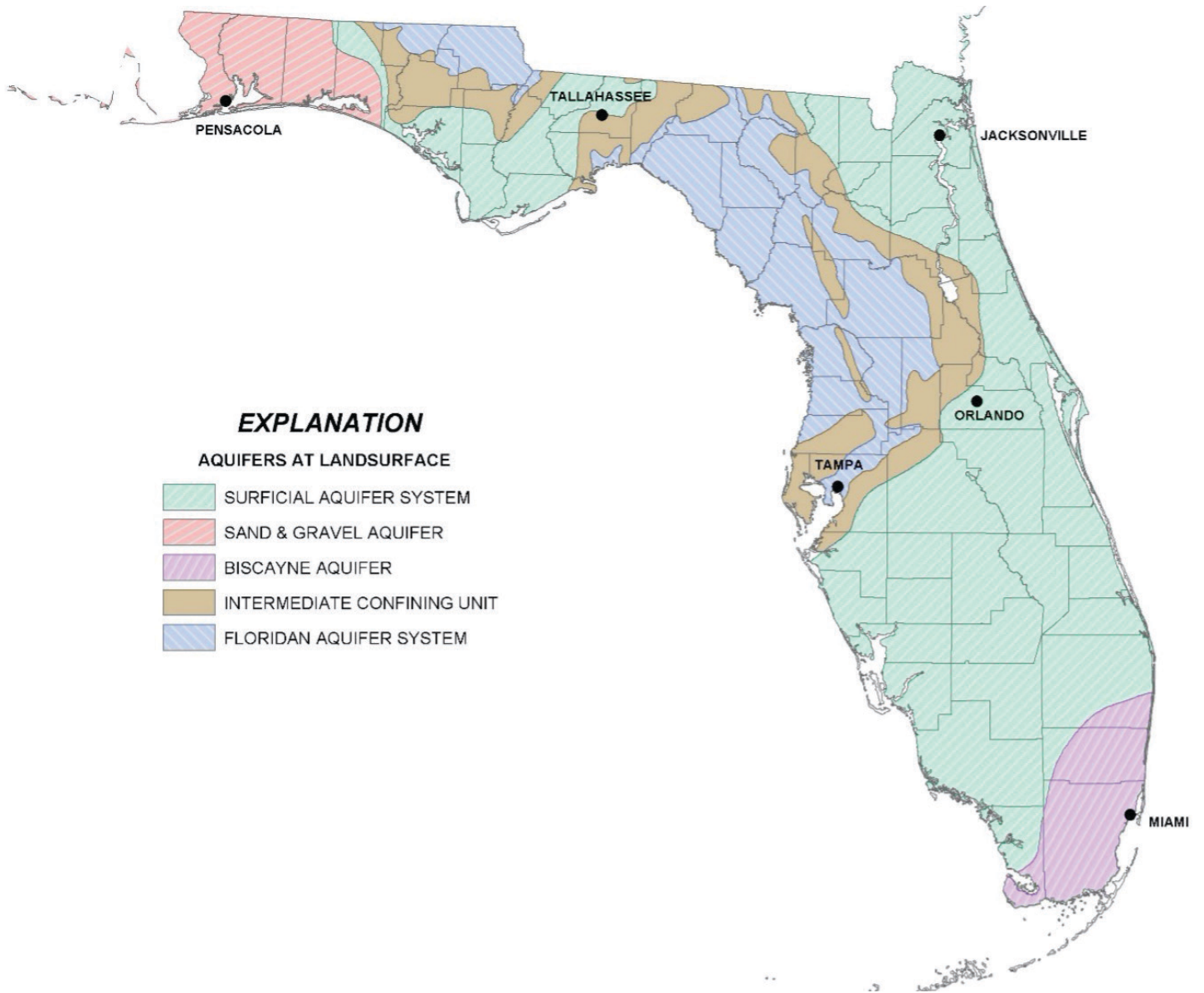


[http://www.mapsof.net/uploads/static-maps/Florida\\_topographic\\_map.jpg](http://www.mapsof.net/uploads/static-maps/Florida_topographic_map.jpg)

