

Cornell University



**“Environmental Education in Urban Communities”**  
Online professional development course  
EECapacity project, Cornell University

# **22 LESSON PLANS**

## **FOR URBAN ENVIRONMENTAL EDUCATION**

**Submitted by course participants**  
**Fall 2012**

**Instructor: Alex Kudryavtsev**  
**Guest instructors: Marianne Krasny, Akiima Price**

# AS LANDSCAPE ARCHITECTS

## Goals and NAAEE Guidelines

### Goals

*Learn how to develop alternatives to solve community problems*

*Contribute with ideas that improve our community environment*

*Contribute to improve a sense of responsibility*

### NAAEE:

Critical and creative thinking.  
Connections to everyday lives.  
Sense of responsibility.

## Materials

White Paper, sketch paper, pencils, crayons, markers, acrylics paints, foam board, boxes [different size and shape]

## Time

The time necessary for do the activity

## Audiences

All public

**Credits: activities are adapted from**

*Conoce Tu Naturaleza; actividades para enriquecer la experiencia educativa (1997). Fideicomiso de Conservación de P.R. [www.fideicomiso.org](http://www.fideicomiso.org)*

*Box City: An interdisciplinary experience in community planning. (2001). 9th Ed. Center for Understanding our Built Environment, Prairie Village, Kansas.*

THE PHYSIQUE OF A COMMUNITY ENVIRONMENT TO DETERMINE THE PSYCHOLOGICAL, EMOTIONAL AND SPIRITUAL ENVIRONMENT OF ITS INHABITANTS. SO YOU BETTER UNDERSTAND OUR ENVIRONMENT WE CAN DESIGN AN ENVIRONMENT CONGRUENTE WITH OUR NECESSITIES.

### Activity steps:

**To begins** ask to the participants:

1. Does your city or neighborhood work for you?
2. Are you responsible for someone else in your city or neighborhood?
3. Mention the different factors that influence in the city or neighborhood.

### Next:

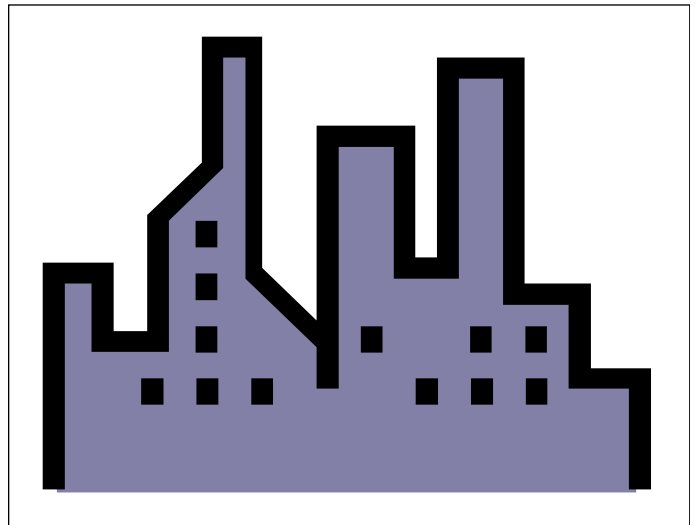
1. Request to the participants to imagine they are landscape architects. If the number of the participants is bigger consider divide it in small groups.
2. Make a walk in the vicinity of the community area, city or neighborhood you will be working.
3. After the visit, the participants must be on a piece of paper or cardboard, make a sketches of the area observed.
4. Analyze each of the comments and list these and where are located in relation to working area.
5. Using the boxes, design the working area as they saw.
6. Ask to the participants to perform a new sketch of the studied site but this time incorporating solutions to the problems encountered and mentioned previously.
7. Determine which of the

solutions will be adopted to achieve. And add those solutions to your boxes design.

8. Analyze both works, before and after, and argue about the results.

### To Finish:

Repeat the questions did to start. Have the participants different answer? Argue about it.



## SECONDARY ACTIVITIES

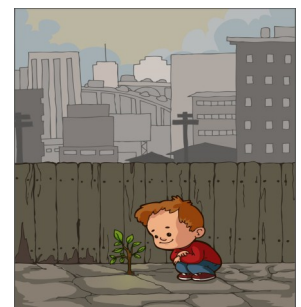
### • Role playing.

Consider assuming the role of an actual citizen whose is necessary to design and create the new city or neighborhood. Assign roles to the participants. In the role description the participants should describe their role personage and their job.

### \* Sabios Arboles, Magicos Arboles [Wise trees, Magical trees]

Project film wise trees magical trees. Reflect on the impacts by the three or green areas and the lack of aesthetics and the absences trees in the communities. You can get a copy of the video at [www.fideicomiso.org](http://www.fideicomiso.org).

**\* Think about this picture and share with the group your reflections.**



# Natural Alphabets

Kate Hofmann

**Objective:** Students search for the letters of their names in the patterns of nature and draw or photograph their discoveries.

**Age:** All ages

**Introduction:** Nature journaling activities can lead students from active exploration of the environment into reflection and creative self-expression. This exercise is playful and fun, but also works to spark students' curiosity, develop their observation skills, and foster greater awareness of and sensitivity to their surroundings.

## Preparation:

Choose an outdoor area where you can take students to search for letters in the environment. You could go to a central location such as a park or garden, set boundaries, and let students explore. Or you could walk slowly as a group through a variety of settings, giving students plenty of time to look as the changing scenery presents new views.

## Activity:

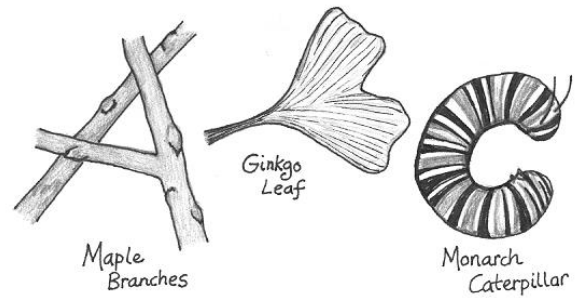
1. Introduce the idea that, by changing our perspective, we can see familiar places and objects in entirely new ways. For example, alphabet letters are hiding all around in the patterns of nature and in the neighborhood where we live! Students may think this claim sounds silly until they see it for themselves. Show them the picture books listed at right or search online for "nature alphabets." You'll find a number of photographers who specialize in capturing letters in natural objects and even [a complete alphabet collected from Google satellite images](#).
2. Explain to students that they will each search for the letters of their first name. Tree branches, stems, leaves, and bark, clouds and jet contrails, shadows, and other natural patterns are all excellent places to look for letter shapes. The built environment offers many interesting shapes to consider as well, such as windows, doorways, bridges, fences, and other architectural features. Encourage them to look for letters that are both very large (a whole building) and very small (the veins in a leaf).
3. Be sure to specify one important rule: Letters must be "found," not made. That means letters printed on signs, license plates, or people's clothing don't count! Neither do letters that students might shape themselves (by arranging sticks or rocks on the ground, for example).
4. As students find each letter, they should document it either by drawing it or photographing it. They should also make some notes to help them remember the context: What was the object? Where was it located?
5. Two other helpful guidelines: If students' names have two of the same letter, they should look for two different objects to represent that letter. If they have a short name or work quickly, encourage them to continue with their middle or last name.
6. After students find all of their letters, invite them to share their favorite discoveries and reflect on the process. Were they surprised at how many letters they found once they started looking? Did they notice anything else interesting because they were studying objects closely or looking at them from unusual perspectives? Did they enjoy the activity? Why? Can they think of other ways they'd like to use this technique?

## Extensions

- Follow up the outdoor exploration by having students create a finished piece of art from their drawings or photos. Display all the pieces in a group gallery and invite each artist to explain his or her work.
- As a group, hunt for and photograph the entire alphabet. Compile all the letters into a picture book, poster, video, or other visual piece. Make a key with a description and location of each found letter. Share it with your community as a fun and unusual view of the neighborhood.

## Research and Guidelines for Excellence:

This activity seeks to foster, in a playful but real way, a deeper connection with place. As students literally find their names written in the environment around them, they investigate their community and explore their role within it. Researchers such as Louise Chawla and David Sobel stress the importance of developing a connection with and attachment to place in childhood, and place-based education is based on the idea that learning rooted in place is meaningful, real, relevant, and effective.



## Materials:

- Journals or drawing paper and clipboards
- Pencils, colored pencils or crayons
- Cameras (optional)
- Picture books such as *The Butterfly Alphabet* by Kjell Sandved and *ABCs Naturally* by Lynne Diebel and Jann Kalscheur

# Virtual Water

Adapted by Meg Domroese from *From Ripples to Waves*, Toronto and Region Conservation (TRCA, [www.trca-education.ca](http://www.trca-education.ca))



*Flickr/pureandapplied*

We use water everyday for washing, drinking, cooking, and flushing the toilet. But we also consume large quantities of water without realizing it—water that is embedded in our food, clothing and other products. This water use contributes to our overall water consumption, or water footprint, and is called “virtual” water because it is no longer contained in the final product.

This activity introduces the concept of virtual water and examines the amount of water that is embedded in our clothing as a result of production. Students will develop a Virtual Water Trail Diagram and identify stages of production that consume water.

