

Science Squad 2018 Curriculum
Friends of Sears Island and Waldo County Soil and Water Conservation District

Activity Name: **Monarch Butterfly Tagging**

This activity requires tagging milkweed that contain monarch larvae and pupa so students have a living visual of these animals. This lesson designed for Sears Island but can be adapted to other sites.

Learning objectives: Children will:

- *Develop an understanding of monarch migration
- *Develop an understanding of the uniqueness of North eastern (Sears Island) Monarch's
- *Develop field skills of observation, data collection, use of field equipment (nets, rulers, tags, magnifying glasses)
- *Develop an understanding of stewardship and conservation.

Materials needed:

Monarch tags from **Monarch Watch**, nets, rulers, magnifying glasses, data collection sheets, pencils, monarch coloring pages, poster of monarch life cycle, notes. Surveyors tape

Lesson Activities

30 min- Children meet at the entrance to Sears Island trails. Information about the monarch life cycle and migration patterns are provided. The life cycle poster is used as a visual. Students answer and ask questions as they develop an understanding of the process monarchs undergo.

-Students learn about the threats to Monarchs and what can be done to mitigate these.

-Students are provided a real monarch pupa so they can accurately identify them.

(Then, 10 min- walk to the Monarch waystation)

1 ½ hours-

- Students are guided through the process of how to net an insect, and how to place the tags on the underside. Practice is provided.
- The concept of "leave no trace" is introduced, so students understand that the milkweed is vital for the monarchs and they should stay on the paths and not trample the milkweed.
- Students can be divided into 2 groups if there are too many children for capturing monarch using the nets. One group can tag with surveyors tape the milk weed that contains instars of monarchs (valuable for future tagging days) The other group can capture and tag, and record data on Monarchs.
- Instructors facilitate each activity making sure all students are able to participate.
- Closure is provided with a question and answer period, encouraging students to continue participating in nature activities to protect species. Parents and students can take tags if they are committed to returning the data to Sears Island for recording.

Activity Name: Winter Survival

This activity requires pre- selection of a shelter site and assurance that there is sufficient brush and branches to construct a shelter. The teacher can redistribute brush from other areas to expedite this process.

Learning objectives: Children will:

- Gain an understanding of survival strategies of animals including migration, adaptation, and hibernation.
- Gain an understanding of plant survival mechanisms for winter including dormancy, and physiological adaptations like antifreeze in needles and wax covering on needles.
- Gain an understanding of what is necessary for an adequate shelter for humans to in the winter, including access to water, moss, leaves, brush, and sturdy branches for building,
- Gain an understanding of what you should take with you if you are hiking in the winter.
- Gain an appreciation of nature in the winter and the need to be prepared if you are planning to be outside in nature for an extended amount of time.

Materials needed:

Samples of plants that provide examples of adaptations for a colder climate, Pack filled with supplies one should take with them when hiking in the winter

Lesson Activities

30 min.- Students meet at the start of Sears Island trails. A discussion about plant and animal winter survival strategies is provided. Students ask and answer questions. Students are asked what they would need to take with them if they were going into the woods in the winter. As they provide answers, the teacher can take the articles out of the packed pack. If there are items they missed, they are prompted then provided with the item from the pack. A discussion about building a shelter is generated through student responses and teacher input.

10 min- students walk to pre-selected site for building a shelter. Along the way, prompt students to find signs of animals and discuss these once you are at the site.

1 ½ hours-

*Students are divided into groups to find items that can be used to build the shelter. The teacher guides them to find proper materials and pile them near the site.

* Teacher and students construct the shelter with lots of input from the students. The teacher needs to impress on the students that taking living materials is not sustainable.

* The teacher guides the students to construct an adequate shelter, strong, near water, layered with brush and containing a roof that will keep out wind and water or snow.

* if there is time, a discussion about what you could safely eat while in the woods, and how you could safely use water, while in the woods.