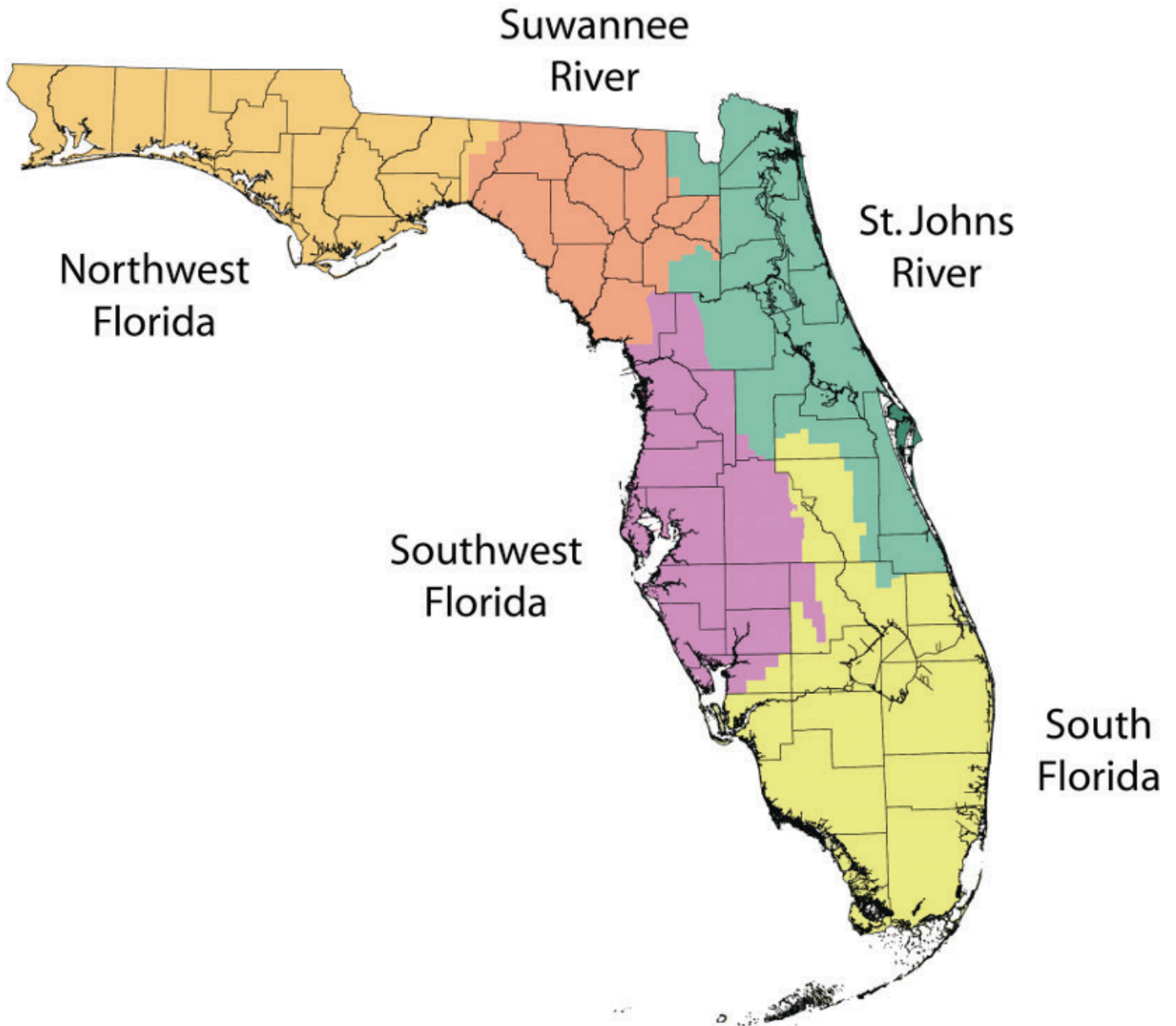
## Appendix B – Plant Hardiness Zone Map



## Appendix C – Florida Aquifers



## Appendix D – Water Management Districts



### Water Management District Websites:

Northwest Florida Water Management District: <https://www.nfwwater.com/>

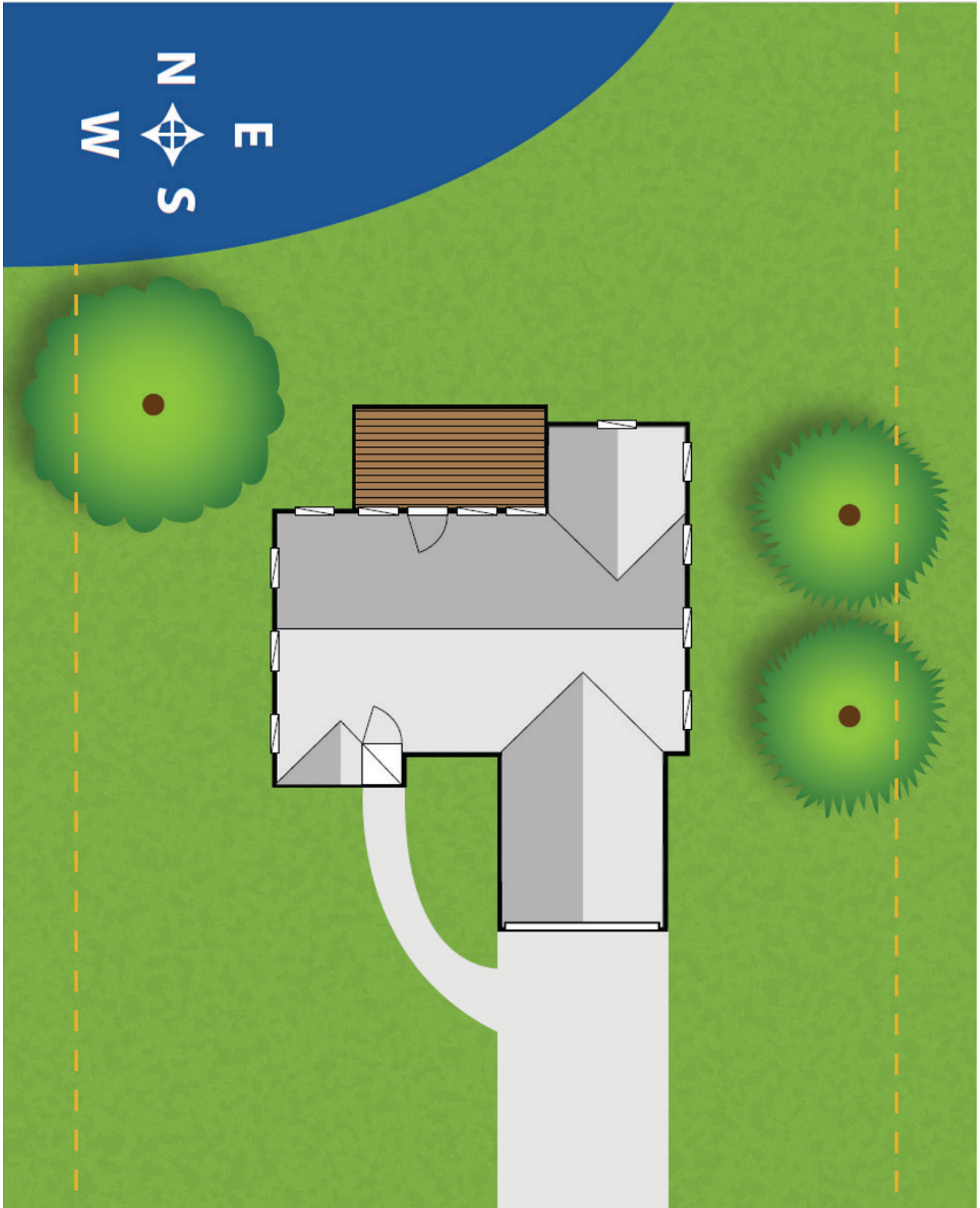
Suwannee River Water Management District: <http://www.srwmd.state.fl.us/>

