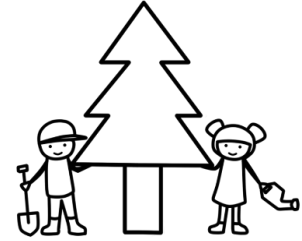


Lesson: Take Action

*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 do the structures of plants and animals help them survive in their habitats?

Unit/Lesson Sequence: This is one of two lessons in the 'Pollinator/Structures for survival' 4th grade module based at Arlington Echo Outdoor Education Center.

Content Standards:

- **Environmental Literacy**
MSDE 1.0 ENVIRONMENTAL ISSUES: The student will investigate and analyze environmental issues and develop and implement a local action project that protects, sustains, or enhances the natural environment.
- **Science**
MSDE 2.0 EARTH/SPACE SCIENCES: The students will use scientific skills and processes to explain the chemical and physical interactions (i.e., natural forces and cycles, transfer of energy) of the environment, Earth, and the universe that occur over time.
2.A.2. Recognize and explain how physical weathering and erosion cause changes to the earth's surface.
 - a. Investigate and describe how weathering wears down Earth's surface.
 - b. Cite evidence to show that erosion shapes and reshapes the earth's surface as it moves Earth's materials from one location to another.
- **Social Studies**
3.D.1. Describe how people adapt to, modify and impact the natural environment.
 - b. Describe ways people in Maryland modify the natural environment and the consequences of modifications.
- **Common Core**
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, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

Length of Lesson:

Overnight Program: 60 minutes

Day Program: 45 minutes

Student Outcome: The students will demonstrate an understanding of the impact of pollinators on the natural environment and ways to support them through local action.

Knowledge of the Learner:

- Prerequisite knowledge, skills, and processes: Students must have a basic understanding of the

environmental issues.

- Student needs, interests, and previous learning: These will be determined during the pre-assessment.
- Conceptual difficulties: Relating sedimentation to ecological problems; building self-efficacy to help solve the problems. Learning to use project materials (i.e. shovel, gravel, native plants, etc.) properly.
- Differentiated: The instructor may pace the lesson according to the responses and participation of the students.
- Differentiated: This lesson will appeal to different types of learners. Kinesthetic learners should do well with the physical act of completing an action project. Interpersonal learners will benefit from the team dynamic required to work together. Visual learners will be able to understand the effects of erosion by seeing water move through different surfaces.

Knowledge of Content:

Content knowledge for the instructor: Provided in the lesson plan and supplements

- **Vocabulary**

Biodiversity	Native	Pollution
Climate Change	Nectar	Pollen
Erosion	Neonicotinoid	Pollinator
Invasive	Non-Native	Pesticide
		Watershed

- **Pollinator Problem Relay Supplies**

Four buckets	Two boards	Four cones
Two tunnels	Four flowers	Container with pollinator cards

- **Citizen Science**

Clipboards (1 per pair)	Data sheets	Pollinator Identification flip book
Chrome books (1 per pair)	Identification tags for flowers	

- **Action Project Supplies (depending on project)**

Buckets	Hand shovels	Water
Wheel barrow	Gloves	Seeds
Plants/seeds	Potting soil	Large tub
Shovels	Pottery clay	Gloves

- **Lesson Setup**

- Set up the Pollinator Game Relay Race (See Supplement A)
- Citizen Science: Go to www.TheGreatSunflower.org on each chromebook and sign in (Username: ehall@aacps.org; Password: ArlingtonEcho).