**Goal or Objective:** Students gain a deeper understanding of how we rely on water resources, increase their awareness of local and global water issues, and gain the knowledge to take action and engage others.

**Age:** Middle and high school

**Materials:** chart paper, markers, scissors, glue or tape

**Activity:**

1. Have the students bring old clothing catalogues or fashion magazines to class.
2. Discuss the concept of virtual water, specifically within the context of clothing production. Resources to help introduce the concept include: The Life of a T-shirt, <http://urbantimes.co/2012/11/life-of-a-t-shirt-infographic>; What do you know about virtual water? <http://www-v1.amnh.org/ology/water#>; An Introduction to Virtual Water power-point presentation, [www.trca-education.ca](http://www.trca-education.ca); and the Water Footprint Network’s “A Comprehensive Introduction to Water Footprints” power-point presentation, [www.waterfootprint.org/?page=files/TM\\_Presentations](http://www.waterfootprint.org/?page=files/TM_Presentations). Highlight some examples. Where does the virtual water in these products come from? How might water be embedded in items of clothing? What stages of production need water?
3. In small groups of 3 or 4, ask students to select one item of clothing that they would want to purchase from the magazines and invite them to reflect on why they selected it: Was it stylish? Did it look comfortable? Was it manufactured in a particular country? Was it manufactured in a particular way?
4. Ask students to research, discuss and develop a Virtual Water Trail Diagram (VWTD) for the clothing item they selected. A VWTD can provide a framework for estimating the amount of water that is used in the production of goods, seeking to identify the various stages of production of a particular item, paying close attention to where water is used, degraded or lost at each stage. How would they begin calculating the amount of virtual water contained in a particular item? (See The Life of a T-shirt, above, for example.)
5. Ask students to list all components and characteristics of the item. What materials are needed? How are these materials acquired? Does the item have a zipper, buttons or other embellishments? Is it dyed, screened or chemically treated?
6. Now ask students to consider what is involved in the stages of production, such as materials and resources acquisition, processing and manufacturing, transportation and retail.
7. Ask each group to draw their VWTD on a piece of chart paper and present it to the class. As a larger group, brainstorm any missing stages that could be included. How could the VWTD be extended to include the disposal of the item?
8. Reflect: How does knowing the volume of virtual water contained in items of clothing make you think about your personal water use differently? Will it change your approach to shopping? Why? Why not?

**Research and Guidelines for Excellence:**

NAAEE Guidelines for Excellence in EE Materials: 2.1 Awareness, 3.2 Applying skills to issues, 4.1 Sense of personal stake & responsibility, 5.3 Connection to learners’ everyday lives, 5.5 Interdisciplinary (civics, geography, math, environmental studies), 6.4 Adaptable: can be used for various grade levels, and to explore a variety of products

**Additional reading:** <http://www.environmentmagazine.org/Archives/Back%20Issues/April%202007/Bytes-apr07.html>

Author: Earth Force Inc.

**Goal:** To identify the **root** cause of an environmental issue

**Age:** K-12

**Materials:** Worksheet and access to the decided upon 'community'. To define community, youth will work as a group to decide what community means to them. (Could be their classroom, school, block or neighborhood.)

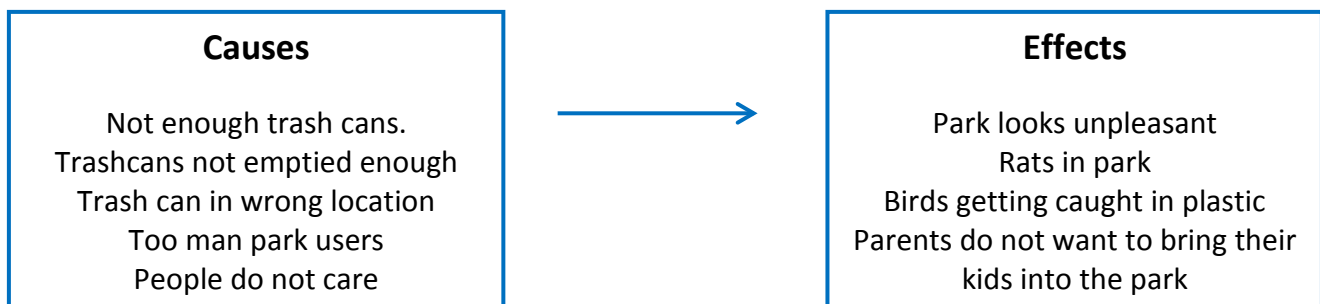
**Activity Plan:** Students will inventory their 'community' by taking a walk about and looking for strengths and issues within their community. As a group, students will compare the different issues they found within their community and work to determine what is a "cause" and what is an "effect". This is to try to get to the root cause of an issue and eventually develop a sustainable solution.

1. Students will select one issue that they came up with and talk about what may cause that issue. The example below takes litter. Students will list every possible cause they can think of that might cause litter, nothing should be ruled out.
2. Students will then talk about the effects of this issue. Again, students should list every possible effect from litter, nothing should be ruled out.
  - a. By making sure every student's voice is heard, you ensure an inclusive look at the issue.
3. Discuss with students the importance of researching each cause they brainstorm in order to ensure they are addressing the correct cause to create a sustainable solution for the issue

**Research and Guidelines for Excellence:** This activity addresses the issue put forth by Pruneau, D., Freiman, V., Barbier, P.-Y., & Langis, J. (2010). They suggest using the following options to help young students to better articulate environmental problems:

- Help students examine a problem visually using pictures and diagrams;
- Examine a problem sequentially with representation of development stages;
- Stimulate kinesthetic and auditory learning through field trips.

## Sample Issue: Lots of litter in the park



### Now You Try It!

Select one of the issues identified in Step One. What could be the cause and effect of this issue?



## Activity : Determine the Percentage of Impervious Surface

Contributors: Alexandra Workman, Kurt Moser, Earth Force

### Goal/Objective

This activity analyzes a portion of a watershed to determine *what percent of a given land area is impervious*. When impervious surfaces cover more than 15% of the land, water quality can be impacted (Arnold & Gibbons 1996). Qualitative information in the form of aerial/satellite imaging is used to attain quantitative data. **Grades 6-8.**

### Materials

- satellite or aerial photo of a portion of your local watershed (8½x11, Google Maps and Google Earth are good sources for current and historical imagery)
- transparent plastic sheet protector, letter-size
- printout of a grid or sheet of graph paper
- 2 wet-erase or dry-erase markers in different colors
- calculator



### Questions for students to consider before starting

What do you think you will find when you investigate the amount of impervious surface in our area? What are some examples of impervious surfaces in our watershed? From your knowledge of the neighborhood, what percent of the land area do you estimate is impervious? What is your estimate based on the photo?

### Quantifying the extent of impervious surface

Place the satellite/aerial photo inside the sheet protector. Use the lighter-color marker to color over only the impervious surfaces (streets, houses, etc.) seen in the photo. When this step is complete, the sheet protector should have color wherever the impervious surfaces were. Remove the photo and place the printed grid inside the sheet protector. Count each square that is *already at least 50% colored in*, using the darker-color marker to put a dot in each grid square as it is counted (if you lose count, you can go back and count dots!).

Example:

More than 50%  
covered. →  
Gets a dot.



Less than 50%  
covered. →  
No dot.



Divide the number of squares counted (i.e., number of dots) by the total number of squares, and express as a percentage. This is the percentage of impervious surface area.

### Discussion questions

What is happening to most of the rainwater that falls in our area? Why are impervious surfaces an issue for the watershed? Are impervious surfaces *increasing* or *decreasing* locally? Why? What steps could be taken to reduce the extent of impervious surface?

### Alignment to Key Characteristics, NAAEE Guidelines for Excellence in EE Materials

*Fairness and Accuracy:* 1.1 Factual accuracy. *Depth:* 2.1 Awareness; 2.2 Focus on concepts; 2.3 Concepts in context; 2.4 Attention to different scales. *Emphasis on Skills Building:* 3.1 Critical and creative thinking. *Instructional Soundness:* 5.1 Learner-centered instruction; 5.3 Connection to learners' everyday lives; 5.5 Interdisciplinary. *Usability:* 6.1 Clarity and logic; 6.2 Easy to use; 6.3 Long-lived.

### References

Arnold, C.L. & Gibbons, C.J. (1996). Impervious Surface Coverage: The Emergence of a Key Environmental Indicator. *Journal of the American Planning Association*, Vol. 62, Iss. 2, 243-258.

Shuster, W.D., Bonta, J., Thurston, H., Warnemuende, E., & Smith, D.R. (2005). Impacts of impervious surface on watershed hydrology: A review. *Urban Water Journal*, Vol. 2, Iss. 4, 263-275.

# Soaring With Sandhill Cranes

Stephanie DeMattee



**Goal or Objective:** To educate people about the importance of migration coordinators and stop over sites for birds and other migrating species and to foster an appreciation for connecting human communities along the migration corridor to promote conservation actions.

