

Cornell University



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

# **26 LESSON PLANS**

## **FOR URBAN ENVIRONMENTAL EDUCATION**

**Submitted by course participants**  
**Fall 2011**

**Instructors: Alex Kudryavtsev, Marianne Krasny, Akiima Price**

# Learning About Biophilia Through Interviews

Carol Kennedy, Alex Kudryavtsev



**Goal:** Students learn about complex ideas such as biophilia and nature deficit disorder by interviewing park visitors.

**Age:** High-school students.

**Activity:** (Step 1) In a classroom, an educator provides and discusses interview questions. Students practice interview skills by interviewing each other. (Step 2) In an urban park, students observe how an educator conducts a practice interview with a park visitor. Then in groups of 3-4, students approach park visitors and ask questions about their background and biophilia. One of students welcomes a random park visitor and invites him/her to participate in an interview. Another student asks questions. Other students record responses using a journal, voice recorder, smartphone, or camcorder. Each group interviews three park visitors.

Sample questions:

1. Where are you from?
2. Do you think there is enough green space or nature in New York City? Do you think some boroughs (Bronx, Manhattan, Brooklyn, Queens, Staten Island) have more green space than others? Why?
3. How do you feel when surrounded by nature or green space?
4. Where do you go to enjoy nature or what is your favorite place to enjoy nature? Why?
5. Are there any aspects of nature that bother you? What aspects?
6. Do you think being around nature affects your mental, physical or emotional health? Why?
7. What do you think biophilia means?
8. What do you think nature deficit disorder means?
9. Do you think it is important that young people get a chance to experience nature? Why?
10. Would you be willing to pay (a very small amount) for more green spaces to be easily available to all persons in the city? Why?

(Step 3) In a classroom, students and an educator discuss interview answers, and reflect on the ideas of biophilia and nature deficit disorder. Compare answers from different interviewees.

**Materials:** Printed interview questions, clipboards/paper or electronic devices to record answers.

**Suggestions:** Each student group may interview 3-4 people in one session. Before interviewing park visitors, students can read a simple article on nature deficit disorder or biophilia. After interviews, students can participate in an in-class discussion or post blog entries about the interview experience, readings, or their own ideas on biophilia. Instead of one park, interviews may be conducted in different types of parks or with people of various demographics, and then responses can be compared.

**Idea:** Carol Kennedy, who came up with the idea for this lesson, believes that students learn better about biophilia in the field from other people than only from reading in a classroom.

**Research and Guidelines for Excellence:** Through the interview activity students may develop social and citizen skills, such as interviewing, by practicing these skills (Scott, 2010). In addition, using the social and natural environment in communities for interdisciplinary learning may contribute to students' academic achievement (Lieberman & Hoody, 1998). This lesson plan also reflects the "EE Materials: Guidelines for Excellence" by addressing key characteristics such as #2Depth (e.g., by fostering awareness of the natural and built environment), #3Emphasis On Skills Building (interviewing and communication skills), and #6Usability (this lesson plan can be adapted and used in different cities).

# Circular Perspectives

Adam Kessel (part of Urban Explorers Curricula)

## Rationale

The major goal is to get students to start thinking about who does science and how different people have different perspectives on what science is. This activity can also be used as an ongoing anchoring practice to bring youth into space where they can freely see and talk about multiple perspectives of phenomena.

## Big Ideas

Different people do Science in different ways from different perspectives. Science is a way of knowing the world and people practice science in different ways.

## Materials and Equipment Needed:

- Chairs set in a circle
- An object to make observations about (used a rock that was painted different colors)

## Activities to Cover Goals/Objectives

Topics to be highlighted within instructional sequence:

- Put all desks in a circle
  - Students enter the circle; they will notice that there is a painted rock (or any object that has distinctly different colors on all sides) in the center of the circle. <sup>1</sup>
  - Each student will be asked to describe the colors that they see. (Do this moving counter clock wise around the circle)
  - Once everyone describes the cube the teacher then calls on two students each on opposite sides of the circle to describe the colors again.
- The teacher then asks if these two students believe one another
  - Do you trust this person that has the opposite perspective as you?
  - Do you know this person who has an opposite perspective as you?
- The teacher then asks two more students that are sitting on the same side as the other two but are closer to one another if they believe their classmates descriptions.
  - They will most likely answer yes (if not pick another person that is closer to the first student) so point out that this makes sense because these students are closer in perspective to the first students.
- The teacher then explains that the rock symbolizes a natural phenomenon and the students represent those who tell the stories and are the scientists that write about these scientific interpretations. Also tie in that the science textbook (which was on your lap and now is standing up in an empty seat in the circle) is one perspective on science. <sup>2</sup>
  - Also ask the class if they know the author of the book. You can use the same questions that were used with questioning student perspectives.
- Students can then begin to share things with the group that they have done with their family or stories that they have heard from their family about activities that could be scientific. <sup>3</sup>

## Discussion Points

- <sup>1</sup>
  - The single item can be replaced with multiple items. If time permits a great way to create multiple layers of conversation is creating topography of items. Place different sized items (boxes) to create different elevations and cover them with the sheet. Now take items that hold different means and mix them up. For example, place out traditional items (hand drum or pipe), contemporary items (mp3 players), and or environmental objects (plastic water bottles). This is a way to be strategic and have the items drive the conversation rather than the teacher. This will allow youth to take control of the conversation while the teacher has control of the set up of the learning environment.
- <sup>2</sup>
  - Let youth move the conversation forward. Some guiding questions could include:
    - What science do we learn in school?
    - Do you do science?
    - Does your family do scientific activities?
- <sup>3</sup>
  - The big idea for youth to leave with is that Native Science is different way of understanding the world than non-native people but these ways are just as valid other scientific pedagogies.

## **POLLEN MOVERS**

**Authors:** Theresa Chormanski and Alison Walker

**Objectives:** Students will observe interactions between plants and pollinators in nature; students will understand the relationship between flower shape, color and smell to the type of pollinators they attract; students will create a hypothesis and then compare observed results using a graph

### **Materials:**

Laminated pollinator syndrome worksheet (attached)

Data sheet (attached)

Pen or pencil

Optional: pollinator picture guide, magnifier, camera, colored pencils or crayons

### **Steps:**

1. Visit a garden or natural area and identify up to five flowers to observe. Write the name of the flowers on your data sheet. If you do not know the names, you may assign numbers to each plant.
2. Record the characteristics (color, shape, smell) of each flower on the data sheet using words and/or drawings.
3. Using the information from the pollinator syndrome worksheet, make a hypothesis as to which types of pollinators might visit each flower and record on your datasheet.
4. Quietly observe your flowers for 10 minutes each and record the types of visitors to your flowers on the data sheet, using words and/or drawings.
5. Create a bar graph demonstrating your individual observations. You may use color coding to represent different types of visitors. In groups, experiment with different ways to arrange data in graphs using different variables (ie color, shape).
6. As a group, discuss observations, data trends, and reflections. You may use the following questions as a guideline:
  - a. Which of the pollinators were “generalist” pollinators, meaning that they visited multiple flower types? Which of the pollinators were specialized?
  - b. Was every insect that visited your plant a pollinator? What else might insects use plants for?
  - c. Do you think that the time of day could have affected your results? Why or why not?
  - d. How might more plant diversity affect the number of visitors? What are some threats to plant or pollinator diversity?

**Research-based justification:** This activity offers the opportunity for youth to observe and experience nature close up, which research shows can help cultivate environmental literacy and pro-environmental behavior (Monroe 2003, Duerden and Witt 2010). The opportunity to do actual fieldwork supplements and reinforces lessons learned in the classroom (Dillon et al, 1996, Meier et al 2010), while the opportunity for reflection at the end of this activity provides a real-world context that engages students in problem solving and sustainable thinking (Duffin et al 2009, McInerney et al 2011).

## Ecological Identity

**Authors:** Chesapeake Classrooms Team

**Audience:** Teachers in a professional development class or high school students

### What is Ecological Identity?

When asked to describe the roots of our personal environmental philosophy, many of us might reply, "I have always loved the outdoors.... I enjoy being outside.... I became angry over environmental degradation." These descriptions of our environmental philosophy only skim the surface. Through deeper reflection we are able to discover the roots that lead to these statements, and how we branch out from our beliefs to take action. This is referred to as our ecological identity. The term ecological identity originally comes from the work of Mitchell Thomas how in his book, *Becoming a Reflective Environmentalist*. To express our identity we are going to each make our own Ecological Identity TREE!

**Directions:** On a blank sheet of paper sketch a tree. Make sure your tree includes roots, leaves, branches and a trunk. For each part of the tree, write one word or phrase that corresponds to your environmental behavior, environmental actions and core values. Below are some guidelines for these terms.

**Roots:** The roots of our **environmental behavior:** how or where we played as a child, experiences solo or with family or friends in the distant and recent past ...actions...events...mentors... positive or negative experiences... seeing wild places disturbed.

**Leaves and branches:** **Environmental actions** (both personal and professional) you have taken: jobs, volunteerism... free time...new ways to stretch yourself... environmental actions you plan on taking.

**Trunk:** **The core values** that you hold: the trunk connects the roots with the leaves, just as your core values connect your 'roots' to your actions. Core values might include things like responsibility for the earth, desire to live simply, reverence for living things, spiritual respect for the gifts of nature, etc.

**Goal:** Have group members think-pair-share their trees. Create their tree, share it with another person in the group, and have that person share a few new items with the entire group about their partner. Then display the trees for the remainder of the class so everyone continues to learn about each other. This activity helps us learn about classmates, think about why we are taking the class, discover new ideas from other people's branches, and how to share this activity with our students.



