Openlands Lakeshore Preserve

Eco-Explorations

High School Program Guide
Grades 9 - 12
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Acknowledgements
The Eco-Explorations program was created by Jaime Zaplatosch, Openlands Education Director; Aimee
  Collins, Openlands Lakeshore Preserve Site Manager; and John Cawood, Openlands Education Program
  Coordinator, in collaboration with Julyne Segar, a contracted Curriculum Specialist.

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  THE GRAINGER FOUNDATION

  Photos on pages 3, 4, 8 and 9 by Openlands (2010-2013). Photo on page 52 courtesy of Wikimedia Commons (2011).
Program Overview

Learning about erosion by building models
Welcome to Eco-Explorations at the Openlands Lakeshore Preserve!

The Openlands Lakeshore Preserve – A Regional Treasure
Located in the Highland Park area on the shores of Lake Michigan, the Openlands Lakeshore Preserve is a 77-acre public nature preserve that offers a unique glimpse of rare lakefront, ravine, and bluff ecosystems. Once part of the Fort Sheridan military base, the Preserve property was acquired by Openlands when the Fort was decommissioned and in 2011, we opened the site to the public.

With generous financial support from many donors, the Preserve has undergone meticulous restoration of its rare ecosystems, which support six state endangered and threatened plant species and serve as an important stop for migrating birds. An ADA-compliant multi-use trail system and an innovative art-based interpretation plan help make the site accessible and deepen the experiences of our visitors in nature. It is our goal to encourage people of all ages to learn about and appreciate this regional treasure, now dedicated as an Illinois Nature Preserve.

Please see our website at www.openlands.org for more information about the Preserve.

The Eco-Explorations Program
The Eco-Explorations Program is a curriculum-based nature experience that begins with lessons provided by Openlands, which are taught in the classroom by teachers. Student understanding of the lesson concepts in science, writing, and other subjects is then enhanced by two site visits to the Preserve each school year (autumn and spring). Each visit is facilitated by an educator and includes activities that build upon classroom work in an experiential outdoor setting.

The curriculum is divided into “abiotic” concepts in the autumn and “biotic” concepts in the spring, all aligned with Common Core standards. Topics explored in autumn include ravine ecosystems, erosion, naturalist observation methods, and nature journaling. In spring, the focus shifts to habitat and the Preserve’s native plant and animal residents, with continued activities in nature observation, journaling, and using the scientific method.

Openlands provides the program curriculum, most materials, bus transportation, teacher training and support, and a professional educator for each on-site visit, at an estimated value of $2,600 per classroom.

Learning Standards
The Eco-Explorations program is carefully designed to align with Common Core and Next Generation Science standards. An overview of the standards met by each lesson is provided on the chart found in the Appendices.

Memorandum of Understanding
Openlands requires that the principal of each participating school, along with each participating teacher, review and sign a Memorandum of Understanding (MOU) at the start of each school year. This document outlines what Openlands provides in the partnership, and also details what is required of each participating teacher throughout the course of the school year. Failure by the school to sign the MOU or uphold their requirements listed on the document may result in Openlands terminating the partnership with the school. Openlands staff facilitates MOU signatures starting around August of each school year. See the Appendices for the MOU form.
Teacher Orientation Sessions

As stated in the MOU, all participating teachers are required to attend a teacher orientation session for the program. A modified refresher orientation session is offered for teachers who have previously participated in the program. Openlands reserves the right to close the Eco-Explorations program to teachers who do not participate in a required orientation session.

Sessions led by Openlands staff and educator(s) are held in the beginning of September during each school year. These sessions are approximately two hours in length and contain a broad overview of the program structure, a visit to the Preserve for new teachers joining the Eco-Explorations program, and a discussion of the curriculum with opportunities to share ideas with staff and other teachers. Openlands staff will coordinate the sessions with teachers starting in August of each school year.

Scheduling

Openlands staff coordinates directly with teachers all scheduling of teacher orientation sessions, autumn and spring visits to the Preserve, and bus transportation. This is generally done via email.

All visits begin at the Midwest Young Artists building in the old historic district of the former Fort Sheridan (now a residential community). Buses arrive at this location in the morning, and here students have an opportunity to take a quick restroom break and meet the educator. The educator will then ride on the bus with the class to direct the driver to the Preserve, located just a short distance away. The bus driver will pick up the students in the afternoon at the Preserve. A return visit to the Midwest Young Artists building for another restroom break prior to heading back to the school is available at the discretion of each teacher.

On-site visits begin between 9:45-10:00 a.m. and wrap up between 1:00-1:30 p.m. We are able to be somewhat flexible with times if needed. A typical on-site visit is as follows:

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total time per visit</td>
<td>3 hours (2.5 hours for guided program and 0.5 hours for lunch)</td>
</tr>
<tr>
<td>Bus arrival</td>
<td>Arrive at Midwest Young Artists Building after 9:30 a.m.</td>
</tr>
<tr>
<td>Program start time</td>
<td>Between 9:45-10:00 a.m.</td>
</tr>
<tr>
<td>Lunch break</td>
<td>0.5 hours, typically 11:45 a.m. to 12:15 p.m. (time may vary)</td>
</tr>
<tr>
<td>Program end time</td>
<td>Between 1:00-1:30 p.m.</td>
</tr>
<tr>
<td>Bus departure</td>
<td>Leave Midwest Young Artists Building between 1:00-1:30 p.m.</td>
</tr>
<tr>
<td>Maximum group size</td>
<td>35 students per classroom (may combine classrooms)</td>
</tr>
</tbody>
</table>
Transportation

Openlands staff will arrange the bus transportation for each on-site visit, and a confirmation of the transportation order with pick-up and drop-off times will be emailed to each teacher prior to the trip. All bus transportation is paid by Openlands.

If for some reason you encounter trouble with your bus the day of your visit, please contact John Cawood, Education Program Coordinator, right away at 312-863-6276.

The bus company is given detailed directions from Openlands at the time of the transportation order, but teachers should consider bringing along directions just in case. See the map with written directions in the Appendices.

The historic district of Fort Sheridan contains many original military buildings dating from the 1890’s, now renovated as private residences. Teachers may wish to complement their visit to the Preserve by having the bus driver circle the old parade grounds to show students this original area of the former Fort. Supplementary in-class activities about the Fort’s history can also be obtained for free from the Lake County Forest Preserve District at http://www.lcfpd.org/fort_sheridan/?rdct=ExploreTheFort.org. See the map with written directions in the Appendices for additional driving instructions if this option is desired.

Contact Information

Your primary contact for Eco-Explorations is:

John Cawood, Education Program Coordinator
Openlands
25 E. Washington, Suite 1650
Chicago, IL 60602
312-863-6276 (office)
jcawood@openlands.org

Teacher materials are available for download at: www.openlands.org/eco-explorations.
Before Each On-Site Visit

In order to ensure the Eco-Explorations Program is a valuable and positive experience for students, teachers hold some responsibilities for preparing the students for their visits to the Preserve and helping them to synthesize their experiences afterwards. The checklist below clarifies the pre-visit responsibilities of each participating teacher; these are also described in the Memorandum of Understanding (MOU). See the Appendices for the MOU form.

 ✓ Complete the Pre-Visit Lesson in the Classroom
   The pre-visit lesson for the appropriate season (autumn or spring) should be completed in the classroom at least one week in advance of the corresponding visit to the Preserve. See the Curriculum section, starting on page 10.

