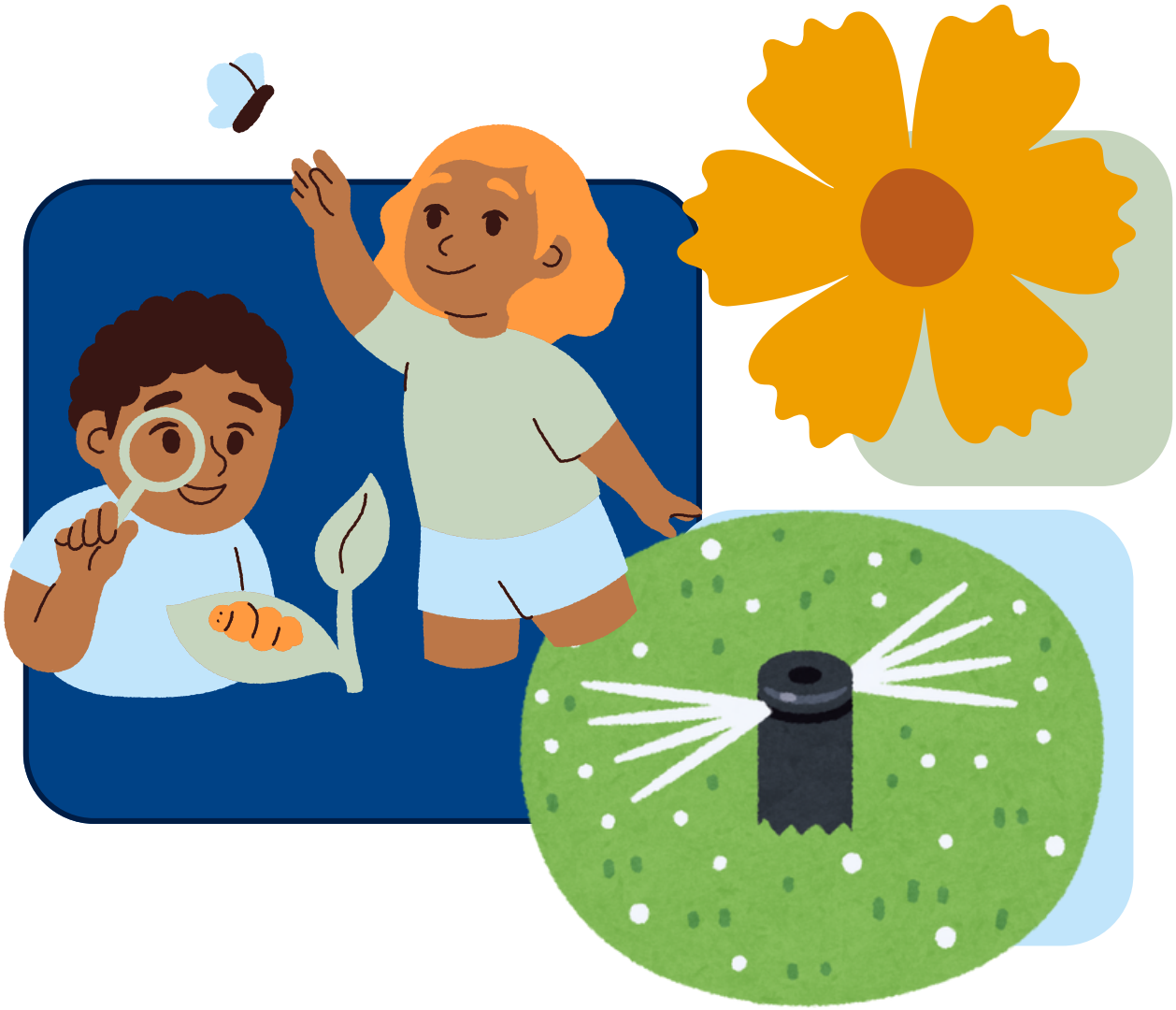
Florida-Friendly Landscaping™ Program

FFL High School Lesson Plans



Published on **September 9th, 2025**

High School FFL Overview

This collection of lesson plans is designed to engage high school students in real-world environmental problem-solving through the lens of the **9 Florida-Friendly Landscaping™ (FFL)** principles. This curriculum covers a range of topics including sustainable plant selection, soil health, pest management, and more! Some of the principles have multiple lesson plans available that can be adapted to either environmental/earth science or life sciences courses to suit the needs of different classes. With the use of hands-on activities, data analysis, and community-focused solutions in each lesson, students learn how to apply scientific reasoning to everyday environmental challenges. These lessons will help students understand the importance of caring for our landscapes as our landscaping decisions have an impact on biodiversity, soil quality, and water quality. This material matters because it provides the next generation with the skills and knowledge on how to create Florida Friendly Landscapes which will improve the health of our ecosystems, reduce environmental impact, and increase our resources.

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High School Curriculum Map

FFL Principle	Essential Questions	Florida Standards	Resources/ Materials	Assessments
1- Right Plant, Right Place (1)	How does choosing the right plant for the right place help conserve water, reduce maintenance, and protect Florida's natural ecosystems? What is the main goal of Florida-Friendly Landscaping? Define "Right Plant, Right Place" in your own words. What are at least 3 environmental conditions you should consider when choosing a plant? How can poor plant choices affect water use and maintenance? What are two benefits of using native plants in a landscape? Why are invasive species considered harmful to Florida ecosystems?	SC.912.L.17.8 SC.912.L.17.11 SC.912.L.17.20 SC.912.L.17.18	Projector or smartboard, slide with diverse Florida landscapes, FFL Website and computer, Think-Pair-Share prompt questions, Whiteboard or chart paper, plant information cards, landscape/site condition scenario cards, Planner 5D website, group worksheet or chart for matching activity, FFL slide deck presentation, student handouts, reference guides or native plant lists, sketch paper or blank printer paper for garden layout, exit ticket prompts, rubric or checklist for garden design evaluation, sticky notes or peer feedback slips (for optional gallery walk), student garden plans	1. Participation in guided discussions, completion of a Florida-Friendly garden design project, and responses to reflection questions. 2. Their ability to justify plant choices based on site conditions and identify the environmental benefits of those choices will demonstrate mastery of the principle.
1- Right Plant, Right Place (2)	What are the indicators of a drought prone landscape? What conditions are essential for plant survival and growth? How do human plant choices impact the ecological role? What specific environmental conditions exist at your site? Which plants are right for this place, and why?	SC.912.L.17.8 SC.912.L.17.20	FFL Handbook extract on Principle #1, printed worksheet, pen/pencil, shovels, soil sampling bags, gloves, baking soda, vinegar, plastic cups, distilled water, transparent bottles with lids, dish soap, digital pH meter (if available), technology to access to the FFL mobile app/website, rubric for assessing presentations	*Completion of a Landscape Rescue Challenge by:* 1. Selecting 6 appropriate native/Florida Friendly plants to replace unsuitable species 2. Justifying their selections based on hardiness zone, light requirements, soil texture and pH

2- Water Efficiently	Why is water efficiency critical to Florida's ecosystem and population? Consider: Florida's unique climate and water table, overwatering and runoff and local environmental pressures like red tide and algal blooms	SC.912.L.17.20 SC.912.L.17.11 SC.912.L.17.16 SC.912.N.1.1	Lecture, printed articles and discussion questions	1. Completed group project 2. Students have presented their project and demonstrated understanding 3. Completed student worksheet/ exit ticket
3- Fertilize Appropriately (1)	How do we know if soil needs fertilizer? What happens to fertilizer after it rains? How can too much fertilizer affect nearby water bodies? What do our data and observations tell us about fertilizer runoff? What are some smart ways we can use fertilizer to protect the environment?	SC.912.L.17.8 SC.912.L.17.20	Soil samples and test kits, planting containers and fertilizers, run off water and test kits, evaluation rubric	1. Observation checklists during soil testing, fertilization simulations, and runoff analysis. 2. Student responses in group discussions, claim-evidence-reasoning activities, and reflective prompts. 3. Completion of a KWL chart that demonstrates a shift from misconceptions to accurate understanding.
3- Fertilize Appropriately (2)	What are the sources of water pollution? How does excess fertilizer cause water pollution? How do best practices prevent fertilizer pollution?	SC.912.L.17.10 SC.912.L.17.11 SC.912.L.17.16 SC.912.P.10.2 SC.912.N.1.1	notebook paper or a teacher prepared handout, Article: *lawnlove.com/blog/why-be-responsible-in-our-use-of-fertilizer/*, colored paper, CER Report directions	1. Review of students' notes and foldable 2. Evaluate student CER reports

4- Mulch (1)	How can mulch make a difference in water conservation? Do mulch types matter? What is the best type of mulch? How much mulch is recommended?	SC.912.L.17.12 SC.912.L.17.8 SC.912.L.17.10 SC.912.L.17.17 SC.912.L.17.20	Computers, internet, IFAS websites, FFL websites, student handouts digital or paper LINK to Presentation, Suggested Resources: What's Happening Around Florida, ffl.ifas.ufl.edu, Mulch Materials: samples of pine straw, wood chips, shredded leaves, pebbles/rocks and rubber (actual samples or pictures), Mulching Worksheet, PSA Rubric	1. Students will answer worksheet questions 2. Creation of a Public Service Announcement, either as a video or pamphlet and will be evaluated by a rubric. 3. Worksheet: Define four mulch benefits; illustrate proper vs improper application. 4. Exit Ticket: Explain the benefits of mulch and how mulch connects to another FFL principle
4- Mulch (2)	What are the benefits of mulch for plants as well as the environment? What are the different types of mulch? How should mulch be applied?	SC.912.L.17.3 SC.912.L.17.10 SC.912.L.17.11 SC.912.L.17.12 SC.912.L.17.17 SC.912.L.17.20	Whiteboard or projector, markers/pens, access to the internet/computers for video and research (optional), various mulch samples (pine bark, pine needles, melaleuca, eucalyptus, leaves, wood chips – if available), two small potted plants (e.g., marigolds, small herbs), watering can, small bags of soil, rulers or measuring tape, handout: "Mulch CER Worksheet", quiz handout, writing prompt handout, optional: Spray bottles, thermometers (soil and air)	1. Exit ticket, 2. quiz 3. writing prompts

5- Attract Wildlife	What is necessary for plants to survive and thrive in a certain location? How do plants interact and impact each other, and how do the plants present impact the other organisms that may be found there? How can students influence their community through outreach and education?	SC.912.L.17.6 SC.912.L.17.8 SC.912.L.17.20 SC.912.N.1.1	FFL Handbook, list of Florida Friendly and Non-Florida Friendly plants- specific to the certain area, Poster board with coloring and art supplies OR laptops/iPads capable of preparing digital images, Art/digital media tools	Create and share an outreach material (poster/flyer/social media post) to inform their community of the importance of considering wildlife when making landscaping decisions
6- Manage Yard Pests (1)	How does our negative impact on the environment give potential opportunities for disease vectors? How can we properly design landscape areas to deter pests?	SC.912.L.17.1 SC.912.L.17.4 HE.912.CEH.2.4 HE.912.CEH.3.3	Powerpoint, FFL principle #6 slides, 1 computer	Students will present their management plans in class
6- Manage Yard Pests (2)	How using natural pests can help reduce the use of insecticides. Give some reasons why broad-spectrum insecticides should be used only as a last resort.	SC.912.L.17.8 SC.912.L.17.17 SC.912.L.17.18 SC.912.L.17.20	Presentation Slides, computers and internet, Natural Pest Management worksheet, PSA Rubric, presentation Slides	1. Possible Pre-quiz and Post-quiz 2. Worksheet: Natural Pest Management 3. Project Grading

6- Manage Yard Pests (3)	What is IPM? How do we identify common pests? What methods can we use to treat pests? What is the least toxic method? What are the environmental impacts of pesticides?	SC.912.N.1.1 SC.912.N.1.4 SC.912.L.17.4 SC.912.L.17.8	Whiteboard or projector, markers or pens, access to computers/internet, "IPM Strategy Worksheet", "Common Florida Landscape Pests & Diseases", various plant samples, magnifying glasses (optional), gloves (optional), quiz handout, writing prompt handout, (Optional) Small spray bottles with water for simulating "treatment"	1. Exit ticket 2. multiple-choice quiz 3. short writing prompts
7- Recycle Yard Waste (1)	What is composting? What type of materials can and can't be composted? How does composting help the environment? What effective strategies can I use to create my own model of composting?	SC.912.L.17.9 SC.912.L.17.10	Video Link: Composting Made Easy | Year-Round Gardening | PBS LearningMedia, Compost Contents 3-column graphic organizer, Video Link: NOVA | Decomposers | PBS LearningMedia, Compost Critters Information Sheet and Worksheet, Compost, Toothpicks, Newspaper, Pencils, Compost bottle activity sheet, scissors, permanent markers, sticky tape, 1- 2 liter bottle per student or group, materials to make compost, science journal or weekly observation sheet, Presentation or Pamphlet instruction sheet, paper, colored pencils, markers, computers	1. Students create their own composting bottle system and observe changes over time (Observation Log) 2. Students will be able to explain why composting is beneficial to the environment (Summative Project)

7- Recycle Yard Waste (2)	How do different types of yard waste break down under composting conditions and what factors influence their rate of decomposition? How can composting yard waste reduce environmental impact and support sustainable landscaping practices in Florida?	SC.912.L.17.11 SC.912.N.1.1 SC.912.E.6.6	2–3 clear plastic containers (e.g., recycled salad boxes or jars with lids and holes), a mix of yard waste samples, soil or compost starter, spray bottle (moisture control), gloves & safety goggles, data sheet for observations, labels for containers	1. Bell work and exit ticket responses. 2. Experiment design, results, and completion 3. Presentation of results 4. Participation in final discussion
8- Reduce Stormwater Runoff (1)	How does stormwater runoff affect the environment and communities in Florida? What features make a stormwater pond both effective and beneficial to the public? Why might some neighborhoods have better stormwater infrastructure than others? How can we redesign a stormwater pond to improve water quality, support wildlife, and serve the community?	SC.912.L.17.8 SC.912.L.17.20	Article, Article summary, review worksheet, pond observation checklist, exit ticket sheet, observation checklist, redesign planning sheet or blank paper, colored pencils, markers, or highlighters, ruler or straightedge (optional), stormwater Pond Design Criteria Handout (optional)	1. *Pond Observation Checklist:* Completed field observations with accurate notes and reflections on environmental and social features. 2. *Group Pond Redesign:* A labeled drawing or model demonstrating understanding of stormwater functions and integration of ecological and community-based improvements. 3. *Presentation/Pitch:* Clear and concise communication of the problem, proposed solution, and justification based on research and observation.
8- Reduce Stormwater Runoff (2)	What is an aquifer? What type of aquifer does Florida have? How do stormwaters move into an aquifer?	SC.912.L.17.19 SC.912.N.1.1 SC.912.L.17.11 SC.912.L.17.16	notebook paper or a teacher prepared handout, Unlabelled aquifer diagram. A word bank can be provided *(optional),* article, Aquifer Plan Handout	1. Review of students' notes, map, article foldables 2. Evaluation of groups' plans and presentations

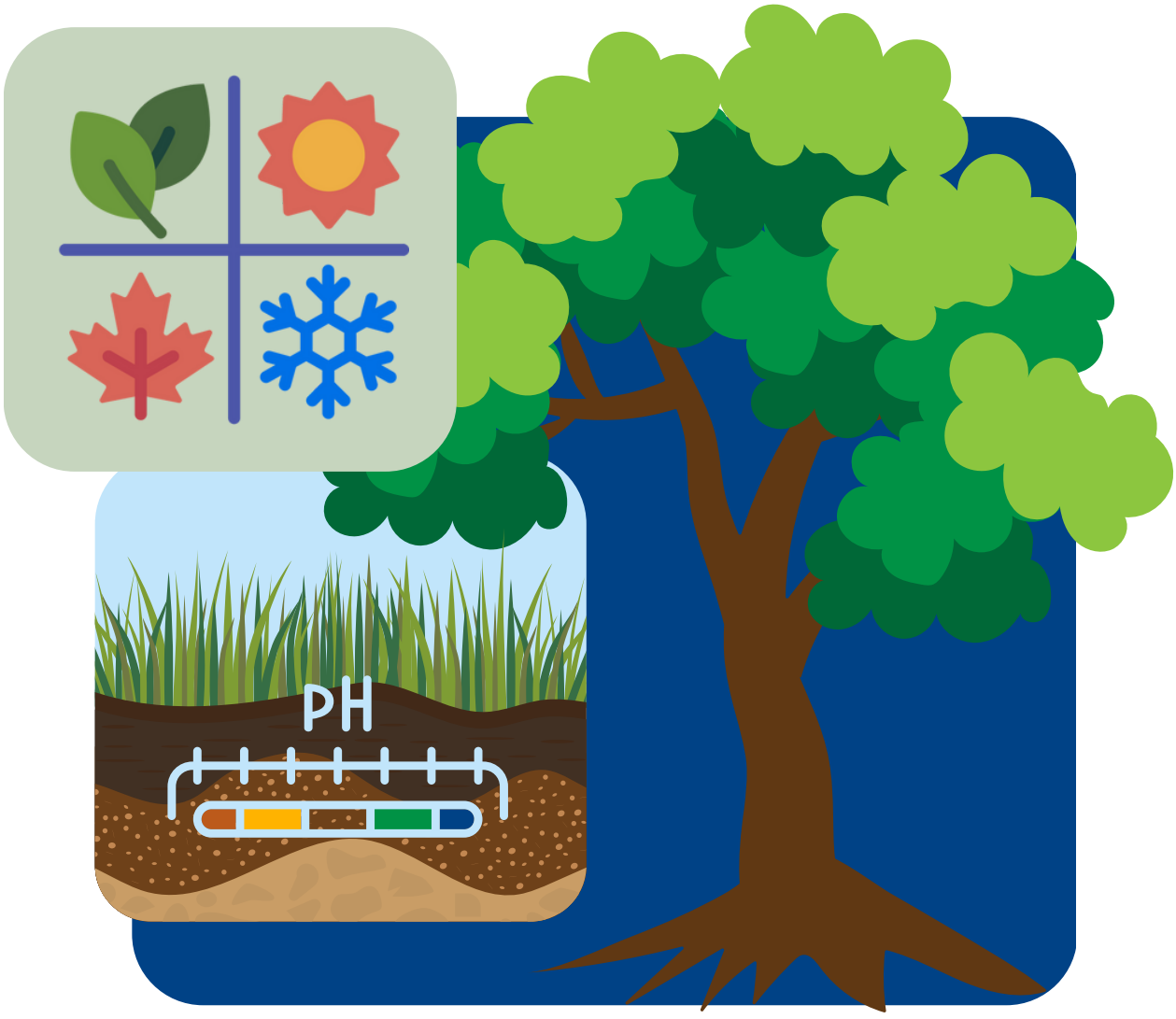
9- Protect Waterfront (1)	How do different types of ground cover and slope affect erosion and water quality, and what landscaping choices can best protect Florida's waterfronts? What causes soil erosion, and why is it harmful to waterfront ecosystems? How does the steepness of land influence the amount of soil washed away during rainfall? Which types of ground cover best reduce erosion and why? Based on the erosion activity, which landscaping methods protect waterfronts most effectively? How can we use what we learned about erosion and landscaping to protect Florida's waterfront environments?	SC.912.E.6.6 SC.912.L.17.11 SC.912.L.17.2 SC.912.L.17.18 SC.912.N.1.6	Aluminum baking pans or plastic trays, sand or bare soil, grass sod or turf samples, mulch or coconut coir, rocks/gravel, books or blocks, protractor, spray bottles or cups of water, colored dye, data collection sheets, rulers, paper towels, data collection sheet, paper or way to collect conclusions	1. Data sheets and lab reports analyzing erosion under different conditions 2. Guiding questions and participation in class discussions 3. Students will submit a landscaping plan or scenario writing assignment applying Florida-Friendly Landscaping principles to protect waterfronts.
9- Protect Waterfront (2)	What ecological functions do waterfront ecosystems serve? How do vegetative buffers reduce pollution and protect aquatic life? Which human activities degrade waterfront ecosystems the most? What signs (biological, chemical, physical) indicate a stressed or healthy shoreline ecosystem? How can personal or community lifestyle choices protect water resources?	SC.912.L.17.20	FFL Handbook extract on Principle #9 Slide show, photos of waterfronts, trays, soil, grass, mulch, spray bottles, food dye, worksheet: Visual analysis checklist, redesign sketch sheet, exit ticket prompts, case study template	1. *Formative:* Participation in simulation and class discussions, analysis of waterfront health photos, engagement in design challenge 2. *Summative:* Design proposal, case study report, exit reflection- "What is one change you could make at home or school to protect a nearby body of water?"

Florida-Friendly Landscaping™ Program

Principle 1:

Right Plant, Right Place (1)

High School



Published on **August 11th, 2025**

About This Activity

Title: Right Plant, Right Place

Subject, Grade, Level:
High School Science

Abstract:

This high school-level lesson, "Right Plant, Right Place," introduces students to the foundational principle of Florida-Friendly Landscaping™ (FFL) by guiding them through the process of selecting appropriate native and Florida-Friendly plants based on specific site conditions. Designed as an interactive, 45–60-minute activity, the lesson engages students in critical thinking about plant needs, local environmental factors, and sustainable landscape practices. Through hands-on matching exercises, group discussions, and garden design projects, students will analyze variables such as sunlight, soil type, and water requirements, and learn how informed plant selection conserves resources, supports biodiversity, and minimizes environmental impact. The lesson aligns with Florida science standards (SC.912.L.17) and includes assessments through design projects, reflections, and peer feedback to ensure students can apply ecological principles in real-world contexts. This program empowers students to make environmentally responsible choices that contribute to healthier ecosystems and more sustainable communities.

Learning Objectives:

At the conclusion of this activity, participants will be able to:

1. Select appropriate native or Florida-Friendly plants for specific site conditions by analyzing sunlight, soil type, and water needs.
2. Explain how these choices contribute to sustainable landscaping and ecosystem health.

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Williston Middle High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.8	Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
SC.912.L.17.11	Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, and food.
SC.912.L.17.20	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.
SC.912.L.17.18	Describe how human population size and resource use affect environmental systems.

Timeframe:

This activity is designed to take approximately 45-60 minutes of class time, plus an extra 10 min if you choose to use the FFL Plants App.

List of Materials

- Projector or smartboard
- Slide with diverse Florida landscapes
- FFL Website and computer
- Think-Pair-Share prompt questions (printed or projected)
- Whiteboard or chart paper for class brainstorming
- Plant information cards (with name, image, sun/water/soil needs, native/invasive status)
- Landscape/site condition scenario cards
- Planner 5D website
- Group worksheet or chart for matching activity
- Slide deck presentation (Florida-Friendly Landscaping principles)
- Student handouts (garden design template, vocabulary)
- Reference guides or native plant lists (printed or digital)
- Sketch paper or blank printer paper for garden layout
- Exit ticket prompts (printed or displayed on screen)
- Rubric or checklist for garden design evaluation
- Sticky notes or peer feedback slips (for optional gallery walk)
- Student garden plans (from Step 3)

Activity Set-Up:

Before the lesson begins, arrange the classroom for small group collaboration. Prepare plant information cards and landscape scenario cards ahead of time. Place handouts, sketch paper, and any optional coloring supplies at each station or in a central materials bin. If doing a gallery walk, designate a wall space or use table surfaces for displaying student work.

Procedure and General Instructions (for instructor)

Introduction

Step 1: Engage (10–15 minutes)

- Begin the lesson by showing images of different Florida landscapes (coastal, wetland, pine flatwoods, urban yard). Ask students to think about what kinds of plants would thrive in each environment and why. Facilitate a brief Think-Pair-Share where students consider what plants need to survive and how the local environment affects plant success. This will activate their prior knowledge and set the stage for the day's topic. Utilize the FFL website.

Step 2: Explore (20–25 minutes)

- Distribute plant information cards and landscape descriptions. In small groups, students will match each plant to the appropriate environment, justifying their choices based on sunlight, soil, and water requirements. Guide them to identify which plants are native, drought-tolerant, or invasive. This hands-on activity encourages critical thinking and introduces key vocabulary.

Step 3: Explain & Elaborate (20–25 minutes)

- Present a brief mini-lesson using the slide deck, focusing on the Florida-Friendly Landscaping™ principles, especially "Right Plant, Right Place." Highlight why plant selection matters for environmental conservation. Then, have students apply what they've learned by designing a small Florida-Friendly garden plan. They will select 5–7 appropriate plants based on hypothetical site conditions and create a simple sketch to demonstrate layout and zoning.

Step 4: Evaluate (10–15 minutes)

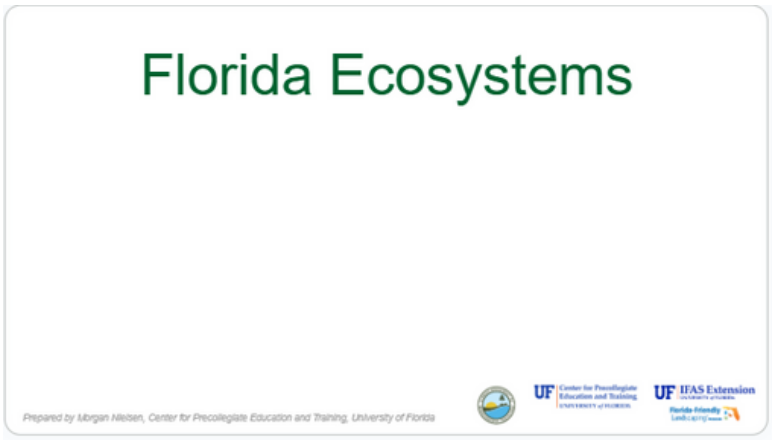
- Wrap up the lesson with an assessment of understanding. Students can complete an exit ticket with reflection questions such as, "Why is it important to choose native or Florida-Friendly plants?" or "How can plant selection affect resource use?" Alternatively, conduct a gallery walk where students display their garden designs and give peer feedback. Use this to gauge their grasp of key concepts and practical application.

Student Activity Sheets and Assignments

Included with this Activity

1. Florida Ecosystems PowerPoint
2. Landscaping Plants in Florida Plant Information Cards
3. Right Plant, Right Place: Creating Sustainable Landscapes PowerPoint
4. FFL Landscaping Design Template

Included Slides from the Florida Ecosystems PowerPoint:



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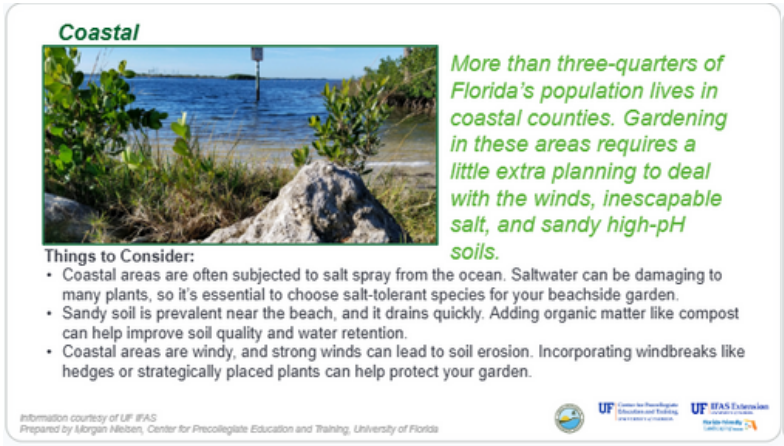

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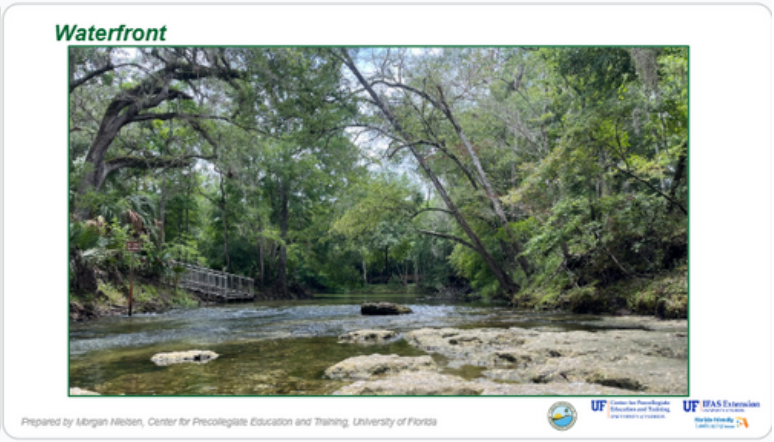

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Waterfront

According to the Florida Fish and Wildlife Conservation Commission, Florida has around 12,000 miles of accessible rivers, streams, and canals.

Things to Consider:

- Appropriate shoreline vegetation attracts wildlife and reduces erosion
- Native aquatic plants can create a low-maintenance buffer zone at the water's edge that reduces pesticide and fertilizer runoff
- Don't let grass clippings or leaves get washed into the waterbody because their high nutrient content can increase pollution.

Information Courtesy of UF IFAS and the FWC
Prepared by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

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Pine Flatlands

Prepared by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

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Pine Flatlands

These "river swamp" wetlands constitute about one-third of Florida's swampland and are found primarily in north Florida.

