



Cornell University



naaee

North American Association
for Environmental Education

**“Urban Environmental Education”
Online Professional Development Course
EECapacity, Cornell University, NAAEE**

25 LESSON PLANS FOR URBAN ENVIRONMENTAL EDUCATION

**Submitted by course participants
Spring 2014**

Course facilitator: Alex Kudryavtsev, PhD, Cornell University

EECapacity PI: Dr. Marianne Krasny, Cornell University

The views expressed in these lesson plans are solely those of the authors—participants of the Urban Environmental Education online course. EECapacity, EPA, Cornell University, and NAAEE do not endorse any teaching approaches, teaching activities, products or services mentioned in these lesson plans.

Making Connections

Urban Environmental Education

Amanda Woomer, Kennesaw State University

Learning Goal: Ages 10-14

- To encourage students to make connections between local and global environmental problems through reflective thinking.
- To encourage students to use critical thinking to identify causes and solutions to environmental dilemmas.



Background

Most of today's environmental problems—pollution, habitat loss, acid rain, drought, flooding—can be found in many places around the world. These problems are connected and impact many different parts of peoples' lives.

Education is often reductionist, breaking subjects down into pieces rather than exposing their relatedness. This activity takes a systems approach and encourages students to reflect on and become aware of the interdependence of the environment. It also empowers students as they analyze environmental problems, determining causes and potential solutions.

Additional Resources:

- [NAAEE Guidelines for Excellence](#)
- [Integration as a Tool for Sustainability Education](#)
- [Global Connections: Forests of the World](#)

Activity

- 1) Break students into groups of 4 or 5, depending on class size.
- 2) Take students out into the city to observe the environment (natural and manmade).
 - a. Within their groups, ask students to identify problems or issues related to the environment.
 - b. Encourage students to take notes, draw pictures and, if possible, photograph what they observe.
- 3) Next, ask students to reflect on what they saw within their groups. Potential questions include:
 - a. "What are the possible causes of and solutions to these problems?"
 - b. "How do these problems impact your lives or your community?"
- 4) Now, provide students with examples of 4-6 environmental problems occurring in other parts of the world. These can be tailored to what issues are most interesting or relevant to the students.
- 5) In their groups, students will then select 1 or 2 of the examples to compare to what they observed earlier.
 - a. If possible, the groups should conduct additional research on the example(s) chosen.
 - b. Next, ask students to determine similarities and differences between what they observed and the example(s) chosen.
 - c. Each group will present their findings to the class using images as support.
- 6) Finally, ask students to reflect individually on the connections between local and global environmental problems, in a journal for example. Potential questions include:
 - a. "How are these issues connected, both in terms of causes and solutions?"
 - b. "How can what you learned today be applied to other problems or other parts of your life?"
 - c. "How can what you learned be used to best serve the Earth now and in the future?"

Migration Hopscotch

Brenda Boddiger, Florida Atlantic University

Goal: Kids will gain an understanding of seasonal bird migration and how local actions can have global impacts.

Age: 5 years and up

Activity: (1) Create a hopscotch board – this can be designed however you want, or can be designed by the students; include stopover points for birds (rest, food, etc.). This can be as large or as small as you want!

(2) Introduction: Discuss migration (birds), and the importance of resources along the way; determine how humans can negatively/positively affect survivability of birds on their way south.

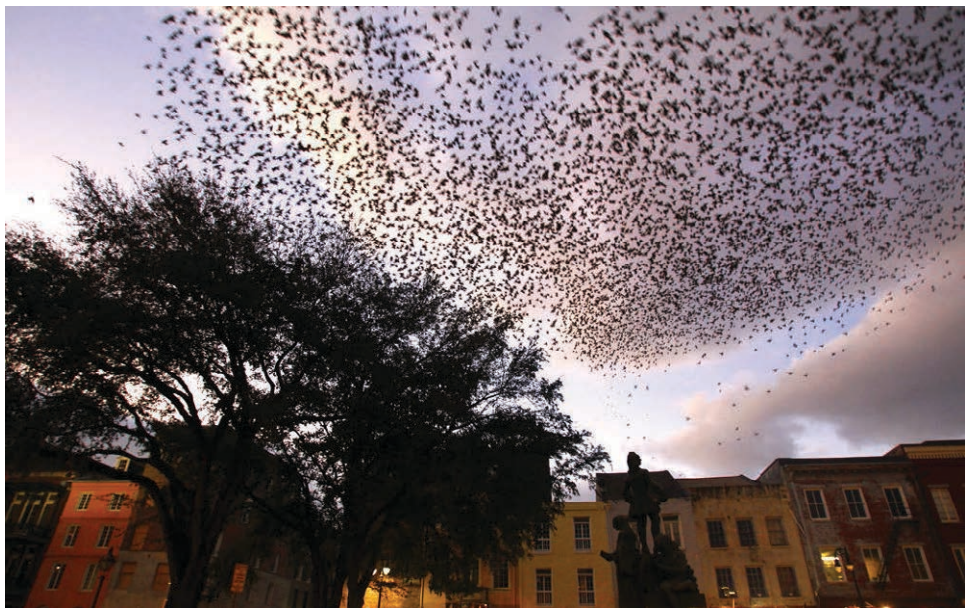
(3) Divide students into 2 groups – depending on how many squares are in the original hopscotch board, divide blank white sheets between groups

- a. One group will draw activities that impede migration (building on feeding grounds, buildings with lots of windows with clear glass, filling in wetlands, etc.); this group should receive more blank sheets than the other group.
- b. One group will draw activities that can be done to aid in bird migration – bird feeders, shades on windows, native plants/flowers, etc.).
- c. Collect all sheets and combine them into one pile.

(4) Have all students go through the hopscotch board to simulate a natural bird migration.

- (5) Next, have a student pick out one drawing from the collection. Place the drawing over an original hopscotch “square”.
- a. If the drawing that was chosen represents an activity that impedes migration, students should jump OVER that square.
 - b. If the drawing that was chosen represents an activity that aids migration, students are able to use this as an additional stepping-stone.

(6) As drawings are chosen, distances between squares will either get closer or further apart. When available squares get farther apart, this represents habitat/resource loss. Additional stepping-stones represent steps that communities can do to benefit bird migration.



Materials: Colored chalk or white paper and markers or crayons.

Suggestions / Tips: This activity ideally would be conducted outside, but can also be played indoors. This activity can be as simple as a hopscotch board drawn on a sidewalk, or you can really get into it and draw individual pictures for each square.

References: Activity idea obtained from Ashley Moore; *Ten Ways to Make a Difference for Migrating Birds*, Audubon Society. <http://athome.audubon.org/ten-ways-make-difference-migrating-birds>

Standards: Next Generation Science Standards (K-2) - Information Processing (LS1D), Interdependent Relationships in Ecosystems (LS2A), Ecosystems Dynamics, Functioning and Resilience (LS2C), Social Interactions and Group Behavior (LS2D), Adaptation (LS4D), Biodiversity and Humans (LS4D), Developing Possible Solutions (ETS1B).

Citizen Scientist Watershed Walk – Mobile Classrooms



Carmen Skarlpka, Herring Bay Watershed

Objective: Students will utilize smartphones and tablets to visualize, collect, and analyze in-field observational data of storm drains, trees, amphibians and reptiles while exploring their local watershed. Students will utilize free citizen scientist smartphone applications capable of advanced geospatial mapping and analysis of their observational data. All data will contribute to open source environmental scientific research repositories. Emphasis is on conducting data visualization, field-data collection, environmental modelling to further stewardship and advocacy of native and non-native species conservation initiatives.

Ages: 4th-12th Grade

Activity 1 - Citizen Scientist Smartphone Applications: Introduce and install the following citizen scientist applications on all smartphones.



MapplerK (Storm Drain Stenciling) – Storm drain location and condition identification. Storm drain map icons, unstenciled are  and stenciled are . Developed by IM Rivers.



Leafsnap – Urban tree species identification using leaves, flowers, fruit, petiole, seeds, and bark. Developed by Columbia University, University of Maryland and Smithsonian Institute Botany Department. Best results when photo taken against a white background.



i-Tree Streets – Urban Tree canopy location and identification. Developed by the USDA Forest Service.



H.E.R.P. Mobile - Amphibian and reptile location and identification (living and deceased). Developed by North American Field Herping Association (NAFHA) Herpetological Education and Research Project (HERP).

Activity 2 – Map Your Watershed: Search the three databases, [Storm Drain Stenciling](#), [i-Tree Streets](#) and [H.E.R.P.](#) Print a map with the current available data for your area noting existing storm drains, trees, amphibians and reptiles.