**Age:** All ages. Pre K to Adult

**Activity:** Online mapping tool and classroom/community presentations.

**Materials:** Online website and access to internet.

PowerPoint presentations for presentations (For both in school and out of school presentations)

Fact sheets on Sandhill Crane behavior and viewing opportunities

**Activity Overview:** Every Spring and Fall a flock of about 20,000 Greater Sandhill Cranes migrates from New Mexico to Idaho and back again, wintering in New Mexico and breeding in Idaho. During this 3 week migration each of the 20,000 birds will stop along the way to re-fuel and sleep along the way. These areas where they stop are called stopovers and each of them is equally as important as the next. This activity is aimed at engaging each of the communities around the stopovers and making the communities feel like they are an important part of the larger picture for these birds and make them feel like they can be a big part of finding solutions to the conservation issues threatening the species.

**How it works:** We have created a Geographic Information Systems (GIS) map based online tool where anyone can log on and track the Sandhill Cranes along their migration every spring and fall. The idea is that if someone sees or hears (you usually hear them before you see them) a flock of cranes they can log on and input their location and how many cranes they saw. This is a basic user format for anyone to get involved. Each year the Audubon Society receives hundreds of calls asking "where the cranes are." This gives us a resource to turn the public to that will give them current sightings from all along the flyway.

On this webpage a user will find many different tools that will help them engage in the crane migration. The main stopovers are highlighted on the map so someone can see where the cranes will be stopping. If someone wants to go see the cranes there are directions to get to those stopovers and appropriate "Sandhill Crane viewing" etiquette that will keep both the birds and people safe. The idea is that if someone is interested in going to one of these stopovers to see cranes they can follow the sightings seen at the prior stopover which will give them an idea of the number of birds that are currently flying towards them. Working with Mother Nature is unpredictable and this gives bird watchers and other community members a chance to predict what they will be seeing.

We are developing this tool in classrooms and community groups to be a form of contact with different stopover areas so they can share what is happening at each area along the way. The different communities will be observing the same flock of birds in different numbers, different weather conditions, different habitat types etc. There are many variables that come into play when dealing with migration which prompts the investigative learning. This allows for schools to do investigative research as to why the different numbers? How does the weather effect their migration? Are they migrating earlier every year? Has a new land management approach at one of the stopovers attracted more birds?

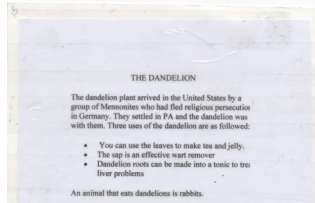
We have developed PowerPoint Presentations and Fact sheets with a wide variety of information for teachers to use to educate their classes about cranes before going out to see the birds. We will have YouTube videos of the presentations given by Audubon staff so educators can just show those videos instead of learning the presentation themselves. The fact sheets include information like Sandhill Crane history, different crane behaviors, what the cranes eat, why they are stopping at each specific site, the conservation threats at each site, potential predators at each site and much more.

The website will also have contact information for biologist along the flyway that teachers can connect with. We have used these biologists to call into classes every day and give an update on what the cranes are doing.

This tool is a work in progress and is designed to be used by remote educators and bird watchers from Mexico up to Canada. It is aimed to better track the cranes and give people the opportunity to virtually experience the last great migration of North America.

**Research and Guidelines for Excellence:** Non-Formal Guidelines for excellence

Needs Assessment 1.1, Environmental Issue or condition - Organizational Needs and Capacity 2.1, Consistent with organizational priorities  
Program Scope and Structure 3.3, Program format and delivery - Program Delivery Resources 4.1, Assessment of resources needed  
Program Quality and Appropriateness 5.2 Field testing - Evaluation 6.1, Determination of evaluation strategies



**Concept / Goals:** Identify weed plant species and their impacts on populations of existing plants in the environment. Estimate weed plant population using sampling method. Calculate population density.

**Specific Objectives:** Students will

- Identify species that have been relocated by human intervention and accident.
- Identify how other plant species have been affected by the relocation.
- Identify relocation impacts upon environment and human society.
- Calculate population density of a particular plant in a square yard.
- Predict population size of a weed plant in schoolyard habitat.
- Understand medicinal and food value of certain weed species.

**Required Materials:**

Schoolyard Habitat, Journals, colored pencils, Field Guides to Native Plants

**Step-By-Step Procedures:**

1. Review organism, species, population, community, ecosystem, habitat, limiting factors and carrying capacity concepts in the field.
2. What is a “Weed”?
3. Review Supporting Notes/Field Guides.
4. Students identify weed plant species in the schoolyard habitats.
5. Students draw one weed species in journal.
6. Students select a sample site with hoola hoops.
7. Population Size Determination
  - a. Demonstrate direct observation.
  - b. Demonstrate indirect observation examples...deer scat and tracks.
  - c. Demonstrate Sampling
8. Calculate population size of a weed species in hoola hoop. Estimate population density on 1 acre field site.

**Closure:**

1. Discuss impacts of relocated species, with an emphasis on the effects the movement of these species on the environment.
2. Discuss some of the benefits of invasive weeds that were historically used for food and medicine by the early Americans.

**Homework:**

Draw a dandelion on 3x5 card and write a paragraph of 5 sentences. Include how the dandelion arrived in the United States, name three historical uses of the dandelion as food or medicine and what parts of the dandelion plant are used.

**Research Based Justification:**

*McInerney, P., Smyth, J., & Down, B. (2011). Coming to a place near you? The politics and possibilities of a critical pedagogy of place-based education. Asia-Pacific journal of teacher education, 39(1), 3-16.*  
<http://dx.doi.org/10.1080/1359866X.2010.540894>

**NAAEE Guidelines for Excellence in EE Materials:**

- 3.1 Critical and creative thinking
- 4.1 Sense of personal stake and responsibility
- 5.3 Connection to learners’ everyday lives.



## Bird Bill Adaptations

Gardiner Platt, Tualatin River National Wildlife Refuge, Oregon

**Authors:** Berk Moss and June Poling (adapted from: Flying Wild: Fill the Bill; and Project Wild: Adaptation Artistry)



**Overview:** Students will learn about bird bill adaptations and how they reflect different types of food and environments.

**Age:** Grades 4-8

**Duration:** 30 minutes

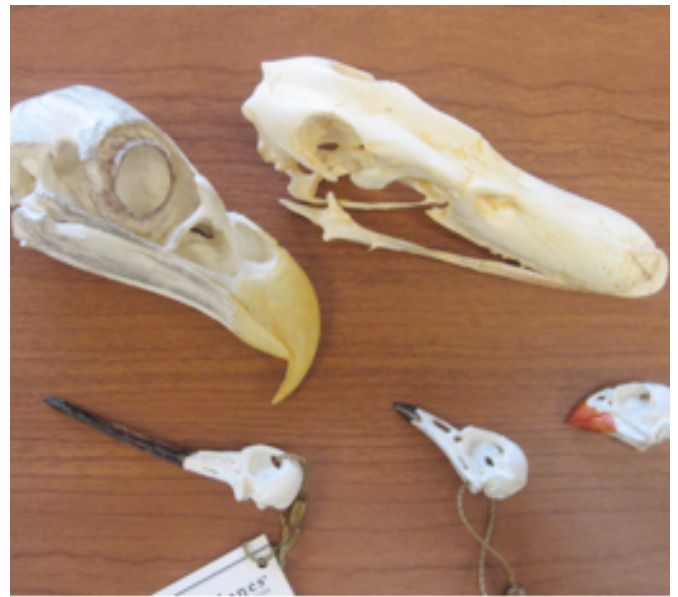
### Vocabulary

**Adaptations**—special features, both physical and behavioral characteristics, developed over time that help animals and plants survive within their environment

**Habitat**—a place where an organism or population of organisms lives

**Generalist species**—a species that can live in many different habitats, eat a variety of food and tolerate a wide range of environmental conditions

**Specialist**—a species that can live in only one type of habitat, eat few varieties of food and tolerate a narrow range of climatic and other environmental conditions.



**Objectives:** After this activity students will be able to: understand how birds use their beaks for eating; note how different adaptations are for different environments; name 2-3 different bird species and how their bills are adapted to their habitat.

**Benchmarks:** Diversity & Adaptations, Making Observations, Organisms

**Materials:** Bird Bill PowerPoint, Bird Adaptation Game, Student Handout, Pencils

### Background Information

Each bird species has different adaptations to the environment where it lives. Some birds are generalists and can survive on a variety of foods or environments, while others are more specialized and may only eat fish. All parts of a bird are specially adapted to their environment such as the bill for specific foods, the length of feathers for different flight, or the feet and talons for grasping, walking or swimming. Students will examine some of these adaptations then focus on the different feeding techniques of birds by rotating through six stations, using different tools to simulate bird bills.

### Suggested Procedure

1. Show the brief bird video and lead a discussion about bird adaptations and the variety of bills and feeding methods.
2. Set up six stations to simulate six different types or species of birds: wren, hummingbird, finch, raptor, duck and swallow.
3. Students should rotate through the stations, trying to pick up different types of foods using available tools that simulate different bird species bills such as a strainer, small fishnet, straw, eyedropper, forceps, tweezers, chopsticks, and pliers.
4. Break students up into six groups with one handout per group and rotate to each station, spending 1 minute at each station.
5. Before the activity begins, discuss the various student roles. One student in each group is the “lookout”; one student records data; and the rest try the different bills. The “lookout” keeps students moving, relaying the concept that birds must eat quickly and efficiently to avoid predation.
6. Working as a group, students will fill in their handout at each station, noting which tool works best for which food choice and which bill belongs to which bird.
7. After all rotations are complete, students will review with the other groups what they discovered about the differences in bird bills, what are the bill adaptations for each bird listed on their handout, did they answer correctly, and what does this tell them about birds native to the Refuge and its different habitats?