Things to Consider:

- These areas developed under frequent lightning and human-caused fires
- Characterized by seasonal droughts and flooding
- Relatively poorly drained, acidic and sandy soil

Information Courtesy of UF IFAS
Prepared by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

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Suburban/Home Landscaping

Prepared by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

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Image Credits:

Coastal (slides 2-3) UF/IFAS Extension – Hernando County Sea Grant. Retrieved from https://sfyl.ifas.ufl.edu/hernando/marine-science---sea-grant/ directory.ifas.ufl.edu+12

Waterfront (slides 4-5) Courtesy of Morgan Nielsen

Pine Flatlands (slides 6-7) Courtesy of the US Forest Service
https://www.fs.usda.gov/wildflowers/regions/southern/PineFlatwoods/index.shtml

Suburban/Urban Landscaping (slides 7) courtesy of UF IFAS FFL Program- example image
https://ffl.ifas.ufl.edu/about-ffl/ffl-examples/home-photos/

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COLORS: (USE EYEDROPPER TOOL)

This is the color I've used for worksheets

Color

CPET colors

Standard fonts are Calibri and Aptos

Colors from FFL Canva

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Landscaping Plants in Florida Plant Information Cards

Landscaping Plants in Florida Plant Information Cards

All information and images derived from the Florida-Friendly Landscaping™ Plant Guide

Florida Arrowroot *Zamia integrifolia*

Photos by Ryan Fessenden

Hardiness Zone: 8a to 11

Native/Non-Native Status: Native

Light Requirements: Can tolerate full/partial shade or full sun

Drought Tolerance: High

Soil:
Any Texture
Well Drained
pH 4.5-8

Appearance: Groundcover

Fun Fact! This poisonous plant is the only larval food plant for the Atala butterfly

Information and images from Florida-Friendly Landscaping™ Plant Guide

Wild Banyan Tree *Ficus citrifolia*

Photos by Ryan Fessenden

Hardiness Zone: 10a to 11

Native/Non-Native Status: Native

Light Requirements: Partial Shade to Full Sun

Drought Tolerance: High

Soil:
Any Texture
Medium Drainage
pH 4.5-8.0

Appearance: 25-50ft trees, edible fruit

Fun Fact! Shouldn't be planted near drain fields due to aggressive roots

Information and images from Florida-Friendly Landscaping™ Plant Guide

Podocarpus *Podocarpus macrophyllus*

Photos by Ryan Fessenden

Hardiness Zone: 7a to 11

Native/Non-Native Status: Not Native

Light Requirements: Partial Shade to Full Sun

Drought Tolerance: High

Soil:
Sandy
Well Drained
pH 4.5-7.2

Appearance: Large Shrub or Small Tree

Information and images from Florida-Friendly Landscaping™ Plant Guide

Chinese Hibiscus *Hibiscus rosa-sinensis*

Photos by Ryan Fessenden

Hardiness Zone: 5b to 9b

Native/Non-Native Status: Not Native

Light Requirements: Partial Shade to Full Sun

Drought Tolerance: Medium

Soil:
Sandy Loam
Medium to Well Drained
pH 4.5-6.5

Appearance: Large spreading shrubs with large, colorful flowers

Information and images from Florida-Friendly Landscaping™ Plant Guide

Firebush *Hamelia patens*

Photos by Ryan Fessenden

Hardiness Zone: 9a to 11

Native/Non-Native Status: Native

Light Requirements: Full Shade to Full Sun

Drought Tolerance: Medium

Soil:
Any texture
Medium to well drained
pH 4.5-8.0

Appearance: Irregularly shaped spreading shrub with red and orange flowers

Fun Fact! Attracts butterflies, hummingbirds and other birds

Information and images from Florida-Friendly Landscaping™ Plant Guide

Croton *Codiaeum variegatum*

Photos by Ryan Fessenden

Hardiness Zone: 9b to 11

Native/Non-Native Status: Not Native

Light Requirements: Partial Shade to Full Sun

Drought Tolerance: Low

Soil:
Any Texture
Well Drained
4.5-8.0

Appearance: Irregularly shaped large shrubs

Fun Fact! This species has over 100 variants in a range of colors and shapes.

Information and images from Florida-Friendly Landscaping™ Plant Guide

Ixora *Ixora coccinea*

Photos by Ryan Fessenden

Hardiness Zone: 9a to 11

Native/Non-Native Status: Not Native

Light Requirements: Full Sun

Drought Tolerance: Medium

Soil:
Any Texture
Medium to Well Drained
pH 4.5-5.5

Appearance: Small, round shrubs with year-round flowers

Information and images from Florida-Friendly Landscaping™ Plant Guide

Scrub Palmetto *Sabal etonia*

Photos by Ryan Fessenden

Hardiness Zone: 9a to 11

Native/Non-Native Status: Native

Light Requirements: Partial Shade to Full Sun

Drought Tolerance: High

Soil:
Sandy Loam
Well Drained
pH 4.5-8.0

Appearance: Small, shrub palm

Information and images from Florida-Friendly Landscaping™ Plant Guide

Simpson's Stopper *Myrcianthes fragrans*

Photos by Ryan Fessenden

Hardiness Zone: 9b to 11

Native/Non-Native Status: Native

Light Requirements: Full Shade to Full Sun

Drought Tolerance: High

Soil:
Any Texture
Well Drained to Wet
pH 6.0-7.2

Appearance: Large Shrub to Small Tree with fine leaves and tiny white flowers that bloom year-round

Information and images from Florida-Friendly Landscaping™ Plant Guide

Powderpuff *Mimosa strigillosa*

Photos by Ryan Fessenden

Hardiness Zone: 8a to 11

Native/Non-Native Status: Native

Light Requirements: Full Sun

Drought Tolerance: Medium

Soil:
Any Texture
Well Drained
pH 4.5-7.2

Appearance: low-growing groundcover with striking pink flowers, tolerates foot traffic and mowing

Fun Fact! Also called the "sensitive plant", the leaves visibly retract when touched

Information and images from Florida-Friendly Landscaping™ Plant Guide

Wild Coffee *Psychotria nervosa*

Photos by Ryan Fessenden

Hardiness Zone: 8b to 11

Native/Non-Native Status: Native

Light Requirements: Full or Partial Shade

Drought Tolerance: Medium

Soil:
Any Texture
Well Drained
pH 6.0-7.2

Appearance: Large, irregularly shaped shrub with tiny white flowers and small, red fruit that provides food for wildlife

Fun Fact! This is NOT the coffee that you drink, and the fruits contain no caffeine.

Information and images from Florida-Friendly Landscaping™ Plant Guide

Maidenhair Fern *Adiantum capillus-veneris*

Photos by Ryan Fessenden

Hardiness Zone: 7a to 11

Native/Non-Native Status: Native

Light Requirements: Partial to Full Shade

Drought Tolerance: Low

Soil:
Any Texture
Medium to Well Drained
pH 6.0-6.8

Appearance: Round spreading fern with fine-textured, delicate leaves

Information and images from Florida-Friendly Landscaping™ Plant Guide

Milkweed *Asclepias* spp.

Hardiness Zone: 8b to 10b

Native/Non-Native Status: Not Native

Light Requirements: Full Shade to Full Sun

Drought Tolerance: Medium

Soil:
Any Texture
Well Drained to Wet
pH 6.0-7.2

Appearance: Upright perennial with large flowers in a range of colors

Fun Fact! These plants are a big food source for caterpillars and butterflies, but all parts are poisonous to humans

Information and images from Florida-Friendly Landscaping™ Plant Guide

Bamboo *Bambusa* spp.

Photos by Ryan Fessenden

Hardiness Zone: 8a to 11

Native/Non-Native Status: Not Native

Light Requirements: Partial Shade to Full Sun

Drought Tolerance: Medium

Soil:
Any Texture
Medium Drained
pH 6.0-7.2

Appearance: Large, fast-growing clumping trees

Fun Fact! Grows very aggressively, should not be planted near lakefronts or streams

Information and images from Florida-Friendly Landscaping™ Plant Guide

Trumpet Creeper *Campsis radicans*

Photos by Ryan Fessenden

Hardiness Zone: 4a to 10b

Native/Non-Native Status: Native

Light Requirements: Full Shade to Full Sun

Drought Tolerance: Medium

Soil:
Any Texture
Medium Drained
pH 4.5-8.0

Appearance: Spreading vines that can reach up to 40 feet long

Information and images from Florida-Friendly Landscaping™ Plant Guide

Fakahatchee Grass *Tripsacum dactyloides*

Hardiness Zone: 8a to 11

Native/Non-Native Status: Native

Light Requirements: Partial Shade to Full Sun

Drought Tolerance: Medium

Soil:
Any Texture
Medium to Well Drained
pH 4.5-7.2

Appearance: Spreading ornamental grass

Fun Fact! Tolerates flooding and standing water

Information and images from Florida-Friendly Landscaping™ Plant Guide

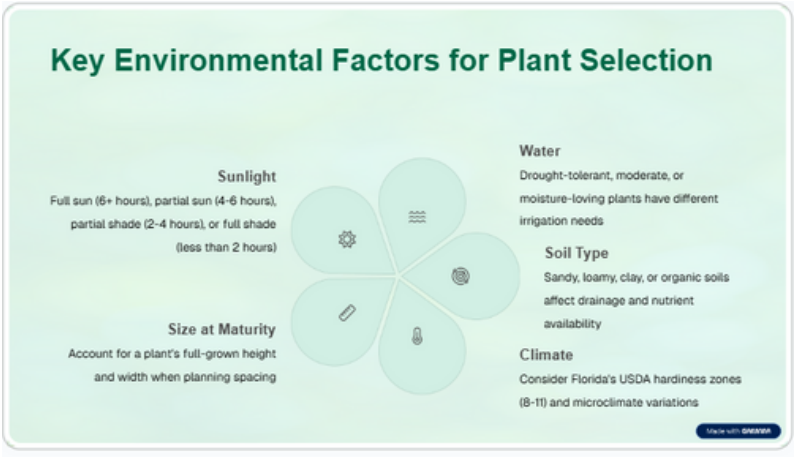
Included Slides from the Right Plant, Right Place: Creating Sustainable Landscapes PowerPoint:

1

2

3

4



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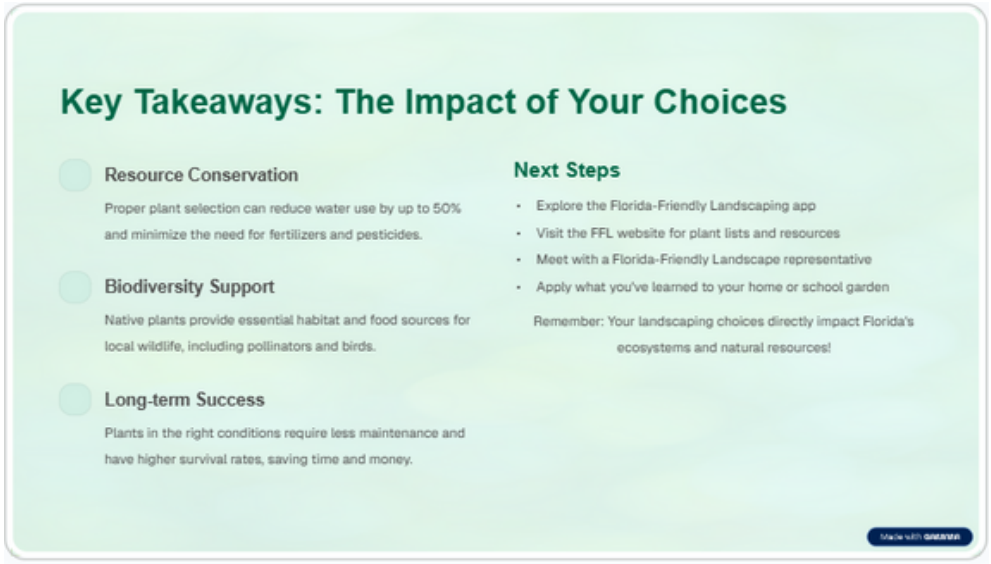
6


Design Challenge: Create Your Florida-Friendly Garden
Step 1: Analyze Your Site
Using the scenario card provided, identify key environmental conditions: sun exposure, soil type, and water availability.
Step 2: Select Appropriate Plants
Choose 5-7 native or Florida-Friendly plants that match your site conditions from the reference materials.
Step 3: Create a Layout
Sketch your garden design, considering mature plant size, water zones, and aesthetic appeal. Utilize the online Planner 5D website.
Step 4: Justify Your Choices
Explain how your selections support sustainability and ecosystem health on your worksheet.

7


Key Takeaways: The Impact of Your Choices
Resource Conservation
Proper plant selection can reduce water use by up to 50% and minimize the need for fertilizers and pesticides.
Biodiversity Support
Native plants provide essential habitat and food sources for local wildlife, including pollinators and birds.
Long-term Success
Plants in the right conditions require less maintenance and have higher survival rates, saving time and money.
Next Steps
Explore the Florida-Friendly Landscaping app
Visit the FFL website for plant lists and resources
Meet with a Florida-Friendly Landscape representative
Apply what you've learned to your home or school garden
Remember: Your landscaping choices directly impact Florida's ecosystems and natural resources!

8

FFL Landscaping Design Template

Florida-Friendly Landscaping™ Design Template

Name: _____

Location: _____

Prepared by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

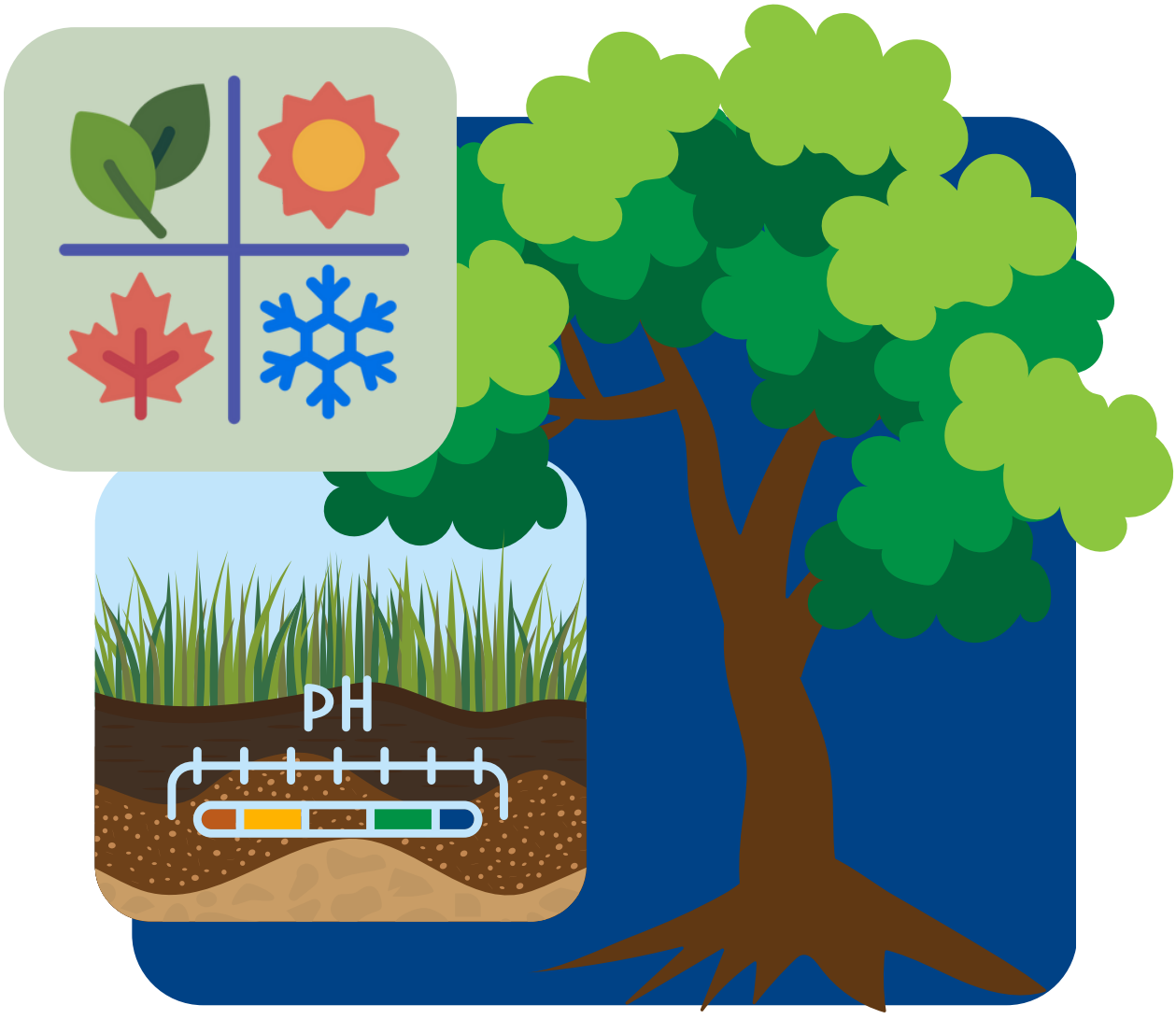
Prepared by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Florida-Friendly Landscaping™ Program

Principle 1:

Right Plant, Right Place (2)

High School



Published on **August 11th, 2025**

About This Activity

Title: Right Plant, Right Place

Subject, Grade, Level:

High School Science

Abstract:

This high school environmental science lab, “Right Plant, Right Place,” engages students in a three-day, hands-on investigation aligned with Florida-Friendly Landscaping™ (FFL) Principle #1. Designed by Hazel Mucherera at Edgewater High School, the lesson explores the ecological and sustainability impacts of plant selection in drought-prone environments. Through field observation, soil testing, and data analysis, students identify site-specific challenges and propose native or Florida-Friendly plant alternatives that promote water conservation and biodiversity. Emphasizing real-world application, the culminating Landscape Rescue Challenge requires students to justify their plant choices based on environmental data, including light availability, soil texture, pH, and USDA hardiness zone. The lesson fosters critical thinking about human impact on ecosystems and encourages advocacy for sustainable landscaping practices in the school community. Aligned with standards SC.912.L.17.8 and SC.912.L.17.20, this lab cultivates both environmental literacy and action through inquiry, collaboration, and place-based learning.

Learning Objectives:

At the conclusion of this activity, participants will be able to:

1. Predict how unsuitable plant choices negatively affect environmental systems (e.g., through increased water waste).
2. Analyze a drought prone landscape scenario and identify factors contributing to biodiversity loss.
3. Select and recommend native/Florida-Friendly plants that promote ecological sustainability.

Author: Hazel Mucherera
Edgewater High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.8	Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
SC.912.L.17.20	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability

Timeframe:

This activity is designed to take approximately 150 minutes of class time (3 class periods).

List of Materials

- FFL Handbook extract on Principle #1. (1 per group).
- printed worksheet (1 per student).
- pen/pencil
- shovels, soil sampling bags
- gloves
- baking soda
- vinegar
- plastic cups
- distilled water
- transparent bottles with lids
- dish soap
- digital pH meter (if available)
- PowerPoint presentations from each group
- technology to access to the FFL mobile app/website
- rubric for assessing presentations

Important Note:

- Need to print before activity: Landscape Rescue worksheets (1 per student) for observations and planning, FFL handbook extract on Principle #1. (1 per group), Protocols for soil pH and texture analysis. (1 per student)
- Optional Extension: Partner with the school's FFA and Green Team to advocate for sustainable landscaping. Develop posters or infographics to promote the “Right Plant, Right Place” Principle.

Procedure and General Instructions (for instructor)

Introduction

DAY 1: INTRODUCTION + KEY TERMS (25 MINUTES):

- Introductory lesson on FFL Principle #1: “Right Plant, Right Place”
- Key terms: invasive species, native species, drought tolerance, drought prone, biodiversity, sustainability
- **SITE ANALYSIS (35 MINUTES):** Conduct a site visit to observe a drought prone landscape on campus.
- In groups of 4: Students discuss and record at least two probable causes of the site issues, determine light ability and record USDA hardiness zone

DAY 2: SOIL SAMPLING AND ANALYSIS

- Collect soil samples from the site **(15 minutes)**
- Analyze soil texture through sedimentation testing **(15 minutes)**
- Determine the soil pH using field testing methods. **(20 minutes)**

DAY 3: PRESENTATIONS AND REFLECTION

Bellwork (10 minutes): Observation and conclusion on soil texture

Group Presentations (35 minutes):

- Use their findings to identify suitable native/Florida-Friendly plant species with the FFL Plant Mobile App/ website
- Each team presents their proposed 6 native/Florida-Friendly plants
- Students justify their choices based on environmental data (hardiness zone, light, soil pH and texture)

Exit ticket (5 minutes): Submission of worksheet with all sections completed.

Teacher-Facing Materials

Included with this Lesson

- PowerPoint

Included Slides:

1

2

3

4

Schedule Layout Day 1: Introduction and Site Analysis

Introduction to FFL Principle #1

Day 1 begins with a lesson on the Florida Friendly Landscaping Principle #1: 'Right Plant, Right Place,' covering key sustainability concepts and vocabulary.

Site Analysis and Environmental Assessment

Students visit a drought-prone campus site, analyze environmental factors, and gather data to guide plant selection decisions.

5

Day 2: Soil Sampling and Analysis

1

Soil Sampling Procedure

Collect soil samples from the site using gloves and sampling bags to ensure contamination-free collection.

2

Soil Analysis Overview

Perform soil pH and texture tests using field methods and lab materials to assess site conditions for plant selection.

6

Day 3: Presentations and Reflection

Identify plants using FFL Mobile App.Group presentation of 6 recommended plants.Justify choices with environmental data.Submit completed worksheet (Exit ticket).

7

Materials and Lab Protocols

Each student receives a worksheet to document site conditions, soil results, and plant selection aligned with Florida Friendly Landscaping principles, ensuring active participation and structured final presentations.

8

Logistics and Coordination

Group Formation and Coordination : Groups consist of 4 students each, with a maximum of 7 groups. The instructor coordinates with the UF/IFAS Agent at the front offkce before the site visit.

9

10

Student Activity Sheets and Assignments

Included with this Activity

- Landscape Rescue Worksheet

Landscape Rescue Worksheet page 1:

UF|CPET

FFL Principle 1- Right Plant, Right Place
Landscape Rescue Student Worksheet

Name: _____

Date: _____

Period: _____

Part 1: Site Analysis

Light Availability	
USDA Hardiness Zone	
Description of Site Conditions	

Part 2: Soil Analysis Procedures

A. Determining Soil pH (Using Vinegar and Baking Soda)

Procedure (adapted from UF/IFAS Extension and Home Soil Testing methods)

1. Place 2 teaspoons of soil into two separate containers.
2. Add distilled water to both containers until the soil is muddy.
3. To the first container, add 1–2 teaspoons of vinegar and observe for fizzing- FIZZING INDICATES ALKALINE SOIL.
4. To the second container, add 1–2 teaspoons of baking soda and observe for fizzing- FIZZING INDICATES ACIDIC SOIL.
5. If neither reacts, the soil is likely neutral.

Observations:

Alkaline Soil Test (positive or negative)	
Acidic Soil Test (positive or negative)	
Conclusion on soil pH	

Landscape Rescue Worksheet page 2:

B. Determining Soil Texture (Sedimentation Test)

Procedure (adapted from USDA NRCS and Gardening Know How sources):

1. Fill a transparent bottle about 1/3 with dry soil.
2. Add water until the jar is nearly full.
3. Add a few drops of dish soap.
4. Shake the bottle vigorously for 1–2 minutes.
5. Set the jar on a flat surface and let it sit undisturbed for 24 hours.
6. Observe the layers:
   - *Sand settles first (bottom layer)*
   - *Silt settles next (middle layer)*
   - *Clay remains suspended longest (top layer)*
7. Measure the height of each layer to estimate percentages.

Observations:

Total Height of sediment layer (cm)	
Sand Layer	*Height (cm):* _____ *Percentage of total:* _____
Silt Layer	*Height (cm):* _____ *Percentage of total:* _____
Clay layer	*Height (cm):* _____ *Percentage of total:* _____

Soil Texture Classification Guide

Use the percentages from your soil test to determine your soil type:

	Sand	*Sandy Loam*	*Loam*	*Silt Loam*	*Clay Loam*	*Clay*
Percentage of sand	85-100	70-85	40-60	0-20	20-45	0-45
Percentage of silt	0-10	0-20	30-50	60-90	15-40	0-40
Percentage of Clay	0-10	0-20	10-20	0-20	27-40	40-100

Classification of your soil: _____

Hazel Mucherera, Edgewater High School
Edited by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Landscape Rescue Worksheet page 3:

Part 3: Florida-Friendly Plant Recommendations

List and describe six Florida-friendly plant species suitable for this sight based on your soil and light analysis.

Common Name	Scientific Name	Features	Justification

Hazel Mucherera, Edgewater High School
Edited by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Florida-Friendly Landscaping™ Program

Principle 2:

Water Efficiently

High School

Published on **August 7th, 2025**

About This Activity

Title: Water Efficiently

Subject, Grade, Level:
High School Science

Abstract:

This high school lesson plan explores the importance of water efficiency in Florida's unique ecosystems through the lens of Florida-Friendly Landscaping™ (FFL) Principle 2: Water Efficiently. Designed as a 100-minute outreach activity across two class periods, the program engages students in evaluating the environmental impacts of water use and proposing sustainable landscaping solutions. Students begin by examining Florida's water sources, threats like pollution and over-extraction, and conservation strategies through interactive lectures and article-based discussions. On Day 2, students work collaboratively to research all nine FFL principles and apply their findings in a water-efficient landscape design challenge. The activity emphasizes critical thinking, scientific reasoning, and environmental literacy, aligning with key biology and environmental science standards. By the end, students are equipped to assess real-world water issues and propose evidence-based, sustainable landscaping practices that reduce runoff, support native ecosystems, and promote long-term water conservation.

Learning objectives:

At the conclusion of this activity, participants will be able to:

1. Recognize how human choices impact natural resources and the environment.
2. Describe strategies that promote sustainability in outdoor spaces.
3. Analyze the relationship between landscape practices and environmental health.
4. Apply scientific reasoning to propose environmentally responsible solutions.

Author: Jennifer Troy
Newberry High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.20	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability
SC.912.L.17.11	Evaluate the costs and benefits of renewable and nonrenewable resources, such as water.
SC.912.L.17.16	Discuss the large-scale environmental impacts resulting from human activity.
SC.912.N.1.1	Define a problem based on a specific need and propose a solution using scientific principles.

Timeframe:

This activity is designed to take approximately 100 minutes of class time over the course of 2 class periods.

List of Materials

- Lecture Power point
- Printed article: Water, Water Everywhere, But Not Enough to Drink
- Reading Worksheet
- Devices to research FFL principles and to design a water-efficient landscape
- Florida-Friendly Landscaping™ Design Template
- Writing utensils

Procedure and General Instructions (for instructor)

Introduction

Day 1: (50 min)

Bell work (5 min)

- Students complete a bell work question- where their water comes from.

Lecture on Florida's water (20 min)

- Sources of Water in Florida: aquifers (especially the Floridan aquifer), springs, rivers, lakes, wetlands, rainfall
- Uses: drinking water, agriculture, landscaping, tourism, industry
- Threats: pollution (nitrates, runoff), over-extraction, saltwater intrusion, climate change
- Conservation Solutions: Florida-Friendly Landscaping™, rainwater harvesting, water restrictions, public policy
- Visual Aids: Use maps, photos of springs, aquifers, and pollution examples; possibly include a short video clip from Florida DEP or SWFWMD.

Article Reading and Discussion (20 min)

- "Water, Water, Everywhere, But Not Enough to Drink?" by Dana L. Crosby, Florida State University Journal of Land Use & Environmental Law (2018); provided for free and open access by Scholarship Repository https://ir.law.fsu.edu/cgi/viewcontent.cgi?article=1162&context=jluel
- Students read individually or in pairs, highlighting or annotating key points about water sources, problems, and solutions.
- **Student Discussion/Reflection Questions**

1. What are the main threats to Florida's freshwater supply mentioned in the article?
2. How does over-irrigation or poor landscaping design contribute to water waste?
3. What role does groundwater (aquifers) play in Florida's ecosystem and daily life?
4. Which water conservation method do you think is most effective in Florida and why?
5. Based on what you've learned, what is one action you or your community could take to improve water efficiency?

Exit Ticket (5 min)

- What is one change Florida needs to make to protect its water, and how would it help?

Procedure and General Instructions (for instructor) cont.

Day 2: (50 min)

Bell work (5 min)

- Students complete the bell work question- Why is water efficiency critical to Florida's ecosystems and population?

Group Activity (30min)

- Divide students into 9 groups, each assigned one of the FFL principles.
- Groups will research their principle using IFAS website
- Groups will present a quick 1-2 min presentation answering the following questions:
  - How does this principle reduce water use or improve water quality?
  - What's one specific landscaping practice that demonstrates this principle?
  - How does it protect or benefit local ecosystems?

Water efficient design challenge (20min)

- Scenario: Your school plans to replace part of the lawn with a sustainable, water-efficient landscape. Using what you've learned, design a plan based on at least 5 of the 9 FFL principles with a strong focus on water efficiency.
- Your design must include:
  - 3 native/drought-tolerant Florida plants
  - A strategy for irrigation that reduces water waste
  - A method for reducing runoff (e.g., rain garden, swales, mulch)
  - Labels showing how the selected FFL principles are applied
  - 2–3 sentence explanation of how the design protects Florida's ecosystems
  - Students can sketch their design by hand or use digital tools.

