

Lesson: Sustainable Table

*Arlington Echo works to continuously improve our lessons. This lesson may be modified over the course of the school year.

Environmental Literacy Question: How have humans affected the Chesapeake Bay and its watershed?

Topic/Essential Questions: How can we reduce our energy use and help the environment?



Content Standards:

- **Environmental Literacy**

5.B.1. *Analyze*, from local to global levels, the relationship between human activities and the earth's resources.

1.B.1: Use recommendation(s) to *develop* and *implement* an environmental action plan.

f. *Recognize* and *explain* that activities and technology of the human species have a major impact on other species in many ways such as: Destruction of habitats through direct harvesting, pollution, atmospheric change (*and erosion*).

5.A.2. Analyze the effects of human activities that deliberately or inadvertently alter the equilibrium of natural processes.

8.A.1. Understand and apply the basic concept of sustainability to natural and human communities.

- **Science**

5.A.1. Analyze the effects on human activities on earth's natural processes.

- **Social Studies**

3.D.1. *Describe* how people adapt to, modify and impact the natural environment

b. *Describe* ways and reasons people in Maryland and the United States modify the natural environment and the consequences of modifications.

- **Common Core State Standards**

CCSS.ELA-Literacy.RI.4.7 *Interpret* information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

Lesson Sequence: This lesson is one of the lessons for Q3 and Q4 at Arlington Echo Outdoor Education Center. This lesson's focus is on decreasing negative environmental impacts of agriculture and eating habits by encouraging sustainable practices such as eating local, seasonal, whole, and organic food.

Length of Lesson:

50 minutes for 6 way overnight programs;

35 minutes for day programs and 9 way overnights.

Student Learning Outcome: The students learn that the food we eat plays an important role in determining the size of our environmental footprint. They will also determine how different farming, shipping and production practices affect energy usage. They will follow a recipe to prepare a simple snack using low environmental impact whole ingredients.

Knowledge of the Learner

- Prerequisite knowledge, skills and processes: Students will complete one lesson in school.
- Student needs, interests, previous learning: Conduct pre-assessment to see level of prior knowledge and address any special needs of students that might need modification.
- Conceptual difficulties: relating production, farming practices, and cooking practices to the cost and ecological impact of food.
- Differentiation: Students are 4th graders, with a diversity of backgrounds and skill levels.

Knowledge of the Content

Vocabulary: (Supplement A)

Blight	Habitat	Preservatives	Sustainable
Compost	Local/Seasonal	Pollinator	Symbiotic
Crop Rotation	Monoculture	Polyculture	Watershed
Fertilizer	Organic		

Materials:

Cutting boards	Felt board
Recipe sheets	Story book
Processed food containers	How to read a label poster
Plastic food	Bicycle information poster
Whole food and other ingredients in recipe	US produce map poster
Knives	Carbon produced from food production poster

Supplements:

- A: Vocabulary
- B: Estimated Carbon released from food production
- C: Food Impact Chart
- D: Recipe plan for of 2017-18
- E: Sustainable Farming Activity
- F: Who can? We can!

Lesson Setup

- Have food containers ready to pass out to students for them to read the labels.
- Ensure that all ingredients and supplies are ready for making the recipe for the day.

Instructional Delivery

Engage: Pass the Energy (5 mins)

Weather permitting, this should be done outside behind the dining hall.

1. Have all the students hold hands in a circle*.
2. Looking up into the sky, ask the students the following questions:
 - **“Where does all energy on earth comes from?”** (*The Sun!*)
 - **“What kind of organisms on earth soak up that energy and make food out of it?”** (*Plants!*) **“And what is that process called?”** (*Photosynthesis!*)
 - **“Plants are then eaten by what?”** (*Animals!*)
3. Explain that these animals are eaten by more animals that spreads the energy throughout the food web.
4. Tell the participants that we will now demonstrate the transfer of energy throughout the food web by “passing the energy” from the sun around the circle. Pick a volunteer to be the first one to pass the energy by gently squeezing the hand next to them**. Tell the students that as soon as they feel a squeeze, they should **gently** squeeze their other hand to keep passing the energy around the circle. Once the person that started the squeezing gets a squeeze we know that the energy has gone all the way around the circle. If time permits and the participants want to see how fast they can do it you can do it again and time it.