**Activity Name: Making Friends with Nature:
An Observation and Nature Journaling Program for Kids**

Jenny Judkins, Belfast Bay Watershed Coalition Natural Literacy Program

Learning objectives: Children will:

- Explore many items on a tactile table.
- Consider relationships with individual items of the natural world, living and non-living,
- Identify subtle differences and similarities in getting to know an item.
- Begin a nature journal cover and binding.
- Research an animal, plant, mineral or fungus for interesting facts and labeling parts.
- Learn techniques for sketching, drawing and coloring.
- Compose a letter to a chosen natural friend.
- Enjoy, Create and Learn!

Materials:

- Diverse natural items for tactile table
- Cardboard for journal covers
- Large construction paper
- Needle and thread for binding
- Miscellaneous art materials including pictures for creating collages
- Plain white paper
- Black pens, pencils and colored pencils
- Field guides and resource books
- VOLUNTEERS!

Activities

15 minute – Introductions and My pet leaf activity

1 – 1.5 hours - Rotation of 4 Stations:

1. Sketching and drawing
 - Blind and modified contour drawing
2. Write a letter to your new natural friend –
 - What do you appreciate about them?
 - What do you want to learn about them?
3. Research and label
4. Create a cover and binding

Activity Name: Recording Phenology in My Backyard Estimated lesson time: 1 – 1.5 hrs

Elisabeth Maxwell, Assistant Coordinator for Signs of the Seasons, elisabeth.maxwell@maine.edu

Learning objectives: Children will:

- Children will learn what phenology is and why it is useful to record over time
- Children will discuss and identify common phenological events that they may already be observing in their environment without realizing it (ex. first snow in winter, budding of leaves/flowers in spring, arrival of butterflies and birds, etc.).
- Children will learn about how different species rely on one another and how those relationships could change if the phenophases shift in different directions (ex. monarch butterflies relying on milkweed).
- Children will learn about tree species common in Maine yards, how to identify them, and how to observe their phenophases.

Materials needed:

- Large sheet of paper with seasons labeled as a calendar (ex. Flip chart)
- Pencils, pens, or markers to write various common phenological events on paper
- Copies of “My Phenology Journal” (attached)
- Clipboards or folders for taking notes in the field
- Binoculars for observing tree phenophases (optional)
- Fact-sheets for species being discussed (ex. monarch & milkweed, red maple, white pine; fact-sheets available online at: <https://extension.umaine.edu/signs-of-the-seasons/>)

Activities

1. Introduction to Phenology (10 minutes)
Define phenology and relate it to local species or species groups. Discuss how shifts in climate can influence species (plants and animals) to adapt their life-cycles. Describe how phenology can be used to record information about the natural world over long periods of time. (Optional: Provide examples of researchers in Maine who are using phenology to provide additional details in their work.)
2. Calendar activity (20 minutes)
Ask students to describe natural events that they observe in each season, moving across the calendar as a group. Ex. start with fall or winter and ask how they can tell which season they are in by looking outside. Types of responses you are looking for: changing color of leaves, leaves falling from trees, first snowfall, budding out of flowers or leaves in spring, arrival of migratory birds, calling by frogs, etc.
3. Introduction of “My Phenology Journal” (5 minutes)
Each student gets a copy of the journal pages, preferably on a clipboard or in a folder with a pencil. Describe how they can use this journal in their everyday life. Ex. what kind of birds do they see in the yard as they are eating breakfast?
*Students can take notes on this as the group walks around to look at the trees.

4. Identifying nearby trees and determining their phenophase (30-45 minutes)

*This section depends on which species are readily available in the area you have to explore. Signs of the Seasons Indicator Species can be found at: <https://extension.umaine.edu/signs-of-the-seasons/>.

Using general descriptors, explain how the students can visually identify the species that they are looking for. Try to compare the target species with other nearby species and have the students describe how they are different (ex. shape of leaves, general size and shape of tree, etc.). Teach the students how to use the Fact-Sheets to identify the species and the various phenophases.

Explain how a single plant/tree can have multiple phenophases present at the same time and describe how to visually estimate which phenophase is most abundant.

