



February: 6-8

Food Plants and Ecosystems

WINTER SQUASH



South Carolina

Farm to School Lessons

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Overview

Welcome to the South Carolina Farm to School February Nutrition Education Lesson. This lesson contains information & hands on activities where 6-8 students will be learning about plants and how components in nature interact with each other in ecosystems. Our goal for this lesson is to help children explore the connection between food production and ecosystems interactions.

These lessons are designed to be delivered over a four week period, noting that introduction & activities will be supplemental to existing curriculum.

Estimated Total time: 70-90 minutes

Teacher Background

Most plants and animals live in areas with very specific climate conditions, such as temperature and rainfall patterns, that enable them to thrive. Any change in the climate of an area can affect the plants and animals living there, as well as the makeup of the entire ecosystem. Some species are already responding to a warmer climate by moving to cooler locations. For example, some North American animals and plants are moving farther north or to higher elevations to find suitable places to live. Climate change also alters the life cycles of plants and animals. For example, as temperatures get warmer, many plants are starting to grow and bloom earlier in the spring and survive longer into the fall. Some animals are waking from hibernation sooner or migrating at different times, too.

Plants and animals have adapted to changes in the environment for millions of years. However, today's changes are happening faster and on a larger scale than in the past, which makes it difficult for plants and animals to adapt. Changes in climate can affect the types of plants that can grow in an area. Animals' food supplies, water, life cycles, breeding habits, and ranges will be affected, too. Some animals will adapt to changing conditions or move elsewhere, but others could have trouble surviving. Some unwelcome invaders (invasive species) could benefit from climate change by expanding their range or being able to survive through the winter in new places. All these changes will affect the way ecosystems function, and changes to ecosystems affect people, too. That's because we rely on ecosystems to provide us with many services, like clean water, food, and medicines.¹

It is easy to forget that food is a product of ecosystems. We usually purchase it in supermarkets and restaurants, where it bears little resemblance to the original plant or animal. Yet, without sunlight, soil, water, plants, and animals interacting in an ecosystem, we would have no food. Food gives us the energy we need to stay alive, grow, and reproduce, and we can get this energy only from other organisms. Although the sun emits enormous quantities of radiant energy every day, our bodies cannot use it directly. Instead, we rely on plants to convert it to chemical energy (food) through photosynthesis. This energy may then pass through a food chain to us. Photosynthesis, pollination, predation, decomposition, the cycling of nutrients, and water are all involved in creating our food.

Although farms and gardens depend on ecosystem processes, they are different from natural ecosystems. Natural ecosystems contain plant and animal populations interacting in balance with one another and nonliving things, and can sustain themselves over time. In farms and gardens, people plant seeds, add water, amend the soil, weed, and remove pests to increase production, all of which can affect both balance and sustainability.

As seen in Nourish, these human impacts are often far-reaching, especially with industrial agriculture. For example, pesticides and fertilizers applied to industrial farms in the Midwest have created a dead zone—where almost nothing can live—thousands of miles away in the Gulf of Mexico.²

¹ Adapted from: A Student's Guide to Global Climate Change (<http://www.epa.gov/climatechange/kids/impacts/effects/ecosystems.html>)

² Adapted from: Nourish Life (http://www.nourishlife.org/pdf/Nourish_Curriculum_Guide.pdf)

Lesson checklist



F2S Aim: Explore the connection between food and ecosystems interactions.

F2S Objectives

Students will be able to:

- * Explain the term "ecosystem".
- * Discuss the role that plants play in nature (food chains, food webs, ecosystems).
- * Demonstrate understanding of the components and interactions of an ecosystem (i.e. process of food production).
- * Observe components and interactions of a local ecosystem (i.e. school garden).
- * Taste the Palmetto Pick of the Month (winter squash).