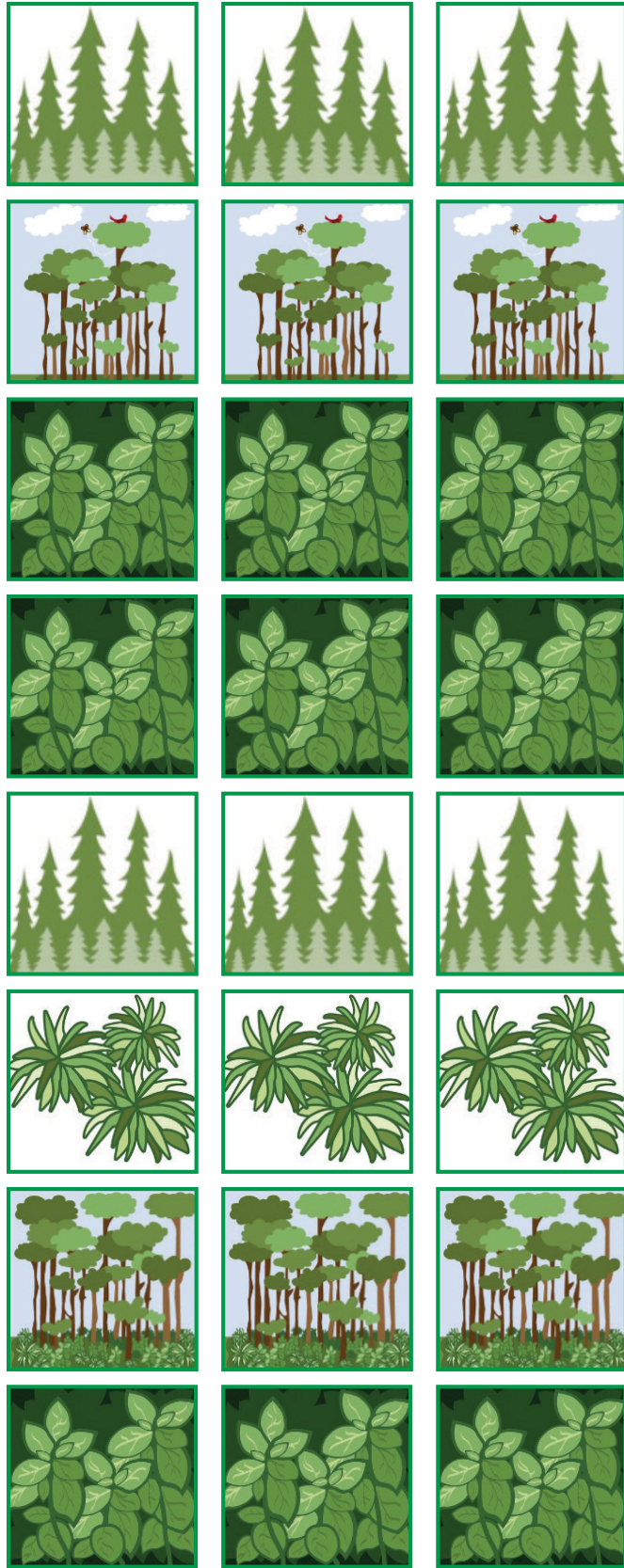
St. Johns River Water Management District: <https://www.sjrwmd.com/>