***If participants are adverse to holding hands please have an adult stand between the students that do not want to hold each other’s hands this often occurs between male and female students.**

**** If you notice that the students are squeezing the hands to hard and causing the other participant to be in pain, please ask everyone to drop hands and review the expectations that we will be gently squeezing hands.**

Explore: Reading Labels (5 mins)

[OVERNIGHT 6-WAY ROTATIONS ONLY]

Weather permitting, this should be done outside at the picnic table behind the dining hall.

1. Ask: **“What does it mean to be sustainable?”** (*To be sustainable is to be able to maintain what you are doing. For example, if you were running at a sustainable pace, that means that you could keep running at that pace for a long time.*)
2. Pass out the packages of processed and whole foods.
Demonstrate where the students can find the ingredients list on the food labels.
3. Ask the students the following questions:
 - **“Does anybody have a food without a label?”** (*These foods are called whole foods.*)
 - **“Does anybody have a ‘food’ with 5 or more ingredients?”** (*It is a general rule that the less processed a food is, the better it is for you and for the earth. Usually more ingredients means that it is more processed. The more processed a food is, the more energy it takes to make it.*)
 - **“Are there any ingredients that you cannot pronounce or that you have no idea what it is?”** (*In order to prevent foods from spoiling during long distance transport and to prolong shelf life, manufacturers often use chemicals or preservatives to keep our food fresh. Some of these ingredients are not actually food, and are not healthy for us or for the environment.*)
 - **“Are all whole foods healthy for the earth?”** (*No – it depends on how they are produced. Even fruits and vegetables, which are whole foods, can have negative impacts on the environment. In order to make fruits and vegetables look attractive, and to get the most as possible from their plants, farmers*

may use pesticides and chemicals on their crops. These chemicals can negatively affect us when we eat the food and negatively affect the environment when it rains and they end up in our waterways. Many times, food products that do not look the way that consumers expect them to look are thrown away – this is a waste!)

4. Point out the garden. Ask the students: **“Is eating food grown in a garden sustainable?”** (Yes – if we use sustainable methods to grow the food. We can grow food again next year in the same place if we do it right and keep the earth healthy.)
5. Tell everybody who has a whole food that they will keep it for the next activity. Collect all of the processed food labels except for one. Give a whole food, including meat and eggs, to everybody who does not already have a food.

Explain: Food and Fuel (5 mins)

Weather permitting, this should be done outside at the picnic table behind the dining hall.

1. Ask the students: *“When you eat a salad or bit into a juicy hamburger do you ever wonder how much energy it took to produce the food you are eating? The production and distribution of food in the USA is a major contributor to greenhouse gases such as carbon dioxide and methane.”* Tell them in this activity they will try to make a meal with the smallest environmental footprint. They will do this by making a tray of food that they think would produce the release of the smallest amount of greenhouse gases. Remind them to think about where it might come from, how it is produced, and how much energy it takes to prepare it.
2. Split the group into teams of 3-4. Give them 1 minute to explore and decide what meal you would like to put together. No one is to touch the food during this time for discussion and decision making. After about a minute, give each group a tray that they will use to put together their meal. Each group will form a line facing the food. Have the first person from each group walk up and pick one food for their tray. When they are all done, have the second person from each group pick their food one at a time. Do this until all participants have chosen a food and the groups’ platters are complete.
3. Explain that the production, packaging, and shipping of each food product produces greenhouse gases, such as carbon and methane. Tell the students to arrange the food products that they have chosen in order from the food that they think produces the least greenhouse gases to the food that they think produces the most greenhouse gases.
4. Use the Impact Number chart in Supplement D for each food to calculate the overall Impact Number for their plate.
5. Ask the students: *“What can we do to reduce the amount of energy required to produce the food we eat?”* Here are some ideas:
 - Eat your leftovers
 - Eat less meat
 - Eat less beef
 - Compost
 - Don’t throw away food by the sell-by date
 - Avoid excess packaging, especially plastic and Styrofoam