### **Guidelines & Research**

. "Multicultural EE acknowledges the diversity of views/values, contributes to solutions of environmental problems" *Marouli, C. (2002)*  
"One of the suggestions based on interviews is that 'the diversity of views, values, and behaviors need to be acknowledged, valued, and utilized in the study of the environment and towards the delineation of innovative solutions to environmental problems.'"

Guidelines for Professional Development|  
- 1.3 and 1.4

Guidelines for Nonformal EE  
- 1.3  
- Summary strand 3 and strand 4

**A project of the Southern Poverty Law Center**

**Framework:** Environmental racism is a term that was coined by Rev. Benjamin Chavis, who conducted a study which found that communities of color are more likely to bear the brunt of environmental hazards than are white communities. That study found that these environmental disparities occurred because of lax enforcement of environmental rules and regulations, as well as the placement of landfills and dumps and the disposal of hazardous waste in minority neighborhoods. The problem is compounded by the fact that members of affected communities are seldom found on city councils, planning committees or regulatory boards.

**Goal or Objective:** In this lesson, students will participate in an activity designed to simulate the inequity of environmental racism. Students will explore the concept of environmental racism through their own experience of fairness, and help them grasp the injustice of this practice.

**Age:** Grades 3-5

**Activity:** Instructor chooses a card randomly from a box/bag containing a class number of cards - half are blue, and half are red. For ex. Class is 24 students: 12 red cards, 12 blue cards.

Instruct all the students with a red card to give their garbage to a person with a blue card over the course of the school day. Hand out garbage bags to all blue card holders. The blue card holders will carry the garbage bag with them at all times for half the school day, and use it to collect their own garbage and any garbage from any red card holder. Explain that the people with blue cards have to live with this garbage even though they didn't create it.

The class might protest and say things like, "That's not fair," "You're playing favorites," or they might ask "Why?" You can tell them, "Just because."

Towards midday, students journal about their experiences. What happened? How did people behave? How did you behave and feel? After journaling, the roles are reversed - everyone who has a garbage bag gives it to someone holding a red card. Towards end of the day, tell everyone to give you back the cards and garbage bags. Repeat journaling then facilitate discussion.

Go around the room and ask how the exercise made the class feel. Let everyone air their feelings and explain that just as some kids were forced to take garbage they didn't make simply because the luck of the draw gave them a red/blue card, in real life, sometimes people are treated unfairly because of where they live or the color of their skin. Ask if your students know words for this. Depending on the age, they might offer terms like, racism, discrimination and prejudice.

Explain that certain neighborhoods are more likely to suffer from issues such as pollution, garbage and other environmental problems. Often this is because of unfair practices. This can include putting dumps and landfills in poor or minority areas where people might not be on the committees that make the decisions about where a dump should go, or where new immigrants might not speak English and won't be consulted about developments in their community.

**Materials:** equal number of red cards and blue cards so each member of class gets a card; container for cards; garbage bags

**Research:**

Bowers: Toward an Eco-Justice Pedagogy

Galvan/LaRocque: "Evaluation & Analyses of Cultural Diversity Training with Environmental Educators

Taylor, Dorceta: Making Multicultural Environmental Education a Reality

**Guidelines for Excellence:**

Preparation and Professional Development of Environmental Educators

3.3 Ongoing learning and professional development

4.1 Knowledge of learners

Environmental Education Materials

1. Fairness and accuracy

2. Depth

3. Emphasis on skill building

5. Instructional soundness; 5.1 Learner centered instruction

6. Usability; 6.2 Easy to use; 6.4 Adaptable

## Big River Game- Land Use and Sediment

Mississippi Watershed Management Organization ([www.mwmo.org](http://www.mwmo.org))

**Activity Summary:** Using a 2½ by 6 foot game board, players must achieve a water quality goal by decreasing the amount of sediment entering the river from five different land uses through application of a variety of Best Management Practices (BMPs). Players explore BMPs for different land uses, allocate budgets and deal with unexpected situations.

**Audience:** Adults: Decision & Policy Makers, Community Leaders, etc. (*can be adapted to use with other audiences and age groups*)

### Learning Objectives:

- Increased knowledge about major sources of sediment to the river
- Increased knowledge about stormwater and land use BMPs and how those practices are used to reach pollutant load reductions
- Understanding of how land use decisions impact water quality
- Understanding that water bodies have limits - they can only take so much before water quality, habitat, and designated uses are degraded
- Understanding of the need for individual and community level solutions for protecting water quality and habitat

### Materials:

- Big River Game Board
- BMP Game Pieces (for five different land uses)
- Watershed Planning Cards
- Dry Erase Markers and Erasers (one set per land use)
- Candy Pieces to act as “Money” (minimum of 35-40 pieces)

**Research and Guidelines for Excellence:** This activity follows many of the principals of the Environmental Education Materials: Guidelines for Excellence, including Action Orientation (#4), Instructional Soundness (#5), and Usability (#6).

### Activity:

Stormwater runoff from various landscapes carries with it pollutants, including sediment, which ends up in our rivers and lakes. Sediment clogs fish gills, decreases light penetration, and carries nutrients and toxic compounds. Unstable, eroding river banks also contribute to sediment pollution. A river can only take so much sediment before it starts to show poor water quality and habitat degradation.

This game uses a fictional river landscape to introduce players to sediment pollution and BMPs designed to reduce sediment impact on the river. Five land uses are included on the game board (Parks & Open Space, Heavy Industrial, Residential, Downtown, Small City). The goal of the game is to reduce the sediment load in the river to a set limit.

### Setup

- 300 sediment points are divided equally among five land uses and upstream (50 points each)
- Target sediment goal is 130 points
- Players are divided among the five land uses and each group starts with five candies (“money”)

### Game Play

- Players have three rounds to reach the sediment goal
- Land use groups select one BMP to play per round. Each BMP has a cost (paid in candy) and a given sediment reduction
- At the end of each round, the sediment points remaining are counted
- Unanticipated events can occur throughout the game to make achieving the sediment goal more challenging (such as river flooding occurs and costs each land use one candy to clean up, or new rules have been established and there is a new, lower sediment load limit)

For more information about the Big River Game and how to get a copy of the game through Northland NEMO, visit:

<http://northlandnemo.org/images/NEMOWatershedGame1PagerMin2.pdf>

### Credits:

The original River version of the Watershed Game was independently developed in 2007 by and through the creative efforts of the Mississippi Watershed Management Organization (MWMO) for its A View from the Big River: A Workshop about Land Use and Water Quality program. The MWMO’s creative efforts were inspired by A View from the Lake program, developed by University of Minnesota Sea Grant, University of Minnesota Extension, the University of Wisconsin Extension and the Lake Superior Research Institute in 2006. Information regarding the MWMO may be found at [www.mwmo.org](http://www.mwmo.org).



## The Cabbage Family Tree

Jim Simon  
Coordinator, Food & Environment  
Isles, Inc.  
Trenton NJ  
[www.isles.org](http://www.isles.org)

### Goal or Objective:

- *Primary* - To understand the concept of characteristics or traits and how a single species can exhibit distinct differences over the course of history through human selection.
- To understand structure and function of plant parts.
- To understand the basic needs of plants and their care.
- To foster an appreciation of food sources.
- To encourage outdoor physical activity.
- To encourage healthy eating behaviors.

**Age:** 4<sup>th</sup> through 12<sup>th</sup> grade

**Activity:** Provide students with a selection of seedlings of *Brassica oleracea* (Cabbage “family”, which includes broccoli, cauliflower, cabbage, collards, kale, and brussel sprouts) to examine. Include color or textural variations when possible (red & green or savoyed cabbage, purple & white kohlrabi, kale of different colors or textures). Without naming the seedlings, ask students to describe similarities and differences, and try to guess what they are. Many of the seedlings may look identical until they start to distinguish themselves nearing maturity. Introduce the cabbage “family”, and ask students to name some of the vegetables in the family. Explain to students that the different vegetables are actually the same species, and discuss how the different characteristics or traits have been selected over the course of human history. Try to lead students to come up with other examples in the plant or animal kingdom (good examples are domestic animals like dogs, cats, cows, horses, etc.) After discussion, students can plant and tend for the seedlings and as they develop, see the differences that emerge. Final steps: harvest & eat!

*Note: A rough timeline for this activity in USDA Zone 6a (New Jersey) would be to plant seeds indoors in mid-February, transplant outdoors in early to mid-April, and expect to harvest leafy crops like collards & kale as early as May, and broccoli & cauliflower in mid to late June.*

**Materials:** Assortment of Brassica seeds or seedlings: collards, kale, kohlrabi, cabbage, cauliflower, broccoli, or brussel sprouts

**Extensions:** With proper guidance and equipment, students can start seeds under grow lights to then transplant outdoors. Students can also explore similar species with divergent traits, for instance: *Brassica rapa* (broccoli raab, mustard greens, turnips, Asian cabbages), *beta vulgaris* (beets and Swiss chard).

### Research and Guidelines for Excellence:

#### Children's interactions with plants influence their actions towards trees and gardening as adults

Lohr, V. I., & Pearson-Mims, C. H. (2005). *HortTechnology*, 15(3), 472- 476.

Researchers concluded that, “Growing up next to natural elements such as flower beds, visiting parks, taking environmental classes, and gardening during childhood were associated with stronger adult attitudes and more actions. Growing up next to urban elements, such as large buildings, had a small, but opposite, influence. (...) These results indicate that horticultural programs for children raised in urban surroundings with few or no plants can be effective in fostering an appreciation for gardening in adults.”