Exit Ticket (5 min)

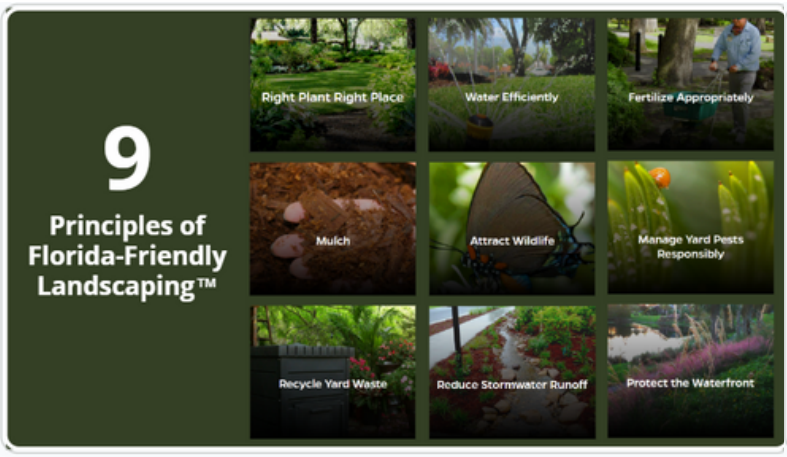
- Describe one change you would recommend to make your school's landscaping more water efficient.

Student Activity Sheets and Assignments

Included with this Activity

1. PowerPoint
2. Student Reading Worksheet
3. Florida-Friendly Landscaping™ Design Template

Included Slides:



1

2

3

4

Irrigation Restrictions

- Implemented by municipalities and water management districts
- Mandatory
- Limit irrigation to certain schedules

5

Turn Off Automatic Irrigation

Does this lawn look underwatered?

9 PRINCIPLES OF FLORIDA-FRIENDLY LANDSCAPING™

6

Turn Off Automatic Irrigation

- Saves water
- Saves money
- Improves health of lawn

March '06	APR'06	MAY '06	JUNE '06	JULY '06	Aug '06	SEPT '06
33000	20000	14000	9000	12000	16000	33000
72000	85000	42000	32000	44000	26000	17000
29000	39000	45000	15000	26000	22000	17000
42000	40000	30000	5000	19000	21000	32000
0	57000	29000	18000	17000	23000	12000
0	38000	45000	41000	40000	33000	25000
21000	19000	4000	11000	5000	4000	3000
64000	20000	19000	6000	16000	6000	10000
0	0	96000	18000	22000	19000	15000

9 PRINCIPLES OF FLORIDA-FRIENDLY LANDSCAPING™

7

Watering to Establish

- "Established" means plant can survive primarily on rainfall
- Promote rapid root growth for establishment

8

Watering Best Practices

Right Plant, Right Place

The right plant in the right place won't need irrigation after it is established

PRINCIPLES OF FLORIDA-FRIENDLY LANDSCAPING™

9

Watering Best Practices

Handwater when possible

- Use a can or hose with a nozzle
- Water pots, shrubs, trees, vegetables and beds

9 PRINCIPLES OF FLORIDA-FRIENDLY LANDSCAPING™

10

Watering Best Practices

Maintain your irrigation system

- Repair leaks and sprinkler heads
- Point heads at plants
- Prune interfering plants

9 PRINCIPLES OF FLORIDA-FRIENDLY LANDSCAPING™

11

Watering Best Practices

Maintain your irrigation system

- Inspect and clean filters and emitters
- Flush system quarterly
- Reset controller seasonally

12

Watering Best Practices

Hire Florida-Friendly

- Too much for you to maintain?
- Hire a landscape professional to maintain your system

13

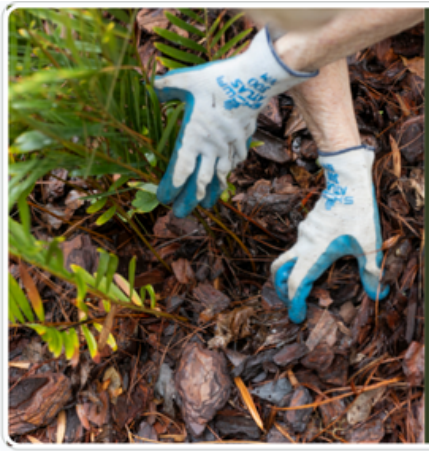
Watering Best Practices

Use microirrigation

- Applies water directly to roots of plants

9 PRINCIPLES OF FLORIDA-FRIENDLY LANDSCAPING™

14



Watering Best Practices

Mulch plants

- Retain soil moisture

9 PRINCIPLES OF FLORIDA-FRIENDLY LANDSCAPING™

15

Watering Best Practices

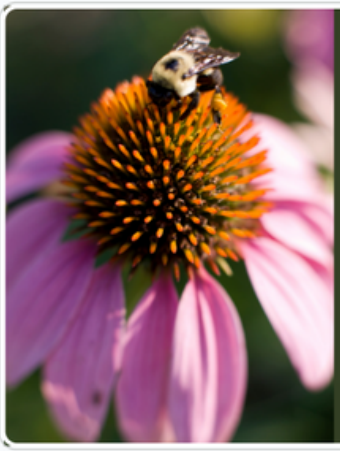
Watch the weather

- Rain is irrigation, too
- Use it to your advantage - it's free!

9 PRINCIPLES OF FLORIDA-FRIENDLY LANDSCAPING™

16

17



Contact Info

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UF IFAS Extension UNIVERSITY of FLORIDA Florida-Friendly Landscaping™

18

Student Reading Worksheet

UF CPET **Article: Water, Water, Everywhere, But Not Enough to Drink?"**
Student Reading Worksheet

Name: _____

Date: _____

Instructions: As you read the article, highlight or annotate and answer the following questions.

Highlight/Annotate:

- ☐ Water Sources
- ☐ Legal, Environmental and Social Problems
- ☐ Policy & Personal Solutions

Guided Reading Questions:

1. What are the major threats to Florida's freshwater supply mentioned in the article, and how are they interconnected?

2. How do landscaping choices and irrigation practices contribute to water scarcity or overuse? How can Florida-Friendly Landscaping address these problems?

3. Explain the importance of Florida's aquifers in both natural ecosystems and human communities. What are the risks if they become overdrawn or polluted?

Guided Activities for Teaching and Outreach Resources

4. Which water conservation strategies (regulatory, technological, or behavioral) seem most promising in Florida's current context? Justify your choice with evidence from the article.

5. What role do individuals, schools, and local governments play in protecting Florida's water resources? Propose one realistic action you or your community could take to improve water efficiency.

FFL Landscaping Design Template

Florida-Friendly Landscaping™ Design Template

Name: _____

Location: _____

Prepared by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Florida-Friendly Landscaping™ Program

Principle 3:

Fertilize Appropriately (1)

High School

Published on **August 12th, 2025**

About This Activity

Title: Fertilize Appropriately

Subject, Grade, Level:
High School Science

Abstract:

This high school lesson applies the 5E instructional model to investigate the environmental impacts of fertilizer use, aligning with Florida-Friendly Landscaping™ Principle #3. Over multiple sessions, students test soil samples, apply varying fertilizer amounts, and simulate rainfall to observe and analyze nutrient runoff. Through hands-on experimentation and data analysis, students explore the relationship between fertilizer use and water quality, particularly the role of nitrogen and phosphorus in eutrophication. The lesson emphasizes informed, sustainable fertilization practices and encourages students to apply and share responsible methods in real-life settings. Assessments include lab work, graphing, class discussions, a quiz, and student presentations.

Learning objectives:

At the conclusion of this activity, participants will be able to:

1. Test the soil to see what nutrients it has and if it needs fertilizer.
2. Apply different amounts of fertilizer and observe what happens to the water that runs off.
3. Look at the data, make graphs, and figure out what it means.
4. Change one part of the experiment and test a new idea.
5. Share your results and explain how to fertilize in a way that protects the environment.

Author: Sanil Nadar
P.K. Yonge Developmental Research School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.8	Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
SC.912.L.17.20	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Timeframe:

This activity is designed to take approximately 150 minutes of class time.

List of Materials

- Evaluation rubric
- Soil samples
- Soil test kits (N, P, K, pH, Fe, Mg)
- Fertilizer samples (synthetic and/or organic)
- Measuring tools (spoons, scales)
- Planting containers or trays
- Watering cans or droppers
- Runoff collection trays labeled "ponds"
- Water quality test kits
- Lab data sheets / Chromebooks
- KWL charts, planning sheets, reflection pages, quiz

Procedure and General Instructions (for instructor)

Introduction

Day 1: Engage & Soil Testing

Objective: Introduce the problem of nutrient pollution and assess baseline soil nutrient levels.

1. Show students an image or short video of algal blooms in Florida water bodies.
2. Discuss the environmental effects of fertilizer runoff.
3. Hand out KWL charts. Students fill in the "Know" and "Want to know" sections.
4. Divide class into small groups (3-5 students each) and distribute soil samples, gloves, and soil test kits.
5. Guide students to test for pH, nitrogen (N), phosphorus (P), potassium (K), iron (Fe), and magnesium (Mg).
6. Record results on a provided lab sheet or spreadsheet.

Day 2 – Explore (Part 2) Fertilizer Application & Runoff Setup

Objective: Apply varying amounts of fertilizer and simulate runoff.

1. Review soil test results and assign treatment groups:
   - Group A: Control (no fertilizer)
   - Group B: Moderate fertilizer (based on IFAS guidelines)
   - Group C: Excess fertilizer (2x guideline)
2. Distribute fertilizer samples and measuring tools.
3. Students apply the fertilizer to their labeled plots or containers.
4. Simulate rainfall using watering cans or graduated droppers.
5. Collect runoff in labeled "pond" containers.
6. Store collected water for testing the next day.

Procedure and General Instructions (for instructor) cont.

Day 3 – Explain: Water Testing & Explanation

Objective: Test runoff water for indicators of eutrophication.

1. Distribute runoff samples from each group.
2. Provide water quality testing kits (nitrate, phosphate, turbidity, conductivity).
3. Students perform water tests and record data.
4. Groups graph results using bar or line graphs.
5. Facilitate a class discussion:
    - How did nutrient levels vary between groups?
    - What might happen if this runoff entered a lake or river?
6. Present mini-lecture on nutrient cycles and eutrophication

Day 4 – Elaborate & Extension Activity

Objective: Deepen investigation with a new variable or hypothesis.

1. Groups plan a second experiment testing a new factor:
    - Organic vs. synthetic fertilizer
    - Fertilizer on mulch vs. bare soil
    - Fertilization before vs. after simulated rain
2. Complete a planning sheet:
    - Hypothesis
    - Independent and dependent variables
    - Materials and procedure
3. Begin extended setup and data collection.

Day 5 – Evaluate & Presentations

Objective: Analyze data, reflect, and demonstrate learning.

1. Groups finalize data tables and graphs.
2. Each group presents findings (poster or short slide deck).
3. Students complete a reflection: "How can smart fertilization protect Florida waters?"
4. Administer a quiz on nutrient cycles, fertilizer impact, and eutrophication.
5. Exit slip: One way I will fertilize smarter is...

Teacher-Facing Materials

Included with this Lesson

- PowerPoint
- Fertilizer Lab Set Up

Included Slides:

Gatorplan 2025
Florida Friendly Landscaping Program (FFL)

CPET
University of Florida

5E model lesson on Fertilizer application (Principle 3)
Grade level 10-12
Time needed – 150 minutes

Instructor – Sanil Nadar
PK Yonge Developmental Research School
University of Florida

UF CPET

1

FFL Principles

Fertilize appropriately

Activity - Fertilize smart
Target audience – High school

Stormwater management

Activity - Stormwater SOS: Students on Solutions
Target audience – High school

2

Lesson design – Inquiry-Based Science Teaching (5E Model[1])

Learning Objectives:
1. Test the soil to determine its nutrient content and identify if it requires fertilizer.
2. Apply different amounts of fertilizer and observe the effect on the water that runs off.
3. Examine the data, create graphs, and interpret the results.
4. Change one part of the experiment and test a new idea.
5. Share your results and explain how to fertilize in a way that protects the environment.

Material needed

- Soil samples, Large coke bottles (1L)
- Soil test kits (N, P, K, pH, Fe, Mg)
- Fertilizer samples (synthetic and/or organic)
- Measuring tools (spoons, scales)
- Planting containers or trays
- Watering cans or droppers
- Runoff collection trays labeled "ponds"
- Water quality test kits
- Lab data sheets / Chromebooks
- KWL charts, planning sheets, reflection pages etc.

1. Duran, Lena Bailone, and Emilio Duran. "The 5E instructional model: A learning cycle approach for inquiry-based science teaching." *Science Education Review* 3.2 (2004): 49-65.

3

Lesson design – Inquiry-Based Science Teaching (5E Model[1])

5E Model

Open Inquiry Lesson

Engage- Introduce the problem of nutrient pollution and assess baseline soil nutrient levels.

- 1-minute news clip or photo of a Florida algal bloom or fish kill in the Indian River Lagoon or Tampa Bay.
- Case study summary[2]

1. Duran, Lena Bailone, and Emilio Duran. "The 5E instructional model: A learning cycle approach for inquiry-based science teaching." *Science Education Review* 3.2 (2004): 49-65.
2. Hall, Cynthia Ann, and Amanda Lorraine Muni-Morgan. "Florida's harmful algal bloom (HAB) problem: Escalating risks to human, environmental and economic health with climate change." *Frontiers in Ecology and Evolution* 9 (2021): 646080.

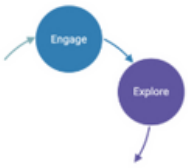
4

Lesson design – Inquiry-Based Science Teaching (5E Model)

© Orlando Science Museum

5E Model

Open Inquiry Lesson



Engage- Introduce the problem of nutrient pollution and assess baseline soil nutrient levels.

Explore- Apply varying amounts of fertilizer and simulate runoff

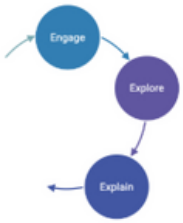
- Allow students to investigate soil nutrient needs, simulate fertilization, and observe runoff effects.
- In groups, students:
  - Conduct baseline soil tests (N, P, K, Fe, Mg, pH)
  - Plan and apply fertilizer to model plots (Control, Appropriate, Over-fertilized)
  - Simulate rain events and runoff collection
  - Test runoff for nitrates, phosphates, turbidity, and conductivity

5

Lesson design – Inquiry-Based Science Teaching (5E Model)

5E Model

Open Inquiry Lesson



Engage- Introduce the problem of nutrient pollution and assess baseline soil nutrient levels.

Explore- Apply varying amounts of fertilizer and simulate runoff

Explain- Test runoff water for indicators of eutrophication.

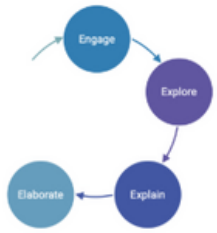
- Student groups present findings from soil and runoff tests.
- Teacher-led mini-lecture:
- Explain nutrient cycles, eutrophication, and urban fertilizer runoff (Tampa Bay case study).
- Discuss the **Florida Friendly Landscaping™ Principle #2** and regional fertilizer ordinances.

6

Lesson design – Inquiry-Based Science Teaching (5E Model)

5E Model

Open Inquiry Lesson



Engage- Introduce the problem of nutrient pollution and assess baseline soil nutrient levels.

Explore- Apply varying amounts of fertilizer and simulate runoff

Explain- Test runoff water for indicators of eutrophication.

Elaborate- Deepen investigation with a new variable or hypothesis. (Open Inquiry)

- Modify variables (e.g., organic vs. synthetic fertilizer) and repeat the experiment

7

Lesson design – Inquiry-Based Science Teaching (5E Model)

5E Model

Open Inquiry Lesson

Engage- Introduce the problem of nutrient pollution and assess baseline soil nutrient levels.

Explore- Apply varying amounts of fertilizer and simulate runoff

Explain- Test runoff water for indicators of eutrophication.

Evaluate - Analyze data, reflect, and demonstrate learning.

- Group lab report with data tables, graphs, statistical analysis, and conclusions

Individual reflection answering:

- What did you learn about fertilizer's role in water quality?
- What recommendations would you give to your community?
- Short quiz: Nutrient cycles, runoff impacts, eutrophication

Elaborate- Deepen investigation with a new variable or hypothesis. (Open Inquiry)

8

Lesson design – Inquiry-Based Science Teaching (5E Model)

Evaluate - Analyze data, reflect, and demonstrate learning.

- Group lab report with data tables, graphs, statistical analysis, and conclusions

Individual reflection answering:

- What did you learn about fertilizer's role in water quality?
- What recommendations would you give to your community?
- Short quiz: Nutrient cycles, runoff impacts, eutrophication

Engage- Introduce the problem of nutrient pollution and assess baseline soil nutrient levels.

Explore- Apply varying amounts of fertilizer and simulate runoff

Explain- Test runoff water for indicators of eutrophication.

Elaborate- Deepen investigation with a new variable or hypothesis. (Open Inquiry)

9

Acknowledgements

- CPET staff
- Presenters
- UF/IFAS
- Florida Museum of Natural History
- Department of Biology, Environmental Engineering
- College of Education

10

Fertilizer Lab Set Up page 1:

Guided Activities for Teaching and Outreach Resources

UF|CPET

FFL Principle 3- Fertilize Appropriately

High School Soil Testing- Lab Set Up and Guidance

Day 1- Initial Testing Overview:

Students will test soil samples for pH, Nitrogen, Phosphorus, Potassium, Iron, and Magnesium. This document details materials prep to run tests using common soil test kits or other accessible materials. Commercially available soil or aquarium test kits will generally work, and the lab can be adapted based on the availability of materials.

Materials Needed Per Group:

- Soil samples: Collect from garden, park or provide prepared samples. *Suggestion: have students bring a ziplock baggy of soil in on lab day.*
- Gloves
- Distilled Water
- Plastic cups or test tubes to mix soil and water
- Stirring rod or spoons for mixing soil slurry
- Coffee filter to filter soil slurry (optional)
- Test kit instructions and result interpretation information (will vary depending on kits/materials used)
- ***Test kit- see materials and suggestions below. Can be modified based on available materials.***

Lab Set Up:

Prepare Workstations

- Arrange soil samples in labeled containers or bags.
  Distribute gloves, cups, stirring rods, and test kits to each station.
- Provide distilled water bottles for slurry preparation.
- Place color charts where all can see or distribute copies

Soil Sample Preparation

  - Students take approximately 1 teaspoon (5 grams) of soil sample.
  - Mix soil with 25 ml distilled water in a cup to make a slurry.
  - Stir well and let settle for 5-10 minutes or filter through a coffee filter.

General Testing Procedures & Alternatives Suggestions

pH Testing: Soil pH test strips or meter.

- ***Procedure:*** Dip strip in soil slurry liquid or insert pH meter probe. Compare test strip to standard color chart or record specific pH
- ***Alternative:*** Use red cabbage juice as a natural pH indicator (boil chopped cabbage in water, strain, then add soil slurry liquid; observe color change)

Nitrogen Testing: Aquarium nitrate test kit.

- ***Procedure:*** Use filtered soil slurry liquid; add reagents; wait for color development.
- ***Alternative:*** If no nitrate kit, discuss nitrogen importance and look for indirect signs (e.g., plant health), or arrange a lab demo with commercial soil test kits.

Phosphorus Testing: Aquarium phosphate test kit.

- ***Procedure:*** Similar to nitrogen test, use soil extract with reagents and compare color.
- ***Alternative:*** Some garden kits provide phosphorus testing strips.

Fertilizer Lab Set Up page 2:

Guided Activities for Teaching and Outreach Resources

Potassium Testing: Potassium test kit (may be difficult to find, but available in certain garden testing kits)

- ***Procedure:*** Test soil extract with reagents per kit instructions.
- ***Alternative:*** If no kit, discuss the role of potassium in plants and consider a qualitative observation activity on soil texture and fertility.

Iron Testing: Aquarium iron test kit.

- ***Procedure:*** Use soil extract, add reagents, observe color change.
- ***Alternative:*** Discuss iron's role in plant health; no easy home test, but lab demo possible with commercial kits.

Magnesium Testing: Aquarium magnesium kit or certain specialty soil kits.

- ***Procedure:*** Test filtered soil extract following kit instructions.
- ***Alternative:*** Use a general hardness (GH) test kit (from aquarium kits) to estimate magnesium/calcium content.

Day 2: Fertilizer Application

Review soil test results and assign treatment groups:

- *Group A:* Control (no fertilizer)
- *Group B:* Moderate fertilizer (based on IFAS guidelines)
- *Group C:* Excess fertilizer (2x guideline)

Distribute fertilizer samples and measuring tools and have students apply fertilizer based on packaging instructions. Simulate rainfall using watering cans or graduated droppers and collect runoff in a shallow dish or similar container labelled "pond" and save pond water for testing the following day.

Day 3: Runoff Testing

For nitrates and phosphates: repeat procedure from day 1

Turbidity Testing: Visual Comparison Method

- ***Materials***: glass test tubes (2), pond water sample, distilled water for comparison, white paper/poster board with a black line or pattern, *optional diagram to standardize results*
  - As an extension, have students prepare and standardize their own results or suggest an alternative procedure to standardize these results.
- ***Procedure:***
  - Add a standard volume of runoff water to the tube
  - Hold tube at eye level and look down through the water towards the black line/pattern on the page
  - Compare the clarity of the water samples against distilled water and have students rank the sample from 0 (distilled water) to 10 (completely opaque)

Conductivity Testing: Using a digital EC or TDS Meter

- Materials: clear cups or clean test tubes (2), pond water sample, distilled water for comparison, calibrated EC or TDS meter
- Procedure:
  - Test the control sample: pour distilled water into clean cup and test; record reading (should be close to 0)
  - Testing runoff sample: rinse meter with distilled water, insert into runoff sample and wait for reading to stabilize and record conductivity- higher reading indicates more dissolved ions (fertilizers or salts)

Student Activity Sheets and Assignments

Included with this Activity

1. KWL Chart
2. Student Soil Testing Worksheet

KWL Chart:

Guided Activities for Teaching and Outreach Resources

UF CPET

KWL Chart

Topic: _____

Know- *What do you already know about the topic?*	Want to Learn- *What questions do you have about the topic? What interests you?*	Learned- *What did you learn?*

Student Soil Testing Worksheet page 1:

Guided Activities for Teaching and Outreach Resources

UF|CPET

FFL Principle 3- Fertilize Appropriately

High School Soil Testing- Data Collection Sheet

Name: _____

Date: _____

Day 1: Initial Data Collection

Soil Test	Observations	Interpretation (Positive/Negative or approximate levels)
pH		
Nitrogen		
Phosphorus		
Potassium		
Iron		
Magnesium		

Day 3: Runoff Testing

Circle your treatment:

Group A (no fertilizer) *Group B (recommended amount)* *Group C (2x recommended amount)*

Data Collection:

Soil Test	Observations	Interpretation (Positive/Negative or approximate levels)
pH		
Nitrogen		
Turbidity		
Conductivity		

Activity designed by Sanil Nadar, P.K. Yonge Developmental Research School
Worksheet developed by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Student Soil Testing Worksheet page 2:

Guided Activities for Teaching and Outreach Resources

Day 4: Experimental Design- Your Turn!

Independent Variable	
Dependent Variable	
Hypothesis	

Why is this variable important to test for soil health?

List three variables you will need to control in this experiment:

- _____
- _____
- _____

Materials Needed (BE SPECIFIC!)

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Procedure (Continue beyond boxes if needed)

Step	Procedure
1	
2	
3	
4	
5	
6	
7	

Activity designed by Sanil Nadar, P.K. Yonge Developmental Research School
Worksheet developed by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Student Soil Testing Worksheet page 3:

8	
9	
10	

Data Collection- Describe how you will collect your data and prepare an appropriate data table.

Florida-Friendly Landscaping™ Program

Principle 3:

Fertilize Appropriately (2)

High School

Published on **August 13th, 2025**

About This Activity

Title: Fertilize Appropriately

Subject, Grade, Level:
High School Science

Abstract:

This high school lesson engages students in exploring the environmental impact of fertilizer use through class discussions, guided readings, and a CER (Claim-Evidence-Reasoning) writing activity. Aligned with Florida-Friendly Landscaping™ Principle #3, the lesson focuses on how excess fertilizer contributes to water pollution and how best practices can minimize environmental harm. Over three class periods, students analyze sources of pollution, differentiate between point and non-point sources, compare fertilizer use in landscapes versus agriculture, and reflect on prevention strategies. Students demonstrate their understanding through interactive note-taking tools, a foldable summary activity, and a written CER response based on guiding prompts. This lesson promotes critical thinking, evidence-based reasoning, and environmental responsibility.

Learning objectives:

At the conclusion of this activity, participants will be able to:

- Understand the process of how excess fertilizer can cause water pollution problems.

Author: Jeneane Maddaloni
Pasco High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.10	Describe the roles of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
SC.912.L.17.11	Explain the role of microorganisms in the cycling of matter within ecosystems.
SC.912.L.17.16	Evaluate how the introduction of invasive species can disrupt ecosystems and cause economic or environmental harm.
SC.912.P.10.2	Explain the law of conservation of energy and demonstrate how energy is transferred within a system.
SC.912.N.1.1	Define a problem based on observations, ask questions, and make predictions.

Timeframe:

This activity is designed to be done over 3 class periods.

List of Materials

- Article: lawnlove.com/blog/why-be-responsible-in-our-use-of-fertilizer/
- Colored paper for foldable
- CER Report directions supplied as example. Notebook paper can be used for reports.

Activity Set-Up:

Part 1: This plan should be done after a brief introduction and textbook reading/notetaking on water pollution. Consider gathering content-specific film clips from YouTube and/or creating a format for the notetaking handout aligned with class expectations.

Part 2: Article can be modified for various reading levels.

Procedure and General Instructions (for instructor)

Introduction

Part 1: Class Discussion of Topics

This includes 5 separate segments to the subject.

- Two or three Film Clips with notetaking.
- T-Chart for point and non-point sources of water pollution.
- Brainstorming the question “How does applied fertilizer enter our waterways?”
- Venn Diagram on differences between landscape and agriculture fertilizer.
- Brainstorm the question “Why do we need to prevent fertilizer caused pollution?”

Part 2: Article Reading and Notes

Students will read the article and create a 6 box foldable from the article. They will use the headings from the article for the topics of each box and fill in the main ideas in each box. Near the end of the class, the teacher will review the foldable and the class will discuss what they put in each box.

Part 3: CER Report (Claim – Evidence – Reasoning)

Students will pick from 3 questions/prompts. They will make a claim, collect/list their evidence, and support their claim by making reasoning paragraphs.

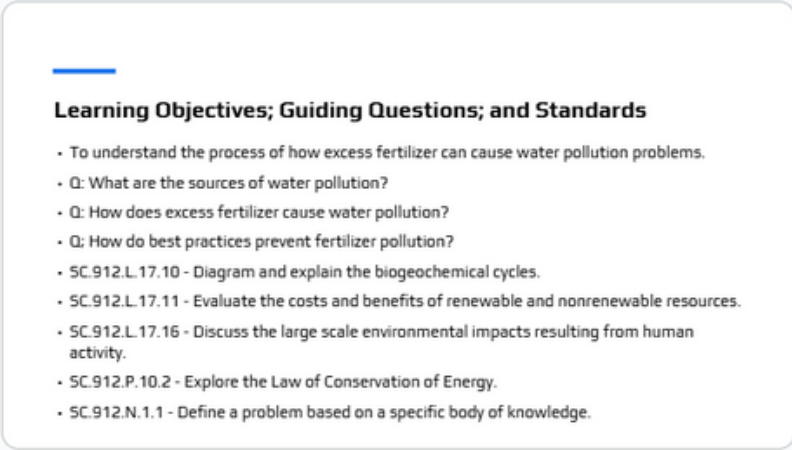
Teacher-Facing Materials

Included with this Lesson

- PowerPoint

Included Slides:

1



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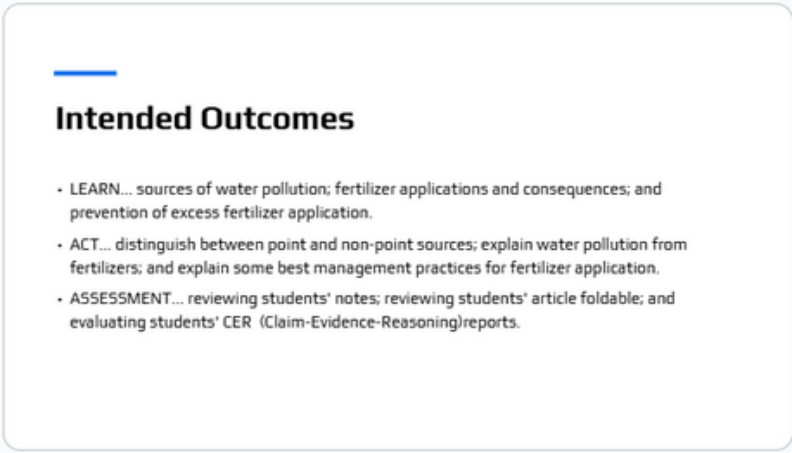

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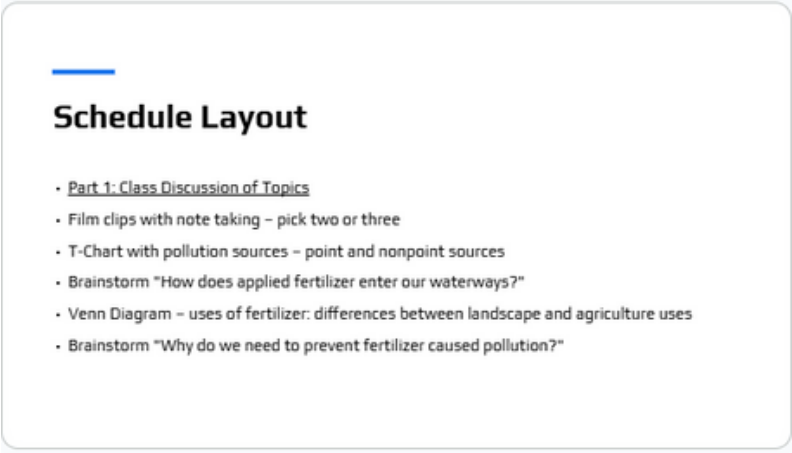


4

- Part 2: Article Reading and Notes
- www.lawnlove.com/blog/why-be-responsible-in-our-use-of-fertilizer/
- "Why do we have to be responsible in our use of fertilizer?"
- Students make a 6-box foldable using the headings from the article. They read each section and pull out the main ideas to place in each box.
- Teacher led class discussion at end of class will help students fill in the gaps if they missed the main ideas.