Activity 3 - SmartPhone Watershed Walk:

1. Head outdoors and break up into small teams each equipped with a minimum of one smartphone and a sheet of white paper.
2. Start all 4 smartphone apps and begin recording photos of each encounter with a storm drain, tree, amphibian (frog, salamander) and reptile (turtles, lizards) during your walk.

Activity 4 - Map your data: Return to the classroom. Search the three databases, [Storm Drain Stenciling](#), [i-Tree Streets](#) and [H.E.R.P.](#) Print a map of the area you just surveyed. Compare the results of Activity 2 (before) and the results of Activity 4 (after). Note the newly collected citizen scientist data the students have contributed to scientific research repositories.

Outcomes: Students will participate in actual citizen scientist projects. Students will collect and contribute observable data to existing scientific databases expanding our collective biodiversity knowledgebase. Students will contribute to watershed awareness initiatives by documenting conditions of un/stenciled storm drains. Students can continue citizen scientist data gathering data outside of school.

Materials: Smartphone, 1-sheet white paper

References: [Mobile Devices Drive Creative Instruction](#)

Explorations of a Community Garden

Chamberlain Segrest, Boston Green Academy



Age: Middle School; **Length:** 2 hours

Learning Goals:

- To broaden students understanding of urban gardens
- To better understand the seed to plate story
- To work on interview skills: handshakes, eye contact, active listening, gratitude
- To work on presentation skills: visuals, group work, articulation

Activities:

1. Split into groups of 3-4 students
2. Rotate between roles for each interview: Interviewer, Recorder, Photographer
3. Interview and collect data from at least 4 different gardeners (try not to overlap)
4. Document what is growing in each plot through photography
5. Share data back in classroom
6. In groups, create visuals (for example: graphs, maps, tables) representing data collected

Interview Questions:

- What is your name?
- Where are you from?
- How long have you gardened here?
- Why do you garden?
- What are your favorite foods to eat/grow?
- Do you grow any foods specific to where you are from? If so, what?
- How did you learn how to garden?
- Do you share your knowledge with younger people? If so, how?
- Do you use any specific gardening techniques (for example: organic, composting, seed saving?)
- What is the hardest/easiest crop to grow here? Why?
- What is your favorite recipe to cook from your harvest?
- Create your own question

Resources:

<https://communitygarden.org/programs/garden-mosaics>

<http://www.bostonnatural.org/communitygardens.htm>

<https://www.cityofboston.gov/food/urbanag/>

<https://www.facebook.com/pages/Clark-Cooper-Community-Garden-CCCG/145572205651063?ref=stream>

Hunting for Bears...In Your Neighborhood

Charissa V. Jones, Green Heritage Fund Suriname & Orlando Science Center

Audience: Community members; all ages

Goals: To promote awareness of the environment in an urban setting. To encourage awareness of the natural and built aspects of communities in order to promote a sense of responsibility and stewardship.

Time: ~ 5 hours

Materials

- Field notebook
- Handouts (*attached*)
- Brown paper bags
- Knife (for adults)
- Pencil / colored pencils

References

- Miller, William R. (1997). Tardigrades, Bears of The Moss (About Tardigrades). The Kansas School Naturalists. Vol.42. No. 3.
- Price, A. (2011). What's good in my hood: a service-learning workbook for investigating urban communities. New York: New York Restoration Project.
- Stilgoe, J. R. (1998). Outside lies magic: Regaining history and awareness in everyday places. New York: Walker and Co.



Environmental Education Materials: Guidelines for Excellence

- 2.3 Attention to different scales
- 4.1 Sense of personal stake and responsibility
- 5.3. Connection to learners everyday lives

Community EE Guidelines:

- 1.A Community wellness
- 3.A Who do my networks consist of?
- 4. Environment-Community Connections

Activity:

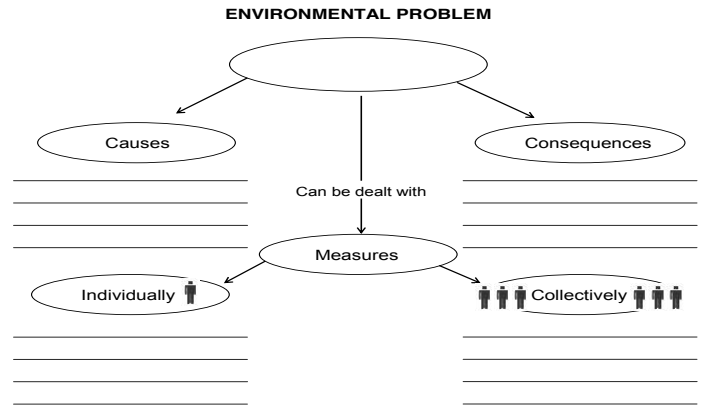
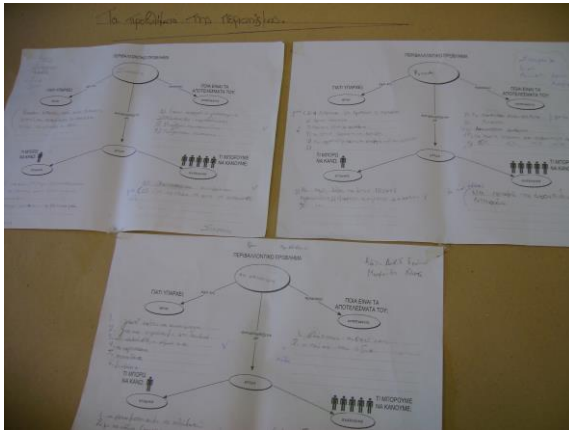
1. Meet community members in front of community center, school, or library. Start the "hunt" off with a literacy activity about Tardigrades, their life cycle, and Disney's fun, feel good movie Lilo and Stitch. ('Cause Stitch is a Water Bear you know!)
2. Have participants split into small groups (with at least one adult in a group with youth) and send them off to "hunt" for Water Bears by looking for moss or lichen in the community.
3. Have adults scrape off lichen samples with a knife. Moss samples can usually be picked up with bare fingers.
4. Participants will place samples in brown paper bag and label them with the following: date, time, season, ID of the tree (if they can), lichen, moss, etc.
5. Make sure bags are closed well so samples can dry out (if they're wet) and keep them in a dry cool place until you are ready to "Hunt for Tardigrades in the Lab".
6. While participants are hunting for Water Bears have them consider the sample questions. In their field notebooks participants can write or draw aspects of the neighborhood that answer the questions. At the end of the "hunt" they will discuss their feelings about their own environment.

Sample Questions:

- Where can you get food? Where does your water come from? How far do you have to travel to find food and water?
- Who feels comfortable in the community? Why wouldn't someone be comfortable?
- Example: Are buildings wheelchair accessible? Do crosswalks enable blind people to cross safely? How are different cultures represented?

Concept maps about urban environmental problems

Dimitris Tsoubaris, New marston primary school



Goal: Students will be able to identify environmental problems in their neighbourhoods, analyze them accordingly and propose solutions.

Essential Question: What elements of your environment do you love? Is there anything you are afraid might harm this?

Age: Grades 9-12

Materials: poster board, markers, concept map worksheets, projector, computer

Time: 1.5 hours in classroom; could be extended into 3 hours in order to include a field trip in the neighbourhood or extra time for debate and internet search

(1) Introduction: (8-10 mins) Students are asked to think and share a word from the environment that starts with the first letter of their name. e.g. Sarah – Sea.

(2) Brainstorming: (10-12 mins) Brainstorming takes place through projection of pictures from the students' neighbourhood. Students are asked to identify the settings and share their relevant knowledge in the class.

(3) Questioning – Debate: (25 mins) A variety of questions could be posed. An environmental problem is shown, the following questions could be posed, “where was this picture taken from?”, “can you guess when?”, “can you guess what has happened?”, “what could we do to improve the situation”, “who should be informed”, etc. If a “beautiful” part of the neighbourhood is shown, pupils could be asked to express feeling and experiences, consider how the situation could be improved or protected by factors which may be threatening it.

- Alternative option: Invite students to take photos of their neighbourhood and bring them in the classroom.
- Extension : Make a field trip around the neighbourhood (extra 45 mins or 1 hour)

(4) Concept maps: (20 - 25 mins) “Trace causes, think of consequences, propose solutions” - Students form groups, they are given concept map worksheets (printed preferably in A3 size paper), they are asked to choose an environmental issue and write down its causes and consequences, to think of potential solutions.

- Extension: students search the internet to find information about their chosen environmental problem, its history, etc.

(5) Presentations: (15 - 20 mins), each group presents its concept map– whole class discussion takes place and groups are invited to comment-contribute on the others' work.