If time allows, have each student describe the plant in their own words using the journal pages and make notes about the individual plant and other characteristics in the environment. The students can make notes about environmental conditions such as cloud cover, time of day, temperature, last known precipitation, etc.

Activity Name: Vernal Pools and Their Surrounding Habitat

Cloe Chunn, John Tipping of Belfast Bay Watershed Coalition

Learning objectives:

- Learn to identify woodfrogs and their egg masses
- Learn why woodfrogs are important
- Learn why woodfrogs need the pristine, forested conditions of vernal pools
- Learn the definition/origin of a vernal pool
- Learn the importance of habitat surrounding vernal pools

Materials needed:

- Net, basin
- Vernal pool identification photos
- Other containers
- Shovel
- Hand lenses
- Binoculars- helpful for looking for frogs and egg masses

- Optional: paper, colored pencils, black pens, clipboards for hard surface

Lesson Activities

1. Netting and examining a wood frog and an egg mass, replacing carefully
2. Playing or singing wood frog song
3. Examination of local habitat around pool
4. Identification of a few species in the habitat (animal, plant)
5. Digging a bit of soil to examine in a container with hand lens
6. Turning over logs, rocks, for red-backed salamanders to examine in container, then replace carefully in same place
7. Learning how all species are connected in and around vernal pools
8. If time permits:
Sketching frog, salamander, plants, insects

Activity Name: **Invasive Forest Pests Workshop for Children** 1.5 hours

Aleta McKeage, Waldo County Soil and Water Conservation District

Learning objectives:

- Children will understand the basic concept of invasive species and what they can do in an ecosystem, as well as how it affects individual species and human well being, and how invasive insects can affect native trees
- Children will be able to identify the adult stage of 3 common invasive forest pests found in Maine: emerald ash borer, Asian Longhorned beetle and hemlock wooly adelgid, and will be familiar with the larval stages of these insects
- Children will understand what signs of these pests look like on appropriate tree species

Materials:

- Colored pencils
- Glue, Scissors
- Build a Beetle materials
- Blank paper
- Index cards with forest pest facts appropriate for the age group, written with bugs in 1st person
- Cootie catchers
- Materials from your Soil and Water District including real examples of bugs, and tree sections with bug evidence, tattoo, pencils, bookmarks, wallet cards
- Bug costumes or costume items to represent bugs ALB and EAB: Contact Maine Forest Service or your Soil and Water Conservation District to borrow costumes or get ideas for making costumes
- Add or subtract or re-order activities as desired.

Activities

1. **Introduction** 15 mins (younger) to 20 mins (older)
 Discuss what invasiveness means. Use analogies such as one's body system, then getting a cold or flu virus. With older children, you may check for understanding of the concept of invasiveness in nature, including plants, ecology, etc.
 Discuss each bug, showing real life examples and pictures. Pass examples around for children to examine. Magnifying glasses help. Talk briefly about what trees they affect, and how they have spread in the US, and how they are affecting Maine. Compare them (size, exit holes, trees) in a Q and A with participants. Discuss insect life cycles as a part of this.
2. **Build a Beetle** 20 mins – Children build a beetle following the online lesson plan. For the sake of having time for more activities, presenter may want to pre-paint bodies and ALB antennae and cut out wings.
3. **Quiz practice with built beetles** 5-10 mins. Presenter reads 1st person bug statements (such as “My larvae bore under bark of ash trees.”) and children hold up the correct bug, each having made both ALB and EAB. Use HWA statements too, and children should hold up neither insect. Some should be for both or all three.

4. **Cootie catchers** (age 10-up) fold and quiz each other with the cootie catchers in pairs. Then do two volunteers in front of group and whole group responds. 10 mins
5. **Bug race** (All ages) 10 -15 mins Children costumed as each insect hop from a start line to a finish line each time a statement about their bug is true. Audience can help. Children may want to take turns being the bugs. OR
Skits (older children) 20 mins The bug costumes can also be used in skits that small groups write.
6. **Draw posters** about invasive forest pests 15 mins. Younger children can just draw the bugs, older children can make an educational or message poster.
7. **Pass out goodies** tattoos, pencils, wallet cards, bookmarks. Give yellow “who to call” cards to adults, and tell children to be on the lookout when they are outside, and to tell a parent or teacher if they think they see an invasive forest pest.