 ✓ Request Parent Chaperones
   We support our educators with chaperones to assist with passing out materials, keeping students on track, and leading small groups of students for individual activities. We require one adult chaperone per ten students.

   It is the responsibility of the teacher to seek an adequate number of these chaperones for the size of the classroom, prior to each visit to the Preserve. Openlands does have some volunteer chaperones available to supplement parent chaperones. Teachers must notify Openlands staff at least one week prior to the visit if they require additional chaperones.

   We have put together a quick reference guide for chaperones which is included in the Appendices. Please distribute this guide to all chaperones about a week prior to the on-site visit.

 ✓ Notify Openlands of Any Special Needs
   Teachers should notify Openlands staff prior to each visit to the Preserve if any students require special needs assistance. We will do our best to accommodate these situations.

 ✓ Have Student Photo Release Forms Signed
   Openlands reserves the right to take photographs of each class during their on-site visits, unless a parent or guardian has specifically stated they do not wish their child to be photographed. A photo release form is included in the Appendices, and may be copied as needed. Please distribute these forms to students prior to the autumn on-site visit so that they may be signed by parents. The completed forms should be brought with on the day of the visit to the Preserve and given to the educator for our records.

 ✓ What to Bring
   • Weather-appropriate clothing: Changeable weather conditions can occur quickly along Lake Michigan. Teachers and chaperones should dress for the weather. Consider reminding students and/or parents of the forecast before each visit to the Preserve. Often hats, gloves, coats, or rainjackets are a must, especially in the autumn. Inadequate clothing can make it difficult for students to concentrate on the program or enjoy their nature experience.
   • Sun and/or insect protection: According to individual requirements. Teachers and parent chaperones should consider if there are bee sting allergies among themselves or students and make appropriate arrangements for bringing necessary medications, per the school’s policy and procedures.
- **Backpacks and Lunch:** Students should bring a sack lunch and a backpack for carrying their lunch during the visit. Please note that drinking water is not available at the Preserve. We ask that students leave their lunches in their backpacks until the designated lunch break, so they can concentrate on the program activities.

- **Trash Bag:** Teachers may bring a trash bag to collect debris from student lunches, or have students carry all trash from their individual lunches out in their backpacks. The trash may be taken back to the school for disposal or discarded in one of the receptacles at the Preserve, located near the bus pick-up and drop-off location.

All other items for each visit to the Preserve are provided by Openlands, including journals, pencils, and activity materials.

Please note that the journals are designed to be used in the autumn and then again in the spring. For your convenience, the journals include sections that can be used to write in during the pre- and post-visit lessons. Teachers are responsible for collecting the journals after the autumn visit to the Preserve and saving them for use in the spring visit. After the spring visit, the students can keep the journals.

**✓ Cancellations Due to Inclement Weather**

Due to budget and seasonal restrictions, we will not cancel a visit to the Preserve unless seriously inclement weather poses a significant safety risk or overly negative impact on the student experience. Therefore, teachers should plan for visits to take place even in lightly rainy or chilly conditions. As previously mentioned, teachers should emphasize to students and/or parents the importance of wearing appropriate clothing for a 3-hour period of time spent outdoors in a variety of potential weather conditions.

Weather conditions that would result in a cancellation include severe thunderstorms, moderate to heavy persistent rain, or severe heat or cold. Openlands staff monitors the weather prior to each on-site visit and will contact you if a cancellation is needed. Contact John Cawood at 312-863-6276 if you need to confirm a cancellation or have questions about weather conditions.

Any cancelled visits to the Preserve must be rescheduled within a maximum of two weeks of the original date. Openlands staff will work directly with teachers to reschedule.

**After Each On-Site Visit**

**✓ Complete the Post-Visit Lesson in the Classroom**
The postvisit lesson for the appropriate season (autumn or spring) should be implemented in the classroom within one week after the corresponding visit to the Preserve. See the Curriculum section, starting on page 10.

**✓ Complete the Post-Visit Survey**
Teacher feedback is a critical component of the Eco-Explorations program, and it allows us to continue to improve the experience for students, teachers, and chaperones. Shortly after each on-site visit during the school year, teachers will receive an emailed link to a brief online survey about their experience. Surveys should be completed within two weeks of receiving the link. Additional comments or suggestions may be submitted at any time to Openlands staff via phone or email.
Curriculum

Exploring Bartlett Ravine during an Eco-Explorations autumn on-site visit
Autumn Pre-Visit Lesson: PowerPoint Introduction

This pre-visit lesson helps prepare students for a meaningful educational experience during the autumn visit to the Openlands Lakeshore Preserve. The lesson introduces the concepts of erosion and ecological restoration. The pre-visit lesson should be implemented in the classroom one week prior to the scheduled autumn visit.

Time Needed: 30-45 minutes

Curriculum standards
- Next Generation Science Standards Performance Expectations: HS-ESS2-2, HS-ESS2-5, HS.ESS3-4
- English Language Arts Common Core Standards: L.11-12.4, L.11-12.6

Objectives
After completing this lesson, students should:
- Understand the three major ecosystems at the Preserve
- Be able to share examples of erosion at the Preserve, and examples of how erosion is controlled

Materials Needed
- Pencils
- Notebooks or paper to write on
- Openlands PowerPoint presentation (see Background and Preparation section below for a download link)

Background and Preparation
- A PowerPoint presentation has been provided for teachers as part of this lesson. To download the presentation, visit http://www.openlands.org/eco-explorations and click on High School Pre and Post-Visit Powerpoint Lesson (ppt)
- The presentation provides an overview of the Preserve, highlights its natural resources, offers a number of maps (including an interactive Google map), and discusses the restoration work that has been done on site. Please note that this presentation is designed to be used for both the autumn pre-visit lesson and the spring pre-visit lesson, so you will not need to show all of the slides each time you use it. The “notes” section of the presentation indicates which slides are applicable to autumn and which should be shown in spring, along with other details to help you present the PowerPoint to the class.

Procedures
1. **PowerPoint Presentation (20-25 minutes):** Show the PowerPoint presentation to your students. The autumn portion of the presentation introduces the Openlands Lakeshore Preserve and its three major ecosystems: bluffs (including flat tableland areas), ravines, and the lakeshore. Use the “notes” section of the presentation to help you explain the restoration process and impacts of erosion at the Preserve, as well as introduce the concept of biotic and abiotic ecosystem components.

2. **Critical Thinking Exercise (10-20 minutes):** Discuss the following questions as a class or in small groups. Have the students record their responses in their notebooks.
   a. How do you think erosion in the ravines affects the homes of people who live nearby? How might erosion also affect the wildlife that lives there?
   b. Explain 2-3 ways people can present erosion in a ravine or along a lakeshore area or beach.
Extensions
- You may be interested in extending your lesson with supplementary materials about the history of Fort Sheridan. Visit the Lake County Forest Preserve District’s online curriculum page at www.lcfpd.org/fort_sheridan/fs_curriculum.cfm for an extensive selection of materials to download.

Assessment
- Students should write a 6-8 sentence response answering one of these two questions:
  o What did you learn about the Preserve from this PowerPoint presentation?
  o What do you expect to see when you visit the Preserve?