We know that it is not always possible to buy locally, due to factors including financial restrictions, convenience, seasonal availability, etc. It’s okay that we can’t always go to a farm stand to buy local food, but when possible buying or growing sustainable produce is much better for us and our environment. This is not the only way to be sustainable. Every little step we take makes a big difference!

When you are done, take the student inside or under the pavilion for the culinary part of the lesson.

Elaborate: Culinary Activity (20 mins)

This activity takes place in the upper resource lab on the right side.

1. Have all students wash their hands
2. Explain that today, the students will be preparing a recipe, using mostly whole and local ingredients. (See **Supplement E** to see what you might be preparing on the date of your program.)
3. Have the students look at the recipe and the ingredients. If you need to multiply the recipe, have students do math to get the correct amounts (use measurement conversion charts). Arlington Echo staff will go over the lesson that will be made on your day of program. Make sure that the students are active participants in the process of measuring and making the food.
4. After the recipe is complete, clean up. Compost from peeling or chopping the ingredients goes into a bucket. Explain that when we compost during meal cleanup, Arlington Echo staff adds the compost to the compost bins behind the dining hall and that we use it in the gardens when it is finished.
5. Between lessons, wash materials (if students ate from them) in the Resource Lab sink.

The Story of Bob and Simone – Sustainable Farming Activity (10 mins)

[OVERNIGHT 6-WAY ROTATIONS ONLY]

This activity will demonstrate what it means to be a sustainable farm by exploring different farming practices.

Materials:

Sustainable Farming felt board
Felt board farm pieces
“A Tale of Two Farms” Story
Numbered action cards

Instructions:

1. Keep students seated at the table. Set up the sustainable farming felt storyboard. Explain that the students will use the board to see how various scenarios affect two different farms (Bob’s Farm and Simone’s Farm). If there is time, introduce the activity with the following questions:
 - **“What do we call people who grow crops?”** (*Farmers!*)
 - **“What are we learning about today that may involve farmers?”** (*Food, plants, compost, energy, etc.*)
 - **“Why do we need farmers?”** (*Because they grow the crops that we need to live!*)
 - **“Why should a farmer practice sustainability?”** (*Because we will still need crops far into the future.*)
2. Distribute the numbered action cards to students. Each card corresponds to an action in the story of Bob and Simone. As you read the storybook to the students and come across the actions, announce the action number. The student holding that action number will come to the board, receive the necessary pieces from the instructor, and follow the instructions in the story to place them on the board.

Debrief:

Explain that the goal of the activity is to decide which farm was more sustainable. Ask the students the following questions and let them discuss the answers:

- How did the different events in the story affect the farms? Were there certain events in the story that affected one farm more than the other?
- What were some things that affected the farms that were beneficial? Harmful?
- What are some advantages and disadvantages of each farm?
- Which farm would you consider to be more sustainable?
- Which farm “won” in the end? Let the students debate the answer.

Evaluate: Who Can? (5 mins)