**Lesson Summary:** Students discover and map the natural and built habitats on their school grounds, making observations about the variety of organisms that live in each.

**Purpose:** Students identify and record different habitats and organisms on school grounds through careful observations and collaboration/teamwork.

**Introduction:**

*You are going to discover what lives right here on your school grounds! Before we start, what is a habitat? Great, so now that we have an idea what a habitat is, we are going to go find some.*

**Focus Question:**

What different habitats can we find on your school ground? What organisms live in the various habitats?

**Age group:** 3<sup>rd</sup>-5<sup>th</sup> grade  
**Venue/s:** Classroom and outdoors on school grounds  
**Materials:**

- One piece of paper or science notebook
- Pencils/Markers

**Time:** 1 hour

**The Core Lesson:**

1. Before breaking into groups, have all students draw the basic perimeter of their school grounds on a blank sheet of paper. *These lines represent the boundaries of our exploration. Be sure to use the whole piece of paper for your map.*
2. Divide the class into two groups. The classroom teacher will take one group and you will take the other. After 20 minutes of exploring and recording observations, the two groups will come together.
3. First, have students focus on drawing the man-made structures, buildings, play grounds, sidewalk, parking lots etc for about 5 min.
4. Next (15 min), have them focus on finding, drawing and outlining the area of the different habitats. Types of habitats to look for and note: bushes / shrubs, grass, pavement (stop and look for life there, especially if you find a puddle or crack in the pavement), wood or stone bench, forest, woodchips, rooftop.
  - a. Ask students to find a minimum of five and to draw and record observations in three parts:
    - i. What is the habitat? (grass, pavement, soil etc.)
    - ii. Where is it?
    - iii. What kind of organisms do you see in each habitat?
5. Explain that it is up to them to decide how to show this on their map-they might use words or symbols.
6. When everyone rejoins after the 20 minutes of exploring and recording, have students gather into groups of 4-6 and compare maps for about 5-10 minutes.

**Formative Assessment and Conclusion** (whole group)

1. What statements can you make about the natural and human-made habitats in your schoolyard? (i.e. In our schoolyard...the buildings are habitats, many organisms live in the grass, I counted 10 habitats, etc.). Give an example if they aren't sure what you mean.
2. After you've heard a handful of responses, continue with asking the following:
  - How might the habitats have looked right here in your school yard before there was a school here?
  - What would have been different if you tried to create this map from the classroom?
  - What helped us be successful in this activity and accomplish our goal?
  - Did anything surprise you about what you found?
  - What questions do you have now?

**Learning Outcomes:**

**Enduring Understandings:**

- Learning can be joyful, empowering, and inspire a sense of wonder
- Environments and communities require many interconnected systems.
- Working well together enhances stewardship and a sense of community

**Knowledge and Skills developed:**

- Students will know that living things need food, water, air.
- Students will know that in a given place some organisms thrive and some don't.
- Students will know that organisms interact in various ways.
- OBSERVING using their five senses and emotional perspectives
- COLLECTING & RECORDING quantitative & qualitative data, using varied tools PREDICTING, ANALYZING, INTERPRETING, and REPRESENTING information using creative, scientific, and verbal approaches
- APPLYING what has been learned to new situations



## How do human activities affect the Earth's ability to support life?

**Lesson Objectives:** (1) Determine how global climate change will affect other organisms related to their “adaptive capacity,” (2) Calculate our role in global climate change, (3) Take action to mitigate our global impact

**High School Content Expectation/s (HSCE):** (E5.4D) Based on data of observable changes in recent history and climate change models, explain the consequences of

warmer oceans and changing climatic zones (including adaptive capacity of the biosphere). (E1.2B) Apply science to social concerns (E1.2k) Analyze how science and society interact.

**Vocabulary/Word Wall:** Adaptive capacity, Extinction, Range contraction, Threatened, Meltwater, Sequester, Native Species, Mitigation.

**Materials:** Class set of laptops, Printed homework articles, Teacher-created action project rubric, colored pencil & poster paper for action project. Anticipated materials for action project (colored pencils, poster paper, etc.)

**Follow the 5 E's when lesson planning: Engage, Explore, Explain, Elaborate, Evaluate**

Engage (This INCLUDES, but is not limited to the Do Now)

**Agenda:** (1) Do Now; (2) Adaptive Capacity; (3) Calculate Your Carbon Footprint; (4) Acton Project: Part I; (5) Review and Revise DQ Board

**Do Now:** Read the very short article titled “Rare Alpine Insect May Disappear With Glaciers” found at [http://www.eurekalert.org/pub\\_releases/2011-04/usgs-rai040411.php](http://www.eurekalert.org/pub_releases/2011-04/usgs-rai040411.php). Then, write a summary/reflection.

**Procedure** (\*\*Explore, Explain, and Elaborate\*):

1. Bookmark the Hinkle Foundation and Carbon Footprint Calculator *beforehand*.
2. Students complete Do Now. [5 min]
3. Discuss student responses. The meltwater stonefly (and others of its ilk) will become severely constricted in its range or extinct by 2030 due to global warming and climate change. As the glaciers recede/disappear. The very cold water it needs to live disappears as well. Unless the meltwater stonefly can adapt to warmer water quickly, they will not survive. This ability to adapt quickly is referred to as “adaptive capacity.” A very slow/low adaptive capacity will likely lead to extinction. The extinction of one creature starts a rippling effect in the entire food web of an ecosystem. On the other hand, weedy species have a very high adaptive capacity, such as the algae in tonight’s homework, and they can take advantage of changing conditions to spread and crowd out other struggling species quickly. [5-10 min.]
4. Let’s take a look at how much of the global climate change problem is due to our behavior. Show the graph of American carbon emissions compared to all other countries found at <http://www.thehcf.org/emaila5.html>. Show “enlarged image.” Discuss our immense use of fossil fuels (directly and indirectly) and our responsibility to take action. [5-10 min.]
5. Students will assess their personal carbon footprint using the calculator found at [http://www.greenprogress.com/carbon\\_footprint\\_calculator.php](http://www.greenprogress.com/carbon_footprint_calculator.php), but are not required to share their impact with the entire class. When students receive their final carbon emissions and report card, encourage them to click on the ideas given in the “Areas for Improvement” section. If they find any changes that they are willing to make, they can go back and recalculate their impact. The global average is 10 tons of carbon dioxide produced a year. Can they get down to global average? If not, what can we do to mitigate the extra carbon that we create? [25 min.]
6. At this point students may be feeling overwhelmed and greatly burdened by the magnitude of the climate change problem and their (likely large) inputs to the problem. This is completely natural. Acknowledge these feelings and the enormity of the situation. Ask the class for ideas of how we could help reduce the creation of emissions of greenhouse gases AND help the Earth sequester the carbon that we are releasing (personally, school-wide, community-wide, city-wide, state-wide, nationally, globally). Brainstorm ideas at each level. [20 min.]
7. Perhaps we cannot control the United Nations, but what we can certainly do is control our own behavior. Give famous Margaret Mead quote, “A small group of thoughtful people could change the world. Indeed, it’s the only thing that ever has.” Today we will use the Internet to search for positive ways to impact the environment. Google search “What can we do about global climate change?” Eartheasy, NASA kids, US EPA, and the Nature Conservancy have clear activity options. Search to find ways to reduce your impact *and* mitigate impacts that we have already created. Give students parameters. Are they allowed to try to start a local movement and contact other active groups in the area? Can they contact the principal about starting a school program like recycling, vermicomposting in the cafeteria, or using less energy for the fall? Would you like the project to simply take action today, such as writing a letter to your representatives? The magnitude of this project is up to you and your students. Plan, debate, and begin implementing a project today. [45 min.]
8. Direct students to Review today’s objectives, especially Huskies. Update Driving Question Board. [5-10 min.]

**Literacy Connections?** Writing a summary/reflection in Do Now, may require significant reading and writing in Action Project, and writing a science fiction story and comic strip in homework. **Technology?** Using Internet to search for global climate change action ideas. **Career Pathways?** Addresses role of active citizenry. **Cross Curricular Connection?** Emphasis on writing (summaries and science fiction) connects to English Language Arts. Political and environmental action connects to social studies. Creating a comic strip in homework connects to art education.

**Evaluation/Assessment** (what will allow you to determine if the objective was mastered?) Student *verbalization* and *overall performance* in discussions and team work opportunities, such as creating their action projects Student *written* responses to the Do Now, action projects, and Homework

**Homework** (What will you assign to continue/expand learning at home?) #39 Read the article titled, “Global Warming Has Devastating Effect on Coral Reefs, Study Shows” <http://news.nationalgeographic.com/news/2006/05/warming-coral.html> on National Geographic website. Then, write a story about what life has been like for a 50-year old hawk billed turtle (eats living coral) living on the reef. What does his future hold?

#40 Read “Harmful Algae Takes Advantage of Global Warming: More Algal Blooms Expected”

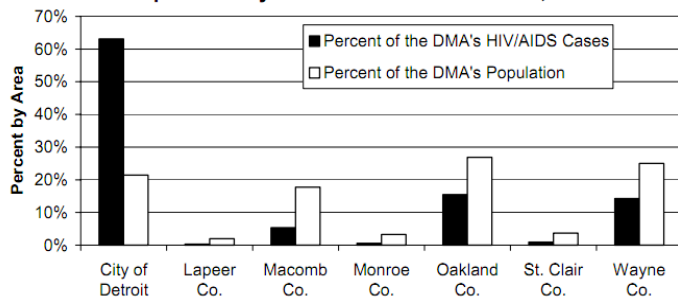
<http://www.sciencedaily.com/releases/2008/04/080403140928.htm> from the Science Daily website. Then, write a cartoon comic strip that explains the “Invasion of Algae.”