Materials:

- * Copies of ecosystem hunt worksheet (Appendix A)
- * Farm to School Planting Sheet (Appendix B)
- * Plant Guide (Appendix C)
- * Winter Squash Power Point (Appendix D & will be sent electronically)
- * Pencils or clipboards
- * Index cards or rings
- * References materials of ecosystems
- * Grocery list: 1 spaghetti squash, olive oil, parmesan cheese
- * Kitchen Supplies: cutting board, knife, oven mitts, fork, paper plates & forks to serve/ eat squash
- * Gardening Journal
- * Family Activity Sheet (Appendix E & in Dropbox)
- * Copies of the February Farm to School Lesson Assessment (in Dropbox)



National Health Education Standards

1.8.1 2.8.4 2.8.5 7.8.2 8.8.3

SC State Standards

Science 7-4.1	Summarize the characteristics of the levels of organization within ecosystems (including populations, communities, habitats, niches, and biomes).
Science7-4.2	Illustrate the energy flow in food chains, food webs, and energy pyramids.
Science7-4.3	Explain the interaction among changes in the environment due to natural hazards, changes in populations and limiting factors.
ELA 7-6.2	Use direct quotations, paraphrasing, or summaries to incorporate into written, oral, auditory, or visual works the information gathered from a variety of research sources.
ELA 7-6.4	Use vocabulary (including Standard American English) that is appropriate for the particular audience or purpose.
ELA 7-6.6	Select appropriate graphics, in print or electronic form, to support written works, oral presentations, and visual presentations.

Lesson Essential Components

Lessons profile	Page(s)	Yes	No	Notes
Palmetto Pick of the Month	9-10	★		Tasting activities with spaghetti squash
Health Education Standards	8-10	★		
SC-Cross Curricular Standards	8-10	★		
SC-F2S Behavioral Goals	8-10	★		
Cooking Activities	9-10	★		
Tasting Activities	9-10	★		
Physical Activity	8-9	★		Team Project at the School Garden
Food Safety	9-10	★		
School Food Garden	8-9	★		
Student to Farmer Connections (i.e. field trips, talks)	8-9	★		
Student to Chef Connections			★	
Farm to Cafeteria			★	
Provision of scientific knowledge/rationale	8-10	★		
Risk and benefits about healthy behaviors	16	★		Benefits of Winter Squash
Obstacles, Barriers & Solution			★	
Family involvement and other supports		★		Family Activity Sheet
Set goals and monitoring progress			★	
Other hands on activities:	8-10	★		Team projects

Let's Learn!

What is an ecosystem?¹

Estimated Time: 15 minutes

1. Review with the students what they have learned about food chains (This topic was introduced in the “November Farm to School Lesson: All about Food Plants”).
2. Point out that most often when we imagine a food chain, we are thinking about one that includes green plants and animals that depend on these plants. If necessary, review the plant parts (roots, stems, leaves, flowers, fruits, and seeds) learned in the Farm to School November lesson.
3. Next introduce the concept of ecosystem with the following discussion questions:
 - Can anyone tell me what an **ecosystem** is?
 - What is the difference between a **food chain** and an ecosystem?
 - What elements make up an ecosystem?
 - Can anyone think of interactions that take place in an ecosystem that make it possible for an organism to survive?
 - What are some of the living or **biotic**, factors in a field ecosystem?
 - What are some of the nonliving or **abiotic**, factors in a field ecosystem?
 - What other conditions affect plant life? (weather, temperature, water)
 - Can you think of a plant and some of the conditions it needs to be able to survive and grown in an ecosystem? If these conditions don't exist, what happens to the plant?
 - What are the conditions that change in the spring, summer, fall and winter? Do these conditions affect the plant life? How?
4. If students are struggling with the concepts of ecosystem, biotic and abiotic interactions, you may wish to review these terms as a class.