1. Ask students about the benefits of eating local foods. You may guide the discussion using the following questions:
 - **“When we buy foods that are imported across the country, how does that impact our environment?”** (*Uses lots of gas, vehicles emit fumes, food is not as fresh due to long travel times so preservatives must be added, extra packaging is required to travel farther distances, chemicals are used to make produce ripen upon arrival, etc.*)
 - **“What options do we have to get fresh produce?”** (*Buy local produce from store, go to a farmer’s market, grow your own.*)
 - **“Food accounts for 1/3 to 1/4 of our carbon footprint. A lot of the energy that goes into food gets wasted; 27% of the food produced in the United States is thrown away! What can you do at home or at school to make wise food choices to protect the bay and have a Sustainable Table?”** (*Use reusable bags, buy products with less packaging, refuse a bag at the grocery store when not needed, reduce the amount of food waste you make, eat leftovers, do not throw away food by its sell-by date. (all food lasts longer than by the sell-by dates! Fruits and vegetables can last for weeks and meats for days), and teach others what you have learned.*)
2. Ask students to come up with things they can do to help reduce the energy needed to produce our meals. Tell the students each time you say, **“Who Can?”** they are to shout back **“We Can!”** Call on students to say something that they could do to reduce energy costs. After each student shares their idea, shout out **“Who Can?”** (Supplement F).

Supplement A: Vocabulary

Blight: A plant disease characterized by sudden and severe browning, withering, or dying. Typically caused by a bacteria, fungus, or virus.

Compost: The process of using organic food waste to produce nutrient-rich soil.

Crop Rotation: A system of growing different crops one after the other on the same area of land. This process avoids depleting resources in the soil and controls weeds, diseases, and pests.

Fertilizer: A chemical or natural substance added to soil to help the growth of plants.

Habitat: A natural environment suited to specifically support life of the plants and animals living in that area; every habitat must have food, water, shelter, and sufficient space for its inhabitants.

Local/Seasonal: Local and seasonal food is more sustainable because it reduces the need for our food to be preserved, transported long distance, or refrigerated before it ends up on our plate.

Monoculture: The production of one crop.

Organic: Food produced without using any chemical fertilizers, pesticides, or preservatives

Preservatives: Chemicals used to prolong the freshness of certain produce, especially when being transported over long distances.

Pollinator: A pollinator is an animal that causes plants to make fruit or seeds. They do this by moving pollen from one part of the flower of a plant to another part. This pollen then fertilizes the plant. Only fertilized plants can make fruit and/or seeds, and without them, the plants cannot reproduce.