Bibliography:

Children's Participation, The theory and practice of involving young citizens in community development and environmental care, Earthscan, Roger Hart & UNICEF, 1997

Appreciating ecosystem services provided by wetlands within the city

Fadzai Matsvimbo, BirdLife Zimbabwe

Goal: The goal of the lesson is for young people to understand the importance of 'open green spaces' within the city and appreciate the services that benefit human well being

Background : The open green spaces within the city act as kidneys and lungs of the city. The city of Harare is built on its catchment. Hence the water in the lake downstream is runoff from the city. The idea is for the children to understand what a wetland is and its functions, as well as its biodiversity. In Harare, typical wetlands are seasonally inundated grassland areas that support a rich diversity of flora and fauna. It is also important for the children to make the connection between the water they get at home and these wetlands.

Suggestions / Tips: I have actually done this before. The children loved being in the wetland looking at various forms of life. They enjoyed looking at the birds, frogs, flowers. It was so popular that they want to do it some more. The best time to have this lesson is right in the rainy season when the wetland is flooded.

Questions to ask:

- 1) How many different types of birds, plants, did you observe?
- 2) What is the colour and texture of the soil in the wetland?
- 3) Where does the water we use every day in our houses come from?



Age: 10 years -16 years

Time: 60-90 minutes

Materials: Gumboots, Binoculars, magnifying glasses, notebooks

Learning Objectives

- Students should be able to outline different components of a wetland ecosystem
- Appreciate wetland ecosystem services and their role in our everyday lives.

Activity: The children can be taken to tour a wetland nearest their school. During this tour they can record the different birds they see, the grasses within the wetland and whatever forms of life they can observe. The list of questions should be discussed the before the tour so the children can collect as much information as possible.

Epiphytic Lichens as Bio-Indicators of Air Quality: A Fieldwork Activity

Jorge Fernandes, Agrupamento de escolas de Mafra, Escola Secundária José Saramago – Mafra (Portugal)



Ramalina farinacea- fruticose lichen



Lobaria pulmonaria – Foliose Lichen



Xanthoria parietina – Foliose lichen

Age: K-12. Can be adapted for other grades. **Time:** 18 hours (3 hours/day).

Goals: Using lichens as biological indicator to show the air quality local in ways that the students can see and feel.

Objectives: Students will identify the four basic growth forms and some species of lichens. Collect and recognize some different lichen species in trees before and after in laboratory. Articulate the rhetorical knowledge with practice. Understand how pollution can affect lichens. Understand that lichens can be used to indicate the air quality (biomarkers). Interpret and promote discussion of the data collected.

Background: Lichens are a common, natural indicator of the health of the air quality in our environment. They are highly sensitive to subtle changes in environmental conditions, especially air pollution from sulfur dioxide, particulates, and nitrous compounds. Students will compare at least two contrasting sites in their local area, identify and count lichen species and use them as bio-indicators of air quality.

Materials: (per student team) Magnifying lens, maps of your community, field guides with pictures showing lichen species, local lichens dichotomous key, table AIP-index atmospheric purity, transparency, measuring tape, a knife or scalpel, small spray bottle with water, GPS, paper bags or packets, field notebook, pencils, rubber, waterproof marking pens, compass, digital camera.

Activity: *Starter:* Show students the PowerPoint presentation about lichens and criteria for identifying lichens and ask them what they think the picture on the first slide is. Introduce lichens by going through and discussing the following slides with the class. Students will use a magnifying glass/microscope to observe and identify the stems, and then draw them on a sheet of paper. *Fieldwork:* 1) Student teams (4-5) should be provided with a map showing the study sites and lichens dichotomous local keys. Sites should be chosen which provide good contrast, e.g. an area close to heavy traffic or intensively fertilized farmland and areas with little disturbance e.g. the edge of woodland, parkland, churchyards. 2) Students select appropriate and similar size trees, and determining latitude and longitude using GPS, use compass to determine geographical orientation of trees and record in field notes. 3) Students identify lichens on local trees and determine which lichens are the best bio-indicators of air quality. After, the students take pictures of lichens. 4) Students place a web/frame (see the photo) on the trunk (25 to 40 cm in diameter), 120-160 cm above the soil. 5) Students count the number of different species, they will be sampling the % of various types and write the results into tables of: a) Lichens tolerant of polluted areas (P); b) Lichens tolerant of moderate pollution (M); c) Lichens tolerant of slight pollution (S); d) Lichens of clean air (C). 6) Carry out five inventories. 7) Determine the frequency and cover of each species and apply a table of correlation values. The assessment of lichen diversity is used by index of atmospheric purity (AIP) in each station. 8) Vote on the best photos and share the results with the community and other schools.



Online sources for Lichens:

National Lichens and air quality database and clearinghouse - <http://gis.nacse.org/lichenair/>

Materials for a Key to the epiphytic macrolichens Portugal http://dbiodbs.univ.trieste.it/carso/chiavi_pub21?sc=465

Natural History Museum-an on-line interactive guide available at <http://www.nhm.ac.uk/jdsml/nature-online/lichen-iguide/index.dsmf>

The British Lichen Society - <http://www.thebls.org.uk/>

<http://www.earthlife.net/lichens/pollution.html>

Lichen collections and herbaria in North America

<http://www.huh.harvard.edu/collections/lichens/guide/guidetoliterature.html#herbaria>

We all live downstream

Karen Siddall, City of Irving

Aim: Students will supplement their study of the impact of development on water quality by learning to analyze stream samples for ambient conditions.

Target: Middle school, high school, adults.

Activity 1: Sum of the Parts

As one group, students will determine what possible effects development in the watershed could have in the downstream river.

1. **Land type (occupancies):** Students will identify the occupancy and activities on the lands along the river.
2. **Representative sample (of activity):** Each student will obtain an object that represents the primary activity on each property (e.g., pizza restaurant - a leftover piece of pizza or napkin, construction site - a baggie of loose soil).
3. **Examine and explain:** Students will form 2 lines of equal length, each line facing the other over “the river,” holding their representative object. They will explain what their site contains (pizza restaurant, construction site), what activities go on at their site, what potential pollutants their activities could add to the stormwater runoff during a rain event (i.e., pizza restaurant – car pollutants from parking lot, litter; construction site – sediment, concrete washout, paint.)
4. **Send downstream:** As each student finishes their explanation, they hand their object to the student standing across and/or “downstream” until the student at the end of the line (the furthest downstream) is holding all the objects brought by the others students.
5. **Round up:** Students visualize and discuss how we all live downstream from someone else and that pollution adds up. Even though each only had a small item when they started out, the student at the end of the line had difficulty holding everything that was handed to them.



Activity 2: Identifying water quality core values

Each group of 2 students is given a stream sample analysis kit to measure air temperature, water temperature, conductivity, pH, and dissolved oxygen. After demonstration of testing methods and using samples from the local river, students collect data for each of the above listed parameters for their water sample. They share their results with other groups (working on samples from other locations, upstream/downstream on the same river.)



Questions to discuss:

Is it possible for the water quality measurements to be different up and down the river?

What activities near the river might affect what is found in the water?

Are the impacts short-term or long-term or both?

What precautions could be taken to minimize the effects of these activities?

Materials: Various items representing activities at riverside locations (brought by students), LaMotte water quality test kits, goggles, latex (or vinyl) gloves in various sizes, white or clear buckets with lids for grabbing stream/river samples, rope, paper towels.

References:

Sum of the Parts activity adapted from activity by the same name from Project WET



LOCAL PARK EXPLORATION

Kenny Points, National Park Service Rivers, Trails, and Conservation Assistance

Goal: Encourage youth to spend time outdoors, learn about their area ecosystem, and promote stewardship.

Rationale: Many urban youth spend time in and around neighborhood parks but have little knowledge of the animals and plants that share these spaces with them. This activity can be used as a first step in a project that escalates towards the kids' first forest experience.

Ages: 5-10 years



Activity: (1) Meet children at the park or walk them from a local school, community center, or other facility.

(2) Split the children into groups of 2-4 each (depending on group size) and ask them to find something they would like to know more about. Tell them it can be anything from a small rock to an entire tree.

(3) Have the children discuss differences between their objects with another group. This can be texture, size, color, function; encourage the children to be creative.

(4) Help each group identify their object and tell them more about it. Example: A group has an acorn, explain acorns come from oak trees and show them the tree.

(5) If time allows the children can choose a different object and repeats steps 1-4, if not skip to 6.

(6) Talk with the children about their findings and discuss how animals and plants use and need the park too.

Materials: No materials are required. If available, compasses can be used to navigate the park and field guides can help the children identify objects on their own.

Suggestions / Tips: Google Maps is a great resource to locate parks close to your target audience.

Education Benefits: This activity meets the Nebraska science standards for communication, observations, and properties and structure of matter for children in kindergarten through fifth grade.