Resources
- Chicago Wilderness: A regional collaboration promoting conservation and education in Chicagoland; their website has lots of information about initiatives that can be used in the classroom. www.chicagowilderness.org
- Park District of Highland Park: Information about local ravines. www.pdhp.org/hpravines
- Highland Park Ravines Blog: A collaboration between many partners with information about current ravine restoration projects. www.hpravines.blogspot.com
- Illinois State Geological Survey (ISGS): Technical information about erosion and geologic resources at the state level. www.isgs.illinois.edu
- Illinois Department of Natural Resources (IDNR): Free posters and activities, plus information about state-level conservation and restoration initiatives. www.dnr.state.il.us
- Lake County Forest Preserve District: Historical information and extension lessons about Fort Sheridan. www.exploretafort.org
- North American Association for Environmental Education (NAAEE): Lessons about all kinds of different topics in conservation, teacher resources, and more. www.eelink.net
- Shabica and Associates: This local company designs erosion control and restoration plans for coastal areas and ravines; sample sustainable approaches and plans are available on their website. www.shabica.com

Acknowledgements
This lesson was written by Julyne Segar, contracted Curriculum Specialist for Openlands, and revised by John Cawood, Openlands Education Program Coordinator.
Autumn Post-Visit Lesson: Data Analysis

This post-visit lesson should be implemented in the classroom within one week of the autumn visit to the Openlands Lakeshore Preserve, for best reflection on the experience. The Eco-Explorations program for high schools is specifically designed to be lab-based, but we encourage students and teachers to do further investigations upon returning to school. An extensive web resource list is provided at the end of this lesson for teachers and students to use for expanded classroom research and activities.

Time Needed: 35-45 minutes

Curriculum standards
- Next Generation Science Standards Performance Expectations: HS-ESS2-2, HS-ESS2-5
- English Language Arts Common Core Standards: W.11-12.1, W.11-12.4, W.11-12.6

Objectives
By reviewing data and exploring their physical place in the world, students will synthesize the information learned in the autumn pre-visit lesson and their autumn visit to the Preserve.

Materials Needed
- Pencils
- Eco-Explorations student journals
- If a water sample analysis is desired, you will need the water samples you collected at the Preserve and the necessary lab equipment to study them. For more information about how to analyze samples, contact John Cawood, Education Program Coordinator, at 312-863-6276 or jcawood@openlands.org.
- If you decide to do the Sense of Place Extension Activity as part of this lesson, you will also need to gather a few other items. See the end of this lesson for the activity.

Procedures
1. Lead students in a review of the data collected in their journals during the autumn visit to the Preserve. Explore the following:
   a. Review the three sites where data was collected - the ravine, the lakeshore, and the bluff.
   b. Discuss the similarities and differences in the data between the collection sites.

2. Choose one of the following two extension activities to complement your weather data analysis:
   a. Analyze the water samples your class collected at the Preserve, if applicable. Some potential options include looking at pH, turbidity, conductivity, and dissolved oxygen.
   b. Complete the Sense of Place Extension Activity, included at the end of this lesson.

Resources
- Chicago Environmental Network: Provides information about more than 200 regional conservation organizations and volunteer opportunities. www.chicagoenvironment.org
- Chicago Wilderness: A regional collaboration promoting conservation and education in Chicagoland; their website has lots of information about initiatives that can be used in the classroom. www.chicagowilderness.org
- Highland Park Ravines Blog: A collaboration between many partners with lots of information about current ravine restoration projects. www.hpravines.blogspot.com
- Illinois State Geological Survey (ISGS): Technical information about erosion and geologic resources at the state level. [www.isgs.illinois.edu](http://www.isgs.illinois.edu)
- Illinois Department of Natural Resources (IDNR): Free posters and activities, plus information about state-level conservation and restoration initiatives. [www.dnr.state.il.us](http://www.dnr.state.il.us)
- Lake County Forest Preserve District: Historical information and extension lessons about Fort Sheridan. [www.exploretthefort.org](http://www.exploretthefort.org)
- National Audubon Society: Online bird identification guide and more. [www.audubon.org](http://www.audubon.org)
- North American Association for Environmental Education (NAAEE): Lessons about all kinds of different topics in conservation, teacher resources, and more. [www.eelink.net](http://www.eelink.net)
- Park District of Highland Park: Information about local ravines. [www.pdhp.org/hpravines](http://www.pdhp.org/hpravines)
- Shabica and Associates: This local company designs erosion control and restoration plans for coastal areas and ravines; sample sustainable approaches and plans are available on their website. [www.shabica.com](http://www.shabica.com)

Acknowledgements
This lesson was written by Julyne Segar, contracted Curriculum Specialist for Openlands, and revised by John Cawood, Openlands Education Program Coordinator.
Sense of Place Extension Activity

Overview

Time Needed: 35-45 minutes

This extension activity has been adapted for Openlands using the lesson “Maps of Home” from the Alliance for the Great Lakes’ Great Lakes in My World (GLIMW) Curriculum Guide (2005). See the rest of the GLIMW curriculum at www.greatlakes.org/glimwkit/9-12.

Curriculum standards

- Next Generation Science Standards Performance Expectations: HS-ESS2-2, HS-ESS2-5
- English Language Arts Common Core Standards: W.11-12.1, W.11-12.4, W.11-12.6

Objectives

Each student will use their autumn visit to the Preserve as a means to inform their own mental model of the region—specifically, how the land interacts with Lake Michigan and how the land affects their lives.

Materials Needed

- Pencils
- Eco-Explorations student journals
- Several maps showing the local landscape at different scales (see Background and Preparation section below for more information)

Background and Preparation

- Gather a variety of paper maps showing the local landscape at different scales, such as neighborhood, city, and region. Google Maps (www.maps.google.com) and Google Earth (www.earth.google.com) are good resources for this project. Additionally, there are some excellent lakefront map resources available free of charge in the Park District of Highland Park’s Ravine Education Program Activity Guide (www.pdhp.org/hpravines).
- Place these maps on tables throughout the classroom so that students may explore the maps independently.

Procedures

1. Class Discussion (5 minutes): Recap the autumn visit to the Preserve. Did any of the students visit Lake Michigan before being part of the Eco-Explorations program? If yes, where did they visit and what did they do there? Brainstorm with students the reasons why people might visit a place like Lake Michigan’s coast. Brainstorm other places the students have visited before, including those places they visit regularly such as school, their home, homes of friends and family, parks, local hang-outs, etc.

2. Mental Mapping Exercise (20-25 minutes): Students should use pages 12-13 in their journals to complete the following:
   a. List 10 to 15 important places in your community and any place you visit regularly. Include your home, school, Lake Michigan, and the Preserve.
   b. Draw a “mental map” of these places (teachers should remind students which direction they travelled to reach the Preserve).
   c. Draw arrows to show how the different places on the map are connected, and why they are important. For example, you may draw an arrow from home to school and write “place to learn,” or under your drawing of a park you might write “nature,” in order to explain why these places are important and how they are connected.
   d. Write a response to these questions: Where is Lake Michigan and where is the Preserve in relation to your school and home? Would you consider these two places as part of your community? Why, or why not?
3. **Optional Map Reading Extension Activity (if time permits):** As students finish their personal maps, have them browse the selection of maps placed on the tables in the classroom. This can be done individually or in small groups. Students should answer question #5 on page 13 of their journals after browsing the maps.

4. **Mental Map Sharing (5 minutes):** Ask students to share their mental maps with the class.