\* If you have Internet access at home, go online to research these events and other examples of adaptive capacity more fully.

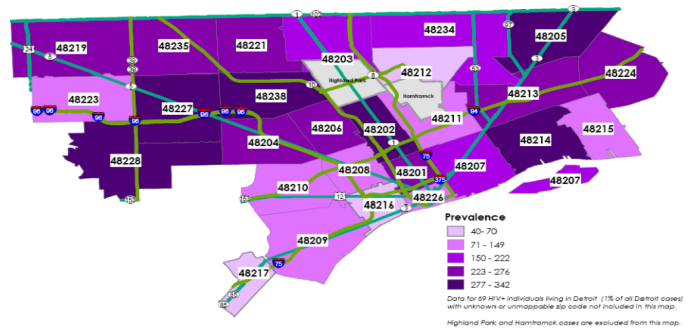
# STI Disparity in Our Community

Kerry Williams

**Figure 1: Detroit Metro Area: Living HIV/AIDS Cases and Population by Local Health Jurisdiction, 1/1/04**



**PREVALENCE OF HIV/AIDS IN DETROIT BY ZIP CODE AT DIAGNOSIS (n=5,611):**  
Current as of April 1, 2010



**Goal:** Students explore the concept of health disparities, STI health disparities in their community, potential causes, including environmental causes, and create a web-based geographic resource for STI prevention.

**Activity:** Create two Google Earth Tours (1) to Analyze Potential Causes of Health Disparities and (2) Health Resources in Our Community.

**Materials:** LCD Projector, Class Set of Laptops with Internet access, student cellular telephones

**Sequence:** Six class periods following a series of lessons on bacteria, viruses, and sexually transmitted infections (STI's).

**Procedure:** 1. Students write a reflection about the data shown above for the City of Detroit as their Do Now.

2. Add that Detroit is not just abnormally high for our state. We are also in the top five **nationally** for HIV, Chlamydia, Gonorrhea, and Syphilis.

3. Probe students to discuss why this may be.

4. Introduce the concept of health disparities using the first quote found in the research to the right.

8. Show PowerPoint at

[http://www.michigan.gov/documents/mdch/HIVDetroitSEMI\\_April2910notes\\_325815\\_7.pdf](http://www.michigan.gov/documents/mdch/HIVDetroitSEMI_April2910notes_325815_7.pdf) titled, "HIV Southeast Michigan and Detroit" by Eve Mokotoff, Michigan Department of Community Health (April 29, 2010).

Emphasize that this is recent and a continuing problem.

9. Introduce the student research project. Explain that such large disparities imply that something different is happening in the City of Detroit compared to the surrounding suburban areas, the state of Michigan, and the nation in general. We will design and conduct field research and analysis in groups of three.

10. Discuss the teacher-created rubric and possible research ideas. These may include research and surveys at various levels: classroom, age brackets, school-wide, school to school, within the community, and between communities in the state of Michigan. Students may be interested in attitudes about sex and contraceptive barriers (condoms), availability of free STI testing, availability of free health care in general, sexual education in schools, condom dispensers in schools, and environmental attributes. Share the second quote to the right and discuss causal and correlation studies. Make sure students chose only one variable to research and keep track of the location being sampled. Create student groups and begin discussion [end day 1].

12. Give students the opportunity to search online, make calls as needed, and survey each other [Day 2 and 3].

13. Students create a Google Earth Map of their findings. They may find a correlation between high HIV rates (map above) and occurrence of their selected variable [Day 3].

14. Students present their findings to each other using Power Point [Day 4].

15. Students compile data from the class and follow a similar process to create a Google Earth Virtual Tour to outline available resources (testing locations, free clinics, free condoms) in the City of Detroit, which will then be available online to the public [Day 5 and 6].

## Research and Guidelines for Excellence:

"Both the life expectancy and the overall health of Americans have improved greatly over the last century, but not all Americans are benefiting equally from advances in health prevention and technology. There is compelling evidence that race and ethnicity correlate with persistent health disparities in the burden of illness and death... Current information about the biologic and genetic characteristics of these populations does not solely explain these health disparities. These disparities result from complex interactions among genetic variations, **environmental factors**, specific health behaviors, and differences in health care access and quality."- David Satcher, Surgeon General 1998-2001

"Boarded-up housing remained a predictor of gonorrhea rates... because of its potential adverse impact on social relationships and opportunities to engage in healthful behaviors. Neighborhood physical conditions deserve further consideration as a potential global factor influencing health and well-being."- Cohn et. al. 2003

This lesson reflects the *Environmental Education Materials: Guidelines for Excellence* Domains 1-6, especially Characteristics 1.1 factual accuracy, 1.3 openness to inquiry, 2.2 Concepts in context, 3.1 critical and creative thinking, 3.2 applying skills to issues, 4.1 sense of personal stake and responsibility, 5.3 connection to learner's everyday lives.



**Goal or Objective:** The main objective is for students to:

- 1) reflect on the *Abbott Hall of Conservation, Restoring Earth* exhibit at The Field Museum,
- 2) understand the ways in which conservation is done and the role of scientists, organizations, and community members, and
- 3) share stories that relate to their own experiences in nature.

**Age:** Middle and/or High School

**Activity:** *Pre-visit Activities:* (Step 1) **In preparation for visit to the museum** and *Abbott Hall of Conservation, Restoring Earth* exhibit, small-group discussion centers on several key questions:

1. What does conservation mean to you?
2. What is meant by the term “Restoring Earth?”
3. What are some of the ways in which scientists and community members help conserve the natural world?
4. Why does an institution like The Field Museum of Natural History collect objects?

(Step 2) To help guide the conversation, explore videos from the website that touch on the many facets of conservation:

<http://restoringearth.fieldmuseum.org/media.html>

(Step 3) **Students visit *Restoring Earth***, taking notes about stories in the exhibit that stand out to them in some way. Revisit the same questions explored in the classroom, allowing for self-guided discovery as students move through the exhibit.

(Step 4) At the center of the exhibit is an interactive activity that allows one to **create a digital exhibit box or “mini collection.”** (see <http://restoringearth.fieldmuseum.org/interactive.php> for examples). As a classroom (or if time is available, students can create individual collections) design a mini collection, answering a series of questions. Random multiple-choice questions and images range from: “If you could choose a superpower, what would it be?” to “If you could explore a type of habitat what would it be?” to “How would your friends describe you?” Based on the choices made, objects are selected for inclusion in a virtual exhibit box.

(Step 5) **Back in the classroom**, project the class’ digital exhibit box up onto a smart board or projector. Students select one object from the exhibit box that speaks to them in some way and answer one or more of the following questions:

1. Which object tells a story about a time when you were connected to nature? Please tell us about this experience. How did you feel about nature before and then after experiencing *Restoring Earth*?
2. Which object reminds you of something new and inspiring that you discovered in the exhibit? How and why? How might you want to be involved in *Restoring Earth* in the future? How and why do you think conservation is important?

(Step 6) Instructor facilitates the group discussion, situates group in a circle, and discusses how respect and listening is a part of sharing stories. Students take turns passing a natural object around the circle. When it is ones turn to hold the object, they share their reflection with the group.

**Materials:** at The Field Museum: pens/paper, *Restoring Earth* “mini collection” interactive activity (located at The Field Museum); upon return to classroom: computer, smart board or projector to view digital “mini collection” box, pens/ paper,

**Extension Opportunities:**

- Students create an actual exhibit box or diorama. Research what species call the local environment home. Use mixed media to recreate natural objects/specimens in the box (including a collection of at least 4 favorite items from the local environment). Develop a key with a label for each item in the exhibit box. Students share their collections with one another, along with explanations and stories about why objects were included and lessons learned.
- Students research one object from the class digital exhibit box. Report back findings in a variety of ways, from writing a song or a report, to creating a PowerPoint presentation, to breaking out into small groups and teaching one another lessons learned.

**North American Association for Environmental Education Guidelines for Excellence in EE Materials:**

- 1.2 Balanced presentation of differing viewpoints
- 3.1 Critical & creative thinking
- 4.1 Sense of personal stake & responsibility
- 5.2 Different ways of learning
- 5.3 Connection to learners’ everyday lives
- 5.4 Expanded learning environment

# Sounds Around Your Field Site: Conducting A Sound Survey

Urban Ecology Institute and Boston College

**Goal or Objective:** Understand how sound can be measured and mapped.

Generate student inquiry into the sources of sound around a neighborhood or field site and the impact sound pollution can have on communication strategies of humans, birds, and other wildlife.

**Age:** High School (typically physics and/or environmental science)

**Activity:** Step 1: Download an aerial photo of your study site from a mapping website such as google maps or google earth and print one copy for each group of students.

Step 2: Divide the field site into sampling areas (either in a grid format or into transects) and mark sampling areas on maps.

Introducing the Lesson:

1. Provide students with a reading related to noise pollution in urban areas. Review sample sound maps with the class, and explain that you will be constructing similar maps on a smaller scale.
2. Explain to the students that you will be conducting a sound survey in your neighborhood, park, or schoolyard site. Either provide students with the areas they will be sampling, or facilitate a discussion about which areas on the maps they think should be sampled. Which locations might have more noise? How might this vary by time of day? Are all of the areas the same?
3. Pass decibel meters out to pre-selected groups of students and remind them how to use the meters correctly.
4. Pass out orthophotos, data sheets, and clipboards. Before heading outside, make sure each group has the grid or transect they will be sampling marked on their maps.
5. Bring students to the study site and allow them to take measurements of the decibel levels as well as record specific information about what they are observing (traffic, planes, trains, humans, bird song).
6. At the end of this activity, facilitate a discussion with the class: What kinds of sound did you hear? Did you hear any birds or other animal sounds? What was the loudest part of the field site? Did the intensity of sound at any of the locations surprise you? Do you think the intensity varies over the course of the day? What kinds of sounds would you identify as noise?