References: Nebraska Department of Education Science Standards

<http://www.education.ne.gov/science/Documents/ArticulatedScienceSinWord.pdf>

Rocks in the Classroom

Kristen Sinicariello, Christodora, Inc.

Aim: Students will be able to identify sedimentary, metamorphic, and igneous rocks and how they are formed.

Target: New York City middle school students. This is a classroom prequel to Christodora's field lesson on the Rock Cycle.

Activity 1: Making a Rock

Students will work in groups and imitate the rock cycle using crayons. The educator facilitates the lab and draws a diagram of the rock cycle and its processes on the chalkboard while the students create their own rock cycle.

1. **Sedimentary Rocks:** Simulating weathering, students use a sharpener to make "sediments" from various colors of wax crayons. Next, they deposit these sediments, in layers, onto a sheet of aluminum foil and compact it gently using the pressure of their palm. *Weathering and erosion create sediments from already existing rocks. These sediments settle in layers, creating sedimentary rocks which can usually be found near rivers and other bodies of water.*
2. **Metamorphic Rocks:** Students apply much more pressure to their sedimentary rocks. They can wrap their rock in the foil and step on it using all of their weight. *Metamorphic rocks are often formed from heat and pressure over time within mountains.*
3. **Igneous Rocks:** Students melt their metamorphic rock over a flame or on a hot plate. Once this melted magma cools, it will form an igneous rock. *Magma is formed from molten rock under the earth's surface and creates igneous rocks when it cools.*

Questions to consider: Must rocks always follow the cycle in this order? Could a sedimentary rock be formed from a metamorphic rock? Could a metamorphic rock transform to another metamorphic rock? What is the significance of a cycle?



Activity 2: Identifying Rock Examples

Each group of students is given various rock samples and a chart with information on some characteristics of various types of sedimentary, metamorphic, and igneous rocks. Using the chart and what they just learned and witnessed of the rock cycle, students must work with their groups and place the rock samples within the right categories on the chart.



Debrief: Rocks in New York City

How does the rock cycle apply to New York City? Why is it important to understand the rock cycle?

Did you know ...

- New York City is built on a bedrock of schist, a metamorphic rock
- The Empire State building is made from granite and limestone
- Concrete is a mixture of crushed igneous and sedimentary rocks along with cement and water

Materials: Aluminum foil, crayons, sharpener, heat source, samples of different types of rocks, magnifying glasses, identification key

References:

Crayon lab adapted from the Geological Society of America, www.geosociety.org

Conservation Comics – Illustrating the Powers of Native and Invasive Plants

An Urban EE Lesson by Lola Bloom, City Blossoms

Lesson Overview

This lesson uses comic books and art to teach the qualities of native and invasive plants, and their impacts on the local ecosystems. The product of this lesson can be displayed as educational posters for the community to learn more about the biodiversity in their school garden.

Level Grades 6-8

Learning Objectives

Synthesis – Students will create images of native and invasive plants as part of a comic book story.

Comprehension – Students will explain through a comic book story how invasive plants can be destructive to an eco-system; alternately how native plants can help to promote a healthy eco-system.

Knowledge – Students will be able to identify several species of invasive and native plants.

Connections to Standards

Next Generation Science Standard - MS-LS2-4.

Time Frame This lesson can take from 3 45-minute sessions to 5 45-minute sessions.

Materials needed

Pictures of invasive and native plants

Scrap paper

Pencils

Colored pencils

Erasers

Pencil sharpener

White paper, maybe cardstock

Templates for comic book pages and covers

Examples of comic book style lettering, images (optional)



Activity

Engage

1. Ask students in class, “Have any of you ever read comic books? Who are some of your favorite comic book characters?” Make a list as a group. “All of these characters have certain special powers, or characteristics. Plants do too – some are the “Good Guys”, and others are “Villains” in our gardens. We are going to make comic books as a way to tell the stories of our plants.”
2. Discuss the roles that plants can play in the garden, i.e. invasive plants can take resources from other plants (water, sunlight, nutrients), choke other plants, or even poison other plants. Native plants help feed and attract wildlife and maintain a healthy habitat for diverse species in gardens.

Explore

1. Students will research and learn about some of the good and not-so-good plants that exist in their communities, neighborhoods or school grounds. Either go outside and find these plants, or use photographs, books and websites to give the students an idea of their characteristics.
2. Students will create plant profiles to list characteristics of the invasive and native plants that affect the school environment.

Explain

To illustrate the comic book about natives and invasives, the students will create stories about their school environment. Day 1 - The students will use their imagination to develop characters in the garden by designing their garden alter ego. Day 2 – In groups, students will create stories for their comic books, with one sentence per person in the group (i.e. if there are 5 people in the group, there are 5 sentences). Each student will be tasked with illustrating a sentence. For students who are insecure about their drawing abilities, teamwork and creativity is encouraged (sharing the coloring of the book versus the drawing; using pictures and photos to make collages). Students will work on their comic book pages for 2-3 days, and then assemble them on a storyboard to display to the class. Requirements for the story/comic book include:

- At least one garden “superhero” must be featured in playing a role to “save the day.”
- A plant villain must be included in the story. The story should explain why this plant is bad for the ecosystem.
- The superhero must use at least one real technique in eliminating the plant villain (i.e. weeding vs. using fireballs)
- Part of the solution needs to include planting at least one native plant, and explaining why.

Evaluate

Students are evaluated on their ability to identify and explain the differences between native and invasive plants, and what steps can be taken to plant a sustainable and healthy ecosystem within the comic book stories they design.

Resources for Native and Invasive Plant Research

Ladybird Johnson Wildflower Center

<http://www.wildflower.org/>

Pollinator Partnership

www.pollinator.org

How to Draw Plants: instructional videos:

<https://www.youtube.com/playlist?list=PLpcRk9AaBeWgsQNAdYBS37KL3Ie93vPjr>

Discovering Urban Eco-Niches

Created by *Marisela Chávez*, University of Kansas

Ages: 7-10

Goal: Students will learn what ecological niches are and why they are important for a healthy ecosystem. Most importantly, how they can find eco-niches in their own neighborhoods!

Time: 1-1.5 hours

Materials:

- Field notebook
- Handouts (*attached*)
- Camera (*optional*)

References:

Alberti, Marina, John M. Marzluff, Eric Shulenberger, Gordon Bradley, Clare Ryan, and Criag Zumbrunnen. "Integrating Humans into Ecology: Opportunities for Urban Ecosystems." *BioScience* 53.12 (2003), pp 1169-1179. Web.



NAAEE Guidelines:

- 1. Collecting information
- 1. Drawing conclusions and developing explanations
- 2.2 Organisms, populations, and communities
- 2.2 Systems and connections
- 2.4 Human/environment interactions

Activity

1. First, review what an ecosystem is (use pond handout). Then, define what an ecological niche is and put into the context of an ecosystem.
2. Break up into small groups of 3-4 (depending on the class size). Distribute the "The Ecological Niche of a Sunflower in the Backyard" handout. Tell the students to discuss amongst their group the types of clues on the image that may reflect the ecological niche of the sunflower is in that backyard ecosystem (about 10 minutes). Reconvene and ask for groups to share what they discussed with the rest of the class. Make sure to point out and discuss the following:
 - a. Functions of the sunflower in that backyard ecosystem.
 - i. How the sunflower takes advantage of nutrients and energy.
 - ii. Services it provides to other organisms and the environment.
 - b. Why the sunflower is able to have this ecological niche (i.e., lack of other flowers in the backyard that could fulfill a similar role).
3. Next, take the students outside to make observations. Go for a walk around the neighborhood and task each group to identify at least one eco-niche (about 30-45 minutes). In their field notebook, they should write:
 - a. What the organism is, what services it provides to other organisms, how it takes advantage of the available resources, and why it is able to fulfill this role.
 - b. Challenge question: what would happen if that organism did not exist? Are there other kinds of organisms that could take its place?
 - c. If possible, they should make a sketch of the eco-niche they found or take a photo.
4. Find a place outside where the entire group can sit down and discuss each small group's findings (about 15 minutes).

Surrounded by Sounds

Mary McCarthy, Missouri Master Naturalist



Age: PreK-2. Can be adapted for upper grades.

Objectives: Students will actively listen to the sounds around them outdoors. Students will discern living from non-living sounds. Students will explore nonverbal communication utilizing found objects.

Materials: School yard, found objects. For extension: drawing paper, drawing utensils, glue, notions. For further exploration, CDs or websites with calls of birds, insects, toads and frogs.

Background: Nature abounds with sights and smells, but there is another sense nature uses: sound. Birds, bugs, frogs all use sound to communicate with each other, just as humans do. In addition, many birds, bugs, frogs and toads can be identified by their calls. Listening offers us the opportunity to get to know and understand our environment better.