5

- Part 3: CER (Claim-Evidence-Reasoning) Report
- Handout example for student directions.
- Students will pick one of the questions/prompts to help them make a claim. Claim is one sentence.
- Students will make a list of the Evidence that supports their claim. (5 pieces of evidence minimum)
- Students will pick their top 3 pieces of evidence to do their reasoning. (3 paragraphs) They will explain their evidence on how it supports their claim.

6

Student Activity Sheets and Assignments

Included with this Activity

1. Note taking handout
2. CER Handout

Note taking handout page 1:

Guided Activities for Teaching and Outreach Resources

CPET

FFL Principle 3- Fertilize Appropriately: Soil Nutrient Test

Student Worksheet- Sample sheet

Name: _____

Date: _____

Film Notes:

1)

2)

3)

Note taking handout page 2:

Guided Activities for Teaching and Outreach Resources

Pollution Sources

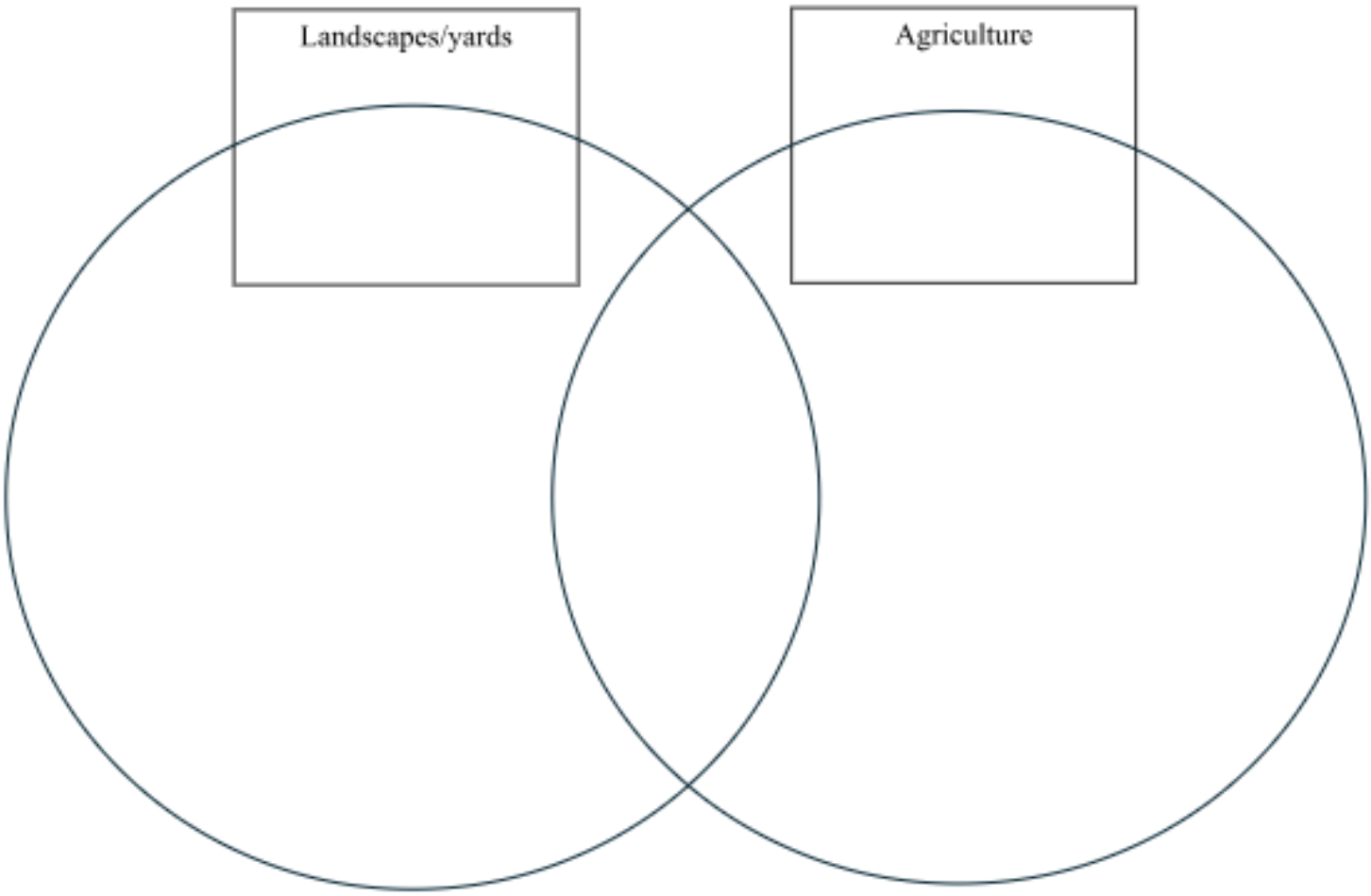
Point Source	Non-Point Source

Brainstorm:

1) How does applied fertilizer enter our waterways?

2) Fill in the venn diagram with similarities and differences between the use of fertilizer on landscapes and agricultural use.

Note taking handout page 3:



3) Why do we need to manage fertilizer use?

CER Handout:

UF CPET

FFL Principle 3- Fertilize Appropriately
Fertilize Appropriately CER Handout

Name: _____

Date: _____

Step 1: Choose one of the following QUESTIONS:

Where does fertilizer fit in the sources of water pollution?

How does excess fertilizer cause water pollution?

How do best practices prevent fertilizer pollution?

Step 2: Make a CLAIM in response to the selected question, using one of the provided sentence starters:

- *The effect of _____ on _____ is _____.*
- *The relationship between _____ and _____ is _____.*
- *_____ causes _____ to _____.*
- *If _____ is _____, then _____.*

My Claim:

Step 3: Provide specific pieces of EVIDENCE to support your claim.

You can list your gathered evidence from the sources covered in the classroom and from your textbook. You will need a minimum of five pieces of evidence- use examples!

- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Step 4: REASONING: Summarize and explain why the scientific evidence that you chose supports your claim.

Pick 3 of your evidence points to explain why each supports your claim. (3 paragraphs- write on a separate sheet of paper).

Jeneane Maddaloni, Pasco High School
Edited by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Florida-Friendly Landscaping™ Program

Principle 4:

Mulch (1)

High School

Published on **August 13th, 2025**

About This Activity

Title: Mulch

Subject, Grade, Level:
High School Science

Abstract:

This high school lesson explores the environmental significance and practical application of mulch through Florida-Friendly Landscaping™ Principle #4. Over 2–3 class sessions, students learn how mulch conserves water, supports biodiversity, improves soil health, and integrates with broader sustainability efforts. Using a combination of direct instruction, group discussions, mulch sample analysis, and multimedia projects, students evaluate various types of mulch and their environmental impacts. The culminating task involves creating a public service announcement to educate others on proper mulching practices. The lesson emphasizes critical thinking, real-world application, and connections to other FFL principles such as water efficiency and stormwater runoff reduction.

Learning objectives:

At the conclusion of this activity, participants will be able to:

- **Understand** the importance of mulch and the correct type of mulch to use in Florida landscaping to conserve water and also attract native wildlife.
- **Define** mulch and explain its purpose in sustainable landscaping.
- **Describe** how mulching supports several of the 9 Florida-Friendly Landscaping™ principles.

Author: Vicki Craig
West Port High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.12	Discuss the political, social, and environmental consequences of sustainable use of land.
SC.912.L.17.8	Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
SC.912.L.17.10	Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle (Go into detail about soil properties).
SC.912.L.17.17	Assess the effectiveness of innovative methods of protecting the environment.
SC.912.L.17.20	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Timeframe:

This activity is designed to take approximately 2-3 days of class, 50-60 minutes each day

List of Materials

- Computers, internet
- IFAS websites, FFL websites
- Student handouts digital or paper
- LINK to Presentation
- Suggested Resources: What's Happening Around Florida, ffl.ifas.ufl.edu
- Samples of pine straw, wood chips, shredded leaves, pebbles/rocks and rubber (actual samples or pictures)
- Mulching Worksheet
- PSA Rubric

Details:

Discussion & Reflection Questions:

- What are three key reasons we use mulch in landscaping?
- What happens if mulch is placed too thickly or piled around a tree trunk?
- Which FFL principles do you think mulch also supports, and how?
- Organic vs synthetic mulch: Which is a better choice and why?
- How can using local yard waste as mulch help both the landscaper and the environment?

Suggestions for Differentiation:

- ELL learners: teachers can pair them with a partner or use Google Translate to help with language. ELL students can also make their own PSA in a different language using Canva.
- ESE or lower learners: Pair students with a buddy to help them if necessary.

Procedure and General Instructions (for instructor)

Introduction

1. **Introduction (5-10 min)**
    - Present the 9 FFL principles briefly: Right Plant/Place, Water Efficiently, Fertilize Appropriately, Mulch, Attract Wildlife, Manage Pests, Recycle Yard Waste, Reduce Runoff, Protect Waterfront (ffl.ifas.ufl.edu)**, with an emphasis on Principle 4: Mulch**
2. **Exploring Mulch Benefits (10 min)**
    - **Group brainstorm:** "How does mulch help plants and the environment?"
    - Discuss: moisture retention, evaporation reduction, temperature moderation, weed suppression and soil improvement by decomposition
3. **Mulching Technique (10 min)**
    - Types of mulch
    - Mulching basics: spread 2-3 inches deep, keep 2 inches clear around trunks (UF FFL), replenish as it breaks down
    - Explain proper mulching with visuals or class samples.
        - Benefits of mulch and common mistakes
        - How mulching fits into other FFL principles
        - Comparing some mulch types pros and cons
        - Discuss pitfalls: over-mulching ("volcano mulches"), water blockage if too thick (What's Happening Around Florida) https://blogs.ifas.ufl.edu/pascoco/2018/10/26/mulch-

Procedure and General Instructions (for instructor) cont.

4. **Mulch Evaluation Discussion (20 min)**
    - **Students Analysis**: Students will work in small groups to evaluate each mulch type- include real samples or pictures as well as access to research sources to do further research.
    - **Possible Activity 2: PSA on Benefits of Mulch**
        - **Materials**: Use Canva or some other app to create a 1-2 minute video or infographic on FFL Mulch.
            - Students can work in groups or individually
            - Rubric Provided

5. **Class Discussion (10 min)**
    - Groups share which mulch they picked and why.
    - Link back to FFL principles- water efficiency (conserves water), recycle yard waste (leaf litter as a mulch option), stormwater/runoff reduction (slows runoff), fertilizer (organic mulch adds nutrients)
    - Bring in real-world impacts: better landscapes, less maintenance, healthier waterways.

6. **Wrap-Up & Questions (10 min)**

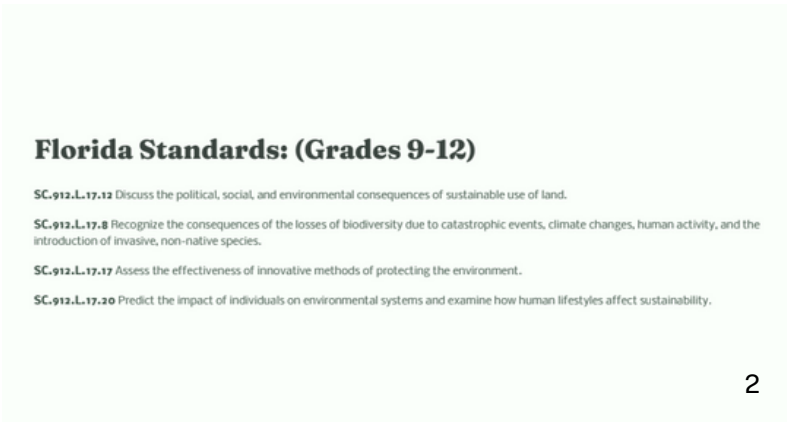
    Pose essential questions. Brief recap and resiliency reflection: “Why is mulch critical in Florida’s climate?”

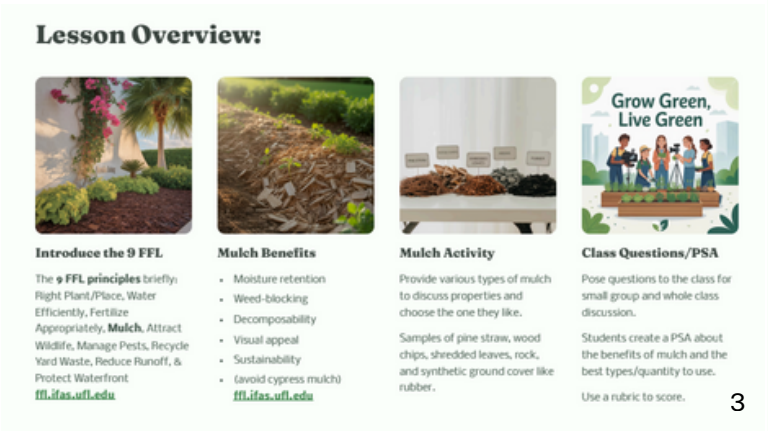
Teacher-Facing Materials

Included with this Lesson

- PowerPoint

Included Slides:





Day 1 Part 2:

Group Brainstorming

Pose this question to the class and allow time for small group discussion (5-10 min):

"How does mulch help plants and the environment?"

Have groups share out with the class before moving onto the other activities.

5

Day 1 Part 3: Types of Mulch:

Organic

Mulch from a living source. Examples: Pine bark, pine straw (needles), Cypress (not recommended) Eucalyptus and Melaleuca (not recommended).

Inorganic

Mulch from a nonliving source. Examples: gravel, crushed rock, seashells, and rubber.

Florida-Friendly Landscaping Program does not recommend inorganic mulches. Use inorganic mulch in walkways.

6

Teacher Explains:

How Mulch Supports Healthy Landscapes

Moisture Conservation

Mulch acts as a protective barrier that reduces water evaporation from soil by up to 70%, keeping moisture available to plant roots even during dry periods. This significantly reduces irrigation needs and helps plants withstand drought conditions.

Weed Suppression

A 2-3 inch layer of mulch prevents sunlight from reaching weed seeds, inhibiting their germination and growth. This natural weed barrier reduces the need for herbicides and time-consuming manual weeding.

Temperature Regulation

Mulch insulates soil, moderating temperature fluctuations by keeping soil cooler in summer and warmer in winter. This temperature buffer protects sensitive root systems and extends growing seasons.

7

More Benefits of Mulching

Improved Soil Structure

Organic mulches naturally break down over time, enriching the soil with vital organic matter. This process significantly enhances:

- Soil texture and aeration
- Microbial activity and biodiversity
- Nutrient cycling and availability
- Root development and overall plant health

Enhanced Aesthetics & Sustainability

Beyond its ecological advantages, mulch elevates your landscape's visual appeal while delivering crucial environmental benefits:

- Creates a uniform, attractive appearance
- Clearly defines garden spaces and pathways
- Effectively prevents soil erosion and compaction
- Promotes sustainability by recycling local organic materials

Caution: Always avoid cypress mulch, as it is sourced from threatened wetland ecosystems.

8

Proper Mulching Techniques

1 Correct Depth

Apply 2-3 inches of mulch for most applications. Too shallow won't provide benefits; too deep can suffocate roots and create moisture problems.

- Coarse mulches: up to 4 inches
- Fine mulches: 2 inches maximum

2 Proper Placement

Keep mulch 2-3 inches away from tree trunks and plant stems to prevent rot and pest issues. Avoid "volcano mulching" which can kill trees.

- Create a donut shape around trees
- Extend mulch to drip line when possible

3 Maintenance

Refresh mulch annually or as needed, but don't accumulate excessive layers. Remove old mulch if depth exceeds recommendations.

- Top off when reduced to 1 inch
- Fluff compacted mulch periodically

Source: Florida-Friendly Landscaping™ Program

9

Common Mulching Mistakes to Avoid

"Volcano" Mulching

Piling mulch against tree trunks creates moist conditions that promote disease, attract pests, and can girdle the trunk. This is the most common and damaging mulching mistake.

Excessive Depth

Mulch layers deeper than 4 inches can block oxygen and water from reaching roots, create habitat for rodents, and cause roots to grow upward into the mulch instead of outward.

Using Synthetic Materials

Using synthetic materials like rubber chips can leach harmful toxins into the soil and also can increase heat and they don't retain moisture as well as organic material. **Inorganic mulch is not recommended.**

10

Mulching and Florida-Friendly Landscaping™ Principles Work Together

Water Efficiency

Mulch reduces evaporation by 25-50%, minimizing irrigation needs. This supports the FFL principle of "Water Efficiently" by conserving water and reducing utility costs.

Yard Waste Recycling

Using yard waste as mulch (fallen leaves, pine needles, etc.) exemplifies the "Recycle Yard Waste" principle, closing the nutrient loop in your landscape.

Stormwater Management

Mulch slows water runoff, increases absorption, and filters pollutants, supporting the "Reduce Stormwater Runoff" principle by protecting water quality.

Pest Management

Proper mulching creates habitat for beneficial insects and reduces plant stress, aligning with "Manage Yard Pests Responsibly" by minimizing pesticide needs.

11

Comparing Mulch Types: Sustainability & Benefits

Mulch Type	Environmental Impact	Longevity	Benefits
Pine Bark/Straw	Sustainable byproduct	6-12 months	Acidifies soil slightly; ideal for acid-loving plants
Eucalyptus	Sustainable plantation-grown	1-2 years	Repels insects; attractive reddish color
Yard Waste/Compost	Excellent - closes waste loop	3-6 months	Adds nutrients; improves soil most rapidly
⚠ Rubber/Synthetic	Mixed - recycles tires but doesn't decompose	5+ years	Not recommended due to toxins and high heat
⚠ Cypress	Poor - often harvested from wetlands	1-3 years	Not recommended due to habitat destruction

Economic Benefits: Mulch reduces water bills by 25-50%, eliminates most weeding labor costs, and can reduce fertilizer needs by 25% through improved soil biology.

12

Activity 1: Collaborative Discussion

Students will work in groups to evaluate each mulch type below for the following properties and then share out with the class which mulch type they like the best and why.

- Moisture retention
- Weed-blocking
- Decomposability
- Visual appeal
- Sustainability

Pine needle mulch

Pine bark mulch

Rock mulch

Rubber mulch

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Student Worksheet

Students will answer questions on their own and discuss in groups and with the class.

Students will answer worksheet questions **LINK**

Florida-Friendly Landscaping: Mulching Worksheet

Name: _____ Date: _____

Part 1: Vocabulary & Key Concepts

Match the terms to their correct definitions. Write the letter next to each number.

Terms:
A. Organic Mulch
B. Inorganic Mulch
C. Mulch Volcano
D. Florida-Friendly Landscaping
E. Soil Moisture

#	Definition	Answer
1	Landscaping approach that protects natural resources through 9 guiding principles	
2	Material made from natural sources that decomposes over time	
3	Non-biodegradable ground cover such as rubber or stone	
4	Excessive piling of mulch around a plant or tree base	
5	The amount of water retained in the soil after watering or rain	

Part 2: Mulch Comparison Activity

Work with your group to examine the mulch samples. Write your observations.

Mulch Type	Moisture Retention (High/Med/Low)	Weed Suppression (Good/Fair/Poor)	Breaks Down? (Yes/No)	Sustainable Choice? (Yes/No/Depends)

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Activity 2: Mulching PSA (if want to use)

Students will create a 1-2 minute video or an infographic using Canva about the importance of including mulch in Florida Friendly Landscapes and the types of mulch to use. Take one or two class periods to create it and then present to the class. PSA Rubric **LINK**

Video PSA Option

Students can create engaging video content to share mulching benefits with their community.

Infographic Option

Students can design visually appealing infographics to communicate mulching best practices.

15

Differentiation:

ELL Learners

Pair students with a partner or use Google Translate to help with language barriers. ELL students can also make their own PSAs in a different language using Canva, which could be great!

ESE and Gifted Learners

Pair students with a buddy to help them if necessary and scaffold information as needed. For gifted students, assign them jobs as group leader or use them as a TA.

16

Class Discussion and Wrap-up

1	2	3
Discussion	**Wrap-up**	**PSA Projects**
After groups looked at the list of the beneficial properties of mulch and chose the one they like best, have groups share out with the class.	Pose some reflection questions to the class: 1. What are three key reasons we use mulch in landscaping? 2. Which FFL principles do you think mulch also supports, and how 3. Organic vs synthetic mulch: Which is a better choice and why?	Have students present their PSA projects to the class and score using the rubric. Allow students to give constructive feedback on other student's PSAs.

17

Thank You!

Thank you for joining us to learn about the power of mulch in creating sustainable landscapes. By implementing these **Florida-Friendly Landscaping™ Principles**, you're contributing to healthier ecosystems and more resilient communities.

Remember: proper mulching is one of the most impactful steps you can take toward sustainable landscaping in Florida.

For additional resources and support, visit **ffl.ifas.ufl.edu** or contact your local Extension office.

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Student Activity Sheets and Assignments

Included with this Activity

1. Mulch Questions Worksheet
2. Mulching PSA Rubric

Mulch Questions Worksheet page 1:

UF CPET **FFL Principle 4- Mulch**

Name: _____ **Date:** _____

Part 1: Vocabulary & Key Concepts

Match the terms to their correct definitions. Write the letter next to each number.

Terms:

A. Organic Mulch
B. Inorganic Mulch
C. Mulch Volcano
D. Florida-Friendly Landscaping
E. Soil Moisture

Definition	Term
Landscaping approach that protects natural resources through a defined set of guiding principles	
Material made from natural sources that decomposes over tim	
Non-biodegradable ground cover such as rubber or stone	
Excessive piling of mulch around a plant or tree base	
The amount of water retained in the soil after watering or rain	

Part 2: Mulch Comparison Activity

Work with your group to examine the mulch samples. Write your observations.

Mulch Type	Moisture Retention (High/Med/Low)	Weed Suppression (Good/Fair/Poor)	Breaks down over time? (Yes/No)	Sustainable Choice? (Yes/No/Depends)
Pine Bark				
Shredded Leaves				
Rubber Mulch				

Mulch Questions Worksheet page 2:

Part 3: Short Answer

Answer in complete sentences.

1. **List two benefits** of using mulch in Florida-friendly landscaping.

   _____

   _____

2. Why is it important not to pile mulch against the base of a tree?

   _____

   _____

3. Which Florida-Friendly principles besides #4 (Mulch) are supported by mulching? Give two examples.

   _____

   _____

Vicki Craig, West Port High School
Edited by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Mulching PSA Rubric:

UF|CPET

FFL Principle 4- Mulch
High School Mulching PSA/Infographic Rubric

Criteria	Excellent (4 pts)	Good (3 pts)	Satisfactory (2 pts)	Needs Improvement (1 pt)
Content Accuracy	Clearly explains mulch and benefits with 3+ examples; uses proper terminology and aligns with FFL principles.	Includes 2–3 mulch benefits, mostly accurate and clear.	Includes at least 1 method; may have minor inaccuracies.	Content is unclear, minimal, or inaccurate.
Connection to FFL Principles	Links mulching to **at least 3 FFL principles** with explanations.	Connects to 2 FFL principles with some explanation.	Mentions 1 principle with little explanation.	No clear connection to FFL principles.
Visual Design & Creativity	Visually engaging, well-organized, and creative layout; strong visual appeal.	Visually clear with some creative elements; easy to follow.	Basic visuals; some organization issues.	Lacks organization or visual effort.
Call to Action / Public Purpose	Strong message encouraging eco-friendly mulch choices; clear call to action.	Includes a message and attempt at a call to action.	Message is vague or lacks action step.	No clear message or purpose.
Grammar & Mechanics	No spelling, grammar, or formatting errors.	1–2 minor errors that do not affect understanding.	Several errors, but meaning is mostly clear.	Errors interfere with clarity.
Effort & Completion	Exceeds expectations; thorough and thoughtful work submitted on time.	Complete and meet all expectations.	Mostly complete; some areas underdeveloped.	Incomplete or lacks evident effort.

Florida-Friendly Landscaping™ Program

Principle 4:

Mulch (2)

High School

Published on **August 13th, 2025**

About This Activity

Title: Mulch: The Unsung Hero of the Landscape

Subject, Grade, Level:
High School Science

Abstract:

This high school lesson introduces students to the environmental importance of mulch through a Claim-Evidence-Reasoning (CER) framework. Centered on Florida-Friendly Landscaping™ Principle #4, students explore how mulch supports plant health and ecosystem sustainability by conserving moisture, reducing weed growth, stabilizing soil temperature, enhancing nutrient cycling, and preventing erosion. Through multimedia engagement, guided reading from the FFL Handbook, hands-on experiments, and collaborative discussions, students build a scientific argument for mulch's ecological value. The lesson culminates in a written CER response and formative assessments, fostering scientific reasoning and real-world environmental awareness aligned with state science standards.

Learning objectives:

At the conclusion of this activity, participants will be able to:

- Formulate a scientific claim about the benefits of mulching.
- Identify and evaluate evidence supporting the benefits of mulching.
- Construct a logical reasoning connecting evidence to the claim.
- Explain the environmental importance of mulching in a Florida-Friendly Landscape.
- Differentiate between various types of mulch and their appropriate uses.

Author: Dawn Parnell
Pensacola High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.3	Describes how ecosystem components like soil and water management influence plant health—aligned with moisture retention and nutrient cycling facilitated by mulch.
SC.912.L.17.10	Involves understanding biogeochemical cycles (water, carbon, nitrogen). The decomposition of organic mulch and its role in nutrient cycling directly supports this standard.
SC.912.L.17.11	Evaluates the ecological costs and benefits of resource use. Choosing sustainably sourced mulch ties into renewable resource evaluation and environmental consequences.
SC.912.L.17.12	Discusses political, social, and environmental consequences of sustainable land use. Proper mulching reduces fertilizer runoff, conserves water, and supports sustainable landscaping practices.
SC.912.L.17.17	Assesses the effectiveness of innovative environmental practices.
SC.912.L.17.20	Predicts how individual practices impact environmental systems. Students designing and applying mulch thoughtfully in landscapes helps them understand their roles in sustainability and ecosystem health.

Timeframe:

This activity is designed to take approximately 90 minutes of class time.

List of Materials

- Whiteboard or projector
- Markers or pens
- Access to the internet/computers for video and research (optional)
- Various mulch samples (pine bark, pine needles, melaleuca, eucalyptus, leaves, wood chips – if available)
- Two small potted plants (e.g., marigolds, small herbs)
- Watering can
- Small bags of soil
- Rulers or measuring tape
- Handout: "Mulch CER Worksheet"
- Quiz handout
- Writing prompt handout
- Optional: Spray bottles, thermometers (soil and air)

Differentiation Suggestions:

Support: Provide sentence starters for the CER worksheet and writing prompt. Pair students strategically for activities. Use visual aids heavily.
Challenge: Have students research the impact of "mulch volcanoes" on tree health. Ask them to design an experiment to test the effectiveness of different mulch types on soil moisture retention over time. Research specific invasive plants (SC.912.L.17) that can be used as beneficial mulch (e.g., Melaleuca).

Procedure and General Instructions (for instructor)

Introduction

1. **Bellringer (5 minutes)**

   Question: "Look at the image on the board. What do you think is happening to the soil around this plant? How might we protect it?
   Instructions: Students should write down their initial thoughts in their notebooks. We will revisit this at the end of class.

2. **Introduction & Claim (15 minutes)**

   Engage with the "Mystery Material": "Today, we're going to talk about a simple yet powerful practice in agriculture and landscaping that has huge benefits for our plants and the environment. It's often overlooked, but it's like a superhero for your soil. Before I tell you what it is, let's watch a short video that might give you some clues."
   Introductory Video: Show a short (2-3 minute) introductory video on mulching. A good option might be a university extension video or a general gardening video explaining what mulch is and its basic benefits. Mulching video
   Unveiling the Claim: After the video, ask: "Based on what you saw, what do you think is this 'superhero' material?" (Guide them to "mulch").
   Claim for investigation: **'Applying an appropriate layer of mulch significantly improves plant health and conserves environmental resources in a landscape.'**

3. **Evidence Collection (30 minutes)**

   Hands-On Activity: "Mulch Matters!" (see supplemental set up document)
   Guided Reading/Discussion (using FFL Handbook snippet):
   Refer to the "FFL Handbook for Home Landscapes" and have students read the “mulch” section individually or in pairs
   Lead a class discussion to extract additional evidence:
   - "What does the handbook say about how mulch helps with water?"
   - "What does it say about weeds?"
   - "What are the other benefits?"
   - "What are the 'Guidelines For Using Mulch' and why are they important?"

Procedure and General Instructions (for instructor) cont.

4. **Reasoning Construction (20 minutes)**

Introducing the CER Framework: Review or introduce the components of a CER activity depending on student familiarity.
Claim (Already established): "Applying an appropriate layer of mulch significantly improves plant health and conserves environmental resources in a landscape."
Collaborative Reasoning: On the board, create a T-chart or a three-column table: "Evidence" and "Reasoning."

- Ask groups to share one piece of evidence they collected and brainstorm the reasoning- "Why did the mulch help the soil stay wetter?"
- Repeat this for several pieces of evidence

Emphasize the scientific principles involved:

- **Water Conservation:** Reduced evaporation, improved infiltration.
- **Weed Control:** Blocking sunlight, physical barrier.
- **Temperature Moderation:** Insulation.
- **Soil Health:** Decomposition adding organic matter, promoting beneficial soil organisms.
- **Erosion Prevention:** Protecting soil from direct impact of rain and wind.