Organizing and Analyzing the Data:

1. Back indoors, review examples of noise maps to help students get a sense of what they are creating.
2. In order to create their sound maps, students will color code each coordinate where they took data on transparencies (or using google earth). These transparencies can then be overlaid on an overhead projector to give an overall picture of the site.
3. For each data point, students should draw a dot on the transparency (or color code in google earth) with the correct color. (example: <50 dB brown, 50-55 purple, 55-60 blue, 60-65 green, 65-70 yellow, 70-75 orange, 75+ red)
4. Examine the noise map as a class. The idea is to try and get students to begin thinking about noise as a source of pollution and to start thinking about how the physical properties of sound might have ecological consequences on humans, birds, and other wildlife using the space. Pose discussion questions such as: What do you think this map tells us? What are the loudest areas of the field site? What are the quietest? Are these habitats different? How so? What happens to sound as you move away from a source? Would you expect to see humans and wildlife using the different spaces in the same way? Were you able to make any observations that back up your claim?

Application:

1. Follow-up this activity with readings related to human and bird communication in noisy areas (examples: “Clamoring for Quiet: New Ways to Mitigate Noise”, “Decibel Hell”, or “The Impact of Environmental Noise on Song Amplitude in a Territorial Bird”).
2. Facilitate a discussion about how communication strategies change in noisy areas (timing, pitch, frequency, etc.).
3. Continue with extension activity of bird song recording and analysis using Ravenlite.

**Materials:** Decibel meters (1 per group of 4), Data Sheets, Orthophotos of field site, markers, Google Earth (optional)

**Research and Guidelines for Excellence:** This lesson plan is designed to support the MA state frameworks in STEM. It also reflects the “EE Materials: Guidelines for Excellence” by addressing key characteristics such as #2Depth (by fostering awareness of the natural and built environment), #3 Emphasis on Skills Building (critical and creative thinking, applying skills to issues), and #6 Usability (fits state and local frameworks and can be applied broadly in various environments).

## Micro Adventures Draft Lesson Plan

Mariana Bergerson



**Goal or Objective:** To explore the pond habitat through field and lab experiences. Students will know living things are made-up of cells, how living things interact with their habitat, and why they are important.

**Age:** Grade 4-6, can be adapted for older audiences.

**Activity:**

1. Students are introduced to John Heinz NWR. They learn what a National Wildlife Refuge is and the 5 different habitats that we have. They are told they will become scientists that will study the pond habitat for their field trip. Students discuss what they know and what they want to know about ponds. Questions such as the following can be used to stimulate conversation.
  - a. How do you know that something is alive? What to living things need to survive?
  - b. What are the living and non-living things in a pond?
  - c. What kinds of creatures or things live in a pond?
  - d. What do you think is the biggest creature to live in a pond like this one? The smallest? What does a pond food web look like?
  - e. Can you see any living things in the water? If so, what?
  - f. Do you think that anything could live in just a single drop of pond water? Why or why not?
2. Students walk out to pond to make observations (Date/Time, Weather, Location, Plants, Animals, Etc.) and collect water samples. Students bring water samples back to lab.
3. Students are given a quick tutorial on how to use a microscope that includes the parts and how to use it as well as how to make a slide. This is completed on a microscope that is projected on a tv so the class learns together how to identify a few micro-organisms.
4. Students work in small groups to make slides and observe a drop of water at 40x and 400x magnifications). Observations should be kept in their student journal.
  - a. Is there anything in the water? What do you see?
  - b. Once you see a living thing, follow it closely and sketch it in your notebook. Draw some of the paths it takes as it moves across the field of your microscope.
  - c. Sketch the shape of the kind of living organism you seem to see most often in your field.
  - d. Do all the organisms you see move in the same way? In what different ways do they move?
  - e. How many different kinds of organisms have you seen? If you had to name these organisms in a way that describes them, what names would you give them? Compare the organisms that you see with the organisms on the pond life chart.
  - f. Do you see something in the field that is not moving? What could this be?
  - g. Discuss the role of these organisms in the ecosystem? Why are they important? What would happen if they weren't there?
5. Students share observations and what they learned with the class.
6. \*\*\*Variations – If time permits, students can sample water from different habitats on the refuge (pond, creek, marsh, and even a puddle!)

**Materials:** Quantities are determined by the number of groups. Field Sampling Materials: Small Net, Bucket, Small Shovel, Metal Tray, and Sample Cup with lid. Lab Materials: Microscope, Slides, Cover Slips, Eye Dropper, and Paper Towels.

**Research and Guidelines for Excellence:** PA State Standards for Ecology and Environment

**Lesson Plan: Urban Site Field Study**  
**Why and how do I conduct a study site evaluation?**

**Goal:** Students will understand the attributes of Urban Ecology as a science, gather data and initially survey their field site, and develop initial questions from their observations.

**Age:** 9<sup>th</sup>-12<sup>th</sup> grade

**Materials Needed:**

- Representation of Inquiry Worksheet
- Student notebooks or clip boards with blank sheets of paper
- Survey data worksheets
- Maps of the survey site if available
- Thermometers for air, soil, and water temperatures
- My Questions Worksheet

**Guidelines & Research**

In the first activity, students will talk about the different approaches that can be taken to researching in science, with a specific focus on those approaches that are most useful for urban ecology. They will then complete an initial physical and biological assessment of their field site using a data collection form. Students will use the field study site in this and other modules so they need to understand why it is important to conduct an initial survey of their site. Students will also generate some initial questions that they have about their study site.

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Researchers have concluded that, "...fieldwork, properly conceived, adequately planned, well taught and effectively followed up, offers learners opportunities to develop their knowledge and skills in ways that add value to their everyday experiences in the classroom.

This lesson relates to the *N.A.E.E. Environmental Education Program: Guidelines for Excellence* 1.1, 1.3, 5.1, 5.3, & 5.4.

**Instructional Sequence:**

1. Distribute the representation of inquiry worksheet and discuss how the study of urban ecology might play out in this representation. Possible discussion questions:
    - What kind of questions would researchers be interested in studying?
    - How would they collect their data? What type of data would be collected?
    - How is this type of research different than experiments? How do the concepts of controls and variables apply or not to this type of research?
- Key ideas to consider about urban ecology research:
- Studying a dynamic system – constantly changing, therefore more interested in resilience than expecting a constant state of being.
  - Takes into consideration the social aspects interacting with the ecosystems, therefore history and legacies are important.
  - Humans are an integral part of the system.
  - In studying systems, many variables may be at play simultaneously and they are not necessarily controllable
2. Introduce the concept of site evaluation and explain the importance of this information.
  3. In the field, give students the site survey forms, clipboards and field notebooks. Students should work in teams of 3-4 people if possible.
  4. After students have completed the site survey, gather together to discuss their observations. This is best done in the field, but it can be done in the classroom. In a circle, have students or groups each describe their most significant or an unusual observation made during the site visit, or they can ask the group a question that they thought of while at the site.
  5. Assign homework to have students write down five initial questions based on their visit form the site. These questions should be revisited throughout the course.

**“Marine Ecosystem Invention”-- written by National Geographic Education staff**

**Objective is that students will be able to:**

- **describe the abiotic and biotic components of a marine ecosystem**
- **list several marine organisms and explain their trophic relationships using a food web**
- **describe the adaptations and niches of several marine organisms**
- **predict the effects abiotic changes or trophic imbalances might have upon an ecosystem**

**This activity reflects the Guidelines for Excellence for Environmental Education materials, especially Depth (focus on concepts in context), Emphasis on Skills Building (critical and creative thinking), and Usability (clarity and logic, easy to use, adaptable, fits with standards).**

**1. Review vocabulary.**

Explain to students that they will work in small groups to create an imaginary marine ecosystem illustrating trophic levels, adaptations, symbiotic relationships, and niches of a community of marine organisms living in that ecosystem.

**2. Introduce the activity.**

Divide students into small groups and distribute the two worksheets: Imaginary Marine Ecosystem Instructions & Organism Descriptions and Imaginary Marine Ecosystem Analysis. Also give each group markers and two pieces of butcher paper. Read aloud the directions. Clarify that students will create at least eight different organisms to inhabit their imaginary ecosystem. Six must be real marine organisms and live in the same real world ecosystem. The other two must be organisms that students invent. Use the worksheet to review what students should include for each organism, using the terrestrial example provided. Next, explain that students will create an imaginary ecosystem illustration. The illustration will include all eight organisms and the important abiotic components of the ecosystem, including water, sediment, rock, energy source, and other habitat features such as ocean floor features. Then, explain that students will create an imaginary ecosystem food web. Tell students to label each organism by name and trophic level and to use different colored arrows to represent each trophic level. Emphasize the importance of using arrows to show the proper flow of energy between organisms and trophic levels. If needed, refer to the two provided examples of rocky intertidal food web diagrams as examples. Finally, explain that students will answer the questions on the Imaginary Marine Ecosystem Analysis worksheet and present their ecosystems to the class.

**3. Give small groups time to complete the activity.**

In their small groups, give students 1 hour, 30 minutes to complete the project, which includes organism descriptions, an ecosystem drawing, a food web, and analysis questions.