Time: Up to 30 minutes.

Activity: (1) Warm-up: Discuss ways humans communicate with each other. How do we express happiness? Sadness?

(2) Lead into discussion of how non-humans communicate. What are the ways they express themselves?

(3) Go outside and listen. Ask students what they hear. Possible answers: traffic, cars, trucks, planes, helicopters, dogs, birds, bugs. Ask students what the animals are saying to each other.

(4) Find objects in the school yard, such as twigs, nut shells, pebbles. Explore how these sound in various ways.

(5) Pair students up in small groups. Utilizing the surrounding found objects, direct students to “talk” to group members without using words. Ask partners to guess what the other members are “saying”.

(6) Discuss ways listening is an important tool.



Extension:

- Encourage students to create their own animal. Make one with found objects or draw one, and share with the class what kinds of noises the animal would make and what the animal is saying.
- Listen to CD or online recordings of birds, amphibians, and insects in your area. Become familiar with some calls and try to identify those animals whenever the class is outdoors.
- Read: [A Forest Tree House](#) by Sheryl A. Reda (World Book, Inc., © 1992, ISBN 0-7166-1621-1)



Suggestions / Tips: The season will affect the sounds heard during this activity. Autumn will provide more insects, i.e. cicadas and katydids. Spring is filled with bird song. This activity can be repeated throughout the year to assess learning.

Online sources for animal calls:

Bird Calls: Cornell University Lab of Ornithology: <http://www.birds.cornell.edu/Page.aspx?pid=1478>

Frog and Toad Calls: <http://www.naturenorth.com/spring/sound/shfrsnd.html>

Cicadas: Cicada Mania <http://www.cicadamania.com/audio/>

NAAEE Early Childhood Environmental Education Programs Guidelines for Excellence

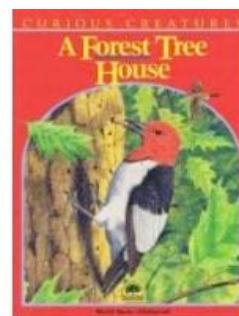
Guideline 2.3 Child directed and inquiry-based

Guideline 3.1 Use of natural world and natural materials

Guideline 4.2 Curiosity and questioning

Guideline 4.3 Development of environmental understandings

Guideline 4.4 Skills for understanding the environment



Storytelling for Social Change

Matt Wyatt, *Anacortes Kayaking; Shaver's Creek Environmental Center*

Objective:

Storytelling is not only how we connect, build relationships, and find community. It's also one of the primary tools used by organizers to inspire, engage, and motivate people to action. By gaining confidence, skills, and practice telling one's own story, youth and adults gain a competency in one of the most important skills in social change organizing.

Goals:

Practice crafting, sharing, and coaching others on telling stories (Skill).
Understand the design of a motivational story (Knowledge).
Appreciate our own power to motivate ourselves & others through stories (Attitude).

Materials: Flipchart, Markers

Audience: 13 years old and up

Source: Adapted from [Real Food Challenge](#) Workshop

Activity:

Introduction (7 minutes)

- With little to no introduction, start telling a somewhat vulnerable story about a challenge you faced.
- Introduce workshop goals on flipchart paper.

Concentric Circles Activity (20 minutes)

- Split the group in half, forming an inner circle facing out, an outer circle facing in—everyone should have a partner.
- Deliver story prompts, have everyone tell a story for 3 minutes, and rotate partners at the end of each prompt:
 - 1) Tell a story about a hobby or interest of yours / something you learned growing up.
 - 2) Tell a story about a time you stood up for something you believed in.
 - 3) Tell a story about a time you felt powerful or powerless.
 - 4) Tell a story about your favorite place.

Debrief (5 minutes)

- Flipchart debrief answers as they arrive, condensing into sharable 'nuggets of wisdom:'
 - 1) What is something that stood out to you from a story you heard?
 - 2) Which question was hard? Which was easy? Why do you think that is?
 - 3) How did it feel to listen to someone else's story? What did it make you think/feel?
 - 4) Did you end up sharing any stories that surprised you? Or hearing ones that surprised you?
 - 5) Did your relationship with the person change after the end of the story?

Brainstorm (10 minutes)

- “Why tell stories?” Flipchart responses. Potential themes: motivate people to action, build community.
- “What makes a good story?” Flipchart responses. Potential themes: structure—beginning, middle, and end; conflict/tension; “you “are the main character.
- Show chart of “What a Good Story Is and Isn't.”

Introduce “Challenge, Choice, Outcome” Model (6 minutes)

- Explain “Challenge, Choice, Outcome;” show with flipchart diagram.
- Ask participants to identify these parts in their stories or the facilitator's story.

Developing Your Story! (30 minutes)

- Let participants write a rough draft of a story they told earlier or with new prompts using the model for 5 minutes.
- Encourage them! “Everyone has many stories; they take work! If you felt emotion (or something!), explore it.”
- Share stories in pairs, giving 7 minutes per story, with time for feedback between. Switch storyteller.

Final Debrief! (10-15 minutes)

- Flipchart responses to same debrief questions, condensing themes into take-home points.

AVIAN ADAPTERS

Nicole Jackson, Franklin Park Conservatory and Botanical Garden

Background:

We see birds everywhere - in the garden, in the street, in parks, and even in rural areas. Most of us live in urban areas where parks and trees aren't too far away. Many birds live in cities and it's worth learning why they have become urbanized.

For over a century, large cities and their surrounding suburbs have grown, replacing rural habitats. Many species of birds have vanished from such areas, but few that we see have adapted themselves to the man-made environment and have survived very well.



The three most common city birds are the starling, sparrow, and pigeon. They are three very adaptable species, always ready to exploit potential food sources.

Learning Goals: Students will understand how specific bird species adapt to an urban environment through monitoring their behavior.

Learning Objectives: Students will be able to correctly identify the three most common city birds and their habitats. Students will be able to identify a bird's potential food source within an urban environment.

Target Group: Grades K-12

Time: 1.5 - 2 hours

Materials: Binoculars, pocket field guides, clipboards, pencils, and paper

Activity:

- Review what the students will be doing; students will have time to explore their urban environment by going on a short birding hike through the city
- Before the walk, students will learn how to use binoculars and field guides to properly identify and monitor the three most common city birds
- Students will break into groups and search for one or more of the three birds and take notes of the habitat they are seen in and potential food sources.
- After the hike students will gather their notes and come back together as one group to discuss their findings.

Questions to ask after bird hike:

What birds do you see frequently in the city? Can you tell what kind of bird it is without using binoculars?

What type of habitat do you see the bird in? How are the habitats different? How are they similar?

What would be a good food source for these three birds? Could we eat what they eat?

What are some ways birds can adapt to an urban environment?

Extension:

You can also look for and monitor urban song birds, birds of prey, and waterfowl. How do they survive in the city?

Resources:

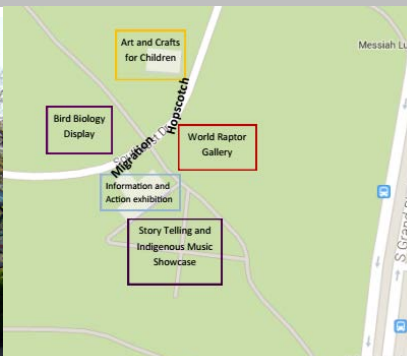
- Cornell University Lab of Ornithology: www.allaboutbirds.org
- Excellence in EE: Guidelines for Learning (K-12)
 - Strand 1: Questioning, Analysis, and Interpretation Skills
 - Strand 2: Knowledge of environmental processes and systems
- Pictures
 - Sparrow: [http://upload.wikimedia.org/wikipedia/commons/9/9e/House_Sparrow_\(M\)_I_IMG_7881.jpg](http://upload.wikimedia.org/wikipedia/commons/9/9e/House_Sparrow_(M)_I_IMG_7881.jpg)
 - Starling: <http://www.birdminds.com/Starling.jpg>
 - Pigeon: http://instructional1.calstatela.edu/lkambhis/tesl565_sp09/yurkovestsky/pigeon.jpg



FOLK BIOLOGY FESTIVAL: “NARRATIVES OF THE SKY” THEME

Paul Oryem, City Raptors & Our Sustainable Response of Digital Arts Collaborative

www.folkbiologyfestival.com



Site for the proposed
2014 Saint Louis Folk Biology & EcoArt Festival

Goal:

Create an interactive forum that incorporates intergenerational and cross cultural exchange of nature folklore with an expo to connect with citizen science projects and local organizations

Format:

Folk biology can be defined as people's everyday understanding of the biological world¹. It is an acknowledgement that feelings, experiences, and attitudes shape environmental perceptions and issues. The festival uses a themed neighborhood approach to incorporate storytelling, music, education, birds, interactive displays, and children's activities.