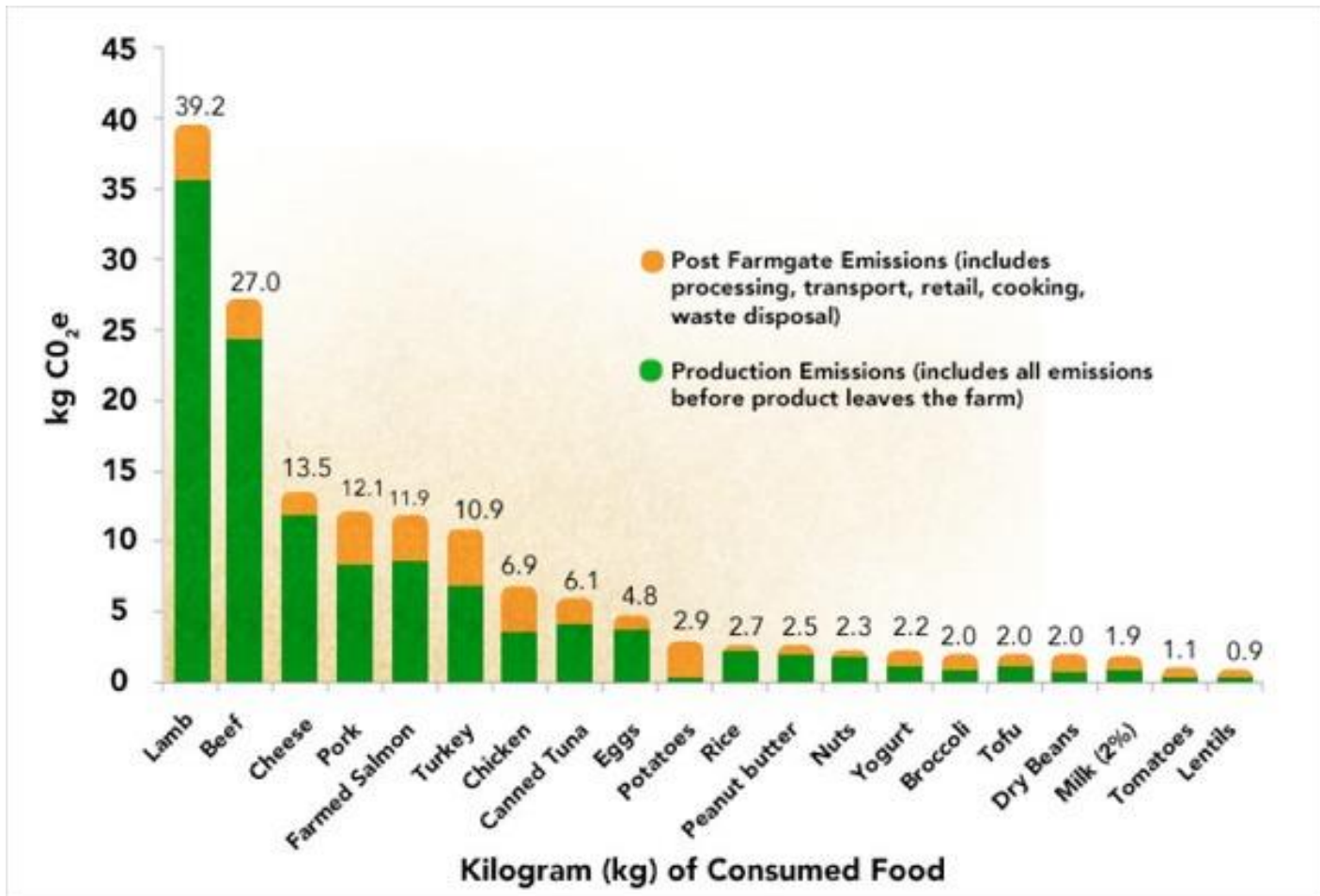
Polyculture: The production of more than one crop.

Sustainable: A way of harvesting a resource so that it is not used up or permanently destroyed.

Symbiotic: A mutually beneficial relationship between two different organisms.

Watershed: An area of land where all water sources flow into a particular body of water.

Supplement B: Estimated amount of Carbon released by the production of different foods



Source: harvard.edu

- Refer to US produce map; point out several examples of where our food comes from, show the labels of packaged food provided, and have students generate ideas about what needs to be done in order to get that food to Maryland. (*Food must be treated with chemicals such as pesticides and preservatives and requires excessive packaging; it needs to be shipped by truck, train, boat or plane, requiring fossil fuels that release more pollution into the air and on the ground. For reference, the distance from the West Coast to the East Coast is about 3,000 miles.*)
- Local seafood is fresh. It never had to be frozen or shipped.
- The higher up the food chain an organism is, the more energy it takes to produce.
- Chicken takes less energy to produce than beef or pork simply because the chicken changes grain into meat more efficiently.
- The pig is more efficient than the cow.
- Processed foods have many ingredients. It would be very difficult and complicated to figure out the amount of energy needed to produce these products. Most of these processed foods contain corn and soy products. Soy and corn are grown on large plots of land and need pesticides, fertilizer, and irrigation to grow. We also would need to account for harvesting, sorting, packaging, and transportation energy costs.
- Cows are very inefficient at producing meat. They use up more energy than any other food product. It takes 1,880 gallons of water to produce one pound of beef. Hamburgers contain meat that has been shipped from all over the country and possibly outside of the country. A single burger can contain meat from as many as 100 cows. Cows are also feed corn, which they do not naturally digest. This causes the cows to release methane gas, which is another greenhouse gas.