### References

Flying Wild: An Educator’s Guide to Celebrating Birds; Project Wild; Stokes. Stokes Beginner’s Guide to Birds: Western Region

# Seed Saving

By: Emily Ritchie



**Objective:** Students will understand where seeds come from and how to save them for future planting.

**Age:** All ages, adapt difficulty of seed harvesting and concepts talked about to age.

**Activity:**

- Ask class: What is seed saving? Has anybody saved seed before?
- Discuss plant life cycle, depending on which plant you are saving seed from. Have students describe this cycle and draw a representation of it.
- Talk about reasons for seed saving: it is a sustainable growing practice (helps keep our garden and food source going), helping our garden program be self-reliant (ask where we usually get seeds if we don't save them), helps local community build knowledge about what plants grow well in their area.
- Divide class into small groups, hand out bowls for collecting seed and compost, newspaper (or any appropriate surface) to do the seed saving over, magnifying glasses, seed pods!
- Have students do detailed drawing of seed pod and seed first. Then demonstrate how to harvest seed (the ones in the picture are kale, you crack open the pod to get to the seeds).
- Let students harvest as many seeds as they can. Collect harvested seeds and put into "seed bank".
- Tell them proper way to store seed: cool, dry, dark.

**Materials:**

- Collect seed pods prior to lesson, either from growing your own plants to seed and harvesting the pods or find some local plants that have gone to seed that you can collect.
- Newspaper
- Bowls
- Magnifying glasses
- Journals, pens, paper, etc.
- Jar to collect seed

**Research and Guidelines for Excellence:**

- Great lesson that provides hands-on activity linked to larger concepts of sustainability, while giving concrete skills.
- NAAEE's Environmental Education Materials: Guidelines for Excellence: 5.2 Different Ways of Learning: Materials should offer opportunities for different modes of teaching and learning. -Diverse sensory involvement is a criterion for selecting learning activities.

# Where Do You Fit In?

Victoria Bahe

A 4th grade lesson by the Urban Ecology Center Staff

## Lesson Outline

### Goals:

Students will practice basic taxonomy skills by identifying characteristics that can be grouped.

Students will be able to name the five main vertebrate phyla and identify two characteristics of each phylum.

### NAAEE Guidelines for Excellence connections:

Strand 2.2 A:

Organisms, populations, and communities

Strand 1 E:

Organizing information

### Materials

Notebooks and pencils  
4 identical "Boxes Of Stuff"

(20 random items to be sorted: cotton ball, pipe cleaner, wood cookie, soda bottle, etc)

Binoculars

Field scopes or hand lenses

Feathers and fur

**Bus Task:** Make a list of all the vehicles you see as we drive. Which ones are similar to each other?

### Introduction:

- Ask students to list a few vehicles seen, write them in columns on the chalkboard as they do (ie. Bikes/cars/trucks)  
Can you see a pattern? Why did I put some vehicles together in the same groups?
- Use their observations to come to a definition of *characteristic* (feature that distinguishes one thing from another) and *classification* (a way of organizing objects into groups by characteristics).

### Box Of Stuff Taxonomy:

- In small groups, students are to make observations of the objects in their box and classify them into 3-6 groups of their determination.
- Give each group an opportunity to share why their grouped their objects that way.
- Compare students' groupings and rationalizations with how scientists group living things. Today we will be looking more closely at the 5 different groups of vertebrates: amphibians, birds, fish, mammals, & reptiles.

### Animal Room Explorations:

- Touch a salamander and snake. Describe the differences in how their skin feels. Look at their "baby pictures" to see how life cycles are different.
- Watch fish as they swim. How do they breathe? How do you think their gills work?

### Hike:

- Find frogs at the pond's edge. Will we be able to find them there in all seasons? Why or why not?
- Use binoculars to watch birds and mammals in the park. Find and observe their homes. Why are they able to be active in winter but other animals are not?
- Find feathers and fur to observe under field scope. (Carry backups in case none are found.)

### Wrap-up—Who Am I?

- Place a picture of an animal on each student's back, so that they cannot see it but others can look at their animal.
- Students must ask yes-or-no questions of other students to determine which object is on their back.



URBAN ECOLOGY CENTER

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# EarthTeam's Aqua Team Project

Maggie Fleming & Chiara Swartout

The **goal** of the project is to involve students in stewardship activities that foster an appreciation and knowledge of, and responsibility for, coastal environments and watersheds. The Aqua Team **objectives** are to: 1) Increase students' eco-literacy, including knowledge of watershed, estuarine and marine concepts. 2) Improve students' communication skills in educating their peers and the public about issues and stewardship opportunities in their local watersheds. 3) Enhance students' skills in conducting environmental investigations, including measuring water quality, collecting data on vegetation characteristics, monitoring aquatic and intertidal species, analyzing the data collected, and reporting the results of the investigations. 4) Increase students' sense of connection with the San Francisco Bay and the Pacific Ocean, recognizing the impacts that their actions have on the greater watershed.

**Activity Plan:** Twenty Richmond High School students meet weekly after school and participate in monthly field events with professional site partners throughout the school year. The core concepts introduced in the weekly meetings include:

- Watersheds (using Richmond's Wildcat Creek watershed as a case study)
- Estuaries (using the San Francisco Bay estuary as a case study)
- Oceans (using the Pacific Ocean and coastline as a case study)

Examples of specific activities incorporated into the after school meetings include:

- Mapping training
- Tracing water flow with a 3-D watershed model
- Albatross bolus dissection
- Preparation for monthly field activities
- Reflection on monthly field outings
- Designing and implementing a service learning project connected to watersheds

Ten monthly field activities consist of the following: hiking, biking, removal of invasive species, weeding, mulching, rapid trash assessments, water quality monitoring, macro invertebrate monitoring, planting, birding, and rocky intertidal monitoring.

**Why?** The Aqua Team project focuses on low-income teens because they need projects that utilize comprehensive, community-building approaches to improve their learning capacity and motivate them to want to learn more (Jolly, Campbell and Perlman, 2004; NSF, 2004). These youth also need compelling place-based experiences to "reinhabit" and improve their urban neighborhoods (Cervone, 2002; Gruenewald, 2003). The need for relevant experiences with science and nature is particularly pressing for students whose schools and neighborhoods are surrounded by asphalt and freeways (Kahn and Kellert, 2002; Rahm, 2002; Louv, 2005). The Aqua Team model includes student planning and leadership, community action projects, science investigations, and critical reflection, which are key youth development approaches that promote science learning and civic action (Schusler and Krasny, 2008; NRC, 2009). Programs with strong youth development models have demonstrated that teens can be effective community educators (Lee and Murdock, 2001).

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## Marshy Adventures

Lesley Bensinger, 2012



**Objectives:** Students will be able to:

1. Draw conclusions from scientific data
2. Collect data using observations, simple tools and equipment
3. Define biodiversity

### Equipment List:

Osprey Room	Access Rd	Dip Net Pier
Spotting Scope	Insect nets, 8	Dip nets, 8
Binoculars, 8 pairs	Containers	Containers
	Insect field guides, 8	

### **Introduction: (10 minutes)**

Welcome the class to the DuPont Environmental Education Center (DEEC), introduce yourself, review the student's names, and ask if the students know why they are at DEEC today. Ask students to define a marsh (type of ecosystem/habitat/place that is wet and the vegetation is mostly grasses). Marsh habitats typically have high biodiversity. Ask students to define biodiversity (biological diversity, number of species that live in an area). In this program we will explore the diversity of the marsh.

### **Section 1: Osprey Room (20 minutes)**

This station focuses on organisms that live in the air. Demonstrate how to use binoculars, distribute materials, and tell students that they have 15 minutes to find as many species as they can. Circulate among the students using the spotting scope and helping with identification. Review species found by the students.

### **Section 2: Access Road (20 minutes)**

This station focuses on organisms that live on land. Demonstrate how to use insect nets, distribute materials, and tell students that they have 15 minutes to find as many species as they can. Circulate among the students to help with identification. Review species found by the students.

### **Section 3: Dip Net Pier (20 minutes)**

This station focuses on organisms that live in water. Demonstrate how to use dip nets, distribute materials, and tell students that they have 15 minutes to find as many species as they can. Circulate among the students to help with identification. Review species found by the students.

### **Wrap Up: (10 minutes)**

Conclude by reviewing the concept of biodiversity. Ask the students if they would expect a healthy ecosystem to have high or low biodiversity compared to an impaired ecosystem. Ask the students if what they found supports the initial claim that marshes are areas of high biodiversity.

### **Research Based Justification: Nonformal EE Programs: Guidelines for Excellence**

Looking at Key Characteristic #5: Program Quality and Appropriateness, this lesson addresses many of the Guidelines including 5.1: quality instructional materials and techniques, 5.2: field testing, and 5.4: sustainability. This field study is part of a larger afterschool series that includes 2 outreaches and another field study. Students first become familiar with common urban and suburban wildlife, are introduced to marsh animals, and visit an urban wildlife refuge to study a freshwater tidal marsh.