- **Supplements**

- A: Removal of nonnative invasive plants
- B. Great Sunflower project directions
- C: Seed Ball

- D. How to Plant
- E: Who Can? Cheer
- F: Pollinator Obstacle course set up
- G. Pollinator Cards
- H: Vocabulary

Engage

Pollinator Problem Relay Race:

1. Ask the students, **“Why do some animals pollinate?”** *They are collecting food (nectar and pollen).*
2. Split the group into two teams and tell each group to line up behind the cones. Have each group choose a pollinator that lives in Maryland (*honey bee, bumble bee, butterfly, moth, humming birds, wasps, carpenter bees*). Ask the groups to think about what that pollinator will need to survive in its habitat. What do they eat? Where do they live?
3. Ask each group **“How can humans impact these populations?”** *Planting native flowers, use of pesticides, loss of habitat (construction), introduction of non-native species, climate change.*
4. Inform the groups that they will compete in a relay race to collect pollen points from the cards that they will pull from a bag. Each team has 3 minutes to get the highest pollen point total.
5. The students will fly like their pollinator through a short obstacle course to the native flowers one at a time, reach into one of the containers located at the base of the flower, and pull out a card without looking at it. Bring back the card to the other end of the field. Repeat until the time runs out.
6. After the relay is over, have each team organize the cards into two piles: one for scenarios that have a positive effect on pollinators and one for scenarios that have a negative effect on pollinators.
7. Each team should read their positive scenarios out loud. If the other team agrees that it is a positive scenario, they are to cheer. If the other team disagrees, they are to boo. If there is a disagreement, the teams need to work it out. Instructor can look at supplement ____ if the groups are unable to come to an agreement. If the team is proven to have mistakenly put a card in the wrong pile, they lose a point. Each positive scenario is worth two points.
8. Each team should then read their negative scenarios, and again the other team should cheer if they agree with the decision and boo if they disagree. If a team moves a card from a negative to a positive pile they do not get the positive points but still lose a point.
9. Ask the students, **“What did you notice about the negative cards? What did you notice about the positive cards?”** Inform the students that we will be participating in different activities to benefit pollinators.

Explore

Citizen science:

1. Take the students to the garden and instruct the students that they will be counting pollinators for a large data collection initiative run by The Great Sunflower Project called "Pollinator Friendly Plant Program." We will be participating in a stationary count of pollinators in the gardens around the Dining Hall.
2. Allow students to explore the gardens for 2-3 minutes and look for pollinators and bright flowers.
3. Bring students together at a flowering plant to demonstrate how to count the pollinators.
4. Ask students how long they would like to observe the flowers. Explain that the longer they observe the more accurate their data will be. They should choose to observe for between 1-5 minutes.
5. Divide the students into pairs and give each group a data sheet to record their count.
6. Have each group choose a plant to watch.
7. Once each group has found a plant, write down the type of flower and the number of flowers they will be counting.
8. Start a timer for the amount of time the students chose and announce the start to the entire group. Students should then tally how many times a pollinator visits their flowers. Use the pollinator flip books to identify the types of pollinators that land on the flowers.
9. After designated time has passed, students should complete the data sheet by writing down the number and types of pollinators observed.
See supplement ___ for how to count pollinators doing a stationary count.
10. Once the observation is completed, students should enter the data on the chrome books. See supplement ____ for directions.

After the groups have completed their pollinator counts, collect their electronic devices and head over to the location of the action project.

Explain

Action Project:

- Before students arrive, note the flagged area where the Action Project will take place.
- Ask the students, "**Why are pollinators important?**" *Animal pollination is responsible for generating over one third of the world's food crop, 75% the worlds flowering plants are pollinated by animals (USDA) pollinators provide nourishing habitats for animals.*
- Inform the students that today they will be 'Taking Action' to support pollinators by

participating in an action project (*This could be a multitude of different projects here at Arlington Echo such as planting, weeding, or invasive species removal. An Arlington Echo staff member will give you the details of the project during the training*).

- Ask the students, **“How will this project assist pollinators?”** *We are helping to create a beneficial environment for native pollinators.*
- Proceed to complete the action project as directed in the training.

Elaborate

If you are participating in a DAY program proceed to the student reflection and closure. If you are participating in an OVERNIGHT continue with the Take home action below.