5. **Wrap-Up Discussion (5 minutes):**
   
   a. Discuss these questions with students:
      
      - How are we connected to Lake Michigan and its shoreline? (e.g. we use it for relaxation, recreation, learning, etc., and it also affects weather, provides food, etc.)
      - What habitats are found along Lake Michigan and the other Great Lakes, and what types of organisms live in them?
   
   b. Tell students that when they return to the Preserve in the spring they will look specifically at the vegetation and wildlife that inhabit the site, e.g. “In the last visit we learned about one of the unique places along the lake, and in the spring we will learn about the plants and animals that make their homes there.”

**Extensions**

- Draw a map of the school grounds. This can be done either outside or inside the school, and students may choose to draw the map from memory. If mapped outside, consider taking measurements of the school grounds using tools and mathematics. If mapped from memory, try to accurately draw the school’s features to scale. Consider printing off an aerial image of the school from an online program such as Google Maps (www.maps.google.com) or Google Earth (www.earth.google.com), and ask the students to compare this image with their school grounds map. What did they accurately capture in their map, and what did they miss?

**Assessment**

Ask students to turn to page 14 in their journals and write a 2-4 sentence journal entry explaining something they learned about the Preserve or Lake Michigan through their autumn visit to the Preserve or the pre- and post-visit lessons.
Summary
By observing their surroundings and collecting and recording data, students will investigate the abiotic conditions at the Openlands Lakeshore Preserve and how these factors affect the site’s three ecosystems. Working in small groups, students will study the effects of erosion on the Preserve’s topography, conduct scientific experiments with field study equipment, and record collected data in a nature journal provided by Openlands.

Total time for visit: 3 hours

Objectives
After completing the autumn pre- and post-visit lessons with a visit to the Preserve, students will be able to:

- Define a ravine ecosystem
- Describe the following terms:
  - Abiotic: Non-living things in an ecosystem, such as rock, water, wind, or sunlight
  - Erosion: A process by which soil and rock are moved from the earth’s surface by natural processes, such as wind and water, and are deposited in another place
  - Topography: The physical features of a landscape, with special attention paid to changes in elevation
- Identify two examples of erosion that occur at the Preserve: 1) bluff erosion along the lakeshore and 2) headward or streamcutting erosion in Bartlett Ravine
- Construct a scientific explanation for different abiotic conditions observed in three separate ecosystems (bluff, ravine, and lakeshore)
- Compare and contrast weather conditions across ecosystems.
- Interpret data and arrive at conclusions, using a nature journal

Standards
- Next Generation Science Standards Performance Expectations: HS-ESS2-2, HS-ESS2-5, HS-ESS2-7, HS-ESS3-4
- English Language Arts Common Core Standards: W.11-12.2, W.11-12.10, L.11-12.4, L.11-12.6

Logistics
Educator should pick up the backpacks of supplies, prior to the bus arrival. Educator is responsible for restocking the bags after each visit from the green plastic bin marked “Eco-Explorations.” Chaperone directions are highlighted in yellow throughout this script.

Bus Arrival: Arrive at the Midwest Young Artists Building after 9:30 a.m.
Program Start Time: Between 9:45-10:00 a.m.
Program End Time: 1:00 p.m.
Bus Departure: Leave the Midwest Young Artists Building between 1:00-1:30 p.m.
Students Per Visit: 35 students maximum
### Autumn On-Site Visit Outline

#### 1.) Midwest Young Artists Building: Welcome and Orientation (20 minutes)
- **Bus arrives.** Educator greets the class and helps unload the bus.
- **Restroom break.** Chaperones can help gather students in the lounge after their restroom break.
- **Educator facilitates orientation and group breakout**
  - Educator introduces him/herself and welcomes the class.
  - Describe the building’s history: “This building was built in 1890 and was a former jail which held 72-120 prisoners when Fort Sheridan was an active Army base. It is now a music school.”
  - Introduce chaperones. Chaperones should have been pre-oriented with the “Chaperone Guide” handout included in the Appendix of the Elementary Program Guide.
  - Break up students into six small groups, each with their own chaperone leader. Chaperones must stay with their group throughout the entire program.
- **Distribute materials and lunches**
  - Educator and chaperones will distribute nametags, journals, pencils, and binoculars to students. Consider using color coding or small stickers on nametags to help define small groups. Each student should write their name on the back of their journal.
  - Students should carry their own lunches in their backpacks.
  - Note that all garbage must be collected by the teacher and packed out for disposal.
- **Travel to the Preserve.** Educator will assist in loading bus and will ride on bus to direct driver to the Preserve’s Patten Road parking lot. Educator will bring the supply backpack(s) on the bus.

#### 2.) Preserve Parking Lot: Drop off (5 minutes)
- **Bus drop off.** Before getting off the bus, the teacher should announce to students that we will get started by gathering on the concrete area at the top of the ravine stairs. Students should keep to the sidewalk and with the group, and make sure to stay out of the street while exiting the bus.
- **Bus parking.** Bus may park at MYA lot or on the west side of Patten Rd, south of the Parking lot.
- **Students walk down stairs.** Use the entrance to Bartlett Ravine as the starting point.

#### 3.) Arc of Nature: Introduction (15 minutes)
- **Introduction.**
  - When everyone reaches the gathering area under the bridge, the Educator has them stand in a circle (making sure there is space for bikers, and walkers to come though undisturbed).
  - Educator introduces students to Openlands and the Preserve: “Openlands is a regional non-profit conservation organization which owns and maintains the Preserve. Openlands conserves Chicagoland’s natural areas and open spaces. We protect large tracts of prairie and woodland, miles of shoreline and wetlands, and parks like the ones in your neighborhood. This land at the Preserve is open to the public and was recently designated as a state nature preserve.”
- **Pass the Cardinal.**
  - Each person takes turns holding the stuffed Northern cardinal.
  - The person with the bird states their name along with a natural area they enjoy visiting (i.e. local park, lakeshore, back yard, etc.)
- **Rules.** Educator will provide a brief reminder of the rules. Even though they are young adults, they should be reminded to be safe at all times:
  - Remember to walk, not run.
  - Stay with your group on the paths and keep off the drains, gutters, and slopes.
  - Leave everything the way you found it. Don’t pick plants or take rocks home.
  - At the lakeshore, DO NOT throw rocks under any circumstances.
• Naturalist introduction.
  o Educator will recommend that students use binoculars to observe their surroundings as the group walks to the next stop.
  o Educator will explain the role of a naturalist: “Today we are all naturalists. Can anyone guess what a naturalist does? A naturalist is a person who studies nature, conservation, ecology, or the environment by using observational skills to study things. And, it is important that observations are collected in a journal to record what has been seen.”
  o Quiz students on how to use binoculars/compasses:
    ▪ Which end of the binoculars do you look through?
    ▪ How do you focus your binoculars?
    ▪ What do the letters N, E, S, W mean?
    ▪ How do you use the compass?

• Walk to erosion demonstration area. Educator will lead group to the pre-determined erosion demonstration area and ask students to gather there for the demonstration.