# Toddler Nature Walk

Authors' Names: Elizabeth Jackson

## Goal or Objective:

- 1) Students will learn to explore nature with their different senses.
- 2) Students will begin to understand what plants and animals live in local parks.
- 3) Students will gain comfort in outdoor settings.
- 4) Students will understand the difference between natural elements and un-natural elements of nature.

Age: PreK

**Materials:** Different colored chips/erasures, magnifying glasses, various un-natural elements placed on trail.

**Activity:** Start by telling the group that they are going to go on a short hike and learn to explore a forest. Ask students **what are some things that you can find in a forest? What are some animals that they might find in the forest** they are about to explore? Ask about big animals and small animals they might find. Ask students how they might have a better chance to see animals. Will they see animals if they are really loud? Tell students they are going to learn to walk like different animals as they move through the forest. Pick one animal that the students listed and explain how to walk like the animal and then lead students along the trail as they walk like that animal. Example: A coyote is very quiet and careful as it walks through a forest. We are going to walk silently and careful as we walk through this next part of the trail.

As you see different animals or interesting elements along the trail stop and observe and discuss the elements with students. When you reach the area with the un-natural trail stop a little ways before the un-natural items begin. Explain to students that **natural** elements in a forest are things that grow there. Point out a tree and ask if it is growing in a forest. Explain that it is natural. Point to other plants and ask if they are growing in a forest and are they natural. Pick a leaf off the ground. Explain that it came from something that grew in a forest and is also natural. Point at an **un-natural** item such as your coat and ask if it is natural or un-natural then point to some other things that are un-natural. Explain to students that somehow some un-natural items ended up on the trail in front of them. As they walk along the trail they are going to point to any un-natural items they see and say "un-natural." Students are not to pick up the items, the adult at the end of the line can pick up the items as they pass them. Lead students along the trail and help them find the un-natural items.

After all the un-natural items have been found gather students together and explain that they are now going to explore the forest as a scientist might. Scientist use different instruments to look closely at things. Students are going to use magnifying glasses to explore the area around them and look closely at any plants or insects they find. Tell the students the boundaries of their exploration and hand out magnifying glasses. Help them identify things to look at.

Collect the magnifying glasses and have students gather back together. Explain that you saw a rainbow this morning and borrowed some pieces from it so that students could use them today. Review the colors that you have with the students. Tell students that they are each going to get a piece of the rainbow and then go and look in nature for the color they have. When they find that color they can then come back and exchange for a new color and they will again go find that color in nature. Give each student a color and begin the activity.

Gather colors back together and explain that you are going to return them back to the rainbow later today. As time allows have students continue to walk like different animals and explore interesting elements in nature.

## Extension Ideas:

- 1) Have students look in nature for something that feels soft and have a tray or area where they place them. Then have them do the same for something hard, rough, or sticky.
- 2) Have students wear a necklace with different shapes on it. Have students look for something in nature that is the same shape as each of the shapes they are wearing.
- 3) At the end of the hike have students participate in planting native trees and shrubs.



**Research and Guidelines for Excellence:** In Early Childhood Environmental Education Programs: Guidelines for Excellence there are many aspects of the guidelines that this particular lesson meets. These include authentic experiences, use of the natural world and natural materials, development of environmental understandings, and curiosity and questions.

## Conifer Removal: Ecological Restoration Project

### Overview

**Summary:** This stewardship project was designed by the NPS for students to actively engage in restoring meadows that have been drastically altered due to human impacts. By removing encroaching conifers, which are native invasive species, students will help increase the biodiversity of these meadows and prepare the site for a potential prescribed burn in the future.

### Learning Objectives

- What defines a meadow?
- What are the functions of a meadow?
- Why should we care about meadows?

**Key Vocabulary:** Wetland, Fen, Hydrophytes, Montane, Snowpack, Hydrologic Cycle, and Groundwater

**Related Activities:** Meet a Tree, Lorax Debate, and Web of Life

**Alternative Names:** Meadow Restoration Project, Stewardship Project  
**Site:** Cooks & Ahwahnee Meadows, Yosemite Valley, and 4000ft elevation.  
**Grades:** 6-8, 9-12  
**Area of Study:** Conservation Biology  
**Facility:** Outdoors  
**Duration:** 1 hr  
**Group size:** groups of 3-5 students with adult chaperone for younger groups

### Preparation

**Learning Context:** This activity can be used as a team building exercise, a stewardship project, and a transference piece to enact change.

### Materials

- Tree identification cards (1 set for each group)
- Historical pictures of meadows, contrasting pictures of meadow health
- White board and markers
- Gloves, volunteer vests, pruners, loppers, and handsaws

**Sources to learn more:** [Meadows in Yosemite](#), [5 hydrologic stages of meadows](#), and [meadow health](#)

### Instruction

**Introduction:** After facilitating Meet A Tree to identify conifers from Oaks, run Walk and Discuss activity to reinforce material by asking questions to the next location. i.e. Why would a tree be labeled as invasive? Explain how an ecosystem might be affected when one species becomes more dominant?

### Procedure:

1. Define Meadow: Draw a line down the white board and label one side Meadow and the other Forest. Ask students to tell you what goes in each side. Investigate what lives in a meadow and what in the importance and function of a meadow.
2. Set up activity guidelines: Designate physical boundaries and what tree size is appropriate to remove. Review rules and safety tips for using equipment. i.e. Safe or not safe?
3. Model proper behavior: Remove trees closest to ground. Carry larger trees as a group.

**Debrief:** Pair Share and then come in and discuss as larger group.

- What was the purpose of removing conifers? Is this considered a best practice?
- Explain how humans over time have impacted this meadow?
- How do meadows aid the ecosystem and us?
- What are other things we can personally do to aid these meadows?
- What is an example of something in your community that has been altered over time? How can you protect these environments?

### NAAEE Guidelines for Excellence in EE Materials

1.3 Openness to Inquiry, 2.1 Awareness, 3.1 Critical and creative thinking, 3.2 Applying skills to issues, 3.3 Action skills, 5.1 Learner-centered instruction, 5.4 Expanded learning environment, 5.7

Appropriateness for specific learning settings

**Goals or Objective:** Youth will discover the different bird species that exist in a local park. They will learn the adaptations and habitat requirements of these birds, and work together to create a wildlife stewardship project that benefits the park. They are to discover different trees and plants as they make a hands-on project that helps local species, and learn tips and tricks on how to create urban oasis for wildlife in their own backyards.

- Youth will learn tips on bird ID and try to identify at least 5 local birds. .
- Participants will participate in a hands-on project and build birdhouses (chickadee boxes).
- They identify at least 5 local plants and learn about their benefits for wildlife.
- Youth learn about habitat components
- Youth discuss how to create wildlife habitat at home

**Age:** 13-17

**Length:** 1.5 – 3 hours (dependent on exploration)

**Materials:** Binoculars, Field guides (bird and plant), Bird house/feeder materials

### **Program Outline:**

#### **Intro (10 min)**

Give a general overview of what the group will be doing. Create a group agreement about respect for the park and wildlife: what do respectful actions look like? Prompt for prior knowledge – encourage the group to share knowledge with each other during the program.

**Birding walk** – lead by volunteer naturalist (1 hour or longer).

Explain how to use binoculars, and best strategies for finding birds. During this walk, while looking for and identifying birds, we will also stop to identify at least 5 native plants that benefit wildlife in Blackie Spit Park. Each plant will exemplify a habitat component: food (eg. Indian plum, detritus that mollusks eat – highlight food chain), water (eg. Vegetation that is creating marshland in the dykes), shelter, (dead wildlife trees), and protection from predators (salmonberry, shrub layer).

At each stop, prompt for ways that we can provide these for wildlife ourselves: eg. protection from predators could be the designated dog beach, the sensitive habitat zone for ground nesters, shelter could be the purple martin nesting boxes).

Be sure to allow plenty of time for exploration and bird discovery during and after the 'directed' portion of the walk.

#### **Build bird houses and feeders (20 – 30 mins)**

Winter can be a challenging time for birds, especially in the city where resources are limited. As stewards of the urban environment, we can create oasis and lend wildlife a hand. These are take-home wooden chickadee nest boxes and feeders. The activity will include a few large nest boxes for other bird species, which the group will build together to be installed in designated places in the park. (These are large and will have to be installed by park technicians). Encourage youth to return to the park to monitor the nest boxes.

#### **Wrap up (10 mins)**

Now that the youth have food or shelter to bring back for their backyard birds, ask them if there are any other habitat components lacking in their yards, and brainstorm with the group how to provide them. (eg. Providing bird baths, installing houses out of the reach of neighborhood cats, planting native plants in a pot for the balcony). Connections – if youth are interested in further birding opportunities, have them write down their names for follow up, and refer them to other community resources.