Southwest Florida Water Management District: <https://www.swfwmd.state.fl.us/>

South Florida Water Management District: <https://www.sfwmd.gov/>

## Appendix E





## Appendix F



European Honeybee



Lady Beetle



Assassin Bug



Ambush Bug



Praying Mantis



Lacewing



**Big-Eyed Bug**



**Ficus Whitefly**



**Aphid**



**Gall Wasp**



**Sri Lanka Weevil**



**Hornworm**





Mealy Bug



June Beetle Larva



Millipede



Centipede



Sow Bug



Pill Bug



**Banana Spider**

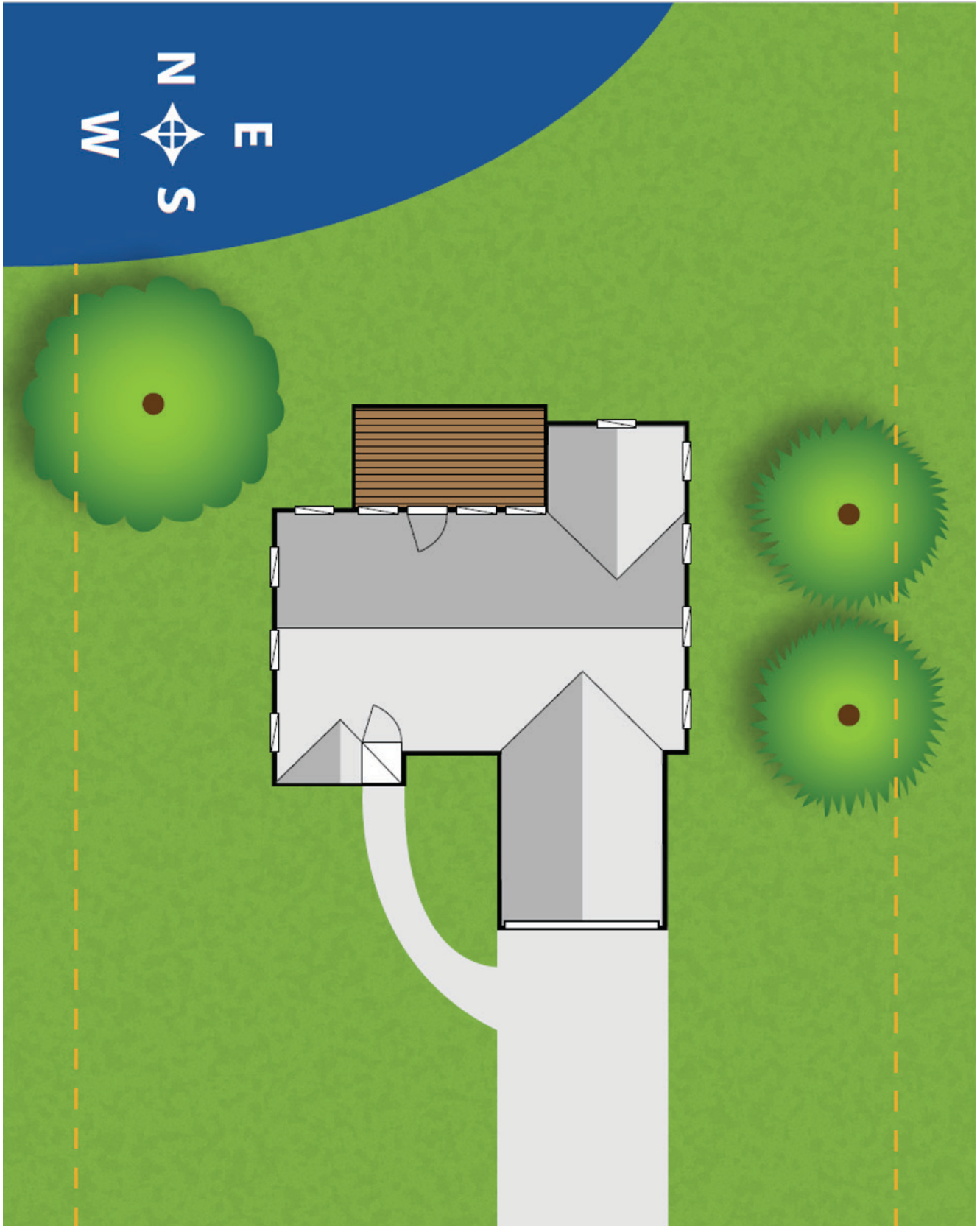


**Scorpion**



**Wolf Spider**

Appendix G (not to scale):



## EVALUATION: Pre-/Post-evaluation for the 4-H Florida-Friendly Landscaping™ Curriculum

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Youth will complete the following evaluation in its entirety before beginning Unit 1 of the *4-H Florida-Friendly Landscaping™ Curriculum*. The instructor may also choose to have youth complete the evaluation by section before beginning each unit. Following completion of each unit, youth will fill in the evaluation for the respective section. Instructors may choose to use each section of this evaluation as a quiz, or they may decide to use the entire post-evaluation as an assessment at the end of the course.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Teacher: \_\_\_\_\_

Class: \_\_\_\_\_

## 4-H Florida-Friendly Landscaping™ Pre-Test

Pre-Test Directions: You will complete this evaluation before beginning Unit 1 of the 4-H *Florida-Friendly Landscaping™ Curriculum*. Read each question carefully and select the best answer choice. Please use your best guess to answer the questions.

### Unit 1: Introduction & Right Plant, Right Place

**1. What does “hardiness” mean?**

- A. A plant’s ability to withstand cold temperatures
- B. The height of a plant when it is finished growing
- C. The amount of sand a plant can withstand in the soil
- D. A plant’s reaction to contact with humans

**2. What are the 4 predominant hardiness zones in Florida?**

- A. 6, 8, 10, 12
- B. 8, 9, 10, 11
- C. 9, 10, 11, 12
- D. 6, 7, 8, 9

**3. Which of the following is NOT a criterion for Right Plant, Right Place?**

- A. Distance from ocean
- B. Soil type and composition
- C. Elevation level
- D. Sun exposure

**4. True or False? Habitat and biome are synonyms.**

- A. True
- B. False

**5. True or False? Not all plants grow in all areas of Florida.**

- A. True
- B. False

**6. Match the following terms to their definitions by writing the letter of the term next to its definition. Use the key below.**

A. Mangrove   B. Beach dune   C. Hammock   D. Freshwater wetland

\_\_\_\_\_ Broad-leaved, evergreen forest with a well-developed canopy

\_\_\_\_\_ Woody plants that grow at the land-sea interface in tropical and subtropical latitudes

\_\_\_\_\_ An area where sand accumulates from the coastline and beach inland

\_\_\_\_\_ Term for bogs, swamps, marshes, fens, and similar areas found in flat or depressional areas between dry land and water and along the shores of rivers, lakes, and coastlines

## Unit 2: Water Efficiently

1. \_\_\_\_\_ is one of the best sources of water, according to 4-H Florida-Friendly Landscaping™.
  - A. Lake water
  - B. Ocean water
  - C. River water
  - D. Rainwater
  
2. How many water management districts are there in Florida?
  - A. Three
  - B. Four
  - C. Five
  - D. Six
  
3. Which of the following is NOT an aquifer system in Florida?
  - A. Natural springs aquifer
  - B. Surficial aquifer
  - C. Sand-and-gravel aquifer
  - D. Biscayne aquifer
  
4. The Department of Environmental Protection and Florida's water management districts are involved with managing the \_\_\_\_\_ of water.
  - A. Mineral content
  - B. Quality and quantity
  - C. Temperature and clarity
  - D. Mineral content and temperature
  
5. True or False? Microirrigation is a method of hand watering plants.
  - A. True
  - B. False
  
6. Match the following sprinkler terms to their definitions by writing the letter of the term next to its definition. Use the key below.
  - A. Drip systems
  - B. Sprayers
  - C. Rotors

\_\_\_\_\_ Pop-ups, ground-level, and elevated

\_\_\_\_\_ Consist of a unit that spins and pulses in timed intervals

\_\_\_\_\_ Usually buried below mulch

### Unit 3: Fertilize Appropriately

**1. What does the term “autotroph” mean as it relates to plants?**

- A. An automatic process for absorbing water
- B. The amount of fertilizer a plant can tolerate
- C. A plant’s ability to make its own food
- D. The process by which a plant expels its waste