5. **Elaboration (10 minutes)**

Types of Mulch and Best Practices: Discuss different types of mulch (organic vs. inorganic, pros and cons).

- "How does choosing the 'right' mulch connect to SC.912.L.17 (Interdependence)?" (e.g., using local, sustainable mulches like melaleuca helps manage invasive species and supports the local ecosystem).

Teacher-Facing Materials

Included with this Lesson

- Activity set-up document

Activity set-up document:

UF CPET **Principle 4- Mulch Matters! Activity Set-Up Guide**

Dawn Parnell, Pensacola High School

Divide students into small groups (3-4 students per group). Provide each group with:

- Two small potted plants (or two small containers filled with soil).
- One bag of soil (if using containers).
- Various mulch samples (if available, otherwise describe them).
- A watering can.
- Rulers.
- Optional: Thermometers.

Setup:

Instruct each group to prepare two identical setups:

- **Control Plant:** A plant with bare soil.
- **Mulched Plant:** An identical plant with a 2-3 inch layer of one of the provided mulch samples (or a general "mulch" if samples aren't available). Ensure they leave a small space around the stem.

Observation & Data Collection:

- **Water Retention:** Have students water both plants with the *exact same amount* of water (e.g., 100ml). Ask them to observe how quickly the water soaks in, if any runs off, and to feel the soil moisture after 5-10 minutes. They should record their observations.
- **Weed Suppression (Simulated):** Ask students to imagine tiny "weed seeds" (e.g., small paper dots) scattered on both soil surfaces. Discuss which surface would make it harder for these "seeds" to sprout and grow.
- **Temperature Regulation (Optional, if thermometers available):** If possible, have them measure the soil temperature of both pots at the start and then again after 15-20 minutes, especially if placed in a sunny spot. Compare the temperatures.
- **Erosion Control (Discussion):** Discuss how a bare soil surface might react to heavy rain compared to a mulched surface.

Group Discussion: Each group discusses their observations and identifies potential pieces of evidence related to the claim.

Student Activity Sheets and Assignments

Included with this Activity

- Mulch Student Handouts

Mulch Student Handouts:

UF CPET **FF Principle 4- Mulch Matters! CER Worksheet**

Name: _____

Date: _____

Our Claim: Applying an appropriate layer of mulch significantly improves plant health and conserves environmental resources in a landscape.

Instructions:

1. During the "Mulch Matters!" activity and class discussion, record your observations and key facts under the "Evidence" column.

2. For each piece of evidence, explain *how* it supports our claim in the "Reasoning" column. Think about the scientific principles at play.

Evidence (What did you observe or learn?)	Reasoning (How does this evidence support the claim? Why does it happen?)

Florida-Friendly Landscaping™ Program

Principle 5: Attract Wildlife

High School

Published on **August 7th, 2025**

About This Activity

Title: Attracting Wildlife: Landscape Architects

Subject, Grade, Level:
High School Biology or Environmental Science

Abstract:

This high school-level lesson plan engages students in ecological design through the lens of Florida-Friendly Landscaping™ (FFL) Principle 5: Attracting Wildlife. Over 2–3 hours, students explore the complex relationships between Florida-Friendly plants, wildlife, and sustainable landscaping practices, learning how thoughtful design can support local ecosystems — even in urban and developed areas. Through hands-on activities, students identify Florida-Friendly and Non-Florida-Friendly plant species, research the habitat needs of Florida's wildlife, and use the FFL Plant Guide app to select appropriate plants for a site-specific landscaping plan. They create detailed designs that incorporate Florida-Friendly plants to attract beneficial wildlife and culminate their learning by producing persuasive outreach materials (e.g., posters, videos, or infographics) aimed at educating their community on the ecological importance of Florida-Friendly Landscaping™. The lesson aligns with biology and environmental science standards and encourages students to connect science learning with real-world action, advocacy, and community impact.

Learning objectives:

At the conclusion of this activity, participants will be able to:

- Learn how to design a natural area in a way that attracts and provides a habitat for Florida fauna and why it is important to mindfully design landscaping to support wildlife and being able to succinctly and effectively inform community members of the importance of developing Florida-Friendly Landscaping™.

Author: Alex Horvath and Morgan Nielsen
UF Center for Precollegiate Education and Training

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.6	Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism
SC.912.L.17.8	Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species
SC.912.L.17.20	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability
SC.912.N.1.1	Define a problem based on a specific scientific body of knowledge; pose investigable questions; conduct systematic observations; consult reference materials; plan investigations; use tools to gather, analyze, interpret, and communicate data; generate and justify explanations; and evaluate explanations of others

Timeframe:

This activity is designed to take approximately 2 to 3 hours of class time.

List of Materials

- FFL Handbook. Available for free online through UF IFAS
- List of native/Florida-Friendly plants- specific to the certain area and in any of the listed formats depending on classroom needs.
- FFL Plants Mobile App (if technology is available)
- Poster board
- Coloring and art supplies or laptops/iPads capable of preparing digital images
- Art/digital media tools
- Power Point

Activity Set-Up:

- Prepare lecture material that is grade/class-level appropriate and focuses on the specific location for FFL “attracting wildlife” principle.
- Choose and prepare cards/slideshow of landscaping plants common to the area, with a good mix of native/Florida-Friendly plants represented.
- Choose and prepare cards/slideshow of Florida wildlife that may rely on landscaping plants for survival.
- Download FFL Plant Guide app to any necessary devices (if applicable)
- Collect and prepare supplies for any poster making or presentations.
- Optional Extension: Partner with a local group (e.g., extension office, garden club, municipal sustainability team) to display the best student posters in a public space.

Procedure and General Instructions (for instructor)

Introduction

1. **Introductory Lesson based on FFL Principle 5 (20min)**
   - Review the role of plants in an ecosystem, trophic levels and biotic and abiotic factors. Give a brief overview of the concept of urban ecology and the importance of meaningful design even in man-made landscaping ecosystems
2. **Students identify common landscaping plants (20min)**
   - Have students work together to identify (from a series of pictures) which common landscaping plants are Florida-Friendly or Non-Florida-Friendly. This could be done as either a “card game” type activity where each group receives a deck of cards with each of the plants or as a gamified PowerPoint or online quiz game where teams can earn points or a prize for correct answers.
3. **Matching Plants to Animals (20min)**
   - Have students consider what types of plants that may attract local species. Depending on grade level, provide a list of native animal species that may rely on local plant growth. Remind students of “right plant right place”. Depending on technology availability, introduce the FFL plants mobile app and show students how many native/Florida-Friendly are available to them and how the app will assist them with their project.
4. **Design Your Landscape (1 hour)**
   - Show students examples of a gardening/landscaping plan and challenge them to design a landscaping area of their own from scratch. Students will need to prepare full renderings of their plan (either sketched and colored or a digital mock-up with image) and include at least four specific, Florida-Friendly species with descriptions of the wildlife that they attract and what makes those species an appropriate choice for that location.
5. **Create Informative Material for Your Landscape (30min)**
   - Students will design a persuasive poster, infographic, brochure or short video that uses scientific explanations to explain the importance of mindful landscaping to attract native wildlife. This item should be designed for the community to see and should propose specific suggestions for that particular community
6. **Gallery Walk or Presentations**
   - Students will display and present their landscaping plans and outreach items and provide feedback. If possible, consider inviting a local environment group or staff for real-world feedback.

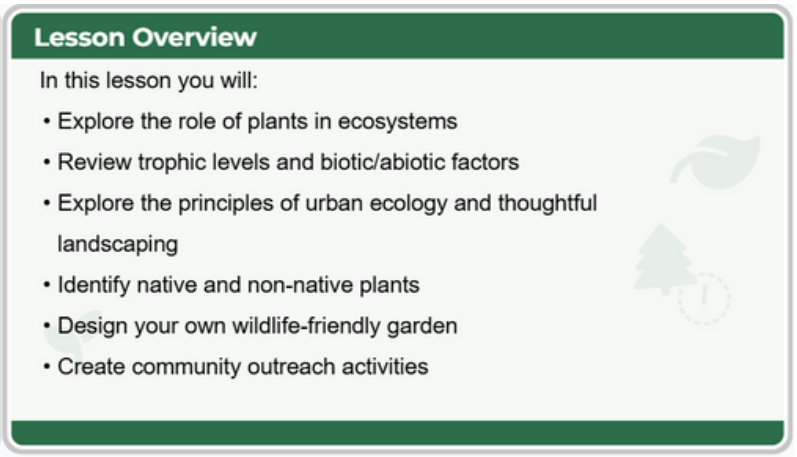
Student Activity Sheets and Assignments

Included with this Activity

- Power Point

Included Slides:

1



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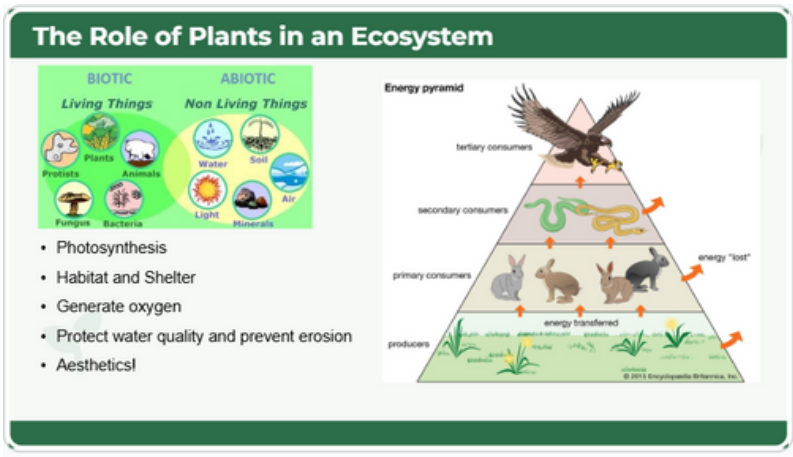

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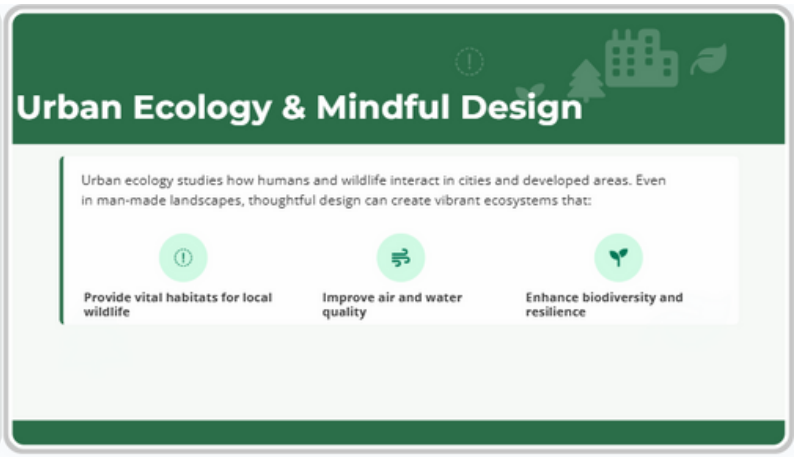


4

Native vs Non-Native Landscaping Plants

Native Example

Leather fern
Acrostichum danaeifolium

Non-Native Example

Holly fern
Cyrtomium falcatum

Why Native Plants Matter:

- Support local wildlife species
- Require less water & maintenance
- Preserve local ecosystem balance

Non-Native Impact:

- May become invasive species
- Disrupt local food webs
- Often require more resources

5

Yellow & red coreopsis

Rudbeckia

6

Plant Selection: Attracting Local Wildlife

Think about which plants attract different wildlife species in your local area:

For Butterflies & Pollinators

- Native milkweed for monarchs
- Flowering plants like salvia and coneflower

For Amphibians & Reptiles

- Moisture-loving plants for pond edges
- Ground cover for shelter and hunting

For Birds

- Berry-producing shrubs like beautyberry
- Trees for nesting and shelter

For Small Mammals

- Native nut and seed producers
- Dense shrubs for cover and protection

Consider which native species are most appropriate for your specific climate and soil conditions.

7

Tying in "Right Plant, Right Place" Principle

Choose plants that thrive in your local conditions. Right plant, right place helps ensure:

- Healthy growth with minimal intervention
- Less water and fertilizer needed
- Fewer pest problems and diseases
- Lower maintenance requirements
- Maximum benefit for local wildlife
- Better long-term plant survival

Consider these factors when choosing plants:

Light: Full sun, partial shade, or full shade

Water: Drought-tolerant or moisture-loving

Soil: Sandy, clay, or loamy preferences

8

Introducing the FFL Plants Mobile

Use the FFL Plants mobile app to:

- Discover native plants for your region
- Get planting tips and care instructions
- Explore which plants attract which wildlife
- Plan your landscape project easily

Browser Link:
https://ffl.ifas.ufl.edu/apps/plants

9

Designing Your Own Wildlife-Friendly Landscape

Project Challenge: Create a landscape plan that supports local wildlife while applying the principles we've learned. Your design will demonstrate how thoughtful plant choices can create functioning ecosystems.

Project Requirements

- Create a full rendering of your landscape (sketched or digital)
- Include at least four specific native plant species
- Describe which wildlife each plant attracts
- Explain why these plants are appropriate for your location

Design Considerations

- Think about usage and aesthetics of the area
- Consider different wildlife needs (food, shelter, nesting)
- Think about seasonal changes and plant diversity
- Design for sustainability and low maintenance

10

Include and label at LEAST four native species in appropriate places

11

Community Outreach Project

Craft a persuasive piece to explain the importance of mindful landscaping practices for attracting native wildlife.

Choose your format:

- Poster or Infographic
- Brochure or Pamphlet
- Short Video (1-2 minutes)

Your project should include:

- Scientific explanation of wildlife benefits
- Community-specific suggestions
- Specific plant recommendations

Project Focus:
Design your outreach material to be persuasive, visually appealing, and informative for your local community. Think about what would motivate residents to adopt Florida-Friendly Landscaping practices!

12

Gallery Walk & Presentations

Present your landscape plan and outreach piece to your class and, if possible, local environmental experts.

- Display your wildlife-friendly landscape designs in the classroom
- Take turns presenting your design choices and wildlife benefits
- Provide constructive feedback to your peers' designs
- Receive expert feedback from environmental professionals
- Discuss how to implement these designs in your community
- Celebrate your learning and contributions to local ecology

Landscape Design | **Presentation** | **Community Outreach** | **Recognition**

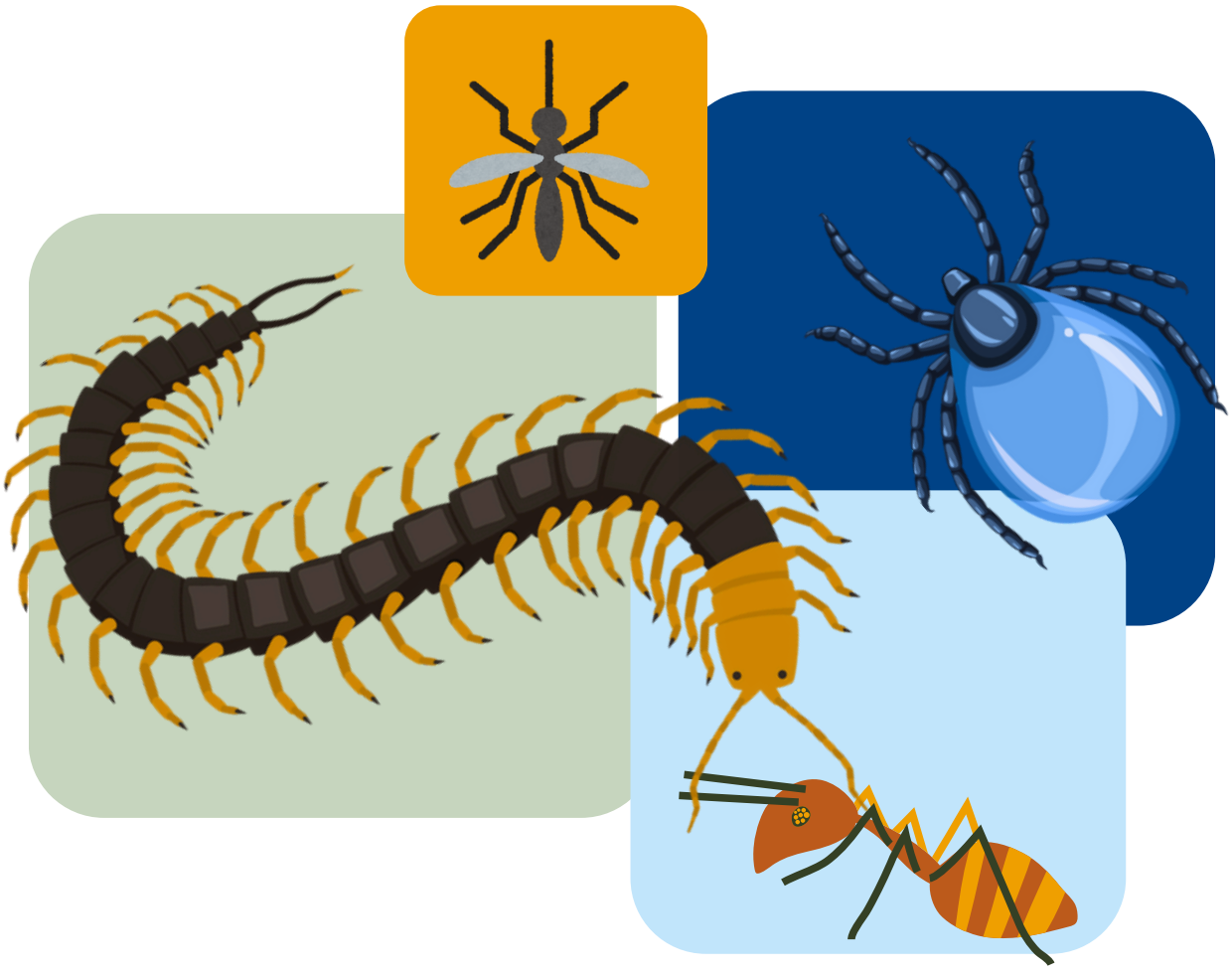
13

Florida-Friendly Landscaping™ Program

Principle 6:

Manage Yard Pests Responsibly (1)

High School



Published on **August 14th, 2025**

About This Activity

Title: OUTBREAK! Pest Management Principle

Subject, Grade, Level:
High School Science

Abstract:

In this interactive high school lesson, students respond to a simulated vector-borne disease outbreak tied to human environmental impacts. Through a mix of lecture, discussion, and group collaboration, they explore how activities such as pollution, poor landscaping, and runoff contribute to the spread of pests like mosquitoes and the public health risks they pose. Using Florida-Friendly Landscaping™ Principle #6 (Manage Yard Pests) and real-world research, students design and present actionable pest management plans tailored to their local communities. The lesson emphasizes environmental stewardship, sustainable pest control, and the connection between landscape decisions and disease prevention, with assessment based on participation and the effectiveness of student-developed solutions.

Learning objectives:

At the conclusion of this activity, participants will know:

- How anthropogenic development impacts abundance and dispersal of disease vectors
- How proper pest management can reduce the spread of diseases through vectors in human populations and protect public health

Authors: Alex Horvath and Morgan Nielsen
CPET, University of Florida

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.1	Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.
SC.912.L.17.4	Describe changes in ecosystems resulting from seasonal variations, climate change and succession.
HE.912.CEH.2.4	Evaluate how environment and community health are interrelated.
HE.912.CEH.3.3	Formulate alternatives to community health-related issues or problems.

Timeframe:

This activity is designed to take about 2 hours of class time.

List of Materials

- PowerPoint
- FFL principle #6 slides (Available online for free)
- At lease 1 computer per group or writing supplies.

Activity Set-Up (start before day of activity):

Talk about following articles with class:

- https://www.cdc.gov/climate-health/php/effects/vectors.html
- Krol, L., Gorsich, E.E., Hunting, E.R. *et al.* Eutrophication governs predator-prey interactions and temperature effects in *Aedes aegypti* populations. *Parasites Vectors* **12**, 179 (2019). https://doi.org/10.1186/s13071-019-3431-x
- Institute of Medicine (US) Forum on Microbial Threats. Vector-Borne Diseases: Understanding the Environmental, Human Health, and Ecological Connections: Workshop Summary. Washington (DC): National Academies Press (US); 2008. 1, Vector-Borne Disease Emergence and Resurgence. Available from: https://www.ncbi.nlm.nih.gov/books/NBK52945/

Teach about:

- Life cycle of mosquitoes
- How runoff occurs and what it is
- Eutrophication of Fresh and Saltwater Ecosystems
- Then teach about Pest management with the help of FFL resources and principles, and discuss some ways to manage pest populations and distribution.

Procedure and General Instructions (for instructor)

Introduction

1. **(30 minutes)**
    - Lecture on disease vectors, public health, and anthropogenic impact

2. **(20 minutes)**
    - Connecting back to FFL principles for Pest management and talking a little more specifically about what that means for Florida communities.

3. **(15 minutes)**
    - Break class into groups of ~4 and introduce the “Outbreak” Scenario/ rules

4. **(45 minutes)**
    - Students will work together to come up with their plans (could also be an at-home activity), and then they will present their pest management plan to the class

5. **(15 minutes)**
    - Students will ask presenters questions

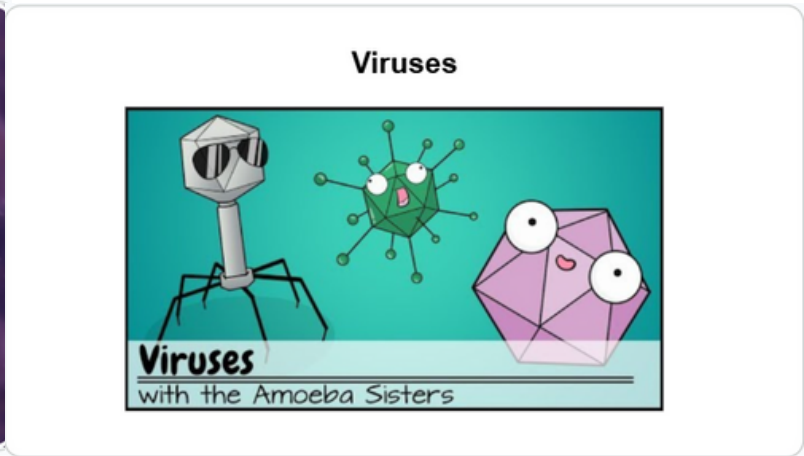
Teacher-Facing Materials

Included with this Activity

- Outbreak PowerPoint

Included Slides:

1



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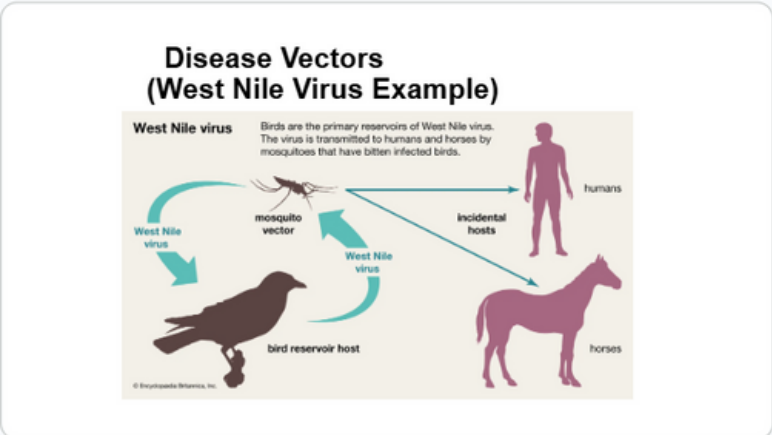

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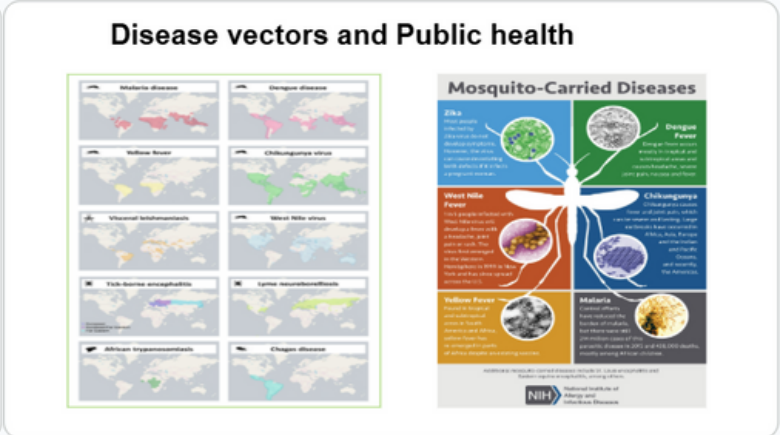
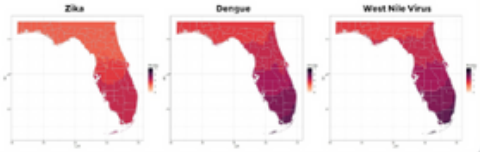


4

How do we impact disease vectors?

- Climate Change: As global temperatures increase, areas with higher temperature increases and precipitation are becoming better ecosystems for insect populations.
- Urban sprawl: As populations increase and cities and suburbs expand, it increases the proportion of people that are more likely to come into contact with insects.
  - Suburban areas also often prioritize visual appeal through "water features" to increase the value of the property. These water features and those people place around their own properties are perfect breeding grounds for many insects that use water as part of their lifecycle



5

Used this as a good source of information. Can be used more for better examples and detailed information. https://onlineentomology.ifas.ufl.edu/are-vector-borne-diseases-on-the-rise/

Source for Florida disease map https://epi.ufl.edu/2024/05/01/floridas-mosquitoes-can-make-you-sick-heres-how-to-protect-yourself/

Discuss the 2 papers linked in the GatorPlan (Can read and or discuss Key points/summary)

- Krol, L., Gorsich, E.E., Hunting, E.R. *et al.* Eutrophication governs predator-prey interactions and temperature effects in *Aedes aegypti* populations. *Parasites Vectors* **12**, 179 (2019). https://doi.org/10.1186/s13071-019-3431-x
- Institute of Medicine (US) Forum on Microbial Threats. Vector-Borne Diseases: Understanding the Environmental, Human Health, and Ecological Connections: Workshop Summary. Washington (DC): National Academies Press (US); 2008. 1, Vector-Borne Disease Emergence and Resurgence. Available from: https://www.ncbi.nlm.nih.gov/books/NBK52945/

6

Overview of Outbreak Activity

- Organize students into groups that make the most sense for your class. I recommend 3-4 students per group.
- Students will have access to paper, pens/pencils, and or computers to write down their management strategies. These ideas should be bulleted for easier reference later on.
- Students may and are encouraged to use internet for help managing this outbreak, but should not use AI, so they think more critically about how they could manage pests.
- At the end each group will list out their management strategies. They should also justify/walk through their reasoning.
- The instructor will take one or two of their bulleted ideas and put them on a board or write them down. At the end the instructor will go through and choose the ~10 bulleted points that are not too overlapping and follow a reasonable management plan.
- Instructor will finally walk through some real management strategies across Florida. Also, talk about pros and cons of each plan within these strategies.

7

Read Scenario out

- What started as a few weird, isolated cases across 2-3 years in the Miami-Dade *(use your local community)* county area. Suddenly became a small epidemic within a month. Over 3000 Patients went to hospitals within a couple of weeks with a high-grade fever of 101F, small raised bumps all over their skin, red eyes, and swollen lymph nodes. The pustules were of major concern due to the probability of secondary infections. Some medications seem to reduce fever and headache, but the pustules won't reduce with medications. Local officials are obviously concerned about this spreading disease and due to the risk to public health. Local officials have reached out to local high schools, universities, and government aid to help resolve the crisis. Your team's goal is to take your knowledge of your local community, pest management, anthropogenic impacts, and all other connecting ideas to come up with an immediately actionable plan to start curbing cases. Good Luck!!!

8

Talk about FFL Principle 6

- Talk about how even though disease vectors are a threat. These vectors still serve an important ecological role and are not really "bad bugs". Discuss management strategies for how to curb outbreaks and not damage insect populations
- This can be done either before the activity but was placed after to show how some of their management strategies may actually impact other wildlife. Also shows how good management strategies can still benefit local ecosystems, while protecting public health.