### **Research and Guidelines for Excellence:**

1. *Needs Assessment:* The need was identified by the youth group themselves, who concluded that most of their stewardship activities were plant focused. While they understand removing invasives 'created habitat for wildlife', there is a knowledge gap of what the wildlife was or what the habitat requirements were.
2. *Organizational needs and capacities:* Supports our organization's goal of specialized to provide opportunities for the public to participate in on- going and long term basis in the sustained care and management (of the urban forest and natural environment on public and private land. The group continually visits this park to remove invasives and plant new vegetation.
3. *Program scope and structure:* Allows for exploration and inquiry, and offers youth ways to continue self-directed learning and stewardship activities after the program.
4. *Program delivery resources:* The resources are primarily the park itself. The staff is the youth volunteer coordinator, and a volunteer naturalist leads the bird walk, thereby connecting youth with a volunteer of another generation. Because the resources are the park itself, there is much room for improvisation and discovery.
5. *Program quality and appropriateness:* Virgin program in this capacity; but it is based on a successful program for families. The naturalist is well-known and the community has given great feedback on previous walks. The park is part of the International Birding Area (world renowned).
6. *Evaluation:* Has not yet been completed.



# Animal Coverings

Scott Lawson

**Goal or Objective:** Students will use observation skills to discover various types of animal body coverings.

**Age:** Grades 1, 2

**Time:** 30-45 minutes

## Materials:

5 microscopes

Magnifying glasses

Biofacts: Box turtle shell, fox tail, ostrich feathers, anaconda scales, preserved salamander

Live animals: spotted turtle, chinchilla, pygmy pouter pigeon, sand boa, crocodile newts

Nature Journals

Pencils

## Activity:

- 1) Five stations will be set up in the classroom before students arrive, each representing a different animal body covering: shell, fur, feathers, scales, and smooth skin. Each station will have one biofact, one specimen to look at under a microscope, and one live animal.
- 2) When students arrive, they will be broken up into 5 groups. The activity will be explained, and they will take their journals and pencils with them to their first station.
- 3) At each station, all group members will look at the 3 examples for the animal covering.
- 4) After observing each example, they will write at least one sentence in their journal about that specific station.  
Example: A sand boa has scales.
- 5) Students will have approximately 5 minutes at each station to observe the examples and write their sentence.
- 6) After 5 minutes have passed, the groups will rotate clockwise to the next animal covering station.
- 7) Steps 3-5 will be repeated until all stations have been visited.
- 8) Nature Journals will be collected, and the activity will be wrapped up with a brief discussion.

## Research and Guidelines for Excellence:

*Duerden, M. D., & Witt, P. A. (2010). The impact of direct and indirect experiences on the development of environmental knowledge, attitudes, and behavior. Journal of environmental psychology, 30(4), 379-392. <http://dx.doi.org/doi:10.1016/j.jenvp.2010.03.007>*

- This lesson gives the students a direct experience with nature, which hopefully in the long term will help to shape their environmental knowledge, attitudes, and behavior.

*Sandell, K., & Öhman, J. (2010). Educational potentials of encounters with nature: reflections from a Swedish outdoor perspective. Environmental education research, 16(1), 113-132.*

<http://www.informaworld.com/smpp/content~content=a919324950>

- This lesson allows the students to have a personal encounter with nature, which contributes to a relational ethical perspective and ideas of democracy.

**Taylor, Andrea Faber; and Frances E. Kuo. "Is Contact with Nature Important for Healthy Child Development? State of the Evidence." In Spencer, C. & Blades, M. (Eds.), Children and Their Environments: Learning, Using and Designing Spaces. Cambridge, UK: Cambridge University Press, 2006.**

<http://www.lhhl.uiuc.edu/documents/Faber2006Iscontactwithnature.pdf>

- This lesson provides students the opportunity to have direct contact with animals, which has a positive impact on child well-being.

**Balmford, A., Clegg, L., Coulson, T., & Taylor, J. "Why Conservationists Should Heed Pokémon." *Science*, 295(5564), 2367-2367, 2002. This study is available online at: [http://www.sciencemag.org/cgi/content/full/295/5564/2367b?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=pokemon&searchid=1141908863643\\_6399&FIRSTINDEX=0&journalcode=sci](http://www.sciencemag.org/cgi/content/full/295/5564/2367b?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=pokemon&searchid=1141908863643_6399&FIRSTINDEX=0&journalcode=sci)**

- This lesson broadens the students' knowledge of animal species.

# Pre-K Literacy Program: Animal Body Coverings

**Age:** 3-4yrs

**Written by** Ashlea Vallejos

**Duration:** 50 minutes

## Objectives

Students will be able to identify different animal body coverings. Students will be able to describe the use of each type of body covering. Students will be able to classify animals based on their body covering.

## Materials

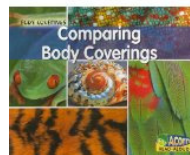
**Books-** Nonfiction- *Comparing Body Coverings* by Rebecca Rissman

Fiction book- *Fur and Feathers* by Janet Halfmann

**Live animal-** lizard

**Body Covering worksheet, glue, pencils, crayons**

**Animal biofacts-** Tiger pelt, sheep wool, snake skin, turtle shell, conch shell, condor, owl, and parrot feathers.



## Activities

- 1.) Have students sit in a circle on the floor. Introduce the topic of animal body coverings. (5 min)
  - a.) Ask students what a cat has covering its body? What does a snake have? What does a bird have? Etc. What types of animals do you see outside? (Ex: squirrel, birds, insects, deer, etc). What do these animals have covering their bodies?
  - b.) Ask students to think about why a polar bear needs thick fur. Where does it live? How might white fur help a polar bear? Why do birds have feathers? How do they move around? Etc. See what the kids know already!
- 2.) Read nonfiction book: *Comparing Body Coverings* by Rebecca Rissman (15 min)
  - a.) Discuss concepts as you go instead of reading book verbatim. Utilize the photos in the book to illustrate topics. Ask students what they know. Continually ask them questions. Repetition is critical for this age group.
  - b.) Ask students how different body coverings can help animals in the wild? (Ex: shells keep them safe, camouflage, bright colors= warning, spines/quills for protection, etc.)
  - c.) Pass around animal biofacts for children to touch as you introduce the different animal body coverings.
- 3.) Meet a live animal! (10 min)
  - a.) Meet a lizard called a Northern Blue Tongue skink! Discuss what type of body covering does he have? **SCALES!**
  - b.) Pass around snake skin so students can see what reptile scales feel like. What animals are reptiles? Snakes, lizards, alligators, crocodiles, turtles, etc. They all have scales
  - c.) It's time to touch! Have students wash hands and then allow them to gently touch the live animal of the day.
- 4.) Read fiction book: *Fur and Feathers* by Janet Halfmann (10 min)
  - a.) The fiction story is meant to be silly at this point in the program. Don't be afraid to do all the character voices, and have the kids act out parts of the story (animal noises etc.). This is their time to unwind a bit and digest all the information you have just discussed in your program. Have fun with it!
- 5.) Evaluation (10 min)
  - a.) Have students complete the animal body coverings worksheet provided. Sort animals into appropriate body covering categories. Ex: put the mammals in the fur bubble, birds in the feathers bubble, etc.

### Support from Early Childhood EE Guidelines:

**Guideline 4.2- Curiosity and Questioning-** Encourage children to manipulate animal artifacts and ask questions

**Guideline 2.4- The Whole Child-** Develop programs that capitalize on children's innate curiosity of animals and have the flexibility to take advantage of "teachable moments" that stem from this curiosity.

**Grades:** K-3  
**Season:** Spring

**Duration:** 40 + minutes

**Objectives:** Students will know that:

- Plants have a circulatory **system** that involves the movement of water mixed with nutrients from roots to leaves and water mixed with sugars from leaves to growing parts and roots. In spring water mixed with sugar surges up the trunk to places where growth is taking place.
- Trees can move hundreds of gallons of water a day through trunk and branches without any moving parts.

**Materials Needed:**

- (5) 1 gallon jugs of water
- Rope to throw over branch
- Pump with 2 buckets, one full of water (one set per pair students)
- Stethoscope, one per pair of students
- Handout: Sequoia Drawing

**Learning Standards**

WA State Science EALRs

Systems: K-1 SYSA; 2-3 SYSA, 2-3 SYSB, 2-3 SYSC.

Inquiry: K-1 INQA, K-1 INQD; 2-3 INQA, 2-3 INQD.

Life Science: K-1 LS1F

**Guidelines for Excellence**

**Early Childhood EE Programs**

Key Characteristic 1

1.1: Focus on nature and the environment

1.2 Focus on education of young children

Key Characteristic 2

2.1: Based on research and theory

2.2: Authentic experiences

2.3: Child-directed and inquiry-based

Key Characteristic 3

3.1: Use of the natural world and natural materials

Key Characteristic 4

4.2: Curiosity and questioning

4.3 Development of environmental understandings

4.4: Skills for understanding the environment

Key Characteristic 5

5.1: Spaces and places to enhance development

5.2: Natural components

5.3: Comfortable for both children and adults.

5.4: Health, Safety, and Risk

Key Characteristic 6

6.4: Planning and implementing environmental education.

6.5 Assessment and Evaluation

## OH, THE WONDER OF TREES

**Author:** Ann Dold. **Adapted from:** Joseph Cornell. *Sharing Nature with Children*. Nevada City: Dawn Publications, 1998; and National 4-4 Council. *Forests of Fun: Reach for the Canopy, Level 2 Forestry Youth Activity Guide Bu-08039*. National 4-H Curriculum. 2004.