**2. Which one is not a part of the soil formation process?**

- A. Parent material
- B. Climate
- C. Rain
- D. Biological factors

**3. True or False? The texture of soil refers to the size of the soil particles and their ability to hold water.**

- A. True
- B. False

**4. True or False? You should never use cat or dog manure to fertilize your landscape.**

- A. True
- B. False

**5. Match the following terms to their definitions by writing the letter of the term next to its definition. Use the key below.**

- A. Organic fertilizer      B. Inorganic fertilizer      C. Micronutrients      D. Macronutrients

\_\_\_\_\_ Mineral or chemical substances that are needed by the plant in large quantities

\_\_\_\_\_ Materials that are mined or synthesized from nonliving materials

\_\_\_\_\_ Mineral or chemical substances that are needed by the plant in very small quantities

\_\_\_\_\_ Materials that are derived from plants and animals



## Unit 4: Mulch

**1. Match the following terms to their definitions by writing the letter of the term next to its definition. Use the key below.**

A. Pine bark    B. Pine straw    C. Cypress    D. Eucalyptus    E. Melaleuca    F. Broken seashells

\_\_\_\_\_ Composted to kill any seeds that might be present

\_\_\_\_\_ Inorganic mulch

\_\_\_\_\_ Consists of peeled-off bark; a by-product of timber harvest

\_\_\_\_\_ Not recommended by Florida-Friendly Landscaping™

\_\_\_\_\_ Bark and wood chipped or shredded specifically for mulch

\_\_\_\_\_ Consists of needles of a particular tree that are bundled and sold

**2. Which of the following is NOT a benefit of using mulch?**

- A. Improved appearance of planting beds
- B. Weed suppression
- C. Increased evaporation of water from the soil surface
- D. Reduced erosion

**3. True or False? There are two types or groups of mulch in Florida: organic and inorganic.**

- A. True
- B. False

## Unit 5: Wildlife

- 1. What does the term “snag” mean as it relates to attracting wildlife?**
  - A. To retreat from a predator
  - B. Broken, dead trees
  - C. Bringing an animal into your home and raising it as a pet
  - D. Designing a wildlife-friendly landscape
- 2. Which of the following animals do we want to attract to our landscape?**
  - A. Wasps
  - B. Rodents
  - C. Feral cats
- 3. What contributes to making a good home for wildlife?**
  - A. Food
  - B. Water
  - C. Shelter
  - D. All of the above
- 4. True or False? To attract wildlife, increase vertical layering.**
  - A. True
  - B. False
- 5. True or False? Increasing pesticide use is a large part of attracting wildlife to your landscape.**
  - A. True
  - B. False

## Unit 6: Manage Yard Pests Responsibly

- 1. What are the stages of incomplete metamorphosis?**
  - A. Egg, Adult
  - B. Egg, Nymph, Adult
  - C. Egg, Larva, Pupa, Adult
  - D. Egg, Larva, Adult
- 2. Which is not part of Integrated Pest Management?**
  - A. Buying pest-free plants
  - B. Properly installing and maintaining plants so they do not become stressed
  - C. Spraying your whole yard with pesticide
  - D. Removing pests by hand
- 3. What is an insecticidal soap?**
  - A. Substance made from plant oils or animal fat
  - B. The same as neem and citrus oils
  - C. Commercial bug spray
  - D. Detergent
- 4. True or False? Of all insect species, less than 1% are pests.**
  - A. True
  - B. False
- 5. True or False? An insect is always an arthropod, but an arthropod is not always an insect.**
  - A. True
  - B. False

## Unit 7: Recycle Yard and Household Wastes

1. \_\_\_\_\_ is the process by which controlled organic matter has reached a point of stability and can be used as compost.
  - A. Monitoring
  - B. Disposal
  - C. Decomposition
  - D. Plowing
2. Which of the following is NOT a benefit of composting?
  - A. Increased aeration and drainage of soils
  - B. Disposal of food and yard wastes through natural processes
  - C. Provision of a safe space for small mammals
  - D. Prevention of plant diseases and pests
3. Why do you need to turn your compost pile occasionally?
  - A. To increase oxygen
  - B. To significantly speed up the deterioration of waste
  - C. To keep the pile drier
  - D. To keep the temperature of the pile as low as possible
4. True or False? Composting dairy products is recommended.
  - A. True
  - B. False
5. True or False? It is important for a compost pile to have a very low temperature.
  - A. True
  - B. False

## Unit 8: Reduce Stormwater Runoff

- 1. True or False? Nonpoint source pollution is the most serious problem in Florida's bodies of water.**
  - A. True
  - B. False
  
- 2. Which of the following features is NOT included in a rain garden?**
  - A. Plants
  - B. Mulch
  - C. Diverse mix of flowering plants, sedges, rushes, and grasses
  - D. The same height for all plants
  
- 3. When does stormwater runoff occur?**
  - A. When rain water stays in the grassy area of your yard
  - B. When rains wash hard surfaces like streets, driveways, and compacted soils
  - C. On a sunny, dry day
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- 4. True or False? Leaching is when chemical nutrients are absorbed slowly by soil.**
  - A. True
  - B. False
  
- 5. True or False? Porous pavers help retain water in the landscape.**
  - A. True
  - B. False

## Unit 9: Protect the Waterfront & Conclusion

- 1. Which of the following is NOT an aquatic plant type discussed in Unit 9?**
  - A. Submerged (submersed)
  - B. Floating
  - C. Deterrent
  - D. Emergent
  
- 2. Why are plants so important to have along the banks of a body of water?**
  - A. They keep people from going into the body of water
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  - A. The water directly next to the bank or shore
  - B. An interpretation taken directly from scientific literature, a "littoral" translation
  - C. A riverbank that is full of litter
  - D. A substance used in special boxes by cat owners

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Teacher: \_\_\_\_\_

Class: \_\_\_\_\_

## 4-H Florida-Friendly Landscaping™ Post-test

Pre-test Directions: You will complete this evaluation before beginning Unit 1 of the *4-H Florida-Friendly Landscaping™ Curriculum*. Read each question carefully and select the best answer choice. Please use your best guess to answer the questions.