9

Disease vector management resources/examples

- Talks about mosquitoes and how to limit exposure
  - https://edis.ifas.ufl.edu/publication/IN1045
- Disease Surveillance strategy
  - https://www.floridahealth.gov/diseases-and-conditions/mosquito-borne-diseases/surveillance.html
- Dengue/Chikungunya Vector Management Plan in Urban Environments
  - https://www.floridahealth.gov/diseases-and-conditions/mosquito-borne-diseases/_documents/guidebook-dengue-chikungunya-vector-management-plan.pdf

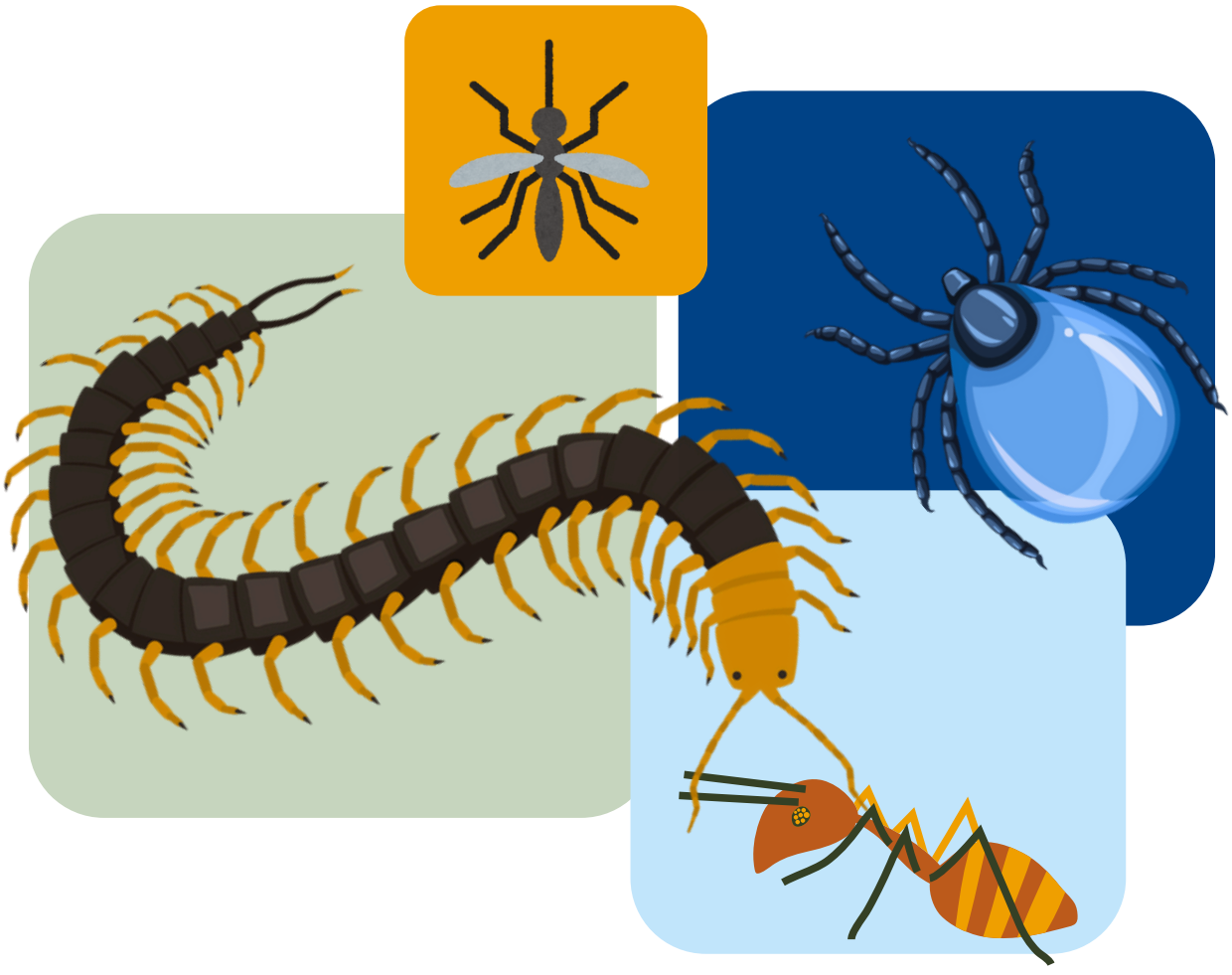
10

Florida-Friendly Landscaping™ Program

Principle 6:

Manage Yard Pests Responsibly (2)

High School



Published on **August 14th, 2025**

About This Activity

Title: OUTBREAK! Pest Management Principle

Subject, Grade, Level:
High School Science

Abstract:

This high school lesson, based on Florida-Friendly Landscaping™ Principle #6: Manage Yard Pests Responsibly, introduces students to Integrated Pest Management (IPM) as a sustainable alternative to broad-spectrum insecticides. Through hands-on activities, students learn to identify common Florida pests and beneficial insects, explore natural pest control strategies, and apply IPM methods using real plant samples. Students analyze how overuse of chemical insecticides affects biodiversity, ecosystem health, and long-term sustainability. The lesson includes a potential PSA (public service announcement) project, where students advocate for responsible pest management. By connecting to additional FFL principles such as Right Plant, Right Place and Attract Wildlife, students gain a holistic understanding of sustainable landscaping and are encouraged to take action in their communities to promote environmentally responsible gardening practices.

Learning objectives:

At the conclusion of this activity, participants will be able to:

- Explain the principles of Integrated Pest Management (IPM) and natural pest control methods.

Authors: Vicki Craig
West Port High School
Edited by Morgan Nielsen, CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.8	Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
SC.912.L.17.17	Assess the effectiveness of innovative methods of protecting the environment.
SC.912.L.17.18	Describe how human population size and resource use relate to environmental quality.
SC.912.L.17.20	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Timeframe:

This activity is designed to take about 1- 2 days of class.

List of Materials

- Presentation Slides
- Computers and internet
- Worksheet: Natural Pest Management
- PSA Rubric
- Presentation Slides

Important Note:

Differentiation:

- **ELL learners**: teachers can pair them with a partner or use Google Translate to help with language. ELL students can also make their own PSA in a different language using Canva.
- **ESE or lower learners:** Pair students with a buddy to help them if necessary.

Procedure and General Instructions (for instructor)

Introduction

1. **Introduction (10 min)**
    - Review the **9 FFL principles**, emphasizing #6: Manage Yard Pests Responsibly (ffl.ifas.ufl.edu, ffl.ifas.ufl.edu).
    - Introduce pest insect species and beneficial insect species with photos and issues they cause in Florida.
    - Discuss why reliance on broad-spectrum insecticides is harmful (resistance, killing beneficials, environmental contamination).

2. **Exploring Natural Pest Management (15 min)**
    - **Present IPM steps:** monitor/scout, identify, use cultural, mechanical/biological methods, and chemical only as last resort (ffl.ifas.ufl.edu)
    - Explain techniques: planting pest-resistant varieties, hand removal, promoting natural/beneficial insects (ladybugs, lacewings, birds), horticultural soaps/oils, spot treatment only.

3. **Activity: IPM in Practice (25 min)**
    - **Materials**: plant specimens (with or without pest damage), hand lenses, simple insect ID guides, various low toxicity management options.
    - **Steps**:

    1. Scout plants: identify signs (e.g., aphids, caterpillars).
    2. Choose treatment: options—manual removal, prune off infested parts, encourage predators.
        - Record: write the method chosen and justify it based on IPM hierarchy
    3. Reflect: which FFL principles are supported?

Possible Activity 2: PSA on Pest Management

- **Materials:** Use Canva or some other app to create a 1-2 minute video or infographic on FFL Pest Management.
- Students can work in groups or individually
- Use the Rubric to score

Procedure and General Instructions (for instructor) cont.

4. **Discussion & Comparison (15 min)**
    - Groups share strategies, actions taken, and rationale.
    - Connect strategies to at least three other FFL principles:
        - #1 Right Plant, Right Place: choose pest-resistant/suitable plants.
        - #5 Attract Wildlife: provide habitat for beneficial predators.
        - #7 Recycle Yard Waste: use pruned material correctly to prevent pests/disease.
        - #2 Water Efficiently: avoid overwatering that stresses plants
    - Compare cost/environment impact: low-toxicity options vs insecticide (safer for family and environment).

5. **Wrap-Up & Questions (10 min)**
    - Pose key questions (see worksheet).
    - Reinforce how natural pest management supports sustainability and biodiversity.

Teacher-Facing Materials

Included with this Activity

- Pest Management Worksheet answer key:

Pest Management Worksheet answer key:

Answer Key

Part A

1. b)
2. c)
3. b), c), d)

Part B

4. Pest-resistant plants reduce vulnerability — fewer pests establish and chemical treatment may not be necessary.
5. Beneficial insects (e.g., ladybugs, birds) prey on pests, reducing infestation without chemicals.
6. Broad insecticides can kill non-target organisms, harm beneficials, cause pest resistance, and pollute environments

Part C

7. Step 1: Scout and inspect damage. Step 2: Gently hose off aphids or hand-remove.

8. *Principle #1 Right Plant*: choosing resilient shrubs. *Principle #5 Attract Wildlife*: encouraging predators with flowering plants or shelter. *Principle #2 Water Efficiently*: avoiding overwatering that weakens plants.

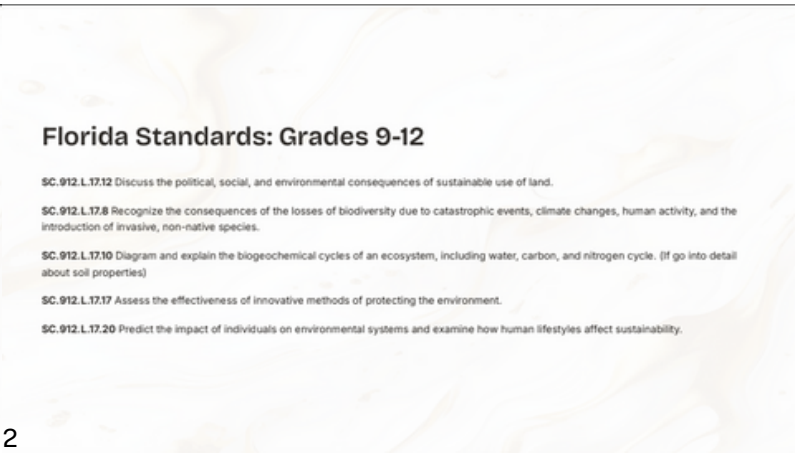
Student Activity Sheets and Assignments

Included with this Activity

1. PowerPoint
2. Pest Management Worksheet
3. Pest Management Rubric

Included Slides:

1



2

3

4

Beneficial Insects in Florida

Ladybug

Eats a variety of pest insects like aphids and mealybugs.

Praying Mantis

Feeds on many pest insects as well as other species.

Assassin Bug

Eats harmful flies, caterpillars and moths.

Honeybee

Important insect for pollination.

5

Principles of Integrated Pest Management

1

Identify First

Correctly identify pests, host plants, and beneficial organisms before taking any action. Proper identification ensures targeted treatments and prevents harm to beneficial species.

2

Monitor & Set Thresholds

Regularly inspect your landscape to track pest populations. Establish action thresholds - the point at which pest numbers become economically or aesthetically damaging enough to warrant intervention.

3

Use Least-Risk Methods

Implement effective, low-risk solutions first, such as cultural, mechanical, and biological controls. Resort to pesticides only when necessary, and choose the most targeted, least toxic options.

4

Evaluate Results

Document treatments and outcomes to evaluate effectiveness. This creates a feedback loop for continuous improvement and more successful pest management over time.

6

Why IPM Matters in Florida

Unique Climate Challenges

Florida's warm, humid climate creates ideal conditions for year-round pest activity and rapid reproduction cycles, intensifying pest management challenges.

Ecological Diversity

The state's rich ecosystems host numerous beneficial insects that provide natural pest control services worth protecting.

Vulnerable Ecosystems

Broad-spectrum pesticides threaten pollinators, disrupt soil health, and can contaminate Florida's extensive waterways and sensitive aquatic habitats.

7

Natural Pest Control: Biological Methods

Beneficial Insects

Encourage natural predators like ladybugs, lacewings, and parasitic wasps by providing habitat diversity and avoiding broad-spectrum pesticides. These allies consume harmful pests such as aphids, mealybugs, and problem caterpillars.

Beneficial Nematodes

These microscopic soil-dwelling organisms target pest larvae and grubs while leaving plants unharmed. They're particularly effective against fungus gnats, root weevils, and certain beetle larvae in Florida landscapes.

Predatory Insects

Larger predators like praying mantises and assassin bugs provide additional pest control by consuming a wide variety of insects. Creating habitat with diverse native plants encourages these natural controllers to thrive.

8

9

Natural Pest Control: Physical and Cultural Methods

Mechanical Control Techniques

- Hand-picking larger pests like tomato hornworms or using yellow sticky traps for whiteflies and fungus gnats
- Pruning infested branches to remove pest sources while improving air circulation
- Installing physical barriers like floating row covers to prevent pest access

Cultural Practices

- Companion planting with marigolds, basil, and other pest-repelling plants
- Crop rotation to disrupt pest life cycles in vegetable gardens
- Proper plant spacing and appropriate watering times to reduce fungal diseases
- Using Florida-native plants adapted to local conditions and naturally pest-resistant

Natural Pest Control: Organic and Safe Products

Neem Oil

Derived from the neem tree, this natural product disrupts pest feeding and reproduction without harming most beneficial insects. Effective against aphids, whiteflies, and many fungal diseases common in Florida landscapes.

- Apply as a foliar spray during cooler parts of the day
- Safe for pollinators when dry

Horticultural Oils

These refined mineral or plant-based oils control soft-bodied insects by coating and suffocating them. Highly effective against scales, mites, and whiteflies that thrive in Florida's climate.

- Apply when temperatures are between 40-85°F
- Target specific pests while preserving beneficials

Diatomaceous Earth

This powdery substance made from fossilized algae has microscopic sharp edges that physically damage the exoskeletons of crawling insects, causing dehydration.

- Effective against slugs, snails, and crawling insects
- Apply as a barrier around plants or directly to soil

10

Benefits of Natural Control & IPM in Florida

Water Protection

Reduces chemical runoff into Florida's extensive network of springs, lakes, rivers, and the vulnerable Everglades ecosystem. Helps maintain water quality for humans and wildlife.

Pollinator Preservation

Protects bees, butterflies, and other pollinators essential for flowering plants and food production. Florida is home to over 300 native bee species and 180 butterfly species.

Health Benefits

Minimizes exposure to potentially harmful chemicals for people, pets, and wildlife. Creates safer outdoor spaces for children and sensitive individuals.

Ecosystem Balance

Maintains natural predator-prey relationships that keep pest populations in check long-term. Creates more resilient, self-regulating landscapes.

11

Advocating for Natural Pest Control

Take Action Today

- Start implementing IPM principles in your own landscape
- Choose native Florida plants that naturally resist pests
- Create habitat for beneficial insects with diverse plantings
- Share successful natural control methods with neighbors

Community Impact

By adopting natural pest control methods, you help protect Florida's unique ecosystems, support biodiversity, and preserve beneficial insect populations for future generations. Visit ffl.ifas.ufl.edu for more Florida-specific IPM resources.

12

Differentiation:

ELL learners

Pair students with a partner or use Google Translate to help with language barriers. ELL students can also make their own PSAs in a different language using Canva, which could be great.

ESE and Gifted learners:

Pair students with a buddy to help them if necessary. Scaffold information as needed. For gifted students, assign them jobs as group leader or use them as a TA.

13

Thank You!

By adopting these sustainable Integrated Pest Management (IPM) and natural pest control methods for Florida landscapes, we can collectively protect our unique ecosystems, support biodiversity, and preserve the beauty and health of Florida for future generations.

For more information, please visit ffl.ifas.ufl.edu

14

Pest Management Worksheet page 1:

FFL Principle 6- Managing Yard Pests
Natural Pest Management Worksheet (High School)

Name: _____ **Date:** _____

Multiple Choice

1. What does IPM stand for:
   a) Insecticide Pest Mechanism
   b) Integrated Pest Management
   c) Immediate Pest Mitigation
   d) Inorganic Pest Method

2. What is the first step in IPM?
   a) Spray insecticide
   b) Plant resistant varieties
   c) Scout/monitor plants
   d) Release biological agents

3. Which is a **natural pest control** method? (choose all that apply):
   a) Broad-spectrum insecticide
   b) Hand-picking pests
   c) Using sticky traps
   d) Using horticultural soap

Short Response

4. **Explain** why planting pest-resistant plants helps manage pests naturally.

5. **Describe** one benefit of attracting beneficial insects into a landscape.

Vicki Craig, West Port High School
Edited by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Pest Management Worksheet page 2:

6. **Give** one reason why broad-spectrum insecticides should be used only as a last resort.

Case Scenarios

Scenario: Your ornamental shrub has aphids on its underside leaves.

7. List two natural treatment steps you would take (in order).

8. Explain which other FFL principles these steps support (name and describe).

Vicki Craig, West Port High School
Edited by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Pest Management Rubric:

FFL Principle 6- Managing Yard Pests
Natural Pest Management PSA Rubric (High School)

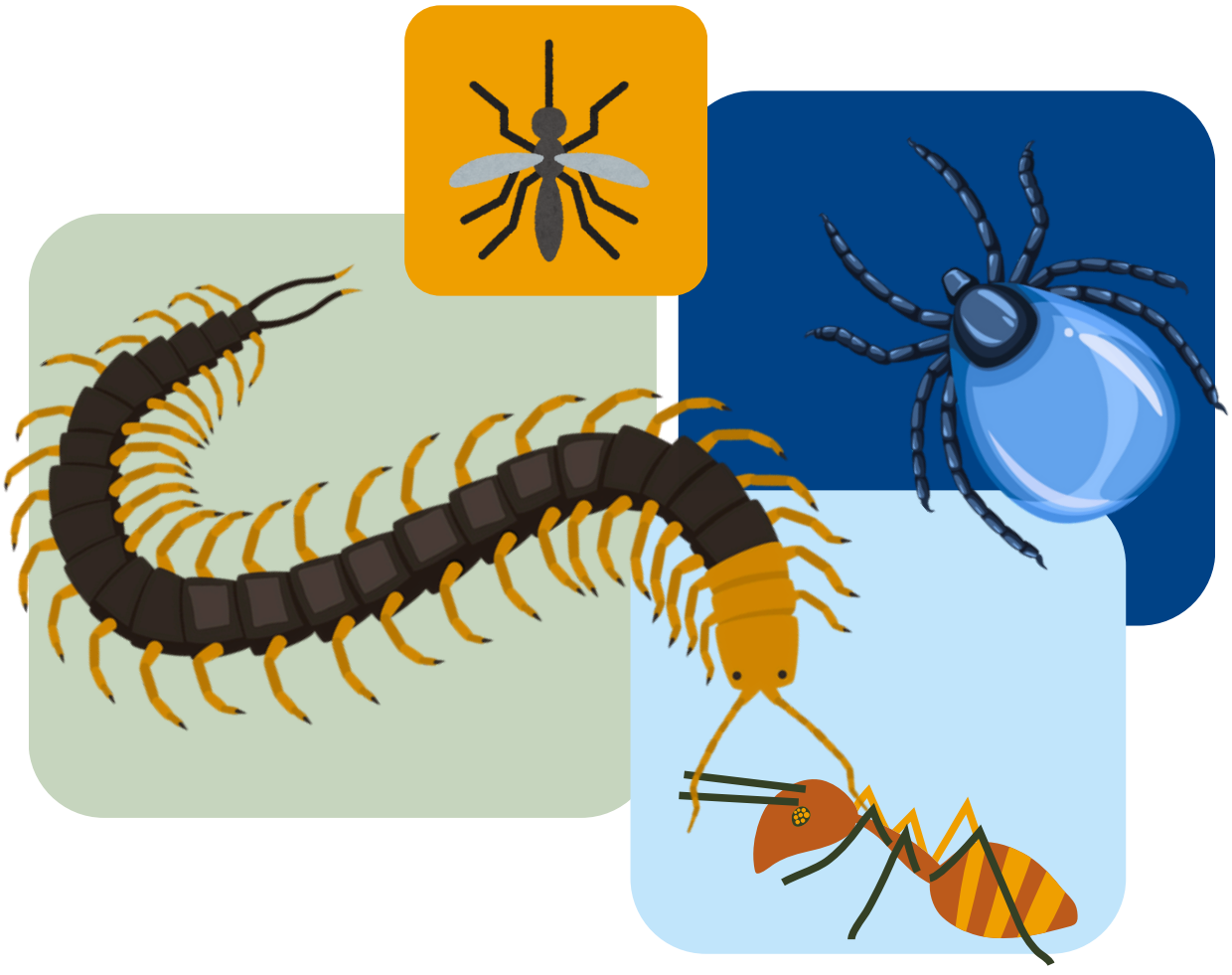
Criteria	Excellent (4 pts)	Good (3 pts)	Satisfactory (2 pts)	Needs Improvement (1 pt)
Content Accuracy	Clearly explains natural pest control with 3+ examples; uses proper terminology and aligns with FFL principles.	Includes 2–3 pest control methods, mostly accurate and clear.	Includes at least 1 method; may have minor inaccuracies.	Content is unclear, minimal, or inaccurate.
Connection to FFL Principles	Links natural pest control to **at least 3 FFL principles** with explanations.	Connects to 2 FFL principles with some explanation.	Mentions 1 principle with little explanation.	No clear connection to FFL principles.
Visual Design & Creativity	Visually engaging, well-organized, and creative layout; strong visual appeal.	Visually clear with some creative elements; easy to follow.	Basic visuals; some organization issues.	Lacks organization or visual effort.
Call to Action / Public Purpose	Strong message encouraging eco-friendly pest control choices; clear call to action.	Includes a message and attempt at a call to action.	Message is vague or lacks action steps.	No clear message or purpose.
Grammar & Mechanics	No spelling, grammar, or formatting errors.	1–2 minor errors that do not affect understanding.	Several errors, but meaning is mostly clear.	Errors interfere with clarity.
Effort & Completion	Exceeds expectations; thorough and thoughtful work submitted on time.	Complete and meets all expectations.	Mostly complete; some areas underdeveloped.	Incomplete or lacks evident effort.

Florida-Friendly Landscaping™ Program

Principle 6:

Manage Yard Pests Responsibly (3)

High School



Published on **July 31th, 2025**

About This Activity

Title: Pest Detectives

Subject, Grade, Level:
High School Environmental Science

Abstract:

This activity introduces high school students to Integrated Pest Management as a scientific, environmentally responsible approach to managing landscape pests. Aligned with Florida science standards, the lesson engages students in diagnosing plant damage, identifying common Florida pests, and developing treatment plans based on the least toxic, most effective methods. Through video, discussion, hands-on investigation, and group collaboration, students learn to evaluate the reliability of information sources, apply critical thinking, and understand IPM's role in protecting biodiversity and water quality.

Learning objectives:

At the conclusion of this activity, participants will be able to:

1. Identify common Florida landscape pests and diagnose plant damage using observation and research.
2. Explain the principles of Integrated Pest Management and distinguish between chemical and non-chemical control strategies.
3. Develop and justify a pest treatment plan using the least toxic, most environmentally responsible method available.

Author: Dawn Parnell
Pensacola High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.N.1.1	Define a problem in a scientific field; pose investigable questions; conduct systematic observations; consult reference materials; plan and carry out investigations; gather, analyze, and interpret data; generate and justify explanations; communicate findings; and evaluate others' explanations
SC.912.N.1.4	Identify sources of information and assess their reliability according to the strict standards of scientific investigation
SC.912.L.17.4	Describe changes in ecosystems resulting from seasonal variations, climate change, and ecological succession
SC.912.L.17.8	Recognize the consequences of losses of biodiversity due to catastrophic events, climate change, human activity, and introduction of invasive, non-native species

Timeframe:

This activity is designed to take approximately 90 minutes of class time.

List of Materials

- Whiteboard or projector
- Markers or pens
- Access to computers/internet for video and research
- Handout: IPM Strategy Worksheet
- Handout: Common Florida Landscape Pests & Diseases
- Various plant samples (some healthy, some with visible pest damage like aphids, leaf miners, fungal spots – collect locally or use images/simulated samples)
- Magnifying glasses (optional, for closer inspection)
- Gloves (optional, for handling samples)
- Quiz handout
- Writing prompt handout (Optional)
- Small spray bottles with water for simulating “treatment”

Important Note:

Details on activity set up are included in the supplemental materials, as well as the activity worksheet and a ten-question multiple choice quiz.

Procedure and General Instructions (for instructor)

- **Bellringer (5 minutes):** Show an example of a damaged plant. “What is your first instinct of what happened? How would you try to fix it?” Encourage them to think about both immediate actions and long-term solutions.

- **Engagement & Introduction (15 minutes):**
  - **Share Bellringer Responses:** Ask a few students to share their reactions. Guide the discussion towards common “quick fixes” (like spraying chemicals) and the potential downsides.
  - **Introduce the Challenge:** “Today, we’re going to explore a more environmentally responsible way to deal with those pesky plant problems called Integrated Pest Management.”
  - **Introductory Video:** Show a short (3-5 minute) introductory video on Integrated Pest Management (IPM). Focus on videos that explain the concept, its benefits, and the tiered approach.
  - **Unpack the Video:** After the video, ask: "What were some key ideas or strategies mentioned in the video? How is this different from just spraying a pesticide?"

- **Exploration & Explanation (30 minutes):**
  - **Defining IPM & Its Pillars:** Introduce IPM formally, referring to FFL Handbook, page 44, discussing the three main pillars and connecting to other FFL principles
  - **Detecting Pest Problems (Monitoring & Identification):** "You can't solve a problem if you don't know what it is." Refer to FFL handbook page 46
    - Importance of regular monitoring and correct identification of pests- mention county extension offices as resources for identification
  - **Treating Pest Problems (Action & Least Toxic First):** "Chemicals are a last resort, not a first line of defense." Review non-chemical methods, less toxic pesticides and chemical pesticides as a last resort- consider targeting specific organisms and water quality

Procedure and General Instructions (Continued)

- **Hands-On Activity: "Pest Detective" (20 minutes)-** details on supplemental document.
  - Group Share: Bring the class together. Have each group share their findings for one plant sample, explaining their diagnosis and proposed IPM strategies. Facilitate discussion and provide feedback.

- **Elaboration (10 minutes)**
  - **Connecting IPM to Environmental Science Standards:**
    - **SC.912.L.17 (Interdependence):**
      - "How does IPM protect biodiversity in our landscapes?" (Protecting beneficial insects, reducing harm to non-target organisms like birds and pollinators).
      - "How does reducing pesticide use impact water quality and habitat destruction?" (Preventing runoff of harmful chemicals into waterways, protecting aquatic life).
      - "Why is it important to tolerate some 'bad guys' in an ecosystem?" (Maintaining food sources for beneficials, understanding natural population dynamics).
    - **SC.912.N.1 (Practice of Science):**
      - "How does IPM exemplify scientific inquiry?" (Observation, identification, hypothesis testing through different treatment methods, data collection on effectiveness).
      - "Why is reliable information (like from the Extension office) crucial in pest management?" (Avoiding misdiagnosis, ensuring effective and safe solutions).
      - "How does IPM encourage critical thinking and problem-solving over a 'one-size-fits-all' approach?"

Teacher-Facing Materials

Included with this Activity

- Activity Details and Set Up
- Student Quiz Answer Key

Activity Details and Set Up

UF|CPET

FFL Principle 6- Managing Yard Pests
Pest Detectives Activity Details

Setup:

Divide students into small groups (3-4 students). Provide each group with:

- 1-2 plant samples (or high-quality images) showing different types of pest damage (e.g., aphids, leaf spots, chewed leaves, webbing).
- Magnifying glasses.
- Handout: "Common Florida Landscape Pests & Diseases" (simplified guide).
- Their "IPM Strategy Worksheet."

Investigation:

- Instruct groups to examine each plant sample carefully.
- Using the guide provided, they should try to:
  - Identify the potential pest or disease.
  - Describe the type of damage observed.
  - Brainstorm possible "Avoiding" strategies that could have prevented this problem.
  - Propose "Detecting" methods for early identification.
  - Suggest "Treating" strategies, starting with the least toxic options.
  - Encourage discussion within groups, simulating a real-world problem-solving scenario.

Student Quiz (Answer Key)

Answer Key and Justifications

1. C. To reduce pest populations to an acceptable level while minimizing risks to people and the environment.
   - Justification: IPM is about sustainable control, not eradication, and prioritizes environmental and human safety.
2. C. Choosing plants that are well-suited to the local climate and soil conditions.
   - Justification: Healthy, well-adapted plants are naturally more resistant to pests and diseases, making "Right Plant, Right Place" a key preventative strategy.
3. B. It ensures that the correct, most effective, and least harmful treatment is applied.
   - Justification: Different pests and diseases require different approaches; accurate identification prevents ineffective or harmful treatments.
4. C. Harm to non-target organisms, including beneficial insects and pollinators.
   - Justification: Broad-spectrum pesticides kill indiscriminately, negatively impacting the biodiversity and ecological balance of an area.
5. C. Only as a last resort, after other methods have failed and the problem persists.
   - Justification: IPM follows a tiered approach, reserving chemical interventions for situations where less toxic methods have proven insufficient.
6. C. Ladybug
   - Justification: Ladybugs are well-known predators of common garden pests like aphids, making them beneficial insects.
7. C. Avoiding Pest Problems
   - Justification: Ensuring plant health through proper cultural practices is a preventative measure that reduces their susceptibility to pests.
8. B. Removing the affected leaves or spraying with a strong jet of water.
   - Justification: These are examples of least-toxic, physical control methods that should be tried before resorting to chemical solutions.
9. B. Ecosystem interdependence
   - Justification: This statement emphasizes that different species in an ecosystem are connected and rely on each other, even predators and their prey, to maintain balance.
10. C. Principle #1: Right Plant, Right Place
    - Justification: Placing the right plant in the right place ensures it thrives, making it naturally more resistant to pests and reducing the need for interventions.

Student Activity Sheets and Assignments

Included with this Activity

1. Pest Damage Sample Images
2. IMP Strategy Worksheets
3. Multiple Choice Quiz

Sample Pest Damage Images *(can substitute for local examples)*

Sample Pest Damage Images *(can substitute for local examples)*

Sample Pest Damage Images *(can substitute for local examples)*

Student IPM Strategies Worksheet (Page 1)

UF|CPET

FFL Principle 6- Managing Yard Pests
IPM Strategies Worksheet

Name: _____

Date: _____

Plant Sample & Problem:

_____

Part 1: Observation & Identification

1. Describe the symptoms or damage you observe on the plant:

2. Based on your observations and the "Common Florida Landscape Pests & Diseases" guide, what is your hypothesis for the pest or disease causing this problem?

Part 2- Integrated Pest Management (IPM) Strategies: For the identified problem, propose strategies.