1. Storytelling features from area refugee & immigrant communities representing 5 different continents. Older adults will provide short bird/nature stories to be prerecorded as downloadable podcasts and a portion to be reproduced live at event.
2. Migration Hopscotch to demonstrate the importance of conservation of natural spaces for wildlife.
3. Raptor Gallery with pictures and information on Missouri raptors² and world raptor data compiled from Global Raptor Information Network³
4. Nature and Outdoor Expo for connections to local opportunities for bird watching/bird walks, citizen science projects and environmental advocacy.
5. Children's activities and interactive displays create bird art and crafts, build life-size raptor nests

Materials:

Audio and video recording equipment and software to produce podcasts

Suggestions: Tablets for cross cultural exchange, introductions and engagement

Sidewalk chalk to create 200 meter world maps to show global flyways for migration hopscotch

Suggestions: Flyways should cover areas that will be featured at festival⁴

Display and poster boards for gallery & showcase

Craft supplies for children's activities and interactive displays to create bird art and crafts, build life-size raptor models and nests

Assumptions:

Raptors are charismatic megafuna that can be sighted in urban areas. State conservation departments and local Audubon and bird societies, networks and nature rescue organizations can provide additional insight and resources.

Resources:

Building Communities Through Recreation <http://www.sustainablepittsburgh.org/OutdoorFestival/OutdoorFestival.pdf>

How to Organize a Birding or Nature Festival <http://aba.org/festivals/consfestlr.pdf>

About Festivals http://www.culturela.org/events/Festivals/festivalproducer/Festival_Handbook.pdf

Culturally Diverse Arts Programs <http://www.harrisonfestival.com/HarrisonFestival5/docs/bestpracticesguide.pdf>

Guidelines and Research:

Environmental Educational Materials: Guidelines for Excellence

Guideline 2.1 Awareness

Guideline 5.2 Creative learning, cross age teaching

Guideline 5.3 Connection to learner everyday lives

Guideline 5.4 Expanded learning environment

¹ <https://cognet.mit.edu/library/books/view?isbn=0262133490>

² Conservation Commission of Missouri. http://mdc.mo.gov/sites/default/files/magazine/2010/03/3222_digital.pdf

³ Global Raptor Information Network. 2014. <http://www.globalraptors.org>

⁴ <http://www.borealbirds.org/report-birdswater.shtml> & <http://www.birdlife.org/datazone/sowb/casestudy/20>

Birds and their habitats

Randall Tseleng, BirdLife Botswana

Habitat is where plants, animals and birds live. Examples of different habitats are woodlands, lakes, wetlands, hills, cities/towns and many more. Habitat is very important for birds, as they need their habitat in order to survive. Therefore it is necessary to conserve habitats in order to safeguard birdlife.

In Botswana the habitats that you may see are

- Desert
- Grasslands
- Savanna and Bushveld
- Forests and Woodlands
- Hills
- Cities, Towns and Villages
- Farmlands
- Rivers and Stream
- Lakes, Lagoons, Dams and Sewage ponds

In this lesson we will focus on Cities, Towns and Villages habitat and the bird species that are found there.

In a city, town or large village most of the natural plants will be found only in parks and gardens. It is here that we mostly find birds listed below for this habitat, especially if there are large trees or shrubs to provide shelter and nesting sites. Of necessity, more and more birds are adapting to this lifestyle and they can be encouraged even in the most closely built-up areas by planting suitable plants.

Activity:

1. What are the main characteristics of this habitat?
2. What is special about this habitat that attracts the birds that use it?
3. What activities do birds carry out here?
4. What changes in this habitat would affect the birds that use it?
5. What are some of the causes of change to birds' natural (not man-made) habitats that might cause them to move to urban areas?
6. What can be done to lessen those changes?

- Yellow-billed Kite
- Red-eyed Dove
- Cape Turtle Dove
- Laughing Dove
- White-rumped Swift
- Little Swift
- White-backed Mousebird
- Red-faced Mousebird
- African Hoopoe
- Crested Barbet
- Barn Swallow
- African Red-eyed Bulbul
- Groundscraper Thrush
- White-throated Robin-chat

Some bird species found in this habitat



Southern-masked Yellow Weaver

Reference: Beginner's Guide to Birds of Botswana edited by Dr. K. J. Senyatso (2008), BirdLife Botswana Director.

Sensory, Solo, Sharing

Ravi Lau, Aim High



Goal: Students will strengthen sensory observation skills and their personal relationship with the natural/urban world/environment. Students will also gain practice with public sharing, active listening, and community stewardship.

Age: 5th grade to Adult

Activity: (1) Prepare students for the “solo” activity by letting them know the activity is very safe, yet may feel challenging, and that the instructor will always be close by. Pass out journal/paper and pens or other art supplies.

Let them know this may be rare opportunity to be “by themselves” in a natural (or partially natural) setting, tune in to their surroundings and make careful observations. Ask students: “What are the senses we use to understand and interact with the world?” (seeing, hearing, tasting, smelling, and touching or “feeling”). Ask students to write these senses down, which can guide their solo activity. Ask them to spend time focused on each sense, noticing what they see, smell, feel, hear, touch, and feel. They can jot down notes and/or draw pictures to capture their observations. Ask if they have any questions or concerns about the plan.

(2) Place students “by themselves” (but within calling distance of a teacher) in a pre-determined natural/urban area; this might be a park, stream, garden, or other semi (or fully) natural setting. They should be instructed not to make contact with one another or otherwise distract each other, even if someone else is within view (this can be the hardest part). Depending on the students’ age, ratio of students to teachers, and general dynamic of trust, students may be able to choose their own solo spot (with teachers noting all locations).

(3) After a pre-determined amount of time (with 7-10 minutes a minimum, up to 30 minutes, depending on age), the teacher visits each solo site and quietly invites students back to a meeting circle.

(4) Thank everyone for taking on this challenge, and invite students to share their sensory observations. Remind them it can take a lot of courage to speak in a circle, and/or share one’s work, so to “take care” of each other and practice active, supportive listening, or viewing of artwork. This “taking care” approach can also be woven into other elements of a “stewardship” theme or stewardship activities, as stewardship can be practiced in many settings, urban, rural, or intra/interpersonally.

Materials: Journal or paper with clipboards; pen or pencils, art supplies (optional)

Suggestions / Tips: The activity works well in a mixed natural/urban or purely natural environment. Even “urban” sounds such as sirens, cars, etc can be noted/observed. If students see the color “green”, challenge/encourage them: “how many shades of green?” or “how many *different* bird songs?”. The sense of “taste” can also be merged with “smell”, unless you’re in an urban garden! Also the sense of “touch/feel” can be expanded to “how did it feel?” to be on your solo, was it scary, fun, relaxing, reflective? Etc.

Reference:

http://www.nols.edu/enrolled/admissionforms/instructor_course_curriculum/EEN.3_Environ._Education_Strategies.pdf

Environmental Racism: Local & Global Solutions

Sammy Lyon, Environmental Service Learning Coordinator, Environmental Charter Schools



Coalition of Immokalee Workers May Day protest of supermarkets, 2011

Guiding Assumptions Environmental issues are not distant problems that we hear about on the news or joke about when summer comes earlier every year. They are real issues that affect real people, and low-income people and people of color are systematically and disproportionately affected by environmental injustices across the globe. Environmental injustice today is inextricably linked with exploitation of people and land, and is part of a long history of colonization. Learning about these injustices helps people with environmental privilege connect to struggles for environmental justice and become a part of the solution.

Materials Environmental Racism Cards | Poster paper & markers

Learning Goals Students will be able to...

- Cite global and local examples of environmental injustice
- Reflect on how environmental issues affect people around the world
- Identify ways they can stand in solidarity with struggles for environmental justice

Introduction: Environmental Issues in the Media Start with the Guiding Assumptions above to set the tone. **Discuss:** Read the following topics out loud and ask youth if they have heard about any them in the media. Ask them to share examples if they have. **Ask:** Why do you think these are reported on in the media? What about the topics we never hear about? **Topics:** Pesticides | Nuclear Waste | Food Deserts | Indigenous People's Loss of Land | Toxic Waste & E-Waste | Climate Change | Oil Spills | Farmworkers Rights | Water Quality | Drought | Pollution

Activity: Environmental Racism Pass out Environmental Racism cards. **Explain:** Here are examples of environmental issues that you may or may not have heard about before. Read the card with a partner or small group. Familiarize yourself with the story; you are going to share what's on the card with the rest of the class. **Prompts:** What stands out about this information? What is the impact on humans and the earth? How does it make you feel? How is power being used in these situations?