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  - A. True
  - B. False

## Unit 8: Reduce Stormwater Runoff

- 1. True or False? Nonpoint source pollution is the most serious problem in Florida's bodies of water.**  
A. True      B. False
- 2. Which of the following features is NOT included in a rain garden?**  
A. Plants  
B. Mulch  
C. Diverse mix of flowering plants, sedges, rushes, and grasses  
D. The same height for all plants
- 3. When does stormwater runoff occur?**  
A. When rain water stays in the grassy area of your yard  
B. When rains wash hard surfaces like streets, driveways, and compacted soils  
C. On a sunny, dry day  
D. Only between January and May
- 4. True or False? Leaching is when chemical nutrients are absorbed slowly by soil.**  
A. True      B. False
- 5. True or False? Porous pavers help retain water in the landscape.**  
A. True      B. False



## Unit 9: Protect the Waterfront & Conclusion

**1. Which of the following is NOT an aquatic plant type discussed in Unit 9?**

- A. Submerged (submersed)
- B. Floating
- C. Deterrent
- D. Emergent

**2. Why are plants so important to have along the banks of a body of water?**

- A. They keep people from going into the body of water.
- B. They change the water's color considerably.
- C. They help prevent erosion.
- D. They prevent fishing in areas where there are not many fish.

**3. To what does the word “riparian” refer?**

- A. The process of designing a Florida-Friendly waterfront area
- B. The flat, irregular area below the water's surface
- C. The process by which the surface of the Earth is worn away by water
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- B. An interpretation taken directly from scientific literature, a “littoral” translation
- C. A riverbank that is full of litter
- D. A substance used in special boxes by cat owners

**5. What skills did you improve by completing the 4-H Florida-Friendly Landscaping™ Curriculum? Circle all that apply.**

- |                        |                       |                   |                     |
|------------------------|-----------------------|-------------------|---------------------|
| Decision-making        | Problem-solving       | Critical thinking | Planning/organizing |
| Using resources wisely | Keeping records       | Cooperation       | Conflict resolution |
| Responsible            | Contribution to group | Teamwork          | Self-motivation     |
| Personal safety        | Self-responsibility   | Citizenship       |                     |

**6.** Did you take on a leadership role during any of the group activities in this curriculum? Circle your answer.

A. Yes    B. No

**7.** Did you improve your community through Florida-Friendly Landscaping™ practices? Circle your answer. There is no right or wrong answer to this question.

A.        Yes    B.        No

**8.** What was the most important and useful thing you learned about Florida-Friendly Landscaping™? There are no right or wrong answers to this question.

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**9.** Have you done anything differently while dealing with your environment after learning about Florida-Friendly Landscaping™? If so, what? There are no right or wrong answers to this question.

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## Evaluation Answer Key

### Unit 1: Right Plant, Right Place

1. A
2. B
3. C
4. B
5. A
6. C, A, B, D

### Unit 2: Water Efficiently

1. D
2. C
3. A
4. B
5. B
6. B, C, A

### Unit 3: Fertilize Appropriately

1. C
2. B
3. A
4. A
5. D, B, C, A

### Unit 4: Mulch

1. E, F, A, C, D, B
2. C
3. A

### Unit 5: Attract Wildlife

1. B
2. A
3. D
4. A
5. B

### Unit 6: Manage Yard Pests Responsibly

1. B
2. C
3. A
4. A
5. A

### Unit 7: Recycle Yard And Household Waste

1. C
2. C
3. A
4. B
5. B

### Unit 8: Reduce Stormwater Runoff

1. A
2. D
3. B
4. B
5. A

## Unit 9: Protect the Waterfront

1. C
2. C
3. D
4. A

## References

- Borden, M. A., Buss, E. A., Brown, S. P., & Dale, A. G. (2018). *Natural Products for Managing Landscape and Garden Pests in Florida*. ENY-350. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/in197>
- Brown, S. P. (2017). *Compost Tips for the Home Gardener*. ENH1065. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/ep323>
- Buss, E., & Dale, A. G. (2016). *Landscape Integrated Pest Management*. ENY-298. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/in109>
- Center for Disease Control. (2016). *Community Water Fluoridation*. Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion. <https://www.cdc.gov/fluoridation/statistics/2014stats.htm>
- Crenshaw, N. (2018). *4-H Project Record Manual: Wetlands*. 4HMEM70. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/4h027>
- EPA. (2017). *Introduction to Integrated Pest Management*. US Environmental Protection Agency. Retrieved February 12, 2019, from <https://www.epa.gov/ipm/introduction-integrated-pest-management>
- EPA. (2018). *Composting at Home*. Retrieved March 5, 2019, from <https://www.epa.gov/recycle/composting-home>
- Florida Department of Environmental Protection. (2019). *Water Management Districts*. Retrieved June 14, 2019, from <https://floridadep.gov/water-policy/water-policy/content/water-management-districts>
- Florida-Friendly Landscaping: *The Smart Way to Grow*. (n.d.). Florida-Friendly Interactive Yard. Retrieved February 8, 2008, from <http://www.floridayards.org/interactive/index.php>
- Florida-Friendly Landscaping™ Program. (2017). *These Nine Principles Will Help You Reach the Goal of a Florida-Friendly Yard*. Gainesville: University of Florida Institute of Food and Sciences. Retrieved March 6, 2019, from [https://ffl.ifas.ufl.edu/homeowners/nine\\_principles.htm](https://ffl.ifas.ufl.edu/homeowners/nine_principles.htm)
- Florida State Legislature. (2009). *The 2009 Florida Statutes (Title XXVIII, Chapter 373)*. Retrieved February 4, 2019, from [http://www.leg.state.fl.us/Statutes/index.cfm?App\\_mode=Display\\_Statute&URL=Ch0373/titl0373.htm&StatuteYear=2009&Title=%2D%3E2009%2D%3EChapter%20373](http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&URL=Ch0373/titl0373.htm&StatuteYear=2009&Title=%2D%3E2009%2D%3EChapter%20373)
- Grunwald. (1999). *Example of Soil Development from the Central United States under a Forest Graphic*.
- Hansen, F., Perez, K., & Momol, E. (2020a). *Florida-Friendly Landscaping™ Pattern Book: Sample Plant Lists and Designs for Four Florida Regions: USDA Hardiness Zones 8A and 8B, North Florida*. ENH1175. Gainesville: University of Florida Institute of Food and Agricultural Sciences. Retrieved March 6, 2019, from <https://edis.ifas.ufl.edu/ep436>
- Hansen, F., Perez, K., & Momol, E. (2020b). *Florida-Friendly Landscaping™ Pattern Book: Sample Plant Lists and Designs for Four Florida Regions: USDA Hardiness Zones 9A, North Central Florida*. ENH1176. Gainesville: University of Florida Institute of Food and Agricultural Sciences. Retrieved March 6, 2019, from <https://edis.ifas.ufl.edu/ep437>
- Hansen, F., Perez, K., & Momol, E. (2020c). *Florida-Friendly Landscaping™ Pattern Book: Sample Plant Lists and Designs for Four Florida Regions: USDA Hardiness Zones 9b, South Central Florida*. ENH1177. Gainesville: University of Florida Institute of Food and Agricultural Sciences. Retrieved March 6, 2019, from <https://edis.ifas.ufl.edu/ep438>
- Hansen, F., Perez, K., & Momol, E. (2020d). *Florida-Friendly Landscaping™ Pattern Book: Sample Plant Lists and Designs for Four Florida Regions: USDA Hardiness Zones 10A, 10B, and 11, South Florida*. ENH1178.