Avoiding Pest Problems (Prevention):

- What cultural practices (e.g., watering, fertilizing, plant selection) could have prevented this problem or would make the plant more resistant?

- Are there any beneficial organisms that could be encouraged to help prevent this pest?

Student IPM Strategies Worksheet (Page 2)

Detecting Pest Problems (Monitoring & Identification):

- How would you regularly monitor for this pest to catch it early?

- What specific signs would you look for?

Treating Pest Problems (Action - Least Toxic First):

- List at least two *less toxic* treatment methods you would try first for this specific pest.

Student Quiz (Page 1)

UF CPET

FFL Principle 6- Managing Yard Pests
Quiz: IPM & Responsible Yard Pest Control

Name: _____

Date: _____

1) What is the primary goal of Integrated Pest Management (IPM)?
   a) To eliminate all pests from an ecosystem.
   b) To rely solely on chemical pesticides for pest control.
   c) To reduce pest populations to an acceptable level while minimizing risks to people and the environment
   d) To encourage the growth of invasive pest species.

2) Which of the following is considered a preventative strategy in IPM?
   a) Applying a broad-spectrum pesticide at the first sign of a pest.
   b) Regularly monitoring plants for pest damage.
   c) Choosing plants that are well-suited to the local climate and soil conditions.
   d) Hand-picking pests off plants once a severe infestation occurs.

3) Why is correct pest identification crucial in IPM?
   a) It allows for the most expensive pesticide to be chosen.
   b) It ensures that the correct, most effective, and least harmful treatment is applied.
   c) It helps to attract more beneficial insects.
   d) It is only necessary for agricultural settings, not home gardens.

4) An environmental consequence of widespread, non-targeted pesticide use is:
   a) Increased biodiversity in the treated area.
   b) Enhanced soil fertility.
   c) Harm to non-target organisms, including beneficial insects and pollinators.
   d) Reduced water evaporation from the soil.

5) According to IPM principles, when should chemical pesticides typically be used?
   a) As the first line of defense for any pest problem.
   b) Routinely, on a fixed schedule, regardless of pest presence.
   c) Only as a last resort, after other methods have failed and the problem persists.
   d) To attract more pests for biological control.

Student Quiz (Page 2)

6) Which of these organisms is considered a beneficial insect in a garden ecosystem?
    a) Aphid
    b) Whitefly
    c) Ladybug
    d) Slug

7) A plant that is stressed due to improper watering or nutrient deficiencies is often more susceptible to pest problems. This statement supports which IPM principle?
    a) Treating Pest Problems
    b) Detecting Pest Problems
    c) Avoiding Pest Problems
    d) Chemical Control

8) If you observe a few aphids on your rose bush, an initial least toxic IPM treatment might involve:
    a) Immediately spraying with a strong chemical insecticide.
    b) Removing the affected leaves or spraying with a strong jet of water.
    c) Waiting for the aphids to disappear on their own.
    d) Introducing a new, non-native predator to the garden.

9) The concept that "in order to have the 'good guys,' such as ladybugs, there must be some 'bad guys,' or pests, for them to feed on" highlights which ecological principle?
    A. Competitive exclusion
    B. Ecosystem interdependence
    C. Genetic mutation
    D. Photosynthesis

10) Which Florida-Friendly Landscaping™ principle is most directly related to avoiding pest problems by ensuring plants are healthy and resilient?
    a) Principle #2: Water Efficiently
    b) Principle #4: Mulch
    c) Principle #1: Right Plant, Right Place
    d) Principle #7: Recycle Yard Waste

Florida-Friendly Landscaping™ Program

Principle 7:

Recycle Yard Waste (1)

High School

Published on **August 7th, 2025**

About This Activity

Title: Recycle Yard Waste Breaking It Down: The Science of Compost

Subject, Grade, Level:
High School Science

Abstract:

This high school lesson plan explores Florida-Friendly Landscaping™ (FFL) Principle 7: Recycle Yard Waste through an engaging, hands-on study of composting. Over a 4-day instructional sequence (~250 minutes plus weekly monitoring), students investigate the biological science behind decomposition, nutrient cycles, and the ecological role of composting. The unit begins with video-based discussions and interactive activities that introduce compostable materials, decomposer organisms, and the environmental benefits of recycling organic waste. Students then construct their own "compost in a bottle" systems to observe decomposition over time, integrating real-world scientific observation and journaling practices. The lesson culminates in a student-designed outreach project, such as a presentation or informational pamphlet, to communicate composting's value to the broader community. Aligned with Florida's high school science standards, this lesson fosters environmental literacy, critical thinking, and responsible action — empowering students to apply sustainable practices both at home and in their communities.

Learning objectives:

At the conclusion of this activity, participants will be able to:

1. Explain the process of composting and its benefits to the environment (Focusing on FFL Principle 7: Recycling)
2. Create their own model of a composting system and observe changes over time in that system.

Author: Denise Trzcinski
Haines City Senior High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.9	Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.
SC.912.L.17.10	Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.

Timeframe:

This activity is designed to take approximately 250 minutes of class time, plus time for weekly monitoring.

List of Materials

- Computer and monitor to show educational videos
- Compost Contents 3-column graphic organizer: Brown, Green, and Non-Compostable Material
- Compost Critters Information Sheet and Worksheet (1 per student) https://www.cvswmd.org/uploads/6/1/2/6/6126179/do_the_rot_thing_cvswmd1.pdf
- Compost
- Toothpicks
- Newspaper
- Pencils
- Compost bottle activity sheet
- Science journal or weekly observation sheet
- Scissors
- Permanent markers
- Sticky tape
- 1- 2 liter bottle per student or group
- Materials to make compost e.g. leaves, flowers, fruit and vegetable peelings, tea bags, grass cuttings, soil, newspaper, and light card
- Presentation or Pamphlet instruction sheet
- Paper
- Colored pencils
- Markers
- Computers

Procedure and General Instructions (for instructor)

Introduction

DAY 1:

1. **Intro to Composting- 10 minutes**
    - "Composting Made Easy" video from PBS (4 mins 25 seconds)
    - Hand-out "Compost Contents" graphic organizer and ask students to take note of examples in the video to fill out their chart.
    - Ask follow-up probing questions using think-pair-share. (Video and questions for this activity were sourced from "Composting Made Easy", Year Round Gardening, PBS Media, via link Composting Made Easy | Year-Round Gardening | PBS LearningMedia)
    - Follow-up questions to consider: What is composting? What kinds of materials can and can't be composted? Which strategy of composting do you think is most important and why? How does composting help the environment?

2. **Decomposers- 10 minutes**
    - Nova **"Decomposers"** Video (3 minutes and 4 seconds)
    - Ask follow-up probing questions. (Video and questions for this activity were sourced from "Decomposers", NOVA, PBS Media, via link NOVA | Decomposers | PBS LearningMedia)
    - **Follow-up questions to consider:** What do decomposers recycle? What kind of organisms are decomposers?

3. **"Compost Critters" Activity- 25 minutes**
    - (Students should be split into groups of four for this activity). Each student will receive and read the compost critters information sheet. Once students take time to review the information sheet, the teacher will ask the probing question: Why are decomposers important to our environment? Use a digital randomizer to select student and have student share out their thoughts.
    - Hand out the Compost Critters Worksheet (one per student) and other activity material (compost, toothpicks, newspaper) to each group. Have students complete the activity as stated in the activity instructions (taking about 8 minutes to explore compost). Each group will take 30 seconds to report their findings to the classroom
    - Compost Critters Activity was sourced from CVSWMD Organics do_the_rot_thing_cvswmd1.pdf courtesy of the Alameda County Waste Management Authority & Source Reduction and Recycling Board

Procedure and General Instructions (for instructor) cont.

DAY 2:

4. **Compost in a Bottle Activity- 50 minutes**

- Students will create their own compost in a bottle using the instructions provided, as well as their knowledge from the previous day.
- ***Please note that the diagram indicates the choice to use a compost booster. This is not necessary or recommended, please omit this step**
- When the compost bottle is completed, students will have 5 minutes to answer the quick write prompt: What observations can you make about your compost bottle in its initial stage?
- Bottles will be monitored and students can make observations weekly and journal them for bellwork on a set day each week. Observations can be put in science notebooks or an observation sheet created for the activity
- Compost a Bottle Activity was sourced from Compost_in_a_Bottle_Activity.pdf Courtesy of West Lothian Council, UK

DAY 3 and 4:

5. **Compost Presentation or Pamphlet- 150 minutes**

- Students will plan and organize how to communicate their knowledge of composting to others. Students will work together in groups, use community resources, develop materials, write, and present their work.
- Compost Presentation or Pamphlet was sourced from CVSWMD Organics do_the_rot_thing_cvswmd1.pdf

Teacher-Facing Materials

Included with this Activity

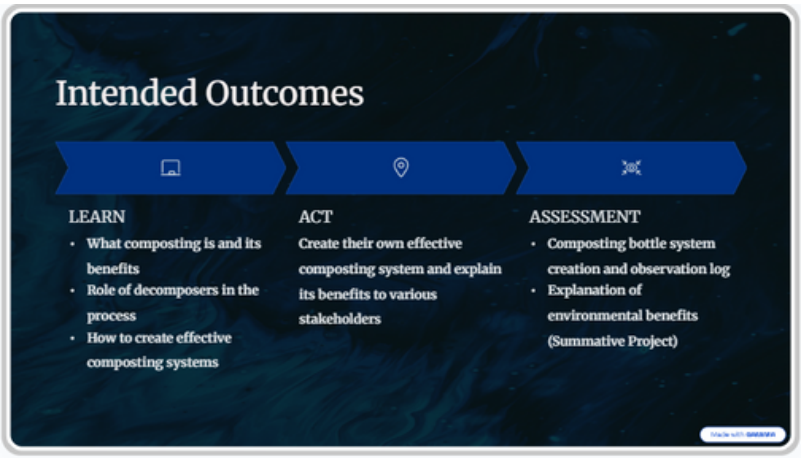
- Power Point

Included Slides:

1

2

3



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Day 1: Understanding Composting Basics

1. **"Composting Made Easy" Video (10 min)**
   Students complete "Compost Contents" graphic organizer identifying brown, green, and non-compostable materials
   Follow-up with think-pair-share discussion on composting benefits and strategies
2. **Nova "Decomposers" Video (10 min)**
   Explore what decomposers recycle and what organisms are considered decomposers
   Random student selection for discussion participation
3. **"Compost Critters" Activity (25 min)**
   Groups of four explore actual compost samples to identify organisms
   Discussion on why decomposers are important to our environment

5

Day 2: Compost in a Bottle

Activity Overview

- 50-minute hands-on activity
- Students create personal compost systems in 1-2 liter bottles
- Initial observations recorded via quick write
- Weekly monitoring throughout the term

Materials Needed

- Activity instruction sheets
- 1-2 liter bottles
- Scissors, markers, tape
- Compost materials (leaves, fruit/vegetable peelings, tea bags, grass, soil, newspaper)
- Science journals or observation sheets

6

What Goes in the Compost?

Brown Materials

- Dry leaves
- Newspaper
- Cardboard
- Wood chips
- Twigs

Green Materials

- Fruit/vegetable scraps
- Coffee grounds
- Tea bags
- Grass clippings
- Plant trimmings

Non-Compostable

- Meat/dairy products
- Oils and fats
- Pet waste
- Diseased plants
- Synthetic materials

7

Days 3–4: Compost Presentation or Pamphlet

1. **Project Overview**
   Students communicate their composting knowledge through group projects (150 minutes total)
   Options include presentations, pamphlets, videos, or podcasts (teacher discretion)
2. **Skills Developed**
   - Collaborative teamwork
   - Research using community resources
   - Material development
   - Written and oral communication
3. **Materials Needed**
   - Instruction sheets
   - Paper, colored pencils, markers
   - Computers for research and digital creation

8

Activity Setup & Preparation

1. **Day 1 Prep**
   Print graphic organizers, queue videos, prepare randomizer
   Gather compost samples, toothpicks, newspaper for "Compost Critters"
2. **Day 2 Prep**
   Print activity sheets and observation logs
   Collect bottles, scissors, markers, tape, and compost materials
3. **Days 3–4 Prep**
   Print instruction sheets for final projects
   Prepare art supplies and ensure computer access

9

Student Activity Sheets and Assignments

Included with this Activity

1. Compost Contents Graphic Organizer
2. Compost Critters Activity Booklet
3. Compost Pamphlet Presentation Student Instructions

Compost Contents Graphic Organizer

UF CPET

FFL Principle 7- Recycle Yard Waste

Breaking It Down: The Science of Compost

Name:
Date:
Period #:

COMPOST CONTENTS

Green Materials:	Brown Materials:	Non-Compostable Materials:

Compost Critters Activity Booklet Page 1

ACTIVITY 6

Compost Critters

Basic Composting
Grades 2-12

Objective
Students will:

- explore active compost, and
- identify various decomposer animals in their piles.

Time
20 minutes

* *Look in the back of this booklet for how this activity applies to the Vermont Framework of Standards and Learning Opportunities.*

Materials Needed

- Compost
- Toothpicks
- Newspaper
- Compost Critter Worksheets (p. 15)
- One Compost Critter Information Sheet (pp. 16-17)
- Pencils

Background Information

There are many different animals that help break down organic materials into the rich soil helper we know as compost. A compost pile and worm bin have an entire network of different bugs. Bacteria do most of the work, even though they are invisible to the naked eye. Other animals large enough to see, such as beetles, worms, centipedes, millipedes, and sow bugs, are also important decomposers. Without decomposer animals all life would stop because new plants would not have the necessary nutrients needed to grow. Decomposers turn our garbage into plant food.

Management Skills

Students will sort through compost in groups of four. Each student will have his/her own worksheet. This is an exploratory activity. For some kids, it will be the first time they will have explored compost.

Procedure

1. Read the Compost Critter Information Sheet before the activity begins. This will give you a good idea about the different roles bugs play in the ecosystem of a worm bin or compost pile.

2. Ask children why they think decomposers are important. Ask them what kind of bugs they have seen in soil.

3. Tell them these bugs eat dead things, turn them into soil, and therefore help new life begin. They play a vital role in the life cycle by breaking down organic materials.

4. Hand out worksheets and pencils to each student.

5. Divide kids into groups of four.

6. Have a representative from each group get a pile of compost and a toothpick for each person in their group.

7. Mention that the compost they are touching used to be grass, fruit, leaves, veggie scraps, etc.

8. Ask them to identify the bugs by referring to their worksheets.

9. Collect the compost after eight minutes or so.

10. The teacher or student may read from the Information Sheet about the different bugs found by the students.

11. Summarize by restating the role and importance of decomposers.

Compost Critters Activity Booklet
Page 2

COMPOST CRITTERS WORKSHEET

Circle Me If You Can Find Me


collenbola


springtail


mite


slug


worm cocoon


sow bug


fruit fly


white worms


beetle


redworm


spider


snail


mold


ant


millipede


centipede


bacteria


pill bug

Name: _____ Date: _____

Compost Critters Activity Booklet
Page 3

Compost Critters Information Sheet

Pill Bug or Roly Poly

I am an isopod, which means I have ten pairs of legs that look very similar to each other. I eat old leaves and veggie scraps. I am about ½ inch long and I roll up in a ball if I am disturbed. Some people think that I look like a little armadillo. I am a grayish, dark color.

Centipede

I move quickly on my many legs. I have 15-137 segments with a pair of legs on each. I am a fierce hunter. I love to eat earthworms. I use my pair of poison claws to help keep my prey from getting away. I am about 1 to 2 inches long. I am usually reddish brown.

Ant

I am an insect with 6 legs. I help to decompose by breaking materials into smaller particles. I create tunnels, and move soil into clumps. Some people would rather not have me around their homes. I am black, brown, or red.

White Worm

I look like a frayed piece of thread. I am a skinny, white worm. I am ½ to 1 inch long. I am related to an earthworm. I like to eat rotting food after the other bugs get to it. You might think of me as one who likes to finish off the job.

Bacteria

We are so tiny that you can't even see us. We are everywhere. I am colorless. I can eat almost anything. Some of us live together in groups and others don't.

Mold

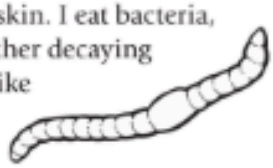
I am a fungus. I am related to mushrooms. Most of us live on old food. You might see me on old food in your home or your worm bin.

Sow Bug

I have 10 pairs of legs. That makes me an isopod like my cousin the Roly Poly. I eat vegetation and old leaves. My ½-inch-long body is oval and flat with flattened plates, but I can't roll up into a ball like Roly Poly. I am related to crayfish and lobsters. I breathe with gills so I must live in a damp, moist place. I am a dark, grayish color.

Earthworm

I am a long, thin, soft-bodied animal. My body is made up of little segments. I do not have legs or eyes. I sense light and I breathe through my skin. I eat bacteria, fungi, and other decaying materials. I like dark, moist places.



Fruit Fly

I am a very small fly. People don't like me, but I don't bite, sting, or make buzzing sounds. I don't harm earthworms either. Sometimes you will see me around a worm bin if a person forgot to bury their food. I like to lay my eggs where it's moist and warm.

Compost Critters Activity Booklet
Page 4

Compost Critters Information Sheet

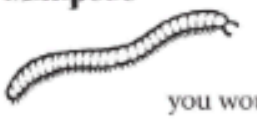
Slug

I have muscular discs on my underside that are adapted for creeping and crawling. I lay egg masses that look like jello. I eat living material but will make an appearance from time to time in your compost pile to eat fresh garbage and garden trimmings.

Mite

I am tiny. It would take 25 of us to cover an inch-long line. My body is round and fat so it's hard to see my 8 legs. I eat plant materials such as mold and soft tissues of leaves. Some of us eat the manure of other organisms. I am usually white or brown.

Millipede



I have so many legs you would have a hard time counting them. My name means "thousand legs," but I don't have that many. I am very shy and I roll up into a ball to avoid danger. I am a vegetarian and eat soft, moist, decaying plants. I am dark-red in color and am 1 to 3 inches long.

Springtail

I am a tiny insect less than 1/16 inch long. I eat molds and decaying materials. I have a little spring that helps me jump high into the air. I am white in color.

Collembola

I am a close relative of the springtail but I can't jump. I am tiny, and less than 1/16 of an inch long. I eat molds and decaying matter. I am white in color.

Beetle

I am an insect with shiny, black, tough wings and am about ½ inch long. I am a predator and eat slugs, snails, and soft insects such as caterpillars. I live beneath stones, boards, and other moist places.

Snail

Like my friend, the slug, I am a mollusk and creep around on my muscular belly. I carry on my back a spirally curved shell. I also have a broad retractable foot and a distinctive head. Like slugs, I prefer to eat living material, but I will also show up in your compost pile or worm box from time to time for lunch.

Spider

I am related to mites and have 8 nifty legs. I am one of the least appreciated animals in the garden and compost. I feed on other insects and work hard to help control pests that will hurt a garden.

Worm Cocoon

You can find me in a worm bin or compost pile. Before I have hatched, I am clear and yellowish and the shape of a lemon, and 1/8 inch long. After I have hatched I turn pea green. Two or more baby worms are hatched at once.

Compost Pamphlet Presentation Student Instructions Page 1

STUDENTS TEACHING COMPOSTING

PROJECT A: Compost Presentation

Description

Compost demonstrations and workshops can be given at school fairs, community events, farmers' markets, school assemblies, or in other classrooms. Students can target specific populations they want to address. Examples might be parents, teachers, administrators, gardeners, children's groups, or neighborhood organizations.

Procedure

1. In groups or individually write down the information you think is necessary to teach someone to compost.

2. Create a master list of the information needed to be covered. Divide this information into categories to help organize the presentation. A suggested format is:

What is Compost;

Why Compost;

How to Compost;

Troubleshooting; and

Questions and Answers.

3. Discuss what teaching format you will use. Will you have a workshop or a demonstration? Will it be participatory or lecture style? How much time will you have? What will the setting be like? Will it be outdoors or indoors? Who will be your audience? How many people will there be? What kind of background information do you think participants might bring with them? What types of materials and visual aids will you use, i.e., drawings, demonstrations, tools, materials, etc.?

4. Prepare an outline for the presentation.

5. Assign the tasks of researching, developing needed materials, and presenting portions of the presentation in practice sessions to individuals or small groups.

6. Practice and rehearse the presentation, paying attention to timing. Give each other feedback, refine, and make necessary changes.

7. After the presentation, do an evaluation. Write or discuss what was successful, what was not, how you felt, and what you would change if you did the presentation again.

For Younger Students

Students can present their worm box at Back-to-School night, to another classroom, or in the cafeteria at lunch. Students could also perform a song or skit and communicate why or how to compost at a school talent show.

Source: Composting Across the Curriculum, Marin County Department of Solid Waste

Compost Pamphlet Presentation Student Instructions Page 2

STUDENTS TEACHING COMPOSTING

PROJECT B: Compost Pamphlet

Description

Written material explaining why and how to compost can be developed and distributed throughout the community and at compost workshops and demonstrations. Developing pamphlets and other written material is an exercise in combining writing and graphics to convey information. If students have access to a computer, they can practice desktop publishing; if not, they can cut and paste.

Procedure

1. As individuals or in small groups, brainstorm and write down the information you feel is necessary to compost successfully.

2. Gather examples of other pamphlets and informational materials to get ideas about different formats and styles.

3. Decide what information will be included in the pamphlet.

4. Decide on the format and style of the pamphlet. How will it be organized? How long will it be? What drawings will be included? What type size will you use?

5. Assign individuals or small groups the task of researching, writing, or illustrating portions of the pamphlet.

6. Compile all the information and illustrations, and edit into a rough draft.

7. Get feedback, refine, proofread, and edit again until you have a final draft.

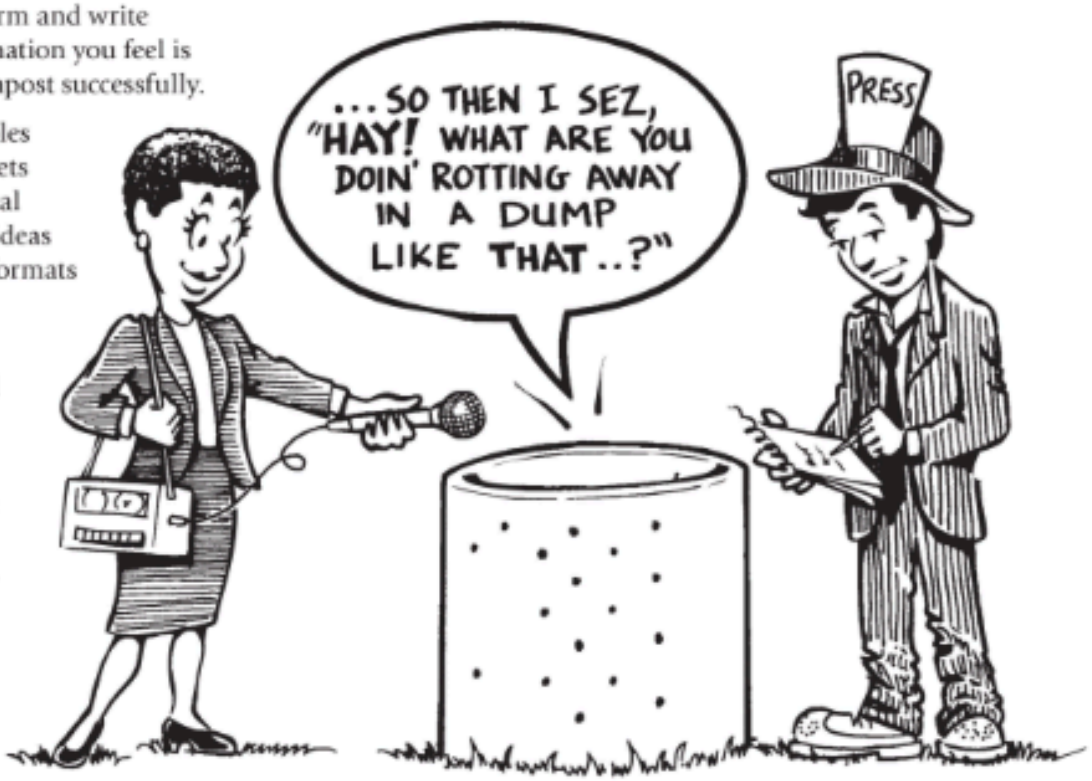
8. Produce the pamphlets using a computer, typewriter, or copy machine. Translate the pamphlet into other languages spoken in you community.

Other Ideas

1. Draw pictures of the nutrient cycle with a compost slogan such as "Rot is Hot" or "Don't Throw It Away."

2. Write letters explaining why or how to compost and send them to a friend or relative.

2. Produce a children's book explaining why and how to compost.



Florida-Friendly Landscaping™ Program

Principle 7:

Recycle Yard Waste (2)

High School

Published on **August 14th, 2025**

About This Activity

Title: Recycle Yard Waste

Subject, Grade, Level:
High School Science

Abstract:

This hands-on outreach lesson introduces high school students to Florida-Friendly Landscaping™ Principle #7: Recycle Yard Waste through a multi-day investigation of composting. Students explore how different types of organic waste decompose under compost-like conditions, collect and analyze data over time, and evaluate composting as a sustainable strategy to reduce landfill use and improve soil health. Aligned with high school science standards (SC.912.L.17.11, SC.912.N.1.1, SC.912.E.6.6), students apply the scientific method to design and carry out a decomposition experiment, connect composting to environmental issues, and present their findings. The lesson fosters critical thinking, environmental stewardship, and encourages students to apply composting practices at home, school, or in their communities.

Learning objectives:

At the conclusion of this activity, participants will be able to:

1. Investigate how different types of yard waste decompose under composting conditions.
2. Collect data on material breakdown over time.
3. Evaluate composting as a method to recycle yard waste and improve soil health.
4. Connect composting to other Florida-Friendly Landscaping™ principles.

Author: Jennifer Troy
Newberry High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.11	Evaluate how human activities impact the environment and natural resources.
SC.912.N.1.1	Define a problem based on scientific principles and develop solutions through design.
SC.912.E.6.6	Analyze how technology and human activity impact Earth's systems.

Timeframe:

This activity is designed to take approximately two 50-minutes class periods, plus time for data collection

List of Materials

- 2–3 clear plastic containers (e.g., recycled salad boxes or jars with lids and holes)
- A mix of yard waste samples (grass clippings, dry leaves, small twigs, food scraps, coffee grounds, etc.)
- Soil or compost starter
- Spray bottle (moisture control)
- Gloves & safety goggles
- Data sheet for observations
- Labels for containers

Procedure and General Instructions (for instructor)

Introduction

DAY 1 (50 minutes):

- **5 min- Bell Work:** Students read a quick summary about Florida Friendly Landscape Principle #7: encourages composting yard waste to reduce landfill use and enrich soil.
- **5 min- Introduction:** Explain that students will test how different materials decompose in compost-like conditions.
- Discuss key compost factors:
  - Green materials (nitrogen-rich like grass clippings, food scraps)
  - Brown materials (carbon-rich like dry leaves, newspaper)
  - Moisture, oxygen, and temperature
- **25 min- Lab Setup:** Groups will be asked to come up with a question and hypothesis.
  - Examples: How might sunlight or moisture levels influence decomposition? What Florida conditions (e.g., heat, humidity) speed up composting?
- Each group will be given a data sheet to track decomposition and then complete the following:
  - Add equal amounts of soil to each container.
  - Chooses two or three types of organic materials to test
  - Labels the containers, adds moisture, and loosely closes lids
- **15 min- Initial Observations & Variables:** Students record initial observations: color, texture, smell, and moisture level.
  - Example observations: Which materials seem more likely to decompose quickly? Is the setup more “green” or “brown”? What effect might that have?
- **5 min- Exit Ticket:** Which material do you predict will break down the fastest? Why?

Procedure and General Instructions (for instructor) cont.

DAY 2-12

- **10 min- Data Collection:** Write down any observations in lab notebook, take photos, or weigh material

DAY 13

- **30 min-** Analyze data and create graphics that students can use to explain their results to the class. (tables, graphs, slideshows, etc)

DAY 14 (50 minutes):

- **5 min- Bell work:** What do you think happens to organic waste like leaves and food scraps if they're thrown away instead of composted? What impact might this have on landfills or the environment?
- **25 min:** Groups report data
- **15 min:** Discussion
  - Connect to Florida-Friendly Landscaping™:
  - How does composting reduce the need for synthetic fertilizers?
  - How could composting support Principle #4: Mulch or #2: Water Efficiently?
- **5 min- Exit Ticket:** How does composting help reduce pollution or protect Florida water resources?

Florida-Friendly Landscaping™ Program

Principle 8:

Reduce Stormwater Runoff (1)

High School

Published on **August 19th, 2025**

About This Activity

Title: Reduce Stormwater Runoff
Stormwater SOS (Students On Solution)

Subject, Grade, Level:
High School Science

Abstract:

This high school lesson plan, aligned with FFL Principle 8: Reduce Stormwater Runoff, uses a project-based learning (PBL) model to engage students in real-world environmental problem-solving. Over two class sessions, students explore how stormwater ponds function, assess their ecological and social benefits, and analyze equity issues in stormwater infrastructure. Using field observations and research, students collaborate to redesign a local pond with low-impact, community-focused improvements. Aligned with Florida science standards SC.912.L.17.8 and SC.912.L.17.20, the lesson emphasizes environmental literacy, engineering solutions, and civic action. Assessments include observation checklists, redesign presentations, and personal reflections, encouraging students to apply their learning and advocate for sustainable, equitable water management in their communities.