Take home action: If you are participating in an overnight program, the students will be continuing to take action by creating something to take home to support pollinators. We have several different possible take-home projects. Arlington Echo staff will determine which project your group will do. If your group is making seed balls refer to Supplement C . If your group is making newspaper pots, refer to Supplement D. After the project is completed, do the “Who Can?” cheer with the students (**Supplement B**)

Student Reflection and Closure: Do the “Who Can?” cheer with the students (**Supplement B**) and ask if what they learned today is a way they can change the world. How can projects like these help at their schools or in their communities?

Evaluate

Question ball: Tell students you are going to throw the ball up in the air. The students should try to catch the ball. If the ball come to you, you are to catch it. Whichever question their right thumb lands on is the question they should attempt to answer. After answering the question, have the student throw the ball up for another student to catch.

After the lesson is finished, students will be escorted by Arlington Echo staff to their next activity.

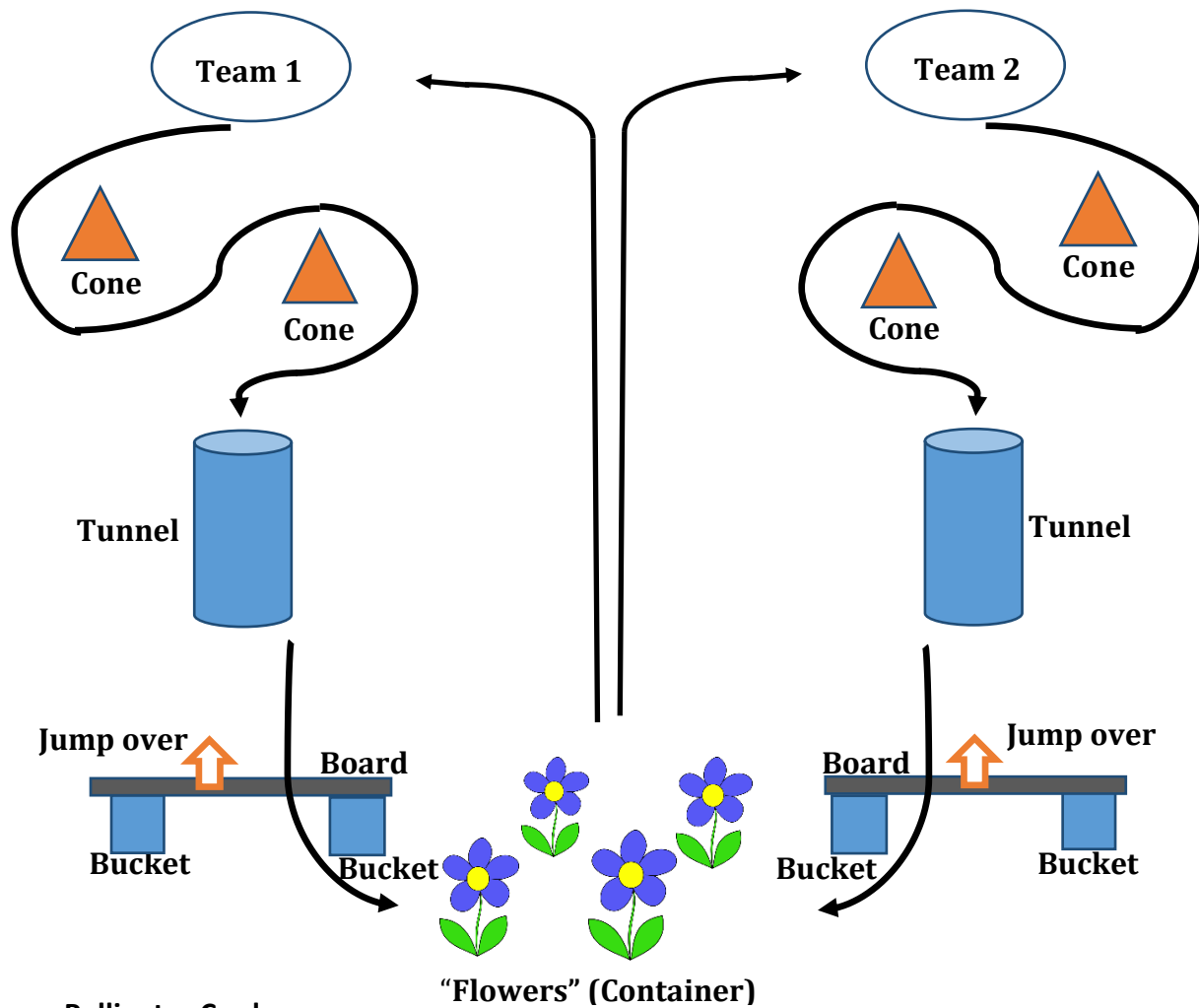
Notes for Clean up:

Please clean, organize, and return the lesson materials to their proper locations at the end of each day of instruction. Remember to inform the Arlington Echo staff if you need assistance or if any materials are damaged or missing.

Notes for Inclement Weather:

Arlington Echo encourages keeping our outdoor activities outdoors—even in the rain—but in the case of severe weather (thunder/lightning, extreme cold, etc.), the rain location for this activity will be under the Main Pavilion or inside Field Hall. An alternate activity will be given to the instructor in case of inclement weather.

Supplement A: Obstacle Course Setup and Pollinator Point Cards



Pollinator Cards

Positive (+2)	Negative (-1)
4 th graders plant native flowers	Farmer uses neonicotinoid pesticides
4 th graders plant a rain garden	Invasive non-native plants displace native flowering plants
Install green roof with flowering plants	Loss of habitat due to construction of a neighborhood
4 th graders remove non-native plants	Loss of habitat due to construction of a mall
Local community builds native green space	Loss of habitat due to construction of a school
Buy food from an organic farm	Loss of habitat due to construction of a hospital
Buy food from a local small farm	Climate change
4 th graders plant a pollinator garden	Erosion
4 th graders plant a wildflower meadow	Invasive predator insects
4 th graders plant milkweed	Neighbor uses pesticides on his lawn
4 th graders weed around pollinator plants	Lack of rain reduces the number of flowers for pollinators

Supplement B: How to Count Pollinators and Enter Data

How to count pollinators when doing a stationary count:

- Start by recording the date, time and location.
- Then, choose a plant to watch and write down what type of plant it is (either a common name or scientific name).
- On that plant, decide how many flowers you are going to watch and write that down.
- If it is a plant with lots of flowers in a spike or bunch, you will need to count how many flowers are in that bunch.
- Once you are settled, start your timer for the designated amount of time and record the number of visits to your flowers by pollinators.
- If possible, write down the type of pollinator. You can be as specific as you want but please only be specific if you are certain! (You may use the pollinator flip books to identify the pollinator.)
- If a pollinator goes away and comes right back, count it twice or as many times as needed. We are interested in the number of visits rather than the actual number of pollinators.
- When you are done, enter the data at the website, www.GreatSunflower.org. Start by logging in at the website and then click on Add a Count. (The site should already be open, logged in, and ready to record the count.)

How to enter your pollinator visit count data on the website:

Step 1

- Under type of count, select 'Stationary'
- Choose an observation time (If you are on a smart gadget or computer, we actually have a built in timer so you can do this all on your gadget!)
- Identify where you were by selecting 975 Indian Landing Road, Millersville, MD 21108 from the location dropdown box.
- Click Next

Step 2

- Enter the number of flowers
- Enter the type of plant (this is a smart box that will give you some choices)
- Click Next

Step 3

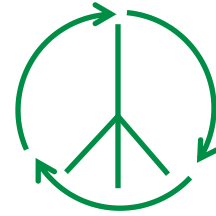
- Enter what you saw using the bright green buttons.
- If you saw more than one species of a particular type of pollinator, you will want to use the "I saw another pollinator" link.
- If you saw no pollinators, please be sure to check the box. This is very important for the data we are collecting.
- Click Next

Step 4

- Enter the number of minutes that you spent observing your flower.
- Click Finish!
- You can then edit anything that was incorrect on the next screen.