Gainesville: University of Florida Institute of Food and Agricultural Sciences. Retrieved March 6, 2019, from <https://edis.ifas.ufl.edu/ep439>

Hansen, G. (2019). *Landscape Elements for a Florida-Friendly Yard*. ENH1163. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/ep424>

Hochmuth, G. J., Maynard, D., Vavrina, C., Hanlon, E., & Simonne, E. (2012). *Plant Tissue Analysis and Interpretation for Vegetable Crops in Florida*. HS964. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/ep081>

Karim, A., & Martin, M. (2018). *Tropical Hardwood Hammocks in Florida*. WEC 181. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/uw206>

Kidder, G. (2003). *Converting Yard Wastes into Landscape Assets*. SL114. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://ufdc.ufl.edu/IR00005545/00001>

Koehler, P. G., Pereira, R. M., & Allen, R. A. (2017). *Pillbugs, Sowbugs, Centipedes, Millipedes and Earwigs*. ENY-221. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/ig093>

Main, M. B., Allen, G. M., & Langeland, K. A. (2012). *Creating Wildlife Habitat with Native Florida Freshwater Wetland Plants*. CIR 912. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://ufdc.ufl.edu/IR00009656/00001>

McCann, S., Ellis, J. D., & O'Malley, M. K. (2017a). *Insects, Oh Yes!: An Introduction*. ENY-1000. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/in758>

McCann, S., Ellis, J. D., & O'Malley, M. K. (2017b). *Guide to Collecting and Maintaining Live Arthropods for Classroom Display in Florida*. ENY-1001. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/in759>

Mullins, G., & Hansen, D. (2007). *Mid-Atlantic Nutrient Management Handbook - Chapter 4: Basic Soil Fertility*. Slide 3 [Power Point Presentation]. Virginia Tech and University of Delaware. Retrieved February 4, 2019, from <https://slideplayer.com/slide/6291291>

Mylavarapu, R., Hines, K., Obreza, T., & Means, G. (2020). *Watersheds of Florida: Understanding a Watershed Approach to Water Management*. SL367. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/ss568>

Natural Resources Conservation Service. *Soil Education*. USDA. Retrieved February 4, 2019, from [https://www.nrcs.usda.gov/Internet/FSE\\_MEDIA/nrcseprd423217.jpg](https://www.nrcs.usda.gov/Internet/FSE_MEDIA/nrcseprd423217.jpg)

Norman, M. N., & Jordan, J. C. (2016). *Using an Experiential Model in 4-H*. 4HSFS101.10. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/4h243>

Park Brown, S. (2020). *Compost Tips for the Home Gardener*. ENH1065. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/ep323>

Rey, J. R., & Connelly, C. R. (2015). *Mangroves*. ENY660. Archived. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/in195>

Schaefer, J. (2016). *Addressing Wildlife Needs in Construction Site Management Plans*. SSWEC114. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/uw105>

Schaefer, J. (2020). *Helping Cavity-Nesters in Florida*. SSWIS901. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/uw058>

Schaefer, J., & Huegel, C. N. (2020). *Hummingbirds of Florida*. WEC21. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/uw059>

Shober, A. L., Reisinger, A. J., Lusk, M. G., & Scalera, S. A. (2019). *Soils and Fertilizers for Master Gardeners: Soil Physical Characteristics*. SL451. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/mg458>

Smith, M. A., & Friend, D. (2019). *Composting for the Homeowner: Materials for Composting*. University of Illinois Extension.