Supplement C: Food Impact Chart

Food	Impact #	Basis for number
Steak	30	Steak is made of beef, which comes from cows. Cows are very inefficient in making meat; it takes 6 pounds of feed to make 1 pound of beef. Another reason this number is so high is because most cows today are fed corn. Cows do not naturally eat corn and thus it is difficult for them to digest. This causes the release of methane gas which is a greenhouse gas. Positive: Whole food.
Hamburger	15	(See steak) Hamburgers have a lower impact than steaks because there is less meat in a hamburger. Much of the burger is made up of tomatoes, lettuce, and bread, which brings the total impact number down. The average McDonalds hamburger contains meat from over 100 different cows. Not a whole food.
Hotdog	14	(See steak) Hotdogs are made of beef and other processed food, but contain less meat than a steak. Not a whole food.
Pork Chop	12	Pork comes from pigs. Pigs are more efficient than cows, but they still use a lot of grain to make 1 pound of food. Positive: Whole food.
Sausage (pork)	12	Pork comes from pigs. Pigs are more efficient than cows, but they still use a lot of grain to make 1 pound of food. Sausage is higher than pork chops because it is more processed. Positive: it is a whole food
Shrimp	12	About 95% of the shrimp we get in the USA comes from other countries such as India, Indonesia, and Thailand, where they are farm raised. Positive: Whole food
Chicken	11	Chickens are much more efficient than cows or pigs. It takes about 2 pounds of grain to make one pound of chicken. Also, chicken have evolved eating grains, so they can naturally digest grains. Positive: Whole food
Ice-cream cone	10	Dairy cows are often fed corn, so they release methane (see steak). Also, ice cream needs to stay frozen, which takes energy. Ingredients for ice cream and cone are shipped from various places. Not a whole food.
Cheese	8	Dairy cows are often fed corn, so they release methane (see steak). It takes energy to make cheese.
Fish	8	Locally caught, but still higher than plants on the food chain. Also, wherever there is fishing, there is also bycatch, which is the accidental catching of non-target, such as turtles, dolphins, and seabirds, as well as the improper disposal of fishing nets and lines in the ocean. Positive: Whole food.
Doughnut	4	Although made locally, the ingredients to make the dough are shipped from other parts. Not a whole food.
Potato chips	4	Potatoes are shipped to the manufacturing plant, bagged, shipped to the distribution center, then shipped to a store. This takes energy. Not a whole food.
Fries /onion rings	4	Takes energy to ship the ingredients, cook the product, and then ship it all over the world. Not a whole food.
Bread	3	Although lower on the food web, it is still processed. It takes energy to ship the ingredients, cook the product, and then ship the product.
Potato	3	Grown locally, but still needs lots of pesticides. Positive: Whole food.
Orange, Grapes, and Bananas	3	These must be shipped from a warmer climate, which takes energy. Positive: Whole food.
Asparagus	1.5	Whole food. Takes a lot of water to grow, which uses energy.
Apples, Pears, Strawberries	1	Whole foods. Locally grown. Low on the food web.
Lettuce, Carrots, Tomato, Broccoli, Cucumber, Soybeans, Eggplant, Corn, Pepper	1	Whole food. Locally grown. Low on the food web.

Supplement D: Tentative schedule for recipes

(This will change depending on what produce is available at the time)

Sustainable Table Produce plan for 2017-18

Week	Food
September and October	Pickles
November and December	Applesauce
February	Applesauce
March	Smoothie with local spinach or kale
April – middle of May	Kale Salad
May and June	Strawberry Smoothie

Supplement E: Who Can? We Can!

1. Compost
2. Grow a garden
3. Buy local
4. Shop at a farmer's market (small farms)
5. Eat your leftovers
6. Have zero waste!
7. Eat what is in season – food grown locally in a greenhouse might not be better
8. Eat less meat
9. Eat lower on the food chain (more plants, fewer animals)
10. Don't eat junk
11. Watch the packaging!
12. Use reusable bags, or none at all
13. Drink water from the tap, not from bottles
14. Don't use Styrofoam
15. Don't throw away food by the sell-by date
16. Buy ugly fruit!
17. Share what you know with others, so that they can make changes, too!