Activity Name: Spring Stewards Day

Ashley Melquier, Friend of Sears Island

Learning objectives:

- Children will learn about plastic pollution in our marine environment and the negative impacts it has on marine life
- Children will participate in a beach clean-up as part of the Ocean Conservancy's International Coastal Clean-up effort
- Children will record data on the types of marine debris found during the beach clean-up and data will be reported to the Ocean Conservancy
- Children will be able to identify the top ten most common types of marine debris found on beaches around the world

Materials needed:

- Work gloves in sizes for children and adults
- Heavy-duty contractor trash bags (although a non-plastic container to hold trash would be a much better option)
- Marine debris data sheets- can be found at: https://oceanconservancy.org/wp-content/uploads/2017/04/OC-DataCards_volunteerFINAL_ENG.pdf
- Clipboards
- Pencils
- Hand sanitizer
- Printouts showing photos of how sea turtles confuse plastic shopping bags with jellyfish, photo of plastic items found in seabird's stomach, graphic showing the trash gyres in the world's oceans, a graphic showing the top ten types of trash found in ocean clean-ups- these can be found at:
 - <https://www.medasset.org/our-projects/you-see-the-difference-a-turtle-does-not/>
 - <https://www.flickr.com/photos/133539753@N03/19155627705>
 - https://www.google.com/search?q=sea+net+trash+gyres&client=firefox-b-1&tbm=isch&source=iu&ictx=1&fir=RlyjQkeLec_YiM%253A%252CDQ7zWYdCYWAZdM%252C_&usg=AI4_kSNKOJ3Vj6zOk_R5sPeyUuuuG1a8Q&sa=X&ved=2ahUKEwie7IT98K7fAhXyct8KHfESA2cQ9QEwAHoECAMQBA#imgsrc=RlyjQke
 - <https://oceanconservancy.org/wp-content/uploads/2017/04/2016-top-ten.jpg>

Activities:

1. Introduction (10 minutes)
 - What is a steward?
 - Define "steward" and have kids give examples of ways you can be a steward
 - Whose job is it to protect our oceans and clean up our beaches?
 - Brief overview of ocean pollution, trash gyres, etc. (what the problem is and what steps we can take to be part of the solution)
2. Introduce members of Ban the Bag in Belfast (10 minutes)
 - The problem with plastics in our oceans (show printouts listed above)
 - What local citizens did about it

- How kids and their families can help
3. Watch educational videos on the dangers of plastics made by Belfast Refuse Reduce Reuse Recycle student group (5 minutes)
 4. Beach Clean-up (approximately 45 minutes)
 - Distribute gloves, trash bags, clipboards with data sheets and pencils
 - Remind families not to pick up anything that is too heavy for them or items that might be potentially dangerous
 - Encourage people to spread out along the beach and cover different areas
 - Pick up marine debris
 5. Closing (10 minutes)
 - What type of trash did you find the most of?
 - What was the most surprising item you found?
 - What is one thing you can do to lessen the amount of plastic pollution that goes into our environment?
 - Collect data sheets, trash bags
 - Hand out bookmarks and Friends of Sears Island badges for being good stewards

Activity Name: Pollination Tag

Robin Huntley, Dirigo Learning

Time

15-30 minutes

Materials

- inflated balloons in 3 different colors (non-helium)
- pollinator labels or ID tags
- fruit and flower labels or ID tags
- pollinator antennae
- (optional) cones or other boundary markers

Objectives

- To learn about the relationship between pollination and growth of food consumed by humans.
- To learn about the transfer of pollen necessary for plants to be pollinated.
- To learn names and physical characteristics of Maine pollinators.