Learning objectives:

At the conclusion of this activity, participants will be able to:

- Understand how stormwater ponds function in Florida.
- Analyze “secondary benefits” such as habitat support, access, and aesthetics.
- Evaluate a local pond using simplified criteria.
- Propose improvements using low-impact design concepts (e.g., vegetation, access paths).

Author: Sanil Nadar
P.K. Yonge Developmental School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.8	Recognize the consequences of the loss of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
SC.912.L.17.20	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Timeframe:

This activity is designed to take approximately 2 days, 50 minutes of class time for each day.

List of Materials

- **Source article:** Fitch, E.R., Tyrna, A. & Lusk, M.G. A comparative study of the secondary benefits of stormwater ponds in economically distinct neighborhoods of Tampa, Florida USA. Discov Water 4, 83 (2024). https://doi.org/10.1007/s43832-024-00144-3
- Article summary
- Review worksheet
- Pond observation checklist
- Exit ticket sheet
- Observation checklist (completed on Day 1)
- Redesign planning sheet or blank paper (for sketching pond redesign)
- Colored pencils, markers, or highlighters (for labeling features in sketches)
- Ruler or straightedge (optional, for neat sketch layout)
- Stormwater Pond Design Criteria Handout (optional guide with example features)

Procedure and General Instructions (for instructor)

Introduction

1. **Day 1- Introduction**

   - Show a short video or images of stormwater runoff or flooding in Florida.
   - Discuss: “Where does stormwater go and why does it matter?”
   - Introduce simplified findings from the Tampa study (vegetation, trash control, access, aesthetics).
   - Small group discussion on what makes a pond effective or problematic.
   - Students visit a school pond or review photos/maps.
   - Complete Stormwater Pond Observation Checklist (plants, trash, erosion, safety, features).
   - One insight + one concern they observed.

2. **Day 2:**
   - In teams, students sketch a redesigned pond:
   - Include at least 2 ecological features (e.g., buffer plants, erosion control).
   - Include 1 social/community improvement (e.g., bench, sign, path).
   - Annotate features with labels and reasoning based on the research.
   - Each group gives a 1-minute pitch: “Here’s what we observed and how our redesign solves it.”- peers give feedback with sticky notes
   - Individual written reflection: What did you learn about stormwater management? What is one action we could take to improve our school/community pond?

Student Activity Sheets and Assignments

Included with this Activity

- Storm Water Observation List

Storm Water Observation List page 1:

Article Summary

Stormwater ponds are crucial infrastructures designed to manage urban runoff and mitigate storm-event flooding. Beyond their primary function of flood control, they also offer various secondary ecological and social advantages, such as filtering pollutants, providing wildlife habitats, enhancing recreational value, and offering access to green spaces. If proper management is not enforced or utilized upon the stormwater ponds construction, the pond can be a health risk and less beneficial than a well-managed pond.

Key features of healthy stormwater ponds:

◦ **Deepwater Zone:** The lowest zone that maintains a permanent pool of water year-round, allowing for natural stormwater treatment and partial pollutant removal between rain events.

◦ **Littoral Zone:** The shallower area, generally less than 1.5 meters (5 ft.) deep, encompassing the entire shoreline. This zone receives adequate sunlight to support wetland plants and can be submerged or dry depending on the season.

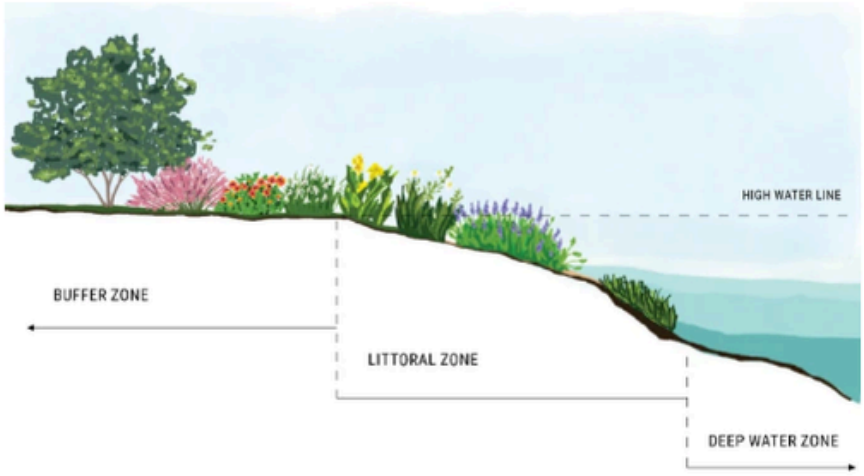
◦ **Buffer Zone:** Extends landward from the high-water level, serving as the perimeter between the littoral zone and the surrounding landscape. It is crucial for protecting the shoreline by filtering nutrients and sediment from upland activities.

Poorly managed stormwater ponds:

- **Narrow or Non-existent Buffer Zones**: These zones, which should ideally be 3 to 10 feet wide, are crucial for filtering nutrients and sediment from upland activities and protecting the shoreline. Poorly managed ponds may have **narrow buffer zones**, like those observed in Riverview, which averaged only 51% of the highest achievable score.
- **Low Plant Density and Diversity**: Both the buffer and littoral zones often consist of mowed turfgrass or lack a diverse variety of native vegetation. This leads to **minimal protection** against erosion, inefficient filtering of sediments, and poor assimilation of excess nutrients. This was a common issue in both East Tampa (29% and 43% for density and diversity, respectively) and Riverview (35% and 46% for density and diversity, respectively).

• **Poor Bank Stability**: Signs of erosion on the banks are indicative of poor management, often linked to narrow buffer zones and a lack of resilient native vegetation. Riverview ponds showed lower bank stability, scoring only 60% of the highest possible score.

Storm Water Observation List page 2 & 3:



Observing stormwater ponds

1) While observing the pond, write down the aspects of the pond that were well planned and managed, what are some of the poorly managed and negative parts of this pond?

Positive	Negative	General Observations

Florida-Friendly Landscaping™ Program

Principle 8:

Reduce Stormwater Runoff (2)

High School

Published on **August 19th, 2025**

About This Activity

Title: Reduce Stormwater Runoff
Stormwater Aquifer Activity

Subject, Grade, Level:
High School Science

Abstract:

This three-day high school lesson plan, aligned with FFL Principle 8: Reduce Stormwater Runoff, introduces students to the connection between stormwater and Florida's aquifer system. Through videos, diagram labeling, article analysis, and group planning, students learn key concepts such as stormwater, groundwater, and aquifer structure. They explore how stormwater pollution impacts groundwater quality and develop actionable plans to protect Florida's aquifer. Aligned with state science standards (SC.912.L.17.19, SC.912.N.1.1, SC.912.L.17.11, SC.912.L.17.16), the lesson emphasizes environmental systems, resource management, and scientific inquiry. Students demonstrate understanding through notes, diagrams, foldables, and presentations, applying their knowledge to propose realistic solutions for reducing water pollution and protecting groundwater resources.

Learning objectives:

At the conclusion of this activity, participants will be able to:

- Understand how we protect our aquifer and other water bodies from stormwaters.

Author: Jeneane Maddaloni
Pasco High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.19	Describe how different natural resources are used to make products and how their availability can influence human activity.
SC.912.N.1.1	Define a problem based on a specific body of knowledge and do the following: pose questions about the natural world, conduct systematic observations, examine books and other sources of information to see what is already known, review what is known in light of empirical evidence, plan investigations, use tools to gather, analyze, and interpret data, pose answers, explanations, or descriptions of events, generate explanations that explicate or describe natural phenomena (inferences), use appropriate evidence and reasoning to justify these explanations to others, and communicate results of scientific investigations.
SC.912.L.17.11	Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.
SC.912.L.17.16	Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and habitat destruction.

Timeframe:

This activity is designed to take approximately 3 class periods.

List of Materials

- Notebook paper or a teacher prepared handout
- **Article:** edis.ifas.ufl.edu/publication/FR440 "Water Quality in the Floridian Aquifer Region"
- Colored paper for the foldable
- Aquifer Plan Handout

Activity Set-Up:

- **Part 1 Teacher directions:** Teacher will need to set up which You-Tube film clips they want to use. Three or four would be good. This is an introduction on aquifers and needs to have the Florida aquifer discussed too. The map needs to be altered for the students to use; word bank also needs to be created.
- **Part 2 Teacher directions:** Teachers can modify the article to reading level or length. Remember to cite the article's source on your modified copies. The discussion part is very important to making sure every student took out what was important to the article. Questions are welcomed.
- **Part 3 Teacher directions:** Plan directions are included on supplementary handout. Groups can be shoulder-partners, groups of three or other configurations. Option to prepare a rubric and give to students to set expectations. Recommended presentations be 3-5 minutes, but can be extended based on class time and expectations of detail.

Procedure and General Instructions (for instructor)

Introduction

1. **Part 1: Introduction to Aquifers and Completion of Diagram**
    - Use three or four Film Clips with note taking. Review each film before moving to the next film.
    - Students will label an aquifer with all of the processes/parts of an aquifer

2. **Part 2: Article Reading and Notetaking**
    - Students will read the article and create an 8 box foldable. They will use the headings from the article for the topics of each box and fill in the main ideas. Near the end of the class, the teacher will review the foldable and the class will discuss what they put in each box.

3. **Part 3: Create Plans to Reduce Water Pollution into Florida Aquifer**
    - Using handout, students will work in a small group or with a partner to create a plan. The plan should have explanations as to why parts are included. Students will present their plans to the class.

Student Activity Sheets and Assignments

Included with this Activity

- Stormwater Aquifer Plan Worksheet

UF CPET

FFL Principle 8- Reduce Stormwater Runoff
Stormwater Aquifer Plan Worksheet

Name: _____

Group Members: _____

Date: _____

Scenarios- please circle your scenario!

1. You are a homeowner in a residential area.
2. You are a farmer/rancher with 100 acres.
3. You are a landscaper with 50 customers.
4. You are a plant manager at a school.

Answer the following questions as a group. Reminder: Your group will be presenting your answers to the class!

1. What are your potential waterway issues, particularly those that will go to the Florida Aquifer? (list at least 3)

2. What are some solutions? Please brainstorm multiple solutions.

3. How do your solutions help protect our aquifer?

4. Pick one solution and explain the pathway to the Florida Aquifer.

Florida-Friendly Landscaping™ Program

Principle 9:

Protect the Waterfront (1)

High School

Published on **August 8th, 2025**

About This Activity

Title: Protect the Waterfront

Subject, Grade, Level:
High School Science

Abstract:

This interactive high school lab explores Florida-Friendly Landscaping™ Principle 9: Protect the Waterfront by engaging students in a hands-on erosion simulation. Through inquiry-based learning and real-world applications, students investigate how slope and various ground covers (bare soil, grass, mulch, rocks) affect soil erosion and runoff. By simulating rainfall over mini-landscapes and analyzing resulting water clarity and sediment loss, students collect, compare, and interpret data to evaluate the environmental impact of different landscaping strategies. Aligned with state science standards, the lesson emphasizes the relationship between human land-use practices and waterfront ecosystem health. Students apply their findings to propose erosion-reducing landscape designs that support sustainability and water quality, fostering critical thinking and environmental stewardship.

Learning objectives:

At the conclusion of this activity, participants will be able to:

1. Analyze how different landscaping methods and slope angles influence soil erosion and runoff, and apply Florida-Friendly Landscaping™ principles to design strategies that protect waterfront ecosystems.
2. Identify the causes and effects of soil erosion near waterfronts.
3. Describe how slope angle affects the rate of erosion and runoff.
4. Compare how different ground covers (bare soil, grass, mulch, rocks) impact erosion control.
5. Analyze experimental data to evaluate the effectiveness of various landscaping materials in preventing erosion.
6. Apply Florida-Friendly Landscaping™ principles to design a strategy that protects waterfronts from erosion.

Author: Kristen Brown
Williston Middle High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.E.6.6	Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.
SC.912.L.17.11	Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, and food.
SC.912.L.17.2	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.
SC.912.L.17.18	Describe how human population size and resource use affect environmental systems.
SC.912.N.1.6	Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Timeframe:

This activity is designed to take approximately 1 to 2 hours of class time (1-2 class periods).

List of Materials

- Aluminum baking pans or plastic trays
- sand or bare soil
- grass sod or turf samples
- mulch or coconut coir
- rocks/gravel
- books or blocks (to create slopes)
- protractor (to measure slope angle)
- Spray bottles or cups of water
- colored dye (food coloring)
- Data collection sheets
- rulers
- paper towels (for cleanup)
- Paper or way to collect conclusions

Important Note:

The activity will take place in the science classroom or an outdoor covered area where tables are available. Students will work in groups of three to four to encourage collaboration and discussion. Before class begins, trays will be prepared with soil or sand and different ground cover options, or students can help set these up at the start of the lesson. Blocks or books will be arranged to create various slope angles for each group's trays. Water bottles with dyed water will either be prepared in advance or students will be provided with food coloring to add themselves. The entire activity is expected to take about 50 to 60 minutes. Students will be reminded to handle water carefully to avoid spills, and paper towels will be available for cleanup.

Extension/Introduction:
Have a IFAS Environmental Science representative come in to talk.

Procedure and General Instructions (for instructor)

Introduction

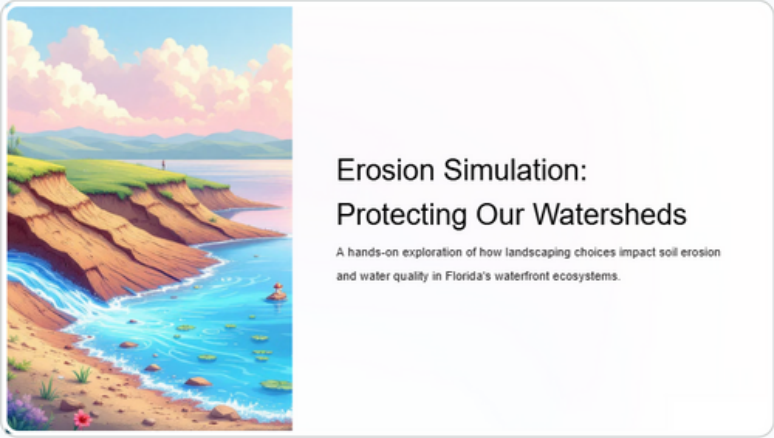
1. **Set Up Your Mini-Landscapes:**
    - Fill each tray with soil or sand to create different "landscapes." Prepare variations with different ground covers: bare soil, grass sod, mulch, and rocks. Adjust the trays to different slopes using books or blocks.
2. **Simulate Rainfall, Waves, or Wind:**
    - Slowly pour a measured amount of water (using spray bottles or cups) over each landscape to simulate rainfall and runoff. Add a few drops of colored dye to the water to visualize runoff flow and sediment.
3. **Observe and Record:**
    - Watch how the water flows over each landscape and note any erosion (soil washed away) and water clarity in the runoff. Record the amount of soil lost (estimate), runoff speed, and turbidity for each setup on your data sheet. Measure amount of erosion.
4. **Compare Results:**
    - Discuss with your group how slope and ground cover affected erosion and runoff. Identify which ground covers best prevent soil loss and why.
5. **Draw Conclusions & Apply:**
    - Use your observations to explain how landscaping choices protect waterfronts from erosion.

Student Activity Sheets and Assignments

Included with this Activity

1. Power Point
2. Erosion Simulation Worksheet

Included Slides:



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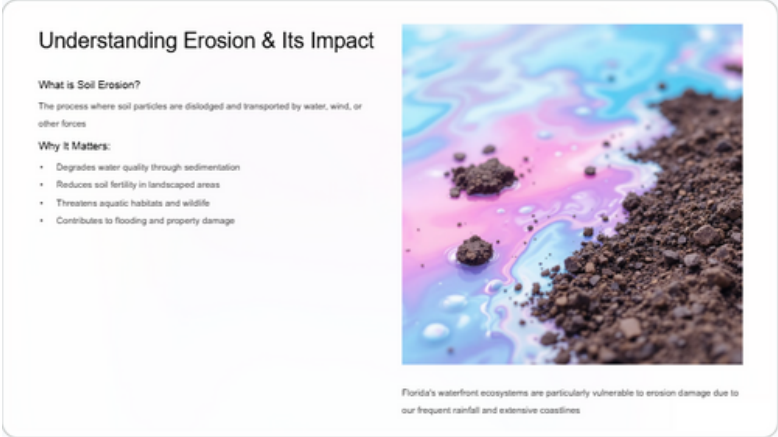

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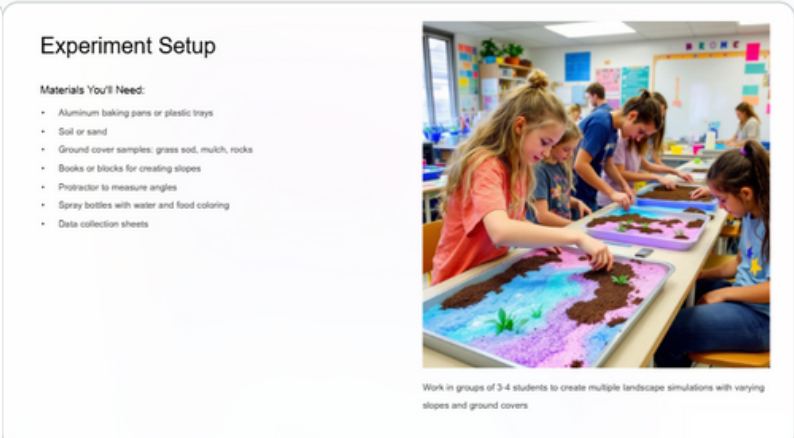


4

Conducting the Experiment

Set Up Landscapes

Fill trays with soil and apply different ground covers (bare soil, grass, mulch, rocks). Use books to create various slope angles.

Simulate Rainfall

Use spray bottles with colored water to create consistent "rainfall" on each tray. The dye helps visualize water movement.

Observe & Record

Document erosion patterns, runoff speed, water clarity, and soil displacement for each landscape setup.

Analyze Results

Compare data across different slopes and ground covers to determine which combinations best prevent erosion.

5

What to Look For & Measure

Key Observations:

Soil Loss	Estimate amount of displaced soil
Runoff Speed	Time how quickly water moves
Water Turbidity	Note clarity/cloudiness of runoff
Erosion Patterns	Document where and how soil moves

The colored water makes it easier to track water flow paths and identify areas where erosion is most severe

6

Your Final Challenge

Assessment Options:

1. Complete lab report analyzing experiment results
2. Design a landscaping plan for a Florida waterfront property that minimizes erosion
3. Write a scenario applying Florida-Friendly principles to a real-world erosion problem

Your work will demonstrate your understanding of how landscape design choices impact watershed health and water quality

An IFAS Environmental Science representative may visit our class to discuss real-world applications of these principles and career opportunities in environmental protection!

8

Florida-Friendly Landscaping Principles

Right Plant, Right Place

Select plants adapted to Florida's climate and specific site conditions that require minimal water, fertilizer and pesticides

Mulch Matters

Apply 2-3 inches of mulch to retain moisture, prevent erosion, and reduce weeds while improving soil structure

Buffer Zones

Create planted areas between lawns and waterways to trap and filter pollutants before they reach water bodies

Manage Yard Waste

Recycle yard waste through composting or proper disposal to prevent nutrient runoff into waterways

Apply these principles when designing your erosion control strategy in the final assessment

7

Erosion Simulation Worksheet page 1:

UF|CPET

FFL Principle 9- Protect the Waterfront
Erosion Simulation Worksheet

Names: _____

Date: _____

Class/Period: _____

Guiding Questions

What causes soil erosion, and why is it harmful to water ecosystems?

How does slope angle affect erosion and runoff?

Which ground covers are most effective at protecting waterfronts?

Materials (Per Group)

4 trays/pans	Paper Towels
Sand or Soil	Grass Sod, Mulch, Rocks/Graven
Books/Blocks (to create slope)	Spray bottle or cup of water
Ruler and Protractor	Optional (food coloring)

Procedure

1. **Set Up Landscapes:** Prepare 4 trays with soil. Leave one tray with *bare soil*, and cover the others with *grass*, *mulch*, or *rocks*.
2. **Adjust Slopes:** Prop up trays at different angles (flat, 15°, 30°). Measure with a protractor.
3. **Simulate Rain:** Slowly pour or spray the same amount of colored water over each tray to simulate rainfall.
4. **Observe and Record:** Watch for erosion and collect runoff (if possible). Note how fast water moves, how much soil is displaced, and how clear the runoff is.
5. **Clean Up:** Carefully dispose of materials and clean your space.

Kristen Brown, Williston Middle High School
Edited by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Erosion Simulation Worksheet page 2:

Data Table

Tray #	Ground Cover	Slope Angle	Soil Loss (Low-Med-High)	Water Clarity (Clear-Cloudy-Muddy)	Runoff Speed (Fast-Slow)
1	Bare Soil				
2	Grass				
3	Mulch				
4	Rocks				

Analysis Questions

1. Which ground cover resulted in the most erosion? The least?

2. How did slope affect the amount of erosion and runoff?

3. Why is erosion a problem for water quality and aquatic life

4. What Florida-Friendly Landscaping practices could help prevent this erosion?

5. Based on what you observed, how would you design a landscape to protect a Florida waterfront property?

Conclusion / Real-World Application

Write a short paragraph explaining how your experiment helps people make better landscaping choices to protect Florida's waterways.

Kristen Brown, Williston Middle High School
Edited by Morgan Nielsen, Center for Precollegiate Education and Training, University of Florida

Florida-Friendly Landscaping™ Program

Principle 9:

Protect the Waterfront (2)

High School

Published on **August 8th, 2025**

About This Activity

Title: Protect the Waterfront- Waterfront Health Check

Subject, Grade, Level:
High School Science

Abstract:

This high school outreach lab, Waterfront Health Check, designed by Hazel Mucherera from Edgewater High School, engages students in evaluating and protecting waterfront ecosystems through the lens of Florida-Friendly Landscaping™ (FFL) Principle #9: Protect the Waterfront. Over two class sessions (100 minutes total), students explore the ecological functions of shoreline environments, assess human impacts such as runoff and eutrophication, and apply sustainable landscaping strategies. Activities include a runoff simulation, visual analysis of shoreline health, and a hands-on design challenge to rehabilitate a degraded waterfront site. The program culminates in student-developed case studies linking lifestyle choices to water conservation. Formative and summative assessments measure understanding and encourage personal action toward environmental stewardship.

Learning objectives:

At the conclusion of this activity, participants will be able to:

- Explain the ecological importance of waterfront ecosystems in maintaining environmental balance.
- Analyze the role of vegetative buffers in reducing nutrient run off and preventing eutrophication.
- Predict the consequences of common landscaping practices on freshwater ecosystems.
- Apply Florida-Friendly Landscaping™ (FFL) Principle #9 to recommend sustainable shoreline strategies.
- Develop a case study demonstrating how lifestyle changes reduce water pollution in waterfront ecosystems

Author: Hazel Mucherera
Edgewater High School
Edited by Morgan Nielsen, UF CPET

This curriculum was created during the 2025 University of Florida Center for Precollegiate Education and Training (CPET) Environmental Science Summer Program, funded in part by the U.S. Environmental Protection Agency and the Bingham Environmental Education Foundation and developed in collaboration with the UF/IFAS Florida-Friendly Landscaping™ Program.

Learning standards:

SC.912.L.17.20	Explain how human activities can impact the environment and the importance of sustainable practices in conserving natural resources.

Timeframe:

This activity is designed to take approximately 100 minutes of class time, plus time for case study development.

List of Materials

- FFL Handbook extract on Principle #9 Slide show Photos of waterfronts
- Trays
- Soil
- Grass
- Mulch
- Spray bottles
- Food dye
- Worksheet: Visual analysis checklist
- Redesign sketch sheet
- Exit ticket prompts
- Case study template

Important Note:

Activity Set-Up:

- Set up runoff trays before class.
- Prep slide deck and FFL principle #9 excerpt.
- Print all student materials: worksheet (1 per student) and case study guide (1 per student).

Logistics: Invite a guest from UF/IFAS Extension (optional) to give a real-world perspective on FFL applications.

Procedure and General Instructions (for instructor)

Introduction

DAY 1

1. **INTRODUCTION (10 minutes):**
    - Deliver a mini lesson on Florida Friendly Landscaping (FFL) Principle #9
    - Define key concepts: buffer zone, runoff, pollutants and eutrophication
    - Show images of healthy versus degraded water bodies

2. **GUIDED DISCUSSION (5 minutes):**
    - “How do landscaping choices near water impact ecosystems?”

3. **ACTIVITY: Runoff simulation (20 minutes):**
    - Run two simulations- tray with grass/mulch (healthy buffer) and a tray with bare soil (poor buffer)

4. **APPLICATION (15 minutes):**
    - Discuss with your group how slope and ground cover affected erosion and runoff. Identify which ground covers best prevent soil loss and why.

Procedure and General Instructions (for instructor) cont.

DAY 2

5. **Bellwork- Review Day 1 Activities (10 minutes)**

6**. Fix the waterfront design challenge (35 minutes):**

- Have student pairs re-design a degraded waterfront scene using notes from FFL Handbook extract on Principle #9. Each pair creates a labeled diagram or sketch of their design showing improvements with short justifications

7**. Exit Ticket /Reflection (5 minutes):**

- Personal action reflection; connection to home/school

8**. HOMEWORK/ASSIGNMENT (7 days):**

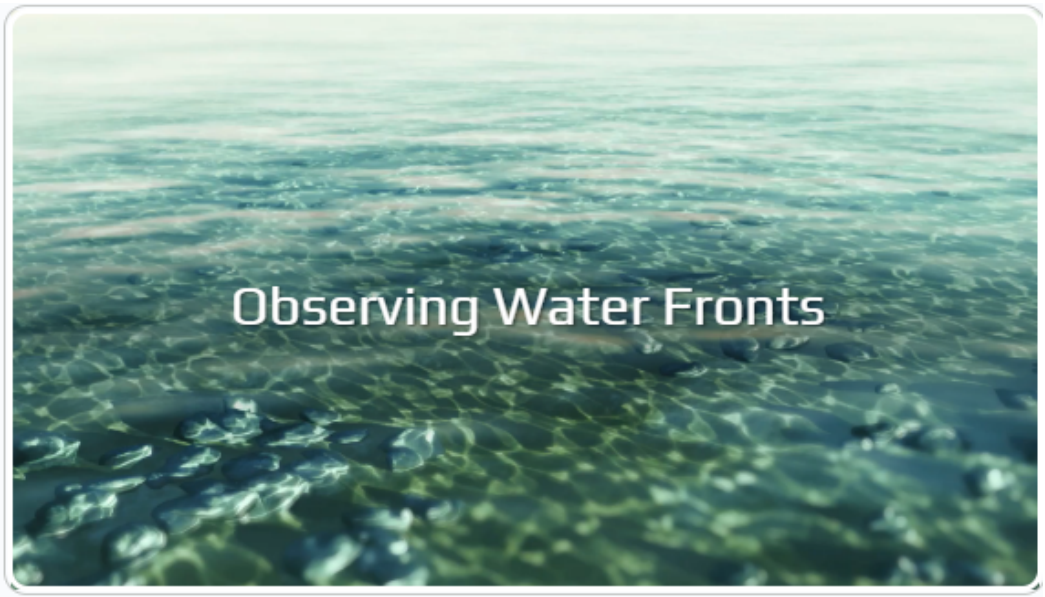
- Case study development

Student Activity Sheets and Assignments

Included with this Activity

1. Power Point
2. Case Study Worksheet

Included Slides:



1

2


Healthy or Degraded?

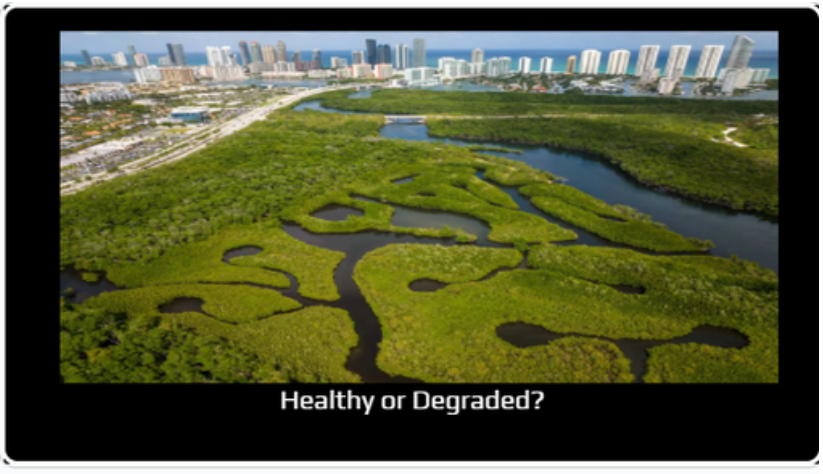
3


Healthy or Degraded?

4


Healthy or Degraded?

5


Healthy or Degraded?

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Case Study Worksheet:

UF CPET

FFL Principle 9- Protect the Waterfront
Waterfront Health Check Case Study

Name: _____

Date: _____

SC.912.L.17.20: Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Case Study Development Task

Title: Lifestyles That Heal the Water

Goal: Investigate a real-world example of how individuals or communities reduced water pollution through behavioral or landscaping changes.

Student Directions:

1. Choose a location in Florida near a lake, river, or coastal area.
2. Identify the environmental issue (e.g., algal blooms, fertilizer runoff, erosion).
3. Describe the actions taken (e.g., rain gardens, fertilizer bans, native buffers).
4. Explain the environmental results (e.g., clearer water, return of aquatic life).
5. Reflect on how this could apply locally.
6. Fill out the following chart and prepare a 2-3 minute video or narrated slideshow with the information.

Chosen Location	
Environmental Issue	
Actions Taken	
Environmental Results	
Reflection & Local Applications	

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