Activity

Ecosystem exploration project²

Estimated Time: 25 minutes

1. Challenge your students to assess ecosystem components and interactions in the school garden.
2. Give students copies of the **Ecosystem Hunt** worksheet (Appendix A). Review the terms and have students provide some possible examples for each. Also review expected behavior for working outside.
3. Take the class to the garden and have students work in pairs to conduct the hunt. As they are working, circulate among them to check in on their findings and to answer any questions.
4. Bring the group together, and ask pairs to share some of the evidence they have collected. Discuss what they learned from the hunt:
 - What evidence did you find for the various ecosystem components and interactions?
 - In what ways do garden plants—and people—depend on each of these elements?
 - Considering the evidence, how healthy would you say this garden ecosystem is?
 - How is the garden ecosystem different from a natural ecosystem?
 - How do growing food and raising livestock affect the surrounding ecosystem?
 - If we were to conduct the same hunt on an industrial farm, what differences might we observe?
5. Explain to students that they will use their evidence from the hunt to create an illustrated, self-guided tour of the garden for faculty, staff, students, and visitors, emphasizing its similarities to a natural ecosystem. The tour may consist of cards on a ring or a booklet, with each card or page focusing on one of the ecosystem components. You may choose to have students work in groups or individually.
6. Make clear that for each component, students should include the name of the component or interaction, add a brief description of what it is and where it can be found in the garden, and illustrate it with a garden example. The first card or page should also provide a brief overview of the garden as an

ecosystem. Have reference materials on hand so that students can refer to them as they create their tours.

7. After they have completed their tours, give students an opportunity to share them with other students in the school.

☆ Gardening Activity

Preparing the Spring Garden

Estimated Time: 15-30 mins

Materials Needed:

Farm to School Planting Sheet (Appendix B)

Plant Guide (Appendix C)

Note: This activity is designed to help the school prepare for Spring planting in their Farm to School raised beds/in-ground gardens. Because schools are implementing lessons at different levels, please consult with the Farm to School Team at your school about the direction the school would like to take for planting the garden before doing this activity.

1. Review with the class the purpose of the school garden.
2. Explain the purpose of this activity is to design how the school garden will be planted. Take a few minutes to watch the following video:
<http://www.youtube.com/watch?v=a-WMWIS12s>
It will discuss considerations when designing your garden such as water and sun access.
3. Next, review the produce that grows successfully in SC in the Spring. See Appendix C for more information. Decide which plants you would like to grow. Remember to look at the plants that will be most successful in your region of the state. For additional information about growing in SC regions, please visit <http://www.clemson.edu/extension/hgic/plants/vegetables/gardening/hgic1256.html>.
4. Use the **Farm to School Planting Sheet** (Appendix B) to design where your seeds/plants will be planted in your raised beds. Think about height of plants, width of plants, varieties of plants, etc. Do not forget to visit your raised beds with your students and take pictures of the raised beds prior to

planting. Have your students envision how the garden will look. Have them record in their garden journal predictions on how quickly the plants will grow. Monitor this and write about it throughout the Spring till harvest.

You can also divide the class into groups and each group will monitor and journal about different aspects of the school garden. Groups can journal about how each of these affect the garden: weather, sun, water/rain, etc.

☆ Palmetto Pick Activity

Noodle Mania!

Estimated Time: 15-20 mins

1. Have students wash their hands (with soap & warm water for 20 seconds) & reinforce that it is important. Show the students that you have washed the spaghetti squash before beginning.
2. Display the **Winter Squash** power point (will be sent electronically-Appendix D) while you are preparing the spaghetti squash.
3. Cut spaghetti squash in half. Scrape out the seeds or select two-three students to help scrape out the seeds.
4. Steam the squash in the microwave, rind side up, for six to eight minutes. *Be careful removing the squash, it will be hot. Wear oven mitts.
5. Separate strands with a fork. When finished, toss with olive oil and parmesan cheese.
6. Serve a 1 oz. portion for each student to taste.

Ingredients:

1 spaghetti squash
Olive Oil (to taste)
Parmesan Cheese (to taste)

Encourage students to discuss the “noodles” of the spaghetti squash. Record on the board some of their perceptions of the spaghetti squash:

- Did it taste like they thought it would taste?
- Does it taste like noodles?
- Is it fun to eat like spaghetti?