**4. Have groups share their ecosystems and discuss them.**

With approximately 20 minutes of class time remaining, ask groups to present and discuss their imaginary marine ecosystems to the rest of the class. Allow other students to ask questions about each ecosystem and their imaginary organisms. To wrap up the activity and assess student comprehension, ask students to discuss question #11 from the Imaginary Marine Ecosystem Analysis worksheet. Ask: *How do ecological and symbiotic relationships shape your imaginary marine ecosystem? Why is it important to understand these relationships?* Display each group's work in the classroom and refer to them throughout the remainder of the unit.



## Explore the Roots of Your Food

Research & discuss what's going on with your food from farm to market to grocery cart to your belly!

**OBJECTIVE:** Students will be able to compare and contrast several methods of food production & consumption

**AUTHORS:** Mike Hotz, Ashlyn Kite-Hartwich, and Melissa Arthur

**AGE:** High School & Middle School/Junior High

**MATERIALS:** Computer(s) with internet access & LCD Projector & Screen (or individual laptops)

**ACTIVITY:** Ask students:

- Do you know where your food comes from? (i.e. where and how and by whom it is grown?)
- What kinds of things do you consider when choosing food? (i.e. nutrition, convenience, etc.)
- Do you think it is important to know where & how your food was produced? Why or why not?

One of the great things about a school garden is that by growing food ourselves, we get to experience the process of food production. Students and young people all over the country who are growing school and community gardens are becoming curious about food production from the garden to the grocery store! Let's explore.

Show one or both of the following movie trailers (preview for appropriateness for your students and objectives):

What's on Your Plate? <http://www.whatsonyourplateproject.org/about/watch>

Nourish <http://www.nourishlife.org/videos/nourish-trailer/>

Several short film clips are available at <http://www.nourishlife.org/videos-all/> if you want to provide additional "food for thought" on some of the topics introduced in these trailers.

After viewing the clips, engage your class in a discussion:

- What are some questions the students in this film are asking?
- What are your questions about food?
- How do you think we might find out more?

There are dozens of books and films about food production & consumption in the United States. A web search on any one food-related topic will yield a variety of different, and often conflicting, perspectives. Many of these topics are highly debated and controversial. Because of this, it is very important to explore all viewpoints to help us think critically about these topics so that we may make informed choices about how we grow, purchase, and consume our food. Ask students:

- Why do you think so many people are interested in exploring food production and consumption?
- What are some of the topics we could explore related to food production and consumption?  
(Locally grown vs. non-locally grown foods, organic vs. non-organic, processed vs. whole foods, fresh vs. packaged, fast food vs. slow food, nutrition, cost of production & transportation of food, fair trade, food safety, food deserts, genetically modified seeds, food additives, etc.)

Ask the class to choose their top 4-5 topics and divide students into small groups to research each topic. Encourage students to find as many different perspectives on each topic as they can. If time and resources allow, students may extend their research to the field by conducting interviews with local food producers and markets. Research may address:

- What information is widely available on your topic?
- What information is more difficult to find?
- What/who are the sources of the information you found on this topic?
- Did all sources agree on this topic, or did you find conflicting viewpoints? Why or why not?
- What did you think/feel about this issue before your research?
- Has your perspective changed, been strengthened, or stayed the same as a result of your research?

### Research & Guidelines for Excellence Justification

McInerney et al. proposed approaches to facilitate critically engaged forms of learning:

- Give students a say in what and how they learn;
- Encourage young people to engage with the big questions confronting the global community;
- Create space for dialogue, reflection and political action

Wals et. Al suggests an "emancipatory EE" that will:

- focus on existentially relevant or 'real' issues essential for engaging learners,
- regard indeterminacy a central feature of the learning process in that it is not and cannot be known exactly what will be learnt ahead of time and that learning goals are likely to shift as learning progresses.

NAAEE Guidelines for Excellence in EE Materials:

- 1.2 Balanced presentation of differing viewpoints
- 3.1 Critical & creative thinking
- 4.1 Sense of personal stake & responsibility
- 5.3 Connection to learners' everyday lives

## How We Use Water

Adapted by Michele Arquette-Palermo from the Michigan Environmental Education Curriculum Support Materials Water Quality Unit

**Essential Questions:** Why is clean, fresh, available water so important to humans? What are direct and indirect uses of water? How would having less water or more expensive water affect people?

**Core Lessons:** Students identify the many ways we use water both directly for household activities, and indirectly in everything we consume.

**Audience:** Upper Elementary (although I have used this with adults)

### Materials and Directions:

**Direct Use:** Draw a bar or pie graph showing the following, 34%, 29 % 19% 13% and 5 %. Label 5 Post it Notes with the following : Showers/Baths, Toilet, Laundry, Kitchen and Outdoors. Give students the post its one at a time and have them try and label graph. As each successive student comes up I let them move any of the previously labeled bars. Once all 5 bars are labeled I ask the group how many think its right? I will then say you have 3, 1 correct and then I let another student try and fix it. After 1 or two tries I fix the graph and then ask based on what they have learned what are the way they can conserve water. Think Price is Right game...

**Indirect Use:** How we use water directly is easy for most to understand and realize but what most of us take for granted is the water used for growing our food, making our cars shoes, clothes etc. This activity shows how we use water indirectly.

Low Tech Version: Use 2 different colors of color stock printer paper. One set has gallon values (I use blue) printed on them, the other has pictures of basic items recognized by all children. For example one blue sheet would say 120 gallons and its matching counterpart would be a picture of an egg. Make enough cards so each student has one. Resources for how many gallons it takes to make .... Can be found

[http://www.noresco.com/behavior/files/how\\_much\\_does\\_it\\_take.pdf](http://www.noresco.com/behavior/files/how_much_does_it_take.pdf) , or

<http://www.ecotechwater.com/Company/watertrivia.html>, there is also an interactive one here

<http://ga.water.usgs.gov/edu/sc1.html>.

Give the students the cards put them in 2 lines across from each other ( one color on each side) however mix them up so they are not directly across from their match then challenge them to find their match. Have them stand next to their match in a large circle. Stand in the center and go through each pair and correct their match and discuss conservation or in the case of the eggs I say if it take 120 gallons for one egg how many for a dozen. FYI Laminate the cards for long term use and I do the low tech outside.

Hi Tech Version: Using Power point I make a game show. The main slide has action boxes with the gallon amounts listed. The list of items is on the bottom of the slide. The gallon action boxes when clicked on go to the slide with the corresponding picture. This picture slide has an action button to return you to home or main slide.

Email [Michele@crwc.org](mailto:Michele@crwc.org) for technical help.

**Extensions:** Give each student a water use log and have them monitor and calculate their personal water use directly and indirectly for one day.

Have students create water conservation posters for display at school.

Have them facilitate the above activities for other students, the PTO or the school board.

## Family Fairy House Day

Lesson plan by Monica Pasos and based the book Fairy Houses by Tracy Kane and the national movement to encourage all children to build fairy houses in their own natural spaces

Goal: to encourage young children and their families to spend more time outdoors.

Set-up: Find a natural space that had trees and shrubs and is big enough for many families to move about.

### Supplies:

- Lots of natural items that families can use to build small structures with such as vines, leaves, bark, acorns and other nuts.
- Copy of Fairy Houses
- Blank paper and pencils

### Activity:

1. Read the book to your group so they understand the idea behind the project. Go over the rules: all building must be done with natural items. No glue allowed! This allows for more creativity and interaction with natural items. You will see all family members begin to really explore the area to find the right spot for their house and test out different materials for their building needs.
2. Pass out a few building supplies to get them started. Make sure you have a well-stocked resource area with more building items. Encourage children to barter with the “store” with items they find.
3. After the village is complete (about 1 hour) provide families paper and pencils so they can map out where their house is in the village.
4. Encourage families to return to their houses for repairs and seasonal updates to the village.

### Research-Based Justification

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# Family Food Traditions

Created by Nia Keith for Mass Audubon's Urban Adventures Summer Program

**Goal:** Students explore the concept of food accessibility and discuss the impact of culture on food accessibility.

**Age:** 5<sup>th</sup> – 8<sup>th</sup> grade

## Activity:

### Step 1 – Sharing Our Food Stories

In the classroom engage the students in a discussion about food. What are their favorite foods? Who does the cooking in the home? What is your family's favorite food tradition? Give the students 15-30 minutes to design a placemat that illustrates one of their favorite family food traditions. After the placemats have been completed, sit in a circle and share the stories depicted on the mats. Have the placemats laminated.

**Research and Guidelines for Excellence:** By sharing their cultural traditions and sourcing culturally appropriate food in their communities, students may increase their feelings of belonging and increase their sense of agency in making environmental change within their communities (Cutter-Mackenzie, A. 2009). This lesson reflects the *Nonformal Environmental Education Program: Guidelines for Excellence* Characteristics 1.1 and 1.3 because it addresses the environmental issue of food deserts and was created in response to the community's desire to have more education around gardens, nutrition, and food. In addition, this lesson meets *Environmental Education Materials: Guidelines for Excellence* Characteristic 2.1, as it fosters an awareness of local environmental justice issues.

Materials – 8 ½ x 11 in. card stock or construction paper, crayons, markers, other art supplies as desired.

### Step 2 – Planning A Feast

Using the food stories as inspiration, work together to create a menu for a family-style meal. Think of what different components a complete meal should have, i.e. main dish, side dish, beverage, dessert, etc. Consider the requirements for a nutritionally balanced meal when creating the menu. Try to create a menu that includes something of cultural significance for each participant.

Materials – paper and pen to take notes.