4. Sluiceway junction: Erosion demonstration, word of the day, and data collection (15 minutes)
• Words of the day – page 5 of journal.
  o At the erosion demonstration area, Educator will introduce “Words of the Day” using the whiteboard and ask one student to read each word aloud. Students should write definitions on page 5 of their journals. “Look around and tell me how the land looks different here than the land near your school (e.g. here there are more slopes; near our school the land is flat).
  o “Topography” is the relief features or surface configuration of an area. “For example, compare the state of Illinois to the state of Colorado. Illinois is very flat, so the topography is similar through the state. Part of Colorado is flat like Illinois, but on the western side of the state are the Rocky Mountains, which have very different topography.” Educator should show students the topographic map of the Preserve [Pass around laminated copies].
  o “Erosion” has caused the unique topography at the Preserve. Educator should ask students if they are familiar with the word.

• Erosion demonstration.
  o Place a pile of sand in the concrete gutter;
  o Pour water from a water bottle over the sand; and
  o Have the class observe what happens - the water displaces the sandy soil to other places.

• Geological history of the Preserve. Educator will explain the geologic history of the Preserve: “Erosion has been happening here for thousands of years. When the glaciers melted about 14,000 years ago, they left a moraine, or a pile of rocks, clay, and sand. The moraine was at one time 100 feet high! Since that time, precipitation has been washing away parts of this moraine, forming deep V-shaped channels in the landscape. These channels (cut-outs in the earth) are called ravines. And the science word for this type of erosion is headward, or streamcutting, erosion.”

• Split into groups. Educator will ask the class to gather into six groups, each with an assigned chaperone (teachers may wish to do this in advance). Chaperones stay with their group throughout the program.

• Describe data collection. Educator explains that students will collect abiotic data in each of the three ecosystems of the Preserve.
  o Ask students to guess what the difference is between biotic and abiotic. “What does abiotic mean? Abiotic means non-living things like water, soil particles, sun, and air.”
  o Using the “Abiotic Factors and Weather Data Collection Table” on pages 4 and 5. Students should list the abiotic factors they see nearby in the “Abiotic Factors” section of the table for “Site #1 (Ravine).”
• **Describe weather meter operations.** Meters will allow the class to track several major abiotic factors. Temperature, humidity, light, and wind.
  o Educator will show students and chaperones how to operate the weather meters.
  o To operate the meters, turn on power and push function button to begin.
    ▪ Air temperature: function, unit zero, C/F button
    ▪ Humidity: function, C/F button
    ▪ Light measurement: function, lux/ft button
    ▪ Wind measurement: function, unit/zero, C/F button.
  o NOTE: A foot candle is used as a unit of light measurement in a space, as in the light produced by one candle at a distance of one foot. One foot candle = 10.764 lux. *Each Weather Meter Kit has a table with examples of light measurements in various situations.*

• **Collect and record abiotic data on Page 4-5 of journals. Additional data can be recorded on page 7.**
  o Students should work in their assigned groups with their chaperone to use the weather data monitors. *Chaperones can assist students as they work.*
  o Students should record data on page 5 in their journals, in the appropriate categories under “Site #1 (Ravine)” in the “Abiotic Factors and Weather Data Collection Table.”
  o After weather data, students should list the abiotic factors they observed elsewhere in the ravine in the “Abiotic Factors and Weather Data Collection Table” on page 4 of their journals.

5.) **Between Sluiceway Junction and Earthbark Prism: Ravine observation and walk (20 minutes)**

- **Walk down the ravine towards the lake as a class, but in small group clusters.**
- **Record Observations of Bartlett Ravine on Page 8.** This is a good point for students to write a bit about what they see, hear, and smell in the ravine. Small groups should stay together. Students are welcome to use colored pencils to add detail to sketches.
  - **Chaperones should use the chaperone guide to help prompt students during this time.**

6.) **Earthbark Prism: Explain Lakeshore Activities, collect water sample in ravine (10 minutes)**

- **Explain activities here because it is harder to hear along the lakeshore.**
  o 1.) Longshore Current exercise will show how quickly the water is moving along the shoreline
  o 2.) Data collection
    ▪ Weather data: Page 5 (each group will do this independently)
    ▪ Lakeshore Observations: Page 9 (each group will do this independently)
    ▪ Water quality data: Page 6 (educator will do this twice, each time with half of the class)
  o 3.) Lunch - Students can eat on grass or on the stairway leading up the bluff, if they make a path
- **Collect Water quality data in Bartlett Ravine. Students record results on Page 5.** Explain that the PCS Tester is an expensive piece of equipment that provides a great deal of information about water samples. We only have one, so students must be very careful with it.
  o Educator should measure each of the categories in the students journals, and prompt them to explain what they know about each measurement (i.e. What is pH, what is total dissolved solids? What are the F and C for temperature? What does parts per million mean?)
  o Water temperature (in Celsius and Fahrenheit)
  o pH: measure of hydrogen ion concentration. Tells how acidic or alkaline a solution is.
  o Total dissolved solids: the amount of substances suspended in water that cannot be seen.
  o Salinity: how much salt is dissolved in the water. Salinity is part of TDS as well. For example if you measure 15ppm of TDS, and 4ppm of Salinity, then you know there are 11ppm of non-salt substances. Also, salinity in the ravine streams are often noticeably impacted by the use of road salts in the winter.
7.) Lakeshore: Longshore Current and Data Collection (20 minutes)

- **Longshore current.** Educator will guide students in the measurement of longshore current. This can be done as a class or by only one of the small groups while the other groups collect weather data.

  **NOTE:** Some schools have requirements that students maintain a certain distance away from open water. Educator should work with the teacher to adapt the longshore current activity as needed and make sure to inform the chaperones of such requirements.

  o To collect longshore current data:
    - Explain that longshore current is the speed of the water as it moves parallel to the shore, calculated in meters per second.
    - Toss a biodegradable, floatable object into the water, such as driftwood or an orange. Educator may elect to retrieve that object after the activity is completed, depending on the nature of the item.

  o Each group will have a different responsibility, as follows. **Chaperones should assist groups with this activity as needed.**
    - Starting line group: stand at the point where the object starts at the time of measurement.
    - Measuring group: measure 10 meters down the shore, to the ending point.
    - Finish line group: stand 10 meters down the shore from the starting line group and indicate when the object has travelled 10 meters.
    - Timing group: use stop watch to determine how long it takes for the floatable object to travel 10 meters.
    - Calculation group: use the following formula to determine speed in meters/second:
      \[ \text{Speed} = \frac{\text{distance (meters)}}{\text{time (seconds)}}. \]

  o The class should measure the current twice. Educator will assist students to average their results and students should record the average in the “Longshore Current” section of the “Abiotic Factors and Weather Data Collection Table” on page 5 of their journals.

  o Later in the day, the students will share their collected weather and longshore current data with each other and discuss their conclusions up at the Elemental Matters overlook, where wave and wind noise is lighter.

- **Weather Data.** Students will again use the weather meters to measure air temperature, light, wind, and humidity in small groups, recording the data in the “Site #2 (Beach)” section of the “Abiotic Factors and Weather Data Collection Table,” located on page 5 in their journals. **Chaperones should assist groups with these experiments as needed.**

- **Collect Water Quality data from Lake Michigan.** Remind students that the PCS Tester is an expensive piece of equipment.

- **When students finish, they should record observations of the lakeshore on page 9 of their journals.** Educator should remind students that they are focusing on the abiotic non-living factors.