Note: One spaghetti squash should yield roughly 40 oz. of “spaghetti”. If you are serving more than 30 students, add additional spaghetti squash. The squash will be very hot, please use caution and wear oven mitts. Spaghetti squash are hard, you may want assistance in cutting the squash and/or you may want to have it cut before you begin the PPM Activity.

Evaluation

Formal Assessment:

1. Use students’ self-guided tour to assess the various ecosystem components and interactions in the garden. As an alternative assessment, students could create a poster showing the components and processes of the ecosystem as a whole.

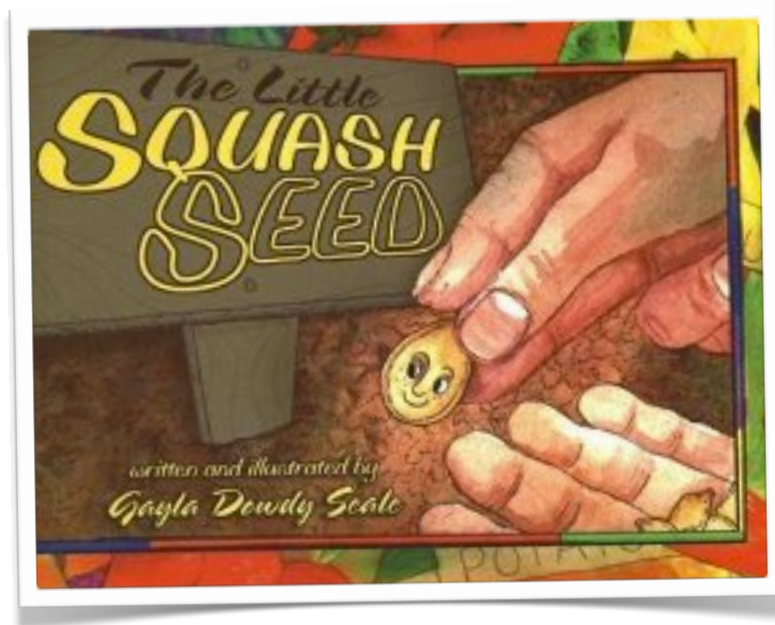
2. **Optional resource:** Administer the **Farm to School February Lesson Assessment** to your students (the electronic copy is in Dropbox). If you decide to use this assessment with your students, please let us know because we would like to summarize any information collected.

Informal Assessment: Observe participation in lesson activities. Complete survey at end of month (survey will be sent electronically).

¹ Adapted from Koch P.A., Barton A.C., Contento I.R. (2007). Growing Food: Lesson 11 Webs of Interaction. Teachers Columbia University & the National Gardening Association, New York, NY.

² Source: Center for Ecoliteracy (2010). What’s the Story of your Food? A Middle School Nourish Curriculum Guide. Activity 4: Food and Ecosystems. Worldlink Initiative. www.nourishlife.org

Resources



Books:

Koch P.A., Barton A.C., Contento I.R. (2007). Growing Food. Teachers Columbia University & the National Gardening Association, New York, NY.

The Little Squash Seed by Gayla Dowdy Seale

Websites:

To request nutrition education materials visit the Clemson University Nutrition and Resource Center (NIRC): www.clemson.edu/nirc

Nourish Curriculum Guide: www.nourishlife.org/pdf/Nourish_Curriculum_Guide.pdf

Discovery Education: Ecosystems-Lesson Plan for 6-8 graders:

<http://www.discoveryeducation.com/teachers/free-lesson-plans/elements-of-biology-ecosystems-organisms-and-their-environments.cfm>

Appendix A (Pages 11-12)

ACTIVITY FOUR
ECOSYSTEM HUNT

Look for two examples or pieces of evidence for each of the ecosystem components below. Describe what you observed and where you observed it.