You can structure this activity in several ways. You could go around in a circle and read each card aloud, or have students read the cards individually, in pairs, or in small groups and then present. To share out, you can:

- Ask youth to share out what they learned from the card and what stands out about it.
- Ask youth to make a poster in small groups addressing the prompts above (and any you want to add!) and present the information to the rest of the group. They can draw, write, perform, etc.
- Any other group reading comprehension activities that you have found to be successful with your youth!

Debrief: Next Steps & Solidarity A lot of people feel overwhelmed and helpless when faced with these issues. **Ask:** What are some things you think you might do if you were in their situation? What are things you could do yourself, in solidarity with their struggle, as someone with both environmental privilege and environmental oppression to varying degrees? This is a great opportunity to show videos & talk about examples of activism by grassroots groups to challenge environmental injustice, whether in your community or others.

Suggestions/Tips If you have an environmental project happening at your program or school (a garden, for example), point to this as not an isolated project, but as being part of a larger struggle for environmental justice in our communities. Try to pair this activity with a hands-on project to show the connections between your program and the issues on the cards. Please adapt the activity based on the age, ability and experience of your students to help them process both the information and the emotional impact of the cards! If you have a great jigsaw activity you use for comprehension, switch that out and use the cards that way instead, and remember to facilitate a safe space.



Environmental Charter HS addresses waste w/composting

References See resources and printable cards at www.lyonideas.com/resources/enviro-racism.

Invisible Toll: calculating human costs of our Food System

Sarah Tracy-Wanck, Common Ground High School

Goal: Students will be able to examine the role migrant labor plays in our food system.

Essential Question: What does our modern food system look like?

Age: Grades 9-12

Materials: Poster Board, Markets, Tomatoes, Buckets, Scale, Calculators, Worksheets, Projector, Computer

Time: 1.5 hours in classroom; 3 hours if done in conjunction with farm work.

Standards: CC SL.9-10.1a-d, W.9-10.2a, RI.11-12.4. EE 9-12 3.1a-b.



Not so invisible: Workers with Coalition of Immokalee Workers. www.ciw-online.org/about

(1) Do Now: (2 mins) Students individually make a list of all the jobs required to grow, transport, process the tomatoes in their school lunch.

(2) Food System Job Graphic: (15 mins)

- ❖ Generate list of jobs that support our food system- list jobs off to side on board or paper.
- ❖ Next, ask students to help create a graphic (on board or paper) with the jobs arranged according to relative status: power, control, profit.
- ❖ Option: create 4 different hierarchical representations for: production, processing, distribution, retail
- ❖ Sample questions to lead discussion: “Supermarket worker: where do they belong in this graphic? How much decision-making power do they have about products or prices? How much do they get paid?”
- ❖ Extension: visually represent number of individuals in each of those positions. Include consumers. “Where do consumers fit into all this? Bottom of hierarchy? Top? What does it mean that there are so many consumers?”

(3) Reading and Terms: (10 minutes) Class reads article about migrant labor in the US Food System.

<http://hungerreport.org/featured/immigrants-us-food-system/>

(4) Debate: (20 mins) “Can farms survive without illegal labor?”

- ❖ Students break into groups to read one opinion on the immigration and farm labor debate. Identify main points of argument and report back to whole class. (Read into together, then pick 4 arguments.)
 - <http://www.nytimes.com/roomfordebate/2011/08/17/could-farms-survive-without-illegal-labor>
- ❖ Where do our tomatoes come from?
 - Watch video: http://www.huffingtonpost.com/daniel-klein/tomato-farming-florida-immokalee_b_1381421.html

(6) Calculating Costs: (25 mins)

- ❖ If possible, students pick tomatoes from a garden, farm, or greenhouse. Weigh tomatoes, calculate the amount of money an Immokalee worker would have earned for that harvest.
- ❖ If no access to farm/garden: If class ordered pizza for the whole school...How many tomatoes would be in all those pizzas? How much would a farm worker have gotten paid for all of those tomatoes?

Use the following guide:

- 4 people per large pizza (divide student pop. by 4)
- 5 tomatoes per pizza (multiply number above by 5)
- Workers make 50c per bucket, which weighs 32lbs.
- About 80 tomatoes per bucket. (Simplify: Earn \$1 for 200 tomatoes picked)
- \$0.016 per tomato

(7) Concluding discussion: (10 mins) Do students see this changing? What are our responsibilities as consumers?

- ❖ Discuss CIW organizing efforts: <http://ciw-online.org/about/>
 - What has been successful about their campaign? What structural challenges do they face?

(8) Exit: (5 mins) Respond to the following quote in journal:

- ❖ “We depend on misfortune to build up our force of migratory workers and when the supply is low because there is not enough misfortune at home, we rely on misfortune abroad to replenish the supply.”
~President Harry S. Truman, 1951

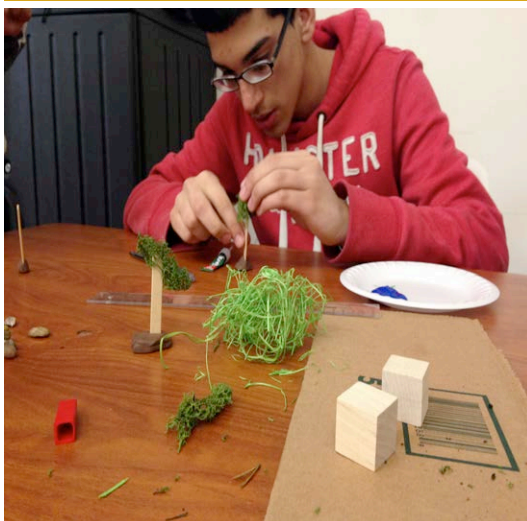
Articles used:

Wainer, Andrew. “Immigrants and the US Food System,” *Bread for the World Institute*, 2014 Hunger Report.
Could Farms Survive Without Illegal Labor?” Multiple Authors. *New York Times* August 17, 2011.
Klein, Daniel. “Did A Slave Grow Your Tomato?” *Huffington Post* March 27th, 2012



Objective:

Students will be able to communicate the value of public green spaces in urban areas, learn about the importance of land management and minimal impact design, and the advantages of parks with interpretive trails and



Materials:

Popsicle sticks	Artificial grass
Wooden blocks	Rubber bands
Craft glue	Paint
Scissors	Paintbrush
Small pebbles	Tape (variety)
Molding clay	Construction paper
Ruler	Artificial plants (assortment)
Drawing paper	
Ribbon or string	
Cardboard box	

Time:

3-4 hours

Age:

5th-12th grade

Sources:

Modified from: "Creating Microparks at the Houston Arboretum & Nature Center, March 2007"

"Educating trail users: advice for planning interpretive trails signs and exhibits." Laura Westrup. California Parks. 2002

Design Strategies for Urban Parks. http://www.asla.org/uploadedFiles/CMS/Meetings_and_Events/2010_Annual_Meeting_Handouts/SUN-B9_Design%20Strategies%20For%20Urban%20Parks.pdf



Outcomes:

- Understand the importance of minimal impact design.
- Gain appreciation for access to public green spaces.
- Think about ways to maintain public green spaces and the importance of park amenities.
- Learn the processes of park design.

Preparation & Instructions:

Gather materials and review activity.

Break students into groups of 3-5 students and have them come up with a team name. Hand out drawing paper and have each group discuss, plan and draw blueprints of what their park will potentially look like.

Inform the groups that their park must include an interpretive trail and a visitor's center. (Explain to your class what an interpretive trail means.)

After each group has developed blueprints have them collect a variety of art materials and build their park into the box (diorama). Give groups about 2 hours to complete their dioramas.

Upon completion each group must elect a "park representative" to present their design to the entire group.

Some questions to ask:

1. How did your group come up with this design and what makes it a great public space? What were some things you all agreed or disagreed on?
2. Why are trails necessary in parks? How do they impact the way people use the park?
3. Why should we appreciate public green spaces? What do these spaces provide for local communities and its wild life?
4. If you could build your park in NYC, where in the city would you build it and why?

Eyes + Feet on the Street: Designing Complete Streets for City People

an Urban EE Lesson Plan by Tom O'Dowd, Bard College



Goal: Students will:

- 1) Develop deepened understanding of the dynamics of a city street, its challenges and its opportunities,
- 2) Observe/discuss/infer what factors contribute to quality of life on a city street near the school, and
- 3) Apply results of their investigation to design a “complete street”.

Age: 10-100 years

Activity:

1) Observe city street dynamics (from sidewalk OR classroom window). Take notes as you see fit.