**Overview:** Students consider the weight of water, listen to the sound of sap surging up through the trunk of a tree, and speculate about how a tree is able to transport so much water from roots to leaves without any motors, pumps, or moving parts.

**Preparation:** Early spring is the best time of year for this activity because trees are pumping sap up to their branches, getting ready for the growing season. Choose deciduous, hardwood trees with thin, smooth bark, at least six inches in diameter. Birch, beech, and cherry trees are good choices. Check to make sure you can hear the sap moving. Place the stethoscope against the trunk of the trees and listen closely. You may need to move the stethoscope around a bit to find a good spot for listening. Hopefully you'll hear your tree gurgling, crackling, and bubbling. Flag these trees. Also place several gallon jugs of water around the Sequoia and tie one to one end of the rope hanging over a lower branch. Place the pumps each with two buckets around this tree.

### Activity Part 1: Activate Background Knowledge (5 minutes)

Gather students in a group around the big *Sequoia* and ask:

- Have you ever listened to your own heartbeat? Did you ever use a stethoscope like your doctor? When you used a stethoscope what did you hear? Did you hear a swishing noise too? What was that noise? (Blood flowing through the heart.)
- Does a tree have a heartbeat? (No.) Does a tree have blood? (No, not like you and me.) Have you ever seen sap coming out of a tree? Do you know what sap is? (Sap is water mixed with nutrients moving from roots to leaves, and water mixed with sugars made in the leaves, moving to parts of the tree that are growing and to the roots for storage. In the spring these sugars mix with water and surge to places that are growing.)

### Activity Part 2: Push the "Wonder Button" and Ask the Focus Question – How does a tree move all that water up so high? (10 minutes)

- Look up at the top of the *Sequoia*, pointing out that big trees like this redwood can move as much as 500 gallons of water a day – from the roots to all parts of the tree.
- Ask students to pick up the gallon jugs of water and pass them around. Tell them that one gallon of water weighs 8 lbs.
- Ask them to pull on the end of the rope hanging over the branch and lift the gallon jug off the ground. Ask them to imagine how hard it would be to lift the other four gallons jugs of water if they tied them to the hanging one.
- Point out that this redwood tree is over 250 feet tall and can lift 500 gallons (500 jugs) a day from the soil to the top. Ask: How do you think a tree like this is able to move as much as 500 gallons of water a day up that high?
- Pair the students up and have them take turns pumping water from one bucket into another to show them how much work it takes to transfer water.
- Ask them if they think there is a mechanical pump inside the tree or maybe a motor that helps the tree move all that water up so high. Invite them to put their ears to the tree to see if they can hear anything or feel any vibrations.
- Capture their imagination by asking: Maybe we can hear all that water moving up a tree trunk the same way we can hear our own blood moving in our hearts? If necessary

### Wonder Facts

- In a growing season, a medium sized tree (50 feet tall) can absorb 10,000 gallons (83,000 lbs.) of water from the soil and some can lift 250 gallons (2,000 lbs.) a day, from root to leaves, at speeds up to 150 feet per hour (4-H Bu-08041)
- Exceptionally large trees, like the giant redwoods, can move as much as 500 gallons a day, from roots to all parts of the tree. California Visitors Center, <http://www.visitcwc.com/Arcata/FAQ/>

remind them of the stethoscope their doctor uses to listen to their heartbeat. Ask them to make a prediction as to whether or not they will hear anything if they use a stethoscope. Why or why not?

### Activity Part 3: Listen to the Heartbeat of a Tree (10 minutes)

Take students to the location where you have previously selected deciduous trees for this activity. Pair students and give them a stethoscope.

- Show them how to place the stethoscope on a smooth part of the bark, cautioning them to hold it perfectly still so as not to make interfering noises. Explain that is also why only one group should be listening to a tree at a time. Encourage them to listen to their own heartbeats as well. Explain they may have to try more than one place on the trunk to find a good listening spot.
- When everyone has had a chance to listen to different trees, gather them back together and then have them report on the results of their investigations.
- Were their predictions correct? Why? Why not?
- Ask: How is the sap flowing in a tree is like your own circulatory system? How is it a system? (Parts of the tree are working together so the tree can live – function as a whole.)

### Activity Part 4: Reflection (5 minutes)

- Ask them to think about what they learned and to ask themselves how a tree might be able to move hundreds of gallons of water a day up to heights of over a hundred feet? Let students speculate freely about an answer. Do not answer the question but facilitate discussion.
- Explain to the students that as they learn more science in school they will be able to build their own understanding of how trees are able to transport so much water, so fast, to such remarkable heights without any moving parts, pumps, or motors.

### Activity Part 5: Assessment (10 minutes)

- Give each student a handout with the drawn picture of a Sequoia. Ask them to use arrows to illustrate the tree's circulatory system. Give them blue crayons to illustrate the water and nutrients moving from roots to leaves and a red crayon to illustrate the sugars moving from leaves to growing parts and roots.





## Student CTD (Conductivity, Temperature, Depth) Activity on the Harlem River

**Obed Fulcar**, Director of EE, Friends of Sherman Creek Project, New York City

**Objective:** Students will develop understanding of how and why data on Conductivity, Temperature, and Depth is collected as part of Citizen Science Stewardship.

**Age:** Middle School Level; 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> Grade

**Activity:** Students will develop understanding of how and why data on Conductivity, Temperature, and Depth is collected as part of Citizen Science Stewardship.



**Materials:** Clipboard, Data Sheet, pencils, LaMotte student water quality test kit, Hydrometer for salinity Student water sampler, armored alcohol thermometer (these items can be ordered from Forestry Suppliers.com), Metric Ruler/Tape.

**Average Learning Time:** This lesson can be taught in 3 class periods of 45 minutes, per week, in 1 semester.

**Overall Concept (Big Idea/Essential Question):** What is the impact of changes in the levels of Salinity and Temperature in the health of marine life?

**Keywords:** Estuary, marine ecosystem, salinity, dissolved oxygen, PPT (parts per thousands), PPM (parts per millionth)

**Guidelines for Excellence justification:** Students learn environmental stewardship, and improve science scores.

### Environmental Stressors affecting the health of Aquatic Life on the Harlem River:

The Harlem River or Harlem Creek, which is how used to be known in colonial times, is not really a river but an arm of the Long Island Sound. It surrounds the island of Manhattan, and the Counties of Bronx and Queens in New York City. It is considered a part of the Hudson River Estuary, which means it is affected by the salt water tides from the Atlantic Ocean in the South, and by the fresh water currents of the Hudson River. During colonial times New York City used to be surrounded by salt marshes that were teeming with wildlife. The native Lenape from the Delaware Indian nation used to inhabit Manhattan and harvest an abundance of oysters, clams, blue crabs, and also fish for striped bass, Chad, alewife or American herring, eels, and several other species. Through the years human development had resulted in water contamination from sewers and factory waste that devastated the oyster and clam population, as well as destruction of the salt marshes that were nurseries of life to many aquatic species.

### Focus Questions (Specific Questions):

1. What is an Ecosystem? What is a Marine Ecosystem?
2. What is Conductivity and how is it measured?
3. How Salinity does affect marine life?
4. What if the impact of water temperature on marine ecosystems?
5. What is the relation between water temperature and the depth of water?
6. What is Dissolved Oxygen and why is it important for aquatic life?
7. What is the impact of water temperature on dissolved oxygen?

### Objectives/Learning Goals:

- 1) Students will make a prediction about what will be the readings for the water temperature, salinity, dissolved oxygen and water depth data from the Harlem River.
- 2) Students will collect data on water temperature, salinity, and dissolved oxygen at different depths of the Harlem River and record it on a chart with 80% accuracy.
- 3) Students will use the data to create a graph on Excel computer software with 80% accuracy.
- 4) Students will determine if their predictions for the readings water temperatures, salinity, dissolved oxygen and water depth data from the samples collected were accurate and if there is connection between them.

### Lesson Procedure:

**Step 1:** Mark the line on the student Water Sampler Bottle using a Metric Ruler or Tape, as well as the line in the armored thermometer. Make the marks using a black permanent marker in Centimeters. Ask students to predict what they think will be the water temperature, salinity, and dissolved oxygen at 4 different depths (surface, 30cm, 60cm, 1 meter) and record in them their notebooks.

**Step 2:** Making sure to secure parental permission to bring students to the Sherman Creek Waterfront Park that can be easily reached by public subway. Once there we go over basic safety rules. A safety kit and sanitizer is recommended to bring. In order to conduct the CTD we locate and lower the water sampler from a bulkhead protected by safety railing.

**Step 3:** Students will work in groups of 2-3 rotating from one protocol to another. One student reads the data, while another confirms the reading and the third records the data on the Data Sheet. Information such as Date, Time, GPS location (can be obtain with a GPS enabled phone or website Google Earth).

**Step 4:** Water sampler bottle is armed and lowered into the water until it reaches below the surface. The trigger is pulled and the bottle is the hoist. Using the attached hose use it to fill in water sample bottle or glass vials. Depth is also recorded. The armored thermometer is also lowered below surface and after 5 minutes then is hoist and temperature is then recorded as well as depth.