### Step 3 – Buying Local

Discuss where the ingredients for our feast can be procured in our community. To what do we have access – a supermarket, a local grocery store, a farmer's market, or a bodega? How easy is it for us to purchase ingredients specific to our families' cultures? Is it difficult to find the food on our menu? Why or why not? Make a plan to purchase or harvest as many of the ingredients locally as possible. This is a great opportunity to take the students to a local farmer's market or to harvest food they have been growing in the garden.

Materials – shopping list, money to purchase ingredients.

### Step 4 – Feasting with Family

Invite family members to attend a feast hosted by the students. Working in teams, prepare the food for the feast. Use the laminated placemats as decorations. During the meal, share food stories. Ask adult family members to elaborate on the food traditions represented on the placemats.

Materials – food, cookware, utensils, and other necessary kitchen supplies, laminated food story placemats.

## Learning to be Neighborhood Tree Stewards

Peggy Middaugh, Worcester Tree Initiative, Mass. Division of Conservation Resources, City of Worcester Forestry Division



Goal: give residents tools and information to help them monitor tree health for trees in their neighborhoods

Age: Teens and Adults ; Group size: 10-20

Activity: (Step 1): WTI trainer leads indoor presentation and discussion of what to look for regarding public street tree health. Present series of photos of various tree "street tree issues" e.g., suckers growing from bottom of tree; trash and weeds in tree pits; "mulch volcanoes"; broken branches; bad staking; good staking; pest damage. For each photo, engage students in conversation: what do you see in this photo that needs tending? What would you do to address the situation? Why is this a problem?

(Step 2) outdoor, hands on workshop on how to prune trees. 2 Foresters from DCR ("trainers") will each prune 1 tree with group of 5-10 students watching and asking questions. Topics to cover: types of pruning shears; how to determine if a branch should be pruned; how close to tree to prune branch; how tree reacts to pruning; best time of year for pruning. After 10-15 minute demonstration, each student or teams of students (depending on number of students) will prune their own tree, with DCR trainer watching and answering questions (10-15 minutes).

(Step 3). Go back indoors and DCR trainers answer questions from students.

(Step 4). WTI trainer provides each student ("neighborhood tree steward) with "tracking sheet" and instructions on how to fill it out in the field as they monitor neighborhood trees and methods for feedback and sharing information.

Materials: 1) Indoor powerpoint presentation with photos/examples of what to look for in the field: 2) handouts on appropriate tree care; 3) bypass pruners 4) gloves 5) tracking sheets

Guidelines for Excellence: Program is designed to build genuine relationships between "neighborhood stewards" and WTI, DCR, and City staff and also among all of the participants .(Tuxill, J. L., Mitchell, N., & Clark, D. (2009). Stewards will participate in program over long term (hopefully years) thereby strengthening their civic engagement Duffin, M., Laven, D., Pranis, E., Mitchell, N., & Camp, M. (2009).

# The Web of Life

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Overview: This simulation activity lets students act out the roles of various organisms connected by the “web of life”.

Skills: Group participation, discussing

Objectives: Students will complete a simulation that describes the interdependence of various organisms with other components of the ecosystem.

Materials: Ball of string or yarn, species cards (provided)

Time: 10–40 minutes depending on leader

Vocabulary: food web, producer, consumer, decomposer

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## Background

This exercise illustrates how all life forms are interdependent, with all organisms existing in a delicate balance. In the stewardship activity, the students will be cutting down buckthorn, a non-native shrub that is overrunning our preserves and other natural areas. Perhaps this will seem contradictory to them, as buckthorn, a living thing, must be part of a web of life. It is, in fact, but buckthorn is not part of any interdependent community here in IL, and it actually destroys the web of life indigenous to northern Illinois.

Looking closely at a buckthorn thicket, the keen observer will see mostly mud and little else underneath, because its dense shade keeps light from reaching the soil where other plants grow. Its leaves are not chewed by insects; deer occasionally nibble young buckthorn sprouts, but it doesn't appear to be their favorite food. Birds, principally robins, eat the berries, but that's all the plant “contributes.” That is the design of having the birds plant its seeds. The children will help our local web of life immensely by tackling this pest!

## Procedure

1. Divide the class into three groups. Assign each group one of the following names: Prairie, Woodland, and Wetland. Hand out appropriate name tags for participants in each group.
2. Name tags represent different parts of an ecosystem. Include producers, consumers, decomposers, and non-living components. Have each group stand in a circle. Give a ball of string to one person in each group.
3. To start the game, the person with the string should wind an end around his/her hand and throw it to another person in the group, stating a relationship between the two things represented on their name tags. The string should be thrown from person to person until every member of the group is linked to everyone else and the ball is returned to the first person. The idea is that all living and non-living components are connected.
4. Each group member should now stand back until the string is taut and stand very still. The person holding the original end of the string should gently begin tugging. Everyone feeling the tugging should tug in response. This should continue until everyone is tugging and the web is shaking. Ask how the tugging demonstration illustrates what happens when one of the links in an ecosystem is damaged through natural or human-made stress. (The rest of the ecosystem feels the effects.)
5. The group is then asked to pick one organism in the system that seems less important than the others. Have the organism drop out by dropping its string. Any organism whose string has gone slack should also drop its string. Soon the entire web lies on the ground.
6. After playing for a few rounds, ask the following questions:
  - a. What happens when we remove a link in the ecosystem? *Organisms that depend on it are affected.*
  - b. Were the changes more dramatic when the system was composed of many parts or when it had fewer parts? *Fewer.*
  - c. What can we say about the relationship between how many parts the system has (its complexity or diversity) and how stable it is? *In general, complexity makes it more stable.*

## Assessment

Each student will explain orally, in writing, or by drawing how the organism he/she was assigned depended on and was depended on by other organisms

# The Built Environment: Sociological analysis of youth's perceptions of what their world is and could be.

By: Regina Maspero



**Goal or Objective:** To determine what youth think about the environment they live in. More specifically, to get a visual reality of how youth picture the world they live in currently and the world that they would create if they had the resources.

**Age:** Grades 3<sup>rd</sup> – 8<sup>th</sup>

**Materials:** Crayons, Markers, Color pencils, Construction paper or Manila paper

## Activity:

**Action 1:** Give students a manila paper and ask students to utilize the sheet and other creative supplies to draw or write on the page what their neighborhood looks like currently. They can choose to get specific to their house, street, school, or they may envision their space in relation to a wider area such as a city or town. Give students about 30 minutes to work on this. What neighborhood do you live in?

**Action 2:** While students are working every few minutes ask a prompt question and have either adult or youth sit in different locations throughout the room to record any responses that students state out loud in response to the prompts.

1. What school do you go to? Are there stores, restaurants, or other buildings near your home?
2. Can you see any natural areas from where you live (ex. Mountains, wooded area, a creek, or a river?)
3. Do you think there is enough green space in San Antonio, Texas?
4. Do some neighborhoods not have as much green space as others? Why or why not?
5. Do you live in an area with a lot of green space? Why or why not?
6. If you do not live close to a natural area where do you go to enjoy the outdoors?
7. How often do you go out into nature?

**Action 3:** Give each student a piece of construction or Manila paper, let them know that the shape of the paper represents one acre of land. Ask students to determine for you what one acre of land looks like in relation to other items. (Ex. Is there school on just 1 acre, is their house on 1 acre, etc.) Remind students that one acre looks almost as big as a football field. You may also scale an acre in the space you are currently using for this activity. Ask students to draw or write on the page and reflect on what their world would like if they had an unlimited amount of resources (ex. Volunteers to help, seeds, capital, all their family in one place) you may want to ask students to create for you a space that provides for all their needs. You can utilize prompts while students are working including:

1. Where will you live?
2. Who will live with you?
3. What type of weather will you have?
4. Can you see natural areas? (Ex. mountain range, hill country, wooded area, a creek, or a river?)
5. How will you eat?
6. Where or how will you get clothing?
7. Is there anything you can't live without? What is it and why?
8. Where will you work?
9. Where will your children grow up?

## Research:

Wals et. Al suggests an “emancipatory EE” that will:

- regard indeterminacy a central feature of the learning process in that it is not and cannot be known exactly what will be learnt ahead of time and that learning goals are likely to shift as learning progresses.

## NAAEE Guidelines for Excellence in EE Materials:

- 1.2 Balanced presentation of differing viewpoints
  - 3.1 Critical & creative thinking
  - 5.3 Connection to learners' everyday lives
- \*\*\*\*Depth-Fostering awareness of the natural and built environment  
\*\*\*\*Usability- Lesson plan can be adapted and used in different cities

## Ríobart (Rob) Breen

**Title:** Human Impact on the Environment in the Syracuse (New York) Bioregion  
(A lesson plan for the Franciscan Earth Club at Bishop Ludden Catholic High School)

**Author:** Ríobart (Rob) Breen (Director, Franciscan Ecology Center)

**Goal or expected outcomes:** Identify local “bioregional” environmental issues; Identify the importance of bioregional environmental issues; Rooting biodiversity protection in religious/cultural values; Identify moral/ethical foundations for environmental stewardship action

*Prep/Setup: Nametags, take pictures, collect membership forms, sign-in sheet, pens*

*environment? If the environment is used, does it benefit people equally?*

### Announcements

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### Responding in Faith

#### Focusing Activity:

Opening Prayer (Large Group)  
Rich Mullins, *I See You*

What are some things we can do to keep informed about environmental issues?

What are some things we can do to get involved in caring for Creation?

Form into small groups

What are some of the things we can do to help us change our hearts and minds to be in a “right relationship” with creation?