People: Who is on the street (age/background) and what are they doing? *Pedestrians:* Sidewalk crowded? Crosswalks? *Bicycles:* Are there cyclists? Painted/protected bike lanes? *Cars/buses:* How many cars/buses/lanes? Bus lanes/stops/shelters? *Plants:* Are there trees or



bushes? Big or small? Healthy? *Cleanliness:* Amount of trash/cans? Gum/poop? *Sit-spots:* Are there benches/chairs or tables? Public or private? *Events:* Are there fairs or markets on this street/sidewalk? Is traffic ever stopped for events?

2) Discuss your observations. *Transportation:* Enough options? Equally safe and/or environmentally-friendly? Optional: Discuss carbon footprints. *Quality of Life:* Does this street feel safe/clean/fun/ welcoming to people of all ages/backgrounds? Safe to walk/bike to school? *Improvements:* What could be added/removed?

3) Design a “complete street”. A complete street is a street that meets all the needs of the people that use it (support the kinds/amounts of transportation, community, nature they need to be well). Choose an option: a) Drawing, b) Diorama, c) Cut & Paste, d) Advanced C&P, or e) Internet option (see materials, below). The task is to balance the needs of various stakeholders on the street all within a limited amount of street/sidewalk space (be general/specific as needed). Share your complete streets with one another and give positive feedback.

4) Evaluation. What worked about your streets? How can people change their streets? Discuss the options (personal/business behavior change, political change/activism, outreach/education).

5) Follow-up topics: Janette Sadik-Khan of NYC, creative urbanism, various complete streets projects, the planning profession, etc. Start a campaign. Watch the film “The Social Life of Small Urban Places”.

Materials: Depends on the option you choose: a) Drawing option: white/graph paper, rulers, and regular/colored pencils/pens/markers. b) Diorama option: shoe boxes and toys (cars, buses, trees, bushes, people of all ages, benches). c) Cut & Paste option: pre-made “street ingredients” cut-outs (car/bus/bike lanes, sidewalks). d) Advanced Cut & Paste: add magnets or cardboard backing for the cut-outs. e) Internet option: Internet access and this website:

<http://streetmix.net/>. Bradford, A. et al. (2013). Street Mix [Street Planning Program]. *Code for America*.

References:

Better Block (2013). How to build a better block. *BetterBlock.org*. Retrieved from: <http://betterblock.org/how-to-build-a-better-block/>

Dodds, A. (2013, Apr 8). Announcing the best complete streets policies of 2012. *Smart Growth America*. Retrieved from: <http://www.smartgrowthamerica.org/2013/04/08/announcing-the-best-complete-streets-policies-of-2012/>

Streets Wiki (2013): Complete Streets. *Streets Wiki*. Retrieved from: <http://streetswiki.wikispaces.com/Complete+Streets>

Walk Score (2013). What is Walk Score? *Walk Score*. Retrieved from: <http://www.walkscore.com/>

PHENOLOGY RESEARCH AT THE PARK

Willy Herrera, Augusta Fells Savage Institute of Visual Arts

NOTE:

Tree ID and Plant ID card – could be a one day lesson.

Phenology – five weeks lesson.

OBJECTIVES: At the end of the lesson students will be able to learn how to monitor the growing season of trees at the park by conducting a field study answering the question “When will the growing season for trees at the park end this autumn?”

GRADE LEVEL: 6th-12th grade

STANDARDS:

MSDE Standard 6.0 Environmental Science

Students will use scientific skills and processes to explain the interactions of environmental factors (living and non-living) and analyze their impact from a local to a global perspective.

Common Core State Standards

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or a chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 9-10 texts and topics.

WHST.9.10.4 Provide clear and coherent writing in which the development organization, and style are appropriate to task, purpose, and audience.

MATERIALS: Lab Protocol, Flagging tape, Clipboards, Pencils, Tree field Guide, Dichotomous Key, IPAD or iphone downloaded with the apps “leafsnap” Metric Ruler, Permanent Marker, flagging tape.

BACKGROUND: Although it can be modified, this lesson is designed to be implemented at the local park in fall season. The lesson could be done in at least 5 weeks of field visits. It is best to start the lesson when the leaves of trees start to show change in color. The lesson involves the skills of observing, asking questions, predicting, measuring, recording and analyzing data, classifying, and problem solving. Students are expected to identify trees using dichotomous key or iphone apps.

ENGAGEMENT:

- Take the students to the park and give them five minutes to look around and name as many colors as they can identify. Ask students to close their eyes and to be quite for 3 minutes. Ask them to identify all the sounds they hear.

EXPLORATION:

- Ask why the leaves are changing colors. Allow students to share their ideas and prior knowledge. Give a short lesson about why leaves change color in fall.
- Ask students to write a hypothesis to the question “When will the growing season for trees at the park end this autumn?”
- Pair up the students and assign them a tree to study. Students are to label to the assigned tree with their group number.
- Using the iphone apps “leafsnap” or dichotomous key, ask students to ID the tree assigned to them. Tell them that they will be working on the same tree for 5 weeks.
- On the first visit, ask students to flag the tree assigned to them. Model how to flag a tree. (Count 6 leaves up from the terminal leaf then wrap a flagging tape around the stem). Students will monitor the color of the leaves, and the number of leaves that have fallen in a period of 5 weeks. Their data chart should include the common name and scientific of the assigned tree, dates of visit, number of leaves that have fallen, and the color of each leaf.
- Students will continue their observation until the time the 6th leaf falls off (this will be the time the growing season ends). Students can also record the weather and other animal sightings during their visits.

EXPLANATION/ EVALUATION:

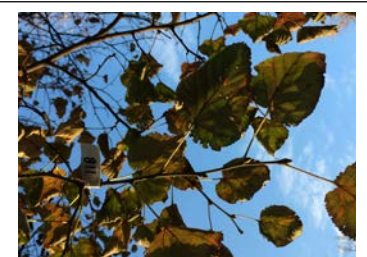
- After the 5-week observation, students will write a conclusion based from their data and observation.
- Ask students to compare their data and observation.

EXTENSION:

- As an extension of this lesson, ask students to complete the following assignments:
 1. Write a poem about the fall season.
 2. Create a plant identification card of the tree assigned to them. The card should include the following information
 - Common Name
 - Scientific name
 - Native or non-native to the area
 - Notes/Short Description
 - Drawings of the tree, the leaf, and fruit. (This information could be gathered through observation or from the leafsnap.

REFERENCES/RESOURCES:

1. <http://www.sciencemadesimple.com/leaves.html>
2. <http://dendro.cnre.vt.edu/dendrology/ident.htm>
3. <http://harvardforest.fas.harvard.edu/schoolyard/phenology-resources>



Developing a Water sensitive neighborhood

Zahra Golshani, University of Illinois



Goal: Learning about practices and techniques that reduce rainwater runoff and conserve water through storage and infiltration of rainwater. These practices are called green infrastructure or low impact development techniques (or simply runoff reduction techniques). They range from simple activities such as installing a rain barrel or adding some native vegetation or a small bio-swale, or more complex ones such as installing a rain garden and permeable pavement.

Age: 15-100 years old

Activity:

- (1) There will be a session to teach people about these techniques, so they will first learn about the techniques and how these practices reduce rainwater runoff and what benefits they provide.
- (2) Next, the neighbors will get together and identify locations that have the most rain runoff in the neighborhood and decide which techniques can be used to reduce runoff in that spot. The educator should walk them through the process and help them out. It's better to start with simple practices such as adding green vegetation or trees in small spots and then create a rain garden in large areas.
- (3) The neighborhood retrofitting can be done as a monthly or weekly activity, so each time neighbors come together and do more retrofitting to their neighborhood (The educator would help them as well.)
- (4) Participating in this activity will have multiple benefits: 1- it will encourage residents to install their own green techniques (such as rain barrels or rain gardens) at their residence so they will have contributed to retrofitting process of their neighborhood. 2- It will remove some barriers such as lack of familiarity with techniques or lack of technical familiarity (how to install them). 3-This will bring neighbors together and will foster the neighborhood social capital. They will develop sense of community and sense of place, while learning about these techniques in a friendly casual environment. One issue in adopting these techniques is people's lack of familiarity with them and lack of technical knowledge. Through educational gatherings, neighbors will learn about these techniques in practice, while enhancing their neighborhood's social capital, developing sense of community and sense of place.
- (5) If they are done with installing rain gardens and similar green measures, they may develop other activities such as maintenance days. The neighbors would come together to take care of the neighborhood green infrastructure (that they have already added to the neighborhood) or even helping other neighbors with their rain garden maintenance.
- (6) The educator can contact city or related NGOs to find out about the incentives and materials that is being provided for such activities.

Materials: trees, native plants, soil, gardening materials, rain barrels.

Suggestions / Tips: Oregon cities have done many successful green infrastructure activities.