- **Examples of Erosion at the Lakeshore:**
  - Instruct students to look at the line of bluffs along the shoreline, which have been eroded by Lake Michigan over the past 10,000 years.
  - Observe the areas near the bluffs and in the water: “The jetties or groins (metal structures) are used in the water to slow down beach erosion. The plants growing on the natural shoreline have adapted to survive extreme weather conditions (such as developing long root systems or having succulent leaves to retain water, etc.).
  - The boulders along the beach were placed here by people about thirty years ago, in order to protect the bluff area from lakeshore erosion.”

- **Before Lunch, share data with each other.** Every student should have the tables filled out on page 46. The only missing piece is weather data from the Bluffs.
8.) Lakeshore: Lunch (30 minutes)

- Lunch.
  - Educator will gather class at the grassy area near Lake Prism for the lunch break. Students can sit on the ground to eat. In the event of rain or damp ground conditions, Educator can lead the class back up the stairs to the Elemental Matters overlook for the lunch break.
  - Educator should give class a five minute warning to wrap up lunch.
  - Teachers and/or chaperones must collect all lunch garbage in a bag and carry it out to the bus for disposal. Trash and recycling cans are located in the parking lot near the bus pick-up point.

- Relaxation time. Educator will inform students that if they finish lunch early, they can choose to sketch or write in their journals, or just relax.

- Walk up bluff staircase to Elementary Matters Overlook. Stop to take in the change of elevation as the class ascends the bluff and noting any abiotic factors that can be observed along the way.

9.) Elemental Matters: Weather Data Collection and Bluff observations (10 minutes)

- Weather data collection. At the overlook, students will again use the weather meters to measure air temperature, light, wind, and humidity in small groups, recording the data in the “Site #3 (Bluff)” section of the “Abiotic Factors and Weather Data Collection Table,” located on page 5 in their journals. Chaperones should assist groups with these experiments as needed.

- Bluff Observations. If time allows, students can write and sketch on pages 10-11 in their journals about their observations or experiences in this area of the bluff, and list the abiotic ecosystem components they observe nearby.

10.) Along Bluff, toward Exelon Overlook: Bluff Path Explorations (20 minutes – IF THERE IS TIME)

- Walk South along the bluff, toward the Exelon overlook
  - If time permits, the Educator can lead the class along the upland bluff trail to the Van Horne Ravine overlook. While the group walks, encourage students to explore differences in topography and look for signs of erosion. Any observations should be noted on pages 10-11 of their journal.
  - At the Van Horne Ravine overlook, the Educator can reinforce how bluff erosion is remediated by the boulders at the bottom of the bluff, and how the beach is protected by the groins. The view of Van Horne Ravine from the overlook also offers an opportunity to revisit the concept of ecological restoration, which was introduced to students in the autumn pre-visit lesson.

- Weather data collection. At the overlook, students will again use the weather meters to measure air temperature, light, wind, and humidity in small groups, recording the data in the “Site #3 (Bluff)” section of the “Abiotic Factors and Weather Data Collection Table,” located on page 5 in their journals. Chaperones should assist groups with these experiments as needed.

- Bluff Observations. Students can write and sketch on pages 10-11 in their journals about their observations or experiences in this area of the bluff, and list the abiotic ecosystem components they observe nearby.

11.) Exelon Overlook: Program Wrap-up (5 minutes)

- Share these wrap-up messages:
  - Recap the types of erosion observed today.
  - Encourage students to return with family and friends for a nature walk.
  - Remind students that they will be returning to the Preserve in the spring season to see how it may be different or the same as the fall season, and to learn about the biota of the Preserve. Ask the students if they can guess what “biota” means.
12.) Return to Buss and Final Departure (10 minutes)

- Return to Bus
  - Educator will guide group along the bus trail to the bus pick-up point at the Patten Road trailhead. Educator will help load the students on the bus.
  - Chaperones should help Educator gather binoculars, colored pencils, and any other materials (except the student journals), and place them in the Educator’s backpacks.
  - Remind teachers to gather journals for the post-visit lesson and for the spring portion
  - Educator will ride with the class back to the Midwest Young Artists building

- At the Building
  - Facilitate second restroom break, and thank teacher & chaperones. Toss garbage.

- After the Bus Departs
  - Educator should scan the backpack for missing items and restock using the supply bin
  - Educator should email the completed daily log to Openlands within one week of the visit.

Indoor Extension Activities for Inclement Weather

These extensions may complete the final hour of the visit if inclement weather requires the visit to be cut short. If rain is expected, the Educator should try to collect weather data at all three data sites prior to the bus arrival, so that the data can be used in the extension activities. Inside the building, students should sit in small groups with their chaperones.

Location: Midwest Young Artists Building
Duration: Replaces 1 to 1.5 hours of the outdoor program depending on weather conditions

1. If needed, students can eat lunch indoors before beginning the extension activity.

2. Analyze weather data:
   a. Turn to the “Abiotic Factors and Weather Data Collection Table” on pages 4-5 of the student journals. Share the collected data with the class and have the students complete the table.
   b. As a class, discuss differences between weather data collection sites. Ask students to answer the questions on pages 6 and 7 of their journals.

3. Recap the site visit. Ask students what they will remember about the Preserve (other than it rained). Ask each student to write a short paragraph on page 14 of their journal, describing something they saw, or summarizing the weather data collection and results.

Acknowledgements
This script was written by Juyne Segar, contracted Curriculum Specialist for Openlands, and revised by John Cawood, Openlands Education Program Coordinator.
Spring Pre-Visit Lesson: PowerPoint Refresher

This pre-visit lesson helps prepare students for a meaningful experience during the spring visit to the Openlands Lakeshore Preserve. The lesson introduces the concepts of invasive and native species and reviews ecological restoration. This lesson should be implemented in the classroom one week prior to the spring visit.

Time Needed: 40-55 minutes

Curriculum standards met by this lesson are listed below. Please see the Curriculum Standards Chart in the Appendix of the High School Program Guide for more information.
- Next Generation Science Standards Performance Expectations: HS-LS2-1, HS-LS.2-6, HS-LS.2-7, HS-LS.2-8, HS-LS.4-5, HS-LS.4-6
- English Language Arts Common Core Standards: W.11-12.3, L.11-12.4, L.11-12.6

Objectives
After completing this lesson, students will be able to:
- Collect comparative data at the Preserve
- Identify wildlife inhabiting the unique ecosystems of the Preserve

Materials Needed
- Pencils
- Eco-Explorations student journals
- Openlands PowerPoint presentation (see Background and Preparation section below for a download link)

Background and Preparation
- A PowerPoint presentation has been provided for teachers as part of this lesson. To download the presentation, visit http://www.openlands.org/eco-explorations and click on High School Pre-and Post-Visit Powerpoint Lesson (ppt) in the sidebar.
- The presentation provides an overview of the Preserve, highlights its natural resources, offers a number of maps (including an interactive Google map), and discusses the restoration work that has been done on site. NOTE: This presentation is designed to be used for both the autumn pre-visit lesson and the spring pre-visit lesson. The “notes” section of the presentation states which slides are for autumn and which should be shown in spring, along with other talking points.

Procedures
1. **Class Discussion (10 minutes):** Facilitate a discussion about the students’ autumn visit to the Preserve. What do students remember seeing during that visit? What were the keywords and topics that we discussed? Prompt students on words and definitions they learned: abiotic and biotic, topography, different types of erosion such as gully, headward, beach, etc. What were the results of the weather data collection?