#### Experiencing Life

*Today we are talking about “Human Impact on the Environment in the Syracuse Bioregion.”*

*What do you think are the most important issues?*

*Very briefly, share it with us. (not everyone must share)*

*[Genesis 9:8-17]*

*God said to Noah and to his sons with him:*

*“See, I am now establishing my covenant with you and your descendants after you **and with every living creature** that was with you: all the birds, and the various tame and wild animals that were with you and came out of the ark.*

*I will establish my covenant with you, that **never again shall all bodily creatures be destroyed** by the waters of a flood; there shall not be another flood to devastate the earth.”*

*God added: “This is the sign that I am giving for all ages to come, of **the covenant between me and you and every living creature** with you: I set my bow in the clouds to serve as a sign of the covenant between me and the earth.*

*When I bring clouds over the earth, and the bow appears in the clouds, I will recall **the covenant I have made between me and you and all living beings**, so that the waters shall never again become a flood to destroy all mortal beings.*

*As the bow appears in the clouds, I will see it and recall the everlasting covenant that I have established **between God and all living beings**--all mortal creatures that are on earth.” God told Noah: “This is the sign of the covenant I have established between me and all mortal creatures that are on earth.”*

#### Reflecting Together

*Reading the newspaper to identify local “bioregional” issues. (Pair up: each team gets an article to SKIM. Define “bioregional environmental issue.” Answer 2 questions).*

- 1) What is the issue?*
- 2) Why is it important?*

Share and discuss

#### Discovering the Faith Story

*Read the Noahic Covenant Story (Genesis 9:8-17)*

*What does the story of Noah say about biodiversity and the human role?*

#### Owning the Faith

Sometimes environmental issues are tough. We have to decide as citizens what we should do. In what ways do you think God calls us to look at these issues? When we make decisions about these issues, what things can we look for to help us make up our minds about what to do?

*Examples: Does it hurt the environment? Does it harm people? Does it affect poor people? How does it affect future generations? Does it show proper care and respect for the*

*Research basis:*

*Stern, M. J., Powell, R. B., & Ardoin, N. M. (2011) identify the limited impacts of short-term experiences, so this lesson is part of a sustained, ongoing, regularly scheduled program. Monroe (2003) identified useful environmental literacy strategies, such as using interesting stories with environmental heroes, and reinforcing environmental values from family and community. This lesson includes both.*



## Planting Trees for Climate Change

**Authors: Safiya Samman, Aynsley Toew, Vicki Arthur**

Objectives - Students will:

- Understand the terms “carbon source” and “carbon sink.”
- Be able to explain how carbon dioxide is added to the atmosphere and ways that carbon can be removed from the atmosphere.
- Plant native tree seedlings to offset some of their personal carbon emissions.

Materials:

- Tree planting worksheet. It can be found in the attachments section on page 31.
- Trees for planting.
- Tree planting tools such as spade, stakes, gloves, and compost or soil.

### **Carbon Source s: Finding the Culprits**

Carbon dioxide (CO<sub>2</sub>) is one of the gases produced when we burn fossil fuels to heat our homes, turn on our lights, and run our schools, businesses, and industries. Because all of these activities add carbon dioxide to the atmosphere, we call them carbon sources.

Since the Industrial Revolution, we have increased CO<sub>2</sub> in the atmosphere by 30 percent. Whether we know it or not, we all add carbon to the atmosphere. But, we can also remove carbon from the atmosphere.

**Carbon Sink s: Trees to the Rescue !** A carbon sink is any natural system that can absorb carbon dioxide from the atmosphere. The big carbon sinks on Earth are oceans and forests. Green plants, in the ocean and on land, take in carbon dioxide from the atmosphere as they grow. The more forests we have, the more carbon sinks we have, and the more carbon dioxide is removed from the atmosphere.

### **Procedure :**

1. Ask students to complete the worksheet found on page 33. This worksheet asks students to find out how much carbon dioxide is produced when using typical appliances or electronics. Then, students will determine how many trees they need to plant to absorb the carbon dioxide produced by that appliance or electronic device. An example of a completed worksheet can be found on page 31.
2. Help the students plant their trees.

### **Assessment :**

Ask students about their tree planting experience. Did they enjoy it? Can humans plant trees to eliminate all of our greenhouse gas emissions? No—we will need to find other solutions as well. What other solutions can the students find to reduce greenhouse gas emissions at school? What projects could they do that would permanently make their Job Corps Center more energy efficient? Find out more about the benefits of planting trees at the Colorado Tree Coalition: <http://www.coloradotrees.org>. Get these Forest Service resources on trees by calling (202) 205–5681. How a Tree Grows: FS-8 Color poster showing parts of a tree.

**Did you Know?** Trees properly placed around buildings can reduce air conditioning needs by 30 percent and can save 20 to 50 percent in energy used for heating.

**Author: Shannon Francis**

## **Vermi-composting/Healing the Soil with Worms:**



*Addressing sustainable practices for climate change and global warming through composting. Learn a basic understanding of how carbon and nitrogen plays an important role in our soil.*

**Ages:** 5<sup>th</sup>-12<sup>th</sup>

### **Goals:**

- 1.) Making the zero waste philosophy connections of how worms eat our food scraps and other compostible materials and turn it into high nutrient fertilizer that we can put back into our soil.
- 2.) Learn about the basic biology of worms, and how to make an indoor bin, care and maintenance for the composting worms.

**Materials:** (Group of 3-6 students)

Other supplies not mentioned in the instructions are: 1 - Plastic Rubbermaid or any brand will do (shoebox size) with closeable lid. Use pointed scissors or dowel to make ventilation holes, several handfuls of soil/dirt, 1lb of red worms and about 1qt water (room temp). Many of these materials you can get at public recycling places if you cannot find them at home.

### **Activity:**

Have each working group write down the following questions and present feedback from each group.

- What kinds of soil are we going to leave for our future generations?
- How does deforestation, the exploitation of our natural resources, and toxic waste spills in our oceans, rivers and lakes affect or impact our watersheds and soil?
- What are some ways that we are able to heal our soil and help protect our soil from future contamination?

\*Discuss the impacts of climate change and global warming, thoughts, comments from students to engage a dialogue.

Briefly review and watch as a class together first: English/Spanish Worm bin info sheet

<https://docs.google.com/open?id=1QsAt7S9Zayb4HEUo1A6SvLWtm2zbBUsOnxwDJL7I073YQB5mKvN784uM2UbW>

Worm Composting Basics

[https://docs.google.com/open?id=1COBA\\_AxQA0cwwTgJ6NqUnSy-XcIST8yhzeRqgmppZ1pPVicBp23BN-qcfE1-](https://docs.google.com/open?id=1COBA_AxQA0cwwTgJ6NqUnSy-XcIST8yhzeRqgmppZ1pPVicBp23BN-qcfE1-)

How to make your own worm bin

<http://www.youtube.com/watch?v=JjuYNiM60>

1.) Start dividing up all the materials for each group that will make a worm bin and refer to the worm bin instructions. Have each group designate two students to shredding compostible materials and placing them in the bin. Have another student mix together as the materials are added to the bin. Have another student pour water slowly into the bin as materials are added and mixed. Have the last student to add the worms by hand if they have no fear of worms.

- Ask the follow up questions after the worm bin has been composting about six weeks.
  - What life is in the soil? What are some of the minerals and nutrients needed in disturbed soil?
  - How are worms are connected to humans?(maybe passing already made worm bins around to look at worms)

\*Encourage the students to smell the soil, and observe the moisture level and identify contents in worm bins that was once food scraps, newspaper, egg shells..etc. They can also record on a log, how much food they are feeding the worms each week, and checking everyday to see how fast the food is being consumed by the worms.

## High School Urban EcoSteward Session 2: Woody Species Planting

Taiji Nelson – Education Program Coordinator, Pittsburgh Parks Conservancy

### Big ideas:

- Importance of biodiversity in woodland ecosystems
- Identifying anatomical and physiological characteristics of woody species
- Site assessment, planting and protection of woody species
- Tool safety and use

### Session goals:

By the end of Session 2, students will be able to...

- Explain the importance of biodiversity in woodland ecosystems
- Identify the nested watersheds we're working in
- Use anatomical characteristics to describe and identify a woody species plant
- Perform a site assessment based on tolerance of individual plant (shade, water, size, etc)
- Demonstrate proper planting and protection of a woody species
- Use proper safety and body kinesthetics for shovel and pick mattock

### Session outline:

Students arrive at site and discuss a question from Session 1 journal entry

Review biodiversity, watersheds, invasive species, and activity from Session 1

Journaling:

- Students select a plant, sketch a leaf, bud, bark and twig
- Introduce new vocabulary and discuss tree anatomy as a means of identification
- Descriptive writing word web activity to generate a sentence with plant characteristics
- Share sentence with a partner and try to identify partner's plant

Stewardship:

- Overview of plant physiology, site assessment, tool use/safety, and proper planting/protection techniques
- Stewardship activity – woody species planting

Journaling:

- Record what we did, something you learned, something you found difficult
- Pose a question to discuss at the beginning of session 3

Clean up and depart

### Vocabulary:

Branching pattern (alt, opp)

Simple vs compound (pinnate, palmate)

Leaf margin (entire, serrated, lobed)

Bud (terminal, axial)

Node

Xylem

Phloem

Woody vs Herbaceous (tree, shrub, herb)

### Research support:

The journaling and stewardship activities provide students with opportunities to make deeper observations and connect with their specimen, giving context to the anatomical and physiological terminology we presented. Additionally, students will be able to review this information by revisiting their plant in future sessions through other activities. In the articles *Active experiences in EE residential programs facilitate episodic recall* (Knapp, Benton, 2006) and *Students learn environmental stewardship, improve science scores* (Karsh, 2009), the authors explain that students better remember information when they have an associated hands-on activity.