**Step 5:** Using the LaMotte water quality kit locate the dissolved oxygen tablets, and following the instructions place them in one of the vials, shake and wait 5 minutes to see the reaction. Compare the color reaction of the sample against the color coded mini chart and record the level on the data sheet.

**Step 6:** Pour water from the bottle sampler into the hygrometer to measure the salinity level. Record it on the data sheet, making sure one student calls the reading, another confirms the data and another records on the data sheet.

**Step 7:** Repeat at different water depths and record all data.

**Step 8:** Using Excel Spread sheet software or graphing paper, plot and graph the data. Look for any patterns: Does the data match your predictions? Does depth affects water temperature, dissolved oxygen or salinity?

Date:	Time:	Tide (High/Low)	Air Temp:	Latitude:	Longitude:
DEPTH Cm	Water Temperature (Celsius)		Dissolved Oxygen (PPM)		Salinity
No 1)					
No 2)					
No 3)					
No 4)					



Wild Edibles  
Nicole Jackson

**Class Size:** 15-20

**Time:** 1-2 hours

**Objectives:**

- To promote awareness of natural foods and their nutritional value
- To encourage creativity
- To discuss survival off the land
- To stimulate an understanding of everyone's dependence upon their environment

**Materials:** Wild Edibles lesson plan, pencils, markers, construction paper, magazines, cooking supplies and eating utensils

**Step by Step plan:**

Wild edibles is a class that takes several days of prep time- studying and learning what to eat and what to avoid. It can be dangerous and even life-threatening, so make sure you have a Naturalist or expert on wild edibles to instruct this class.

Begin in the nature center with a discussion on wild edibles. What are they? Where are they? What precautions do we need to take? Remind students that just because they are taking this class does not mean they will be experts. Use caution at all times and no one picks or eats anything until instructor gives them permission.

This class can take two directions:

- 1) Hike to collect food for preparation later
- 2) Take a "taste" hike; encourage students to taste and eat different plants as you walk along. This involves no cooking. Be sure you know which of the two techniques you want to accomplish for your class.

If you choose to cook, pick a few recipes and enjoy! It's best to choose a drink and one or two foods. Look over the recipes carefully and pick the ones you have time to prepare. Toward the end of class time, ask students to design a booklet using what they learned. It can be in recipe form, like a cookbook, a menu for a wilds restaurant, or even some poems about wild edibles. Hand out materials and let their imaginations flow. Be sure to leave enough time for clean up if needed.

**Research:**

Chawla, L. (2008). Participation and the ecology of environmental awareness and action. In A. Reid, B. B. Jensen, J. Nikel & V. Simovska (Eds.), *Participation and learning. Perspectives on education and the environment, health and sustainability* (pp. 98-110): Springer.

Price, A. (2011). *What's good in my hood: a service-learning workbook for investigating urban communities*. New York: New York Restoration Project.

Wells, N.M., & Lekies, K.S. (2006). Nature and the life course: pathways from childhood nature experiences to adult environmentalism. *Children, youth and environments*, 16(1), 1-24.

# Making Friends with Vegetables!

Adapted by Pam Hosimer from *Growing Healthy Habits* (GHH, [http://md.nutrition-ed.org/tmp/GHH\\_7\\_30\\_12\\_Curriculum\\_Part\\_1.pdf](http://md.nutrition-ed.org/tmp/GHH_7_30_12_Curriculum_Part_1.pdf))

## Goal or Objective:

1. Introduce students to the idea that plants have anatomy, or parts, just like people.
2. Build understanding and awareness of how we use these parts for food.
3. Share this knowledge with others to be a force for good.

**Age:** Kindergarten – 5<sup>th</sup> Grade

**Activity:** This lesson uses materials from *GHH, Parts of the Plant We Eat* UNIT (online pages 67-99), sponsored by University of Maryland Extension Food Supplement Nutrition Education Program.



1. Read the book **“The Vegetables We Eat”** by Gail Gibbons to the group and introduce basic plant anatomy. Compare plant and human anatomy.
2. Using 6 large photographs & plant parts diagram identify the 6 parts of a plant & discuss. Introduce vocabulary.
3. Wash hands!
4. Have a “Parts of the Plant” tasting session. Give each student a sample of the vegetables representing each of the 6 parts of a plant. . Encourage tasting one vegetable at a time. Compare the experience of each student.
5. Divide students into 6 groups. Have each group select one part of a plant. Ask each group to create an anagram poem about their plant part. They will write the completed poem on cardstock and include original illustrations if they would like. When poems are completed the groups will present the poems to the whole group.
6. Evaluate: Ask each student to name a vegetable they like and what part of the plant that is.
7. Poems and illustrations will be displayed in the classroom after the lesson is finished.

## Materials:

- Book - **“The Vegetables We Eat”** by Gail Gibbons
- 1 plant parts diagram (GHH page 97) Put sheet in plastic page protector.
- 6 vegetable photographs (GHH - carrots page 87, tomato page 88, spinach page 89, broccoli page 93, peas & celery page 94) Enlarge photographs of vegetables to 8½” x 11”. Put each sheet in plastic page protector.
- Vocabulary Sheet (GHH page 84)
- 7 page protector sheets
- Colored cardstock
- Markers and/or crayons
- Antibacterial hand wash
- Small paper plates or little cups, one per student

- Paper towels
- 6 Ziploc plastic bags – gallon size
- Cooler with ice for veggie storage

## Tasting Ingredients:

(Cut up the night before lesson and put in Ziploc plastic bags. Store in cooler with ice.):

- 4 long carrots, washed and either shredded or chopped
- 1 bunch of celery, washed and chopped
- 1 1/2 lbs. baby spinach, washed
- 1/2 of a 10 ounce package frozen peas, thawed
- 1 package grape tomatoes, washed
- 1 broccoli crown, washed and cut into small pieces

## Research and Guidelines for Excellence - NAAEE Guidelines for Excellence in EE Materials:

2. Depth. 2.1) Awareness. 2.2) Focus on concepts.
3. Emphasis on Skills Building. 3.1) Critical and creative thinking.
4. Action Orientation. 4.1) Sense of personal stake and responsibility.
5. Instructional Soundness. 5.1) Learner-centered instruction. 5.3) Connection to learners’ everyday lives. 5.8) Assessment.
6. Usability. 6.1) Clarity and logic. 6.2) Easy to use. 6.3) Long-lived. 6.5) Accompanied by instruction and support.



## Additional Resources:

Cleary, B. P. (2011). *Green beans, potatoes, and even tomatoes: What is in the vegetables group?* Minneapolis, MN: Millbrook Press.

Gibbons, G. (2007). *The vegetables we eat*. New York: Holiday House.)

*Grow It! Eat It!* Website – <http://www.growit.umd.edu>

Kenin, J., & Lettenberger, B. (2010). *We grew it, let's eat it!* Washington, D.C.: Tenley Circle Press.

# Sustainable Food Systems : Local Food, Local Farmers



## Lesson Overview

The farmer's market setting provides a unique opportunity to connect students with communities that share beliefs about local food and food production.

## Objective

Students will discuss and reflect on the nutritional, social, economic and ecological benefits of local food and discover local food purchasing options. During the place-based activity students will have the chance to observe the symbiotic relationship between local farmers and the community and find out how local foods travel from farm to customer.

## Vocabulary

Community Supported Agriculture (CSA), Farmer's Market, Co-Operative, Community Garden

## Level

Middle School

## Venue

Farmer's Market

## Materials

'Meet the Farmer' handout  
Pencils & clipboards

## Step 1

Introduce students to local food systems. Contrast and compare to 'industrial/global' food systems. Explain briefly the nutritional, social, economic and ecological benefits of locally grown food. Discuss and reflect on student's food values and preferences and how these choices impact themselves and their community.

- Do students eat more processed food or food made from fresh ingredients?
- How do our food systems affect our choices about what we eat?

## Step 2

Introduce students to the concepts of farmer's markets, community supported agriculture (CSAs), co-operatives and community gardens and showcase a few examples in the area. Discuss consumer benefits to improving local sustainability and support for local agriculture.

- Do students know of any local farmer's markets, CSAs, co-ops or community garden close by?
- What are the benefits of shopping at a farmer's market or CSA versus a conventional grocery store?

## Step 3

Break students up into groups of 3 - 4 with one 'Meet the Farmer' handout per group. Have students conduct interview with vendors/farmers.

## Step 4

Discuss with students interview answers and reflect on importance of the relationship between local farmers, businesses and consumers.

## Sample 'Meet the Farmer' Questions

- What is your name?
- What is the name of your farm?
- Where is your farm located?
- How far do you travel to this market?
- What produce do you grow?
- How long have you been a farmer?
- What types of local vendors do you sell to?
- Which types of foods have limited availability?
- What makes your farm a sustainable operation?

## Reference

Sobel, D. (2005). Place-based education: connecting classrooms and communities. Great Barrington, Massachusetts: The Orion Society.

## EE Guidelines for Excellence

- 2.1 Awareness
- 3.1 Critical and creative thinking
- 5.3 Connection to learners' everyday lives
- 6.2 Easy to use