Southwest Florida Water Management District (SWFWMD). (2007). *The Hydrologic Cycle Poster*. Retrieved February 4, 2019, from [https://www.swfwmd.state.fl.us/sites/default/files/store\\_products/hydrocycletoon.pdf](https://www.swfwmd.state.fl.us/sites/default/files/store_products/hydrocycletoon.pdf)

TAPP: Think about Personal Pollution. (2010). *Rain Gardens: A How-To Manual for Homeowners—Your Personal Contribution to Cleaner Water*. Tallahassee: TAPP. Retrieved March 6, 2019, from <http://tappwater.org/downloads/Rain%20Garden%20Manual.pdf>

Trenholm, L., Momol, E., Shober, A., Denny, G., & Nell, T. (2009). *Frequently Asked Questions about Florida-Friendly Landscaping™*. ENH1113. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://ufdc.ufl.edu/IR00003433/00001>

University of Florida Institute of Food and Agricultural Science. (2018). *Aquatic and Wetland Plants in Florida*. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://plants-archive.ifas.ufl.edu/manage/why-manage-plants/aquatic-and-wetland-plants-in-florida/>

University of Florida Institute of Food and Agricultural Sciences. (2015a). *Florida-Friendly Best Management Practices for Protection of Water Resources by the Green Industries* (3rd ed.). (GIBMP Manual). Gainesville: University of Florida Institute of Food and Agricultural Sciences. [https://ffl.ifas.ufl.edu/pdf/GIBMP\\_Manual\\_Web\\_English\\_2015.pdf](https://ffl.ifas.ufl.edu/pdf/GIBMP_Manual_Web_English_2015.pdf)

University of Florida Institute of Food and Agricultural Sciences. (2015b). *The Florida Yards & Neighborhoods Handbook* (3rd ed.). Gainesville: University of Florida Institute of Food and Agricultural Sciences. [https://ffl.ifas.ufl.edu/materials/FYN\\_Handbook\\_2015\\_web.pdf](https://ffl.ifas.ufl.edu/materials/FYN_Handbook_2015_web.pdf)

University of Florida Institute of Food and Agricultural Sciences. (2015c). *The Florida Friendly Landscaping™ Guide to Plant Selection & Landscape Design*. Gainesville: University of Florida Institute of Food and Agricultural Sciences. [https://ffl.ifas.ufl.edu/media/fflifasufledu/docs/FYN\\_Plant\\_Selection\\_Guide\\_2015.pdf](https://ffl.ifas.ufl.edu/media/fflifasufledu/docs/FYN_Plant_Selection_Guide_2015.pdf)

University of Florida Institute of Food and Agricultural Sciences. (2017). *Florida Waters: Ours to Protect*. Gainesville: University of Florida Institute of Food and Agricultural Sciences. [https://plants-archive.ifas.ufl.edu/wp-content/uploads/files/mng/Florida\\_Waters\\_Ours\\_to\\_Protect.pdf](https://plants-archive.ifas.ufl.edu/wp-content/uploads/files/mng/Florida_Waters_Ours_to_Protect.pdf)

USDA. *Diagram of Soil with Several Horizons*. Retrieved February 4, 2019, from [https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2\\_054308](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054308)

USDA-ARS. (2012). *USDA Plant Hardiness Zone Map*. Retrieved January 18, 2019, from <http://planthardiness.ars.usda.gov>

USGS. (2000). *Florida Aquifers Illustration, F. 3*. Retrieved February 4, 2019, from [http://pubs.usgs.gov/ha/ha730/ch\\_g/jpeg/G003.jpeg](http://pubs.usgs.gov/ha/ha730/ch_g/jpeg/G003.jpeg)

Wilcox, E. V., Hostetler, M. E., Main, M. B., & Voigt, M. (2019). *Attracting Backyard Birds: Bird Feeder Selection*. WEC 162. Gainesville: University of Florida Institute of Food and Agricultural Sciences. <https://edis.ifas.ufl.edu/uw192>

## Beneficial and Pest Insect Photo Credits

Ambush Bug. David Cappaert, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=2106054#collapseseven>

Aphids. David Cappaert, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=5490092#collapseseven>

Assassin Bug. Sandy Granson, UF/IFAS Extension Broward County.

Assassin Bug. Whitney Cranshaw, Colorado State University, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=5305026#collapseseven>

Atala Butterfly Eggs. Sandy Granson, UF/IFAS Broward County Extension Education.

Atala Butterfly Larva. Sandy Granson, UF/IFAS Broward County Extension Education.

Atala Pupa and Adult. Mona Johnston, UF/IFAS Broward County Extension Education Master Gardener.

European Honeybee. David Cappaert, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=2116051#collapseseven>

Ficus Whitefly. Clemson University – USDA Cooperative Extension Slide Series, Bugwood.org. <https://www.ipmimages.org/browse/detail.cfm?imgnum=1236104#collapseseven>

Green Lacewing Adult. Joseph Berger, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=1386017#collapseseven>

Insect Anatomy. Brian Cabrera, UF/IFAS

June Beetle. Clemson University – USDA Cooperative Extension Slide Series, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=1235035#collapseseven>

June Beetle. Steven Katovich, USDA Forest Service, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=5486519#collapseseven>

Lacewings. USDA ARS Photo Unit, USDA Agricultural Research Service, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=1323013#collapseseven>

Ladybug Beetle. Sandy Granson, UF/IFAS Extension Broward County Education.

Mealybug. John A. Weidhass, Virginia Polytechnic Institute and State University, Bugwood.org. <https://www.ipmimages.org/browse/detail.cfm?imgnum=1626044#collapseseven>

Mealybug. Sandy Granson, UF/IFAS Broward County Extension Education.

Praying Mantis. Sturgis McKeever, Georgia Southern University, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=1487028#collapseseven>

Sri Lankan Weevil. Anyi Mazo-Vargas, University of Puerto Rico, Bugwood. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=5411212#collapseseven>

Tomato Hornworm. Forest and Kim Starr, Starr Environmental, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=5172053#collapseseven>

Tomato Hornworm. Whitney Cranshaw, Colorado State University, Bugwood.org. Retrieved on February 12, 2019 from <https://www.ipmimages.org/browse/detail.cfm?imgnum=5304032>



# CERTIFICATE OF COMPLETION

4-H Florida-Friendly Landscaping™ Curriculum



**Youth Name**

In recognition of successful completion of  
4-H Florida-Friendly Landscaping™ Units 1–9

Group Name \_\_\_\_\_

Instructor Signature \_\_\_\_\_

Date \_\_\_\_\_