Supplement C: Who Can? Cheer

Instruct students that when you ask “Who can?” they shout “We can!”



Say: “Who can?”

Students: “We can!”

Say: “Who can?”

Students: “We can!”

Say: “Who can change the world?”

Students: “We can change the world!”

All: “We are ALL connected!”

Supplement D: How to remove non-native invasive plants

Supplement E: Seed Balls

Have the students work together to create the mix and then have them individually form their own seed balls.

Seed Ball Recipe

- 1 cup potting soil
- 1 ½ cups parts pottery clay mix from your local art store
- ½ cup water
- Pinch of seeds of your choice
- Large tub to mix ingredients

Directions:

1. Mix the soil, clay and water thoroughly. There should be no lumps. Slowly add more water until the mixture is the consistency of the toy store molding clay that comes in a can.
2. Each student should be given a ball of clay and soil mixture about the size of a golf ball (Picture A).
3. Have each student flatten out the ball into a cookie shape.
4. Place a pinch of seeds into the center of the circle.
5. Knead the clay mixture until the seeds are thoroughly mixed in.
6. Form the mixture back into a ball (Picture B).
7. Tell the students to dry the seed balls for 24-48 hours in a shady place before sowing or storing. They store best in a cardboard box. Do not use plastic bags. To sow flower seed balls, you can place them carefully over the area to be planted, or you can gently toss them one at a time, which is a lot more fun. Don't bury them and don't water them. You've done your job, now sit back and leave the rest to Mother Nature.



Picture A

Picture B

Read more at Gardening Know How: Seed Ball Recipe – How to Make Seed Balls with Kids
<https://www.gardeningknowhow.com/special/children/making-seed-balls.htm>

Supplement F: Newspaper pots

Materials:

- Newspaper strips
- Pot makers
- Soil
- Plant/seeds

Directions:

1. Line up the newspaper with the edge of the pot maker top just down from the ball of the handle.
2. Roll up the newspaper tightly but not too tight around the pot maker top and fold in the newspaper that extends past the pot maker top.
3. With the bottom folded in, push the pot maker top firmly onto the pot maker base and twist.
4. Slide the pot off of the pot maker and fill the pot with soil.
5. Make a small hole in the soil in the middle of the pot, place your plant/seed into the hole, and then fill in the soil. If planting a plant, make sure not to bury any part of the plant besides the roots.

Supplement E: Vocabulary

Biodiversity: The variety of life in the world or in a particular habitat or ecosystem.

Climate change: A change in global or regional climate patterns. These changes include air and water temperature increases, more violent storms, droughts, alterations to growing seasons, and animal behavior changes. Climate change is a natural process that happens over time, but the current rate of climate change is being dramatically increased due to human activity.

Erosion: The process by which water (usually from waves or rain) picks up soil and carries it away, usually to a body of water.

Invasive: A species that out competes the neighboring species completely taking over an area.

Native: A species that originates from the local area

Nectar: Sugary liquid produced by most flowers to attract pollinators

Neonicotinoid: A relatively new class of Pesticides that share a common mode of action that affects the central nervous system of insects, resulting in paralysis and death.

Non-Native: A species that do not originate from the local area and are usually moved vast distances by human activity.

Pollution: Something that is harmful to the environment.

Pollen: A powdery substance, typically yellow, that is released by flowers for plant reproduction, the pollen can be moved by either wind or animals called pollinators

Pollinator: A pollinator is an animal that moves pollen from one flower to another thus assisting plants in their reproduction and also getting food in the form of nectar and pollen.

Pesticide: A chemical used for killing insects or other organisms, usually applied to farm fields to protect crops or to gardens to protect ornamental plants.

Watershed: An area of land where all of the rain water that falls there makes its way into the same body of water by a system of rivers and streams.