Activities

1. Share with participants that they'll be playing a game that mimics pollination. Ask participants to share what they think they already know about pollination and how it works.
2. Explain pollination in a kid-friendly manner, intentionally using information shared by participants throughout explanation. Emphasize the need for pollen to be moved from one blossom to another, and explain that in nature, pollination happens somewhat by accident as a by-product of pollinators searching for food for themselves. Ask if there are questions, and answer them.
3. Share an example of a local pollinator and a plant that it might pollinate (bee and apple tree for example). Solicit ideas of more local pollinators, and more examples of plants that get pollinated. If time/space allows, search nearby area for evidence of plants that may experience pollination.
4. Introduce Pollination Tag. Share pollinator tags naming and briefly discussing each species included (bee, hummingbird, moth, wasp, butterfly, etc.). Repeat with flower/fruit tags (dandelion, tomato, apple). Share with participants that if they're a pollinator, their job will be to chase flowers. Each flower will carry 2-3 balloons, and when a pollinator tags them, they'll collect one of their balloons. If the pollinator already has a balloon when they tag the flower, they will trade the balloon that they have for one of the fruit's balloons, then move on. Explain that fruits are working to gather new pollen so that they can become a fruit - so while they may want to run from the pollinators, they actually do want to get tagged sometimes in order to gather up new pollen. Suggest that flowers pay attention to the color of the balloons that pollinators have so that they can gather new pollen (for example, dandelions with yellow balloons can look for pollinators holding the red balloons representing tomato pollen). When a flower is holding only balloons that represent pollen from another species, they turn their ID tag to its fruit side and either freeze, sit down, or leave the game and become a spectator (having "won" - accomplished their goal). Allow time to answer questions.
5. Play the game! Outline a contained space within which to play, either using cones or landmarks agreed upon by participants.
6. Debrief. Discuss fun parts, easy parts, and tricky things. Relate discoveries from the game back to what is known about pollination.

Activity Name: Bone Observation

Robin Huntley, Dirigo Learning

Time

1.5 hours

Materials

- entire bone collection (variety of bone types from mammals, fish, and birds)

Objectives

- To learn to look for specific identifying characteristics in animal skeletons that indicate what kind of diet, habitat, behaviors, etc. the species has.

Activities

1. Distribute collection across 3-4 large tables, including a variety of specimens in each collection. Be sure to include a mammal skull, an antler, vertebrae, and bird bones in each collection.
2. Greet participants and share names. Discuss safety and care of specimens, and ensure that all understand.
3. Allow participants time to explore specimens, observe, ask questions, and make guesses about why things look the way they do.
4. Ask participants to bring specimens that include teeth to a group meeting area. Sort specimens into groups based on their type of teeth. Give an example of each type of teeth (rodent teeth like a beaver's, carnivore/omnivore teeth like a coyote's, herbivore teeth like a sheep's), and allow participants to help sort specimens into categories based on examples.
5. Discuss each type of teeth and why they look the way they do, giving simple words that can be used to describe each type (chompy beaver teeth, rip-and-tear meat-eater teeth, flat, grind-y herbivore teeth). Allow participants to look at specimens up close and share out things they know must be true about the animal based on its teeth.
6. Ask participants to bring over specimens that include antlers or horns. Discuss the difference between deer and moose antlers and the horns of cows, sheep, goats, etc. using sheep skull and deer skull to compare. Allow participants to look closely to see the difference between a deer antler and a sheep horn, especially noting the hair-like casing around the horn and the lack of protection on a temporary antler. Discuss what horn and antler types say about each animal, and discuss why it might be helpful to lose antlers in winter (less body to fuel, for example).
7. Ask participants to bring over bones that look like they might have been part of a spine. Closely examine each spine. Discuss what a spine does for a creature, and place individual vertebrae together to see how they stack (allow this to happen by passing around a container of vertebrae, participants try one at a time and then pass while discussion continues). Discuss spine structures not shown, such as snake. Discuss creatures previously discussed and the types of spines that they generally have.
8. Answer questions.
9. Allow participants to explore the bone collection in a self-directed manner, offering observation drawing sheets, hand lenses, rules, and drawing tools for those who would like to use them. Float around and answer questions and share information as necessary.
10. If time allows, call participants together to share what they've learned, noticed, drawn, etc.