   Explain that during the spring visit they will continue collecting abiotic data, such as weather data and water samples, as they did before. However, students will also spend more time exploring the biotic components of the site. These components include the biodiversity of Bartlett Ravine and the adaptations of individual species that have made this unique ravine landscape their habitat.

2. **PowerPoint Presentation (20-25 minutes):** Show the PowerPoint presentation to your students. The spring portion of the presentation refreshes the students’ memory of the Preserve and its three major ecosystems: bluffs (including flat tableland areas), ravines, and the lakeshore.
Use the “notes” section of the presentation to explain to the students which plants and animals they may encounter at the Preserve in springtime. Explain the concepts of:

- Biodiversity: a measure of the number of plant and animal species observed in a defined area.
- Adaptation: the adjustment or changes in behavior, physiology, and structure of an organism to become more suited for an environment. As an example, the presentation slide showing marram grass provides a strong example of adaptation. Sand and sunny beach conditions provide a harsh growing environment, but dune grasses like marram grass are hardy plants that are able to survive on the constantly shifting, sandy beach at the Preserve. This is due to adaptations like long root systems that help the plants remain anchored as sand around them erodes through wind and wave action.

3. **Make Predictions (10-20 minutes):** Discuss the following questions as a class or in small groups. Have the students write their responses on page 29 of their journals.

- How do you expect your springtime biotic observations to differ from the abiotic observations made during the autumn visit? Do you expect to see the same plants and animals?
- How do you expect the weather data collected in spring to differ from the weather data collected in the autumn?
- Do you expect to find the same plants on the beach as you find in the ravine or on the bluff? What do you think will be different about the beach plants?

**Extensions**
- You may be interested in extending your lesson with supplementary materials about the history of Fort Sheridan. Visit the Lake County Forest Preserve District’s online curriculum page at www.lcfpd.org/fort_sheridan/fs_curriculum.cfm for an extensive selection of materials to download.

**Assessment**
- Ask students to write a paragraph in the extra space on page 28 of their journals, summarizing their predictions for the spring visit to the Preserve.

**Resources**
- **Chicago Environmental Network:** Provides information about more than 200 regional conservation organizations and volunteer opportunities. www.chicagoenvironment.org
- **Chicago Wilderness:** A regional collaboration promoting conservation and education in Chicagoland; their website has lots of information about initiatives that can be used in the classroom. www.chicagowilderness.org
- **Highland Park Ravines Blog:** A collaboration between many partners with lots of information about current ravine restoration projects. www.hpravines.blogspot.com
- **Illinois State Geological Survey (ISGS):** Technical information about erosion and geologic resources at the state level. www.isgs.illinois.edu
- **Illinois Department of Natural Resources (IDNR):** Free posters and activities, plus information about state-level conservation and restoration initiatives. www.dnr.state.il.us
- **Lake County Forest Preserve District:** Historical information and extension lessons about Fort Sheridan. www.exploretthefort.org
- **Natural Resources Conservation Services (NRCS):** Lots of information about soils and soil conservation. www.soils.usda.gov/
- **North American Association for Environmental Education (NAAEE):** Lessons about all kinds of different topics in conservation, teacher resources, and more. www.eelink.net
- **Park District of Highland Park:** Information about local ravines. www.pdhp.org/hpravines
- **Shabica and Associates**: This local company designs erosion control and restoration plans for coastal areas and ravines; sample sustainable approaches and plans are available on their website. [www.shabica.com](http://www.shabica.com)
- **Soil Science Society of America**: More information about soils and current issues surrounding soil conservation. [www.soils.org](http://www.soils.org)
- **USDA/NRCS PLANTS Database**: A comprehensive database of invasive and native plant information. [www.plants.usda.gov](http://www.plants.usda.gov)

**Acknowledgements**
This lesson was written by Julyne Segar, contracted Curriculum Specialist for Openlands, and revised by John Cawood, Openlands Education Program Coordinator.
Spring Post-Visit Lesson: Exploring Phenology & Climate Change

This interdisciplinary activity should be done in the classroom within one week after the spring visit to the Openlands Lakeshore Preserve, in order to provide a quality reflection on the experience. Students will use their visit to the Preserve to explore the impacts of a changing climate on phenology in the Chicagoland region. This lesson connects language arts to science while also providing students the opportunity to explore two types of datasets: temperature and phenology.

Time needed: 35-45 minutes

Curriculum standards
- Next Generation Science Standards Performance Expectations: HS-LS.2-6, HS-LS.2-7, HS-LS.4-5, HS-LS.4-6, HS-ESS3-5

Objectives
After completing this lesson, students will be able to:
- Explain the concept of phenology, and how an organism’s phenology can be affected by a changing climate
- Make predictions about how climate change may affect wildlife at the Preserve

Materials Needed
- Pencils
- Eco-Explorations student journals
- Handouts and resources as described in the Background and Preparation section
- Plant samples collected during the spring visit to the Preserve

Background and Preparation
- During your spring visit to the Preserve, work with the Educator to secure a flowering plant sample to take back to the classroom.
- Use the Project BudBurst web resource at [www.budburst.org/choose.php](http://www.budburst.org/choose.php) to look up phenology data for your sample species over the past several years.
- Print out the Project BudBurst “Single Report Form” at [www.budburst.org/getstarted-single-report.php](http://www.budburst.org/getstarted-single-report.php) and make copies for students to use.
- Review the student journals. Pick 2-3 exceptional journal entries from their spring visit to read aloud to the class.
- Gather handouts and resources from these online sources to help you implement this lesson:
  - Project BudBurst’s “Phenology Defined” webpage at [www.budburst.org/science/phenology_defined.php](http://www.budburst.org/science/phenology_defined.php)
- Consider exploring the anticipated impacts of climate change in the Midwest region, using the United States Global Change Research Program’s website at [www.globalchange.gov](http://www.globalchange.gov).
- Consider downloading temperature data for the past several months at Fort Sheridan (zip code 60037) to supplement this lesson. See the Resources section for links to the National Weather Service and Weather Underground online resources.

Procedures
1. Reflect upon the spring visit to the Preserve (5-10 minutes): Review the examples of biodiversity and adaptation that students witnessed at the Preserve. Where did they witness the most biodiversity—the bluff, lakeshore, or ravine? What adaptations do they remember noting among plants and animals they observed?
2. **Read students’ journal entries and show sketches (5 minutes):** Read aloud the 2-3 journal entries written by students during the spring visit that you selected. Invite the students to close their eyes when you read the selected stories or journal in order to focus on the words and images they evoke. After reading the entries, show any sketches that may accompany the writings. Consider leaving the authors of journal entries anonymous.

3. **Explore plant sample(s) that were taken from the Preserve (15 minutes):** Observe the current state of the plant sample(s) in regards to phenology. As a class, determine what *phenophase* (plant lifecycle phase) the plant sample is in. Is it flowering? Are there any fruits growing on the plant? Have the leaves unfolded from the buds? Consider submitting a “Single Report Form” on your plant(s) to Project BudBurst.

   Show students phenology data from past years using the Project BudBurst Phenology Data webpage listed in the Background and Preparation section. How do the observations of the plant samples made by your class differ from other observations made in past years? Consider looking through weather data with the students to explain why plants are blooming early, on time, or later than usual.