LIVING COMPONENTS	EXAMPLE 1	EXAMPLE 2
Producers Organisms that get energy by changing light into chemical energy, producing food		
Primary Consumers (Herbivores) Organisms that get energy and nutrients by eating parts of plants		
Secondary Consumers (Carnivores) Organisms that get energy and nutrients by eating parts of animals		
Decomposers Organisms that get energy by breaking down dead organic material, which is then recycled into the soil as nutrients		
NON-LIVING COMPONENTS		
Energy Sources of energy for living organisms		
Soil Substrate or source of nutrients for living organisms		
Organic Matter Dead plant or animal material that is now leaf litter or soil particles		

PROCESSES

Photosynthesis
Chlorophyll in green plants turning light energy into chemical energy to make food

Cycle of Nutrients
Nutrients passing from one organism to another through eating, decomposition, or through plant roots

Decomposition
Rotting or decaying once-living things which release nutrients into the soil

Web of Life
Energy and nutrients passing from one organism to another through the food chain or predator-prey relationships

Pollination
Transferring of pollen from one plant flower to another by organisms (bees, birds, etc.) or wind

	EXAMPLE 1	EXAMPLE 2

Appendix C

What to Plant

Seeds can be started indoors between January and February and will need to be transplanted to your garden at a later time. Some vegetables, however, can be planted straight from the seed such as beans, beets, cantaloupe, carrots, corn, cucumbers, lettuce, okra, peas, pumpkins, and spinach. If you choose to grow vegetables that you will be able to harvest in a short amount of time, lettuce can be grown in 25 days and radishes can be grown in 45 days. Beets, broccoli, beans, or spinach will mature in 50 days. Additional vegetables and their corresponding planting ranges are listed in the following tables:

Warm Season Vegetables – Plant these in the spring to harvest before school is out for summer

Plant varieties	When to plant	Days to maturity from seed
Cantaloupe	Late March – Early May	30-35
Cucumbers	Late March – Early May	50-70
Eggplant	April – May	65-80
Southern Peas	April – May	65-125
Okra	April – Mid-May	60-70
Peppers	April – May	70-85
Sweet Corn	March – April	80-95
Squash	April – Mid-May	55
Tomatoes	April – May	55-105
Beans	Late March – April	55

Cool Season Vegetables – Plant these vegetables in the fall to harvest before winter break

Plant varieties	When to plant	Days to maturity from seed
Cabbage	Early August	60-80
Carrots	Early August	65-75
Collards	August	70
Lettuce	Late August	55-75
Radishes	September - November	21-28
Spinach	Late Sept – Early Nov	37-45
Beets	Early August	50-70
Broccoli	August - Early September	65-70
Cauliflower	Early August	60-70
Turnips	September – Early October	50-60

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For more information, visit <http://agriculture.sc.gov/schoolgardens>.

Appendix D
Winter Squash Power Point
(will be sent electronically at Dropbox)

<p>PALMETTO PICK OF THE MONTH</p>  <p>WINTER SQUASH (JANUARY)</p> <p><small>Adapted from www.freshfromflorida.com</small></p>	<p>Reason to Eat Winter Squash</p> <ul style="list-style-type: none">• Excellent source of Vitamin A• Excellent source of Vitamin C• Good source of fiber• Healthy vision• Healthy immune system• Strong bones & teeth	<p>Winter Squash Varieties</p> <ul style="list-style-type: none">AcornButternutButtercup or TirbanHubbardSpaghetti
<p>ACORN SQUASH</p> 	<p>BUTTERNUT SQUASH</p> 	<p>BUTTERCUP SQUASH</p> 
<p>HUBBARD SQUASH</p> 	<p>SPAGHETTI SQUASH</p> 	<p>FAMILY ACTIVITY...</p> <p>Go to the grocery store with your parents and identify all of the different varieties of winter squash. Do a price cost comparison. What are the most and least expensive varieties?</p>