4. **Discuss local climate change impacts on phenology (10-15 minutes):** Explain that climate change has many local impacts, both positive and negative. Plant phenophases depend on the temperature and amount of precipitation that falls in an area, so a warming climate will lead to changes in the budding, leafing, and blooming cycles of plants in that location. In fact, over the past several decades the growing season in the Midwest has become about one week longer than it previously has been, because the frost ends earlier in the spring and comes back later in the fall.

   Explore with the students what these changes will mean in the future – both in their community and at the Preserve. What changes in the environment will plants and animals have to adapt to? Do students think these organisms can adapt successfully? Remind them that *individual* animals can migrate to some degree, but plants cannot. How might overall biodiversity of ecosystems be affected? Encourage students to write short paragraphs answering the questions on page 30-31 in their journals.

**Extensions**
- Ask the students to think about the plant that they “interviewed” on pages 22-25 of their journals. How might climate change impact this particular plant species? How might it affect the overall ravine ecosystem? Have students write a paragraph answering these questions on page 28 of their journals.
- Make copies of the students’ journal entries. Display the journal entries on a bulletin board or on a table for school administrators or parents to see at a school event. Includes pictures of your students, if available.
- Explore the phenology of other nature preserves in your neighborhood or near your school. Students should bring the Eco-Explorations journal or another notebook to collect data. Compare that site to the Preserve.
- Encourage students to write letters to a politician about an environmental issue they care about. The class, school, or an after school environmental group may become inspired to get involved with a local restoration project as a result of visiting the Preserve and learning about how changes in climate can have a cascading effect on the world around us.

**Assessments**
- Ask students to explain how climate change can impact wildlife in the Preserve and in their neighborhood.
- Ask students to explain three concepts they learned during the spring visit to the Preserve.

**Resources**
- **Chicago Environmental Network:** Provides information about more than 200 regional conservation organizations and volunteer opportunities. [www.chicagoenvironment.org](http://www.chicagoenvironment.org)
- **Chicago Wilderness:** A regional collaboration promoting conservation and education in Chicagoland; their website has lots of information about initiatives that can be used in the classroom. [www.chicagowilderness.org](http://www.chicagowilderness.org)
- **Highland Park Ravines Blog:** A collaboration between many partners with lots of information about current ravine...
restoration projects. www.hpravines.blogspot.com

- Illinois Department of Natural Resources (IDNR): Free posters and activities, plus information about state-level conservation and restoration initiatives. www.dnr.state.il.us

- Lake County Forest Preserve District: Historical information and extension lessons about Fort Sheridan. www.exploret hefort.org


- North American Association for Environmental Education (NAAEE): Lessons about all kinds of different topics in conservation, teacher resources, and more. www.eelink.net

- Park District of Highland Park: Information about local ravines. www.pdhp.org/hpravines

- Project BudBurst: A web resource that tracks regional and national changes in plant phenology due to climate change. www.projectbudburst.org


- United States Global Change Research Program: A clearinghouse of information on climate change issues, including educator resources. www.globalchange.gov


Acknowledgements

This lesson was written by John Cawood, Openlands Education Program Coordinator.
Spring Educator’s Script

Summary
Students return to the Openlands Lakeshore Preserve, where they investigate biotic components of the Preserve’s three distinct ecosystems: the bluffs, lakeshore, and Bartlett Ravine. Students explore flora and fauna, learn about plant identification and the importance of biodiversity, conduct scientific experiments with field study equipment, and record collected data in a nature journal provided by Openlands.

Total time for visit: 3 hours

Objectives
After completing the spring pre- and post-visit lessons with a visit to the Preserve, students will be able to:

- Define the following terms:
  - Abiotic: Non-living components of an ecosystem, such as rock, water, wind, or sunlight
  - Biotic: Living components of an ecosystem, such as plants and animals
  - Biodiversity: A measure of characteristics of plant and animal life in a defined area
  - Adaptation: The adjustment of change in behavior, physiology, and structure of an organism in order to become more suited to an environment
- State how weather affects erosion in Bartlett Ravine and along the lakeshore
- List at least three plants – native, non-native, invasive, or endangered – at the Preserve
- Name at least two native animals that live at the Preserve
- Interpret data and arrive at conclusions, using a nature journal

Curriculum standards
- English Language Arts Common Core Standards: W.11-12.10, L.11-12.4, L.11-12.6
- Mathematics Common Core Standards: HS-MD.B5, HS.MD.B5b

Logistics
Educator should pick up the backpacks of supplies, prior to the bus arrival, at the Openlands Satellite Office (445 Sheridan Road, Second Floor Center, Highwood, IL 60040). Educator is responsible for restocking the bags after each visit from the green plastic bin marked “Eco-Explorations.”

Chaperone directions are highlighted in yellow throughout this script.

Bus Arrival: Arrive at the Midwest Young Artists Building after 9:30 a.m.
Program Start Time: Between 9:45-10:00 a.m.
Program End Time: 1:00 p.m.
Bus Departure: Leave the Midwest Young Artists
Spring On-Site Visit Outline

1.) Midwest Young Artists Building: Welcome and Orientation (15 minutes)
   - **Bus arrives.** Educator greets the class and helps unload the bus.
   - **Restroom break.** Chaperones can help gather students in the lounge after their restroom break.
   - **Educator facilitates orientation and group breakout**
     - Educator introduces him/herself and welcomes the class.
     - Review the building’s history: “Do you remember visiting this building in the fall? This building was built in 1890 and was a former jail which held 72-120 prisoners when Fort Sheridan was an active Army base. It is now a music school.”
     - Introduce chaperones. **Chaperones should have been pre-oriented with the “Chaperone Guide”**
     - Break up students into six small groups, each with their own chaperone leader. **Chaperones must stay with their group throughout the entire program.**
   - **Distribute materials and lunches**
     - Educator and chaperones will distribute nametags, journals, pencils, and binoculars to students. Consider using color coding or small stickers on nametags to help define small groups. Each student should write their name on the back of their journal.
     - Students should carry their own lunches in their backpacks.
     - Note that all garbage must be collected by the teacher and packed out for disposal.
   - **Travel to the Preserve.** Educator will assist in loading bus and will ride on bus to direct driver to the Preserve’s Patten Road parking lot. Educator will bring the supply backpack(s) on the bus.

2.) Preserve Parking Lot: Drop off (5 minutes)
   - **Bus drop off.** Before getting off the bus, the teacher should announce to students that they will gather in the parking lot, until the Educator guides them across the street into the Preserve.
   - **Bus parking.** Bus may park at MYA or on the west side of Patten Rd, south of the Preserve Parking lot.
   - **Walk to Upland trailhead.** To begin the program, Educator will guide the students across the street crosswalk on Patten Road and gather them at the upland trailhead area.

3.) Patten Road Upland Trailhead: Preserve Refresher (15 minutes)
   - **Welcome Students back to the Preserve.** When students are gathered on the trail at the upland trailhead, the Educator will refresh their memory on the Preserve: “Today we are going to explore new topics here at the Preserve. What you see today will be similar to what you saw during your fall visit, but in many ways it is also very different.”
   - **Pass the Cardinal.**
     - Students, teachers, chaperones, and educator stand in a circle.
     - Each person takes turns holding the stuffed Northern cardinal.
     - The person with the bird states their name and their favorite thing about the spring season.
   - **Rules**
     - Remember to walk, not run.
     - Stay with your group on the paths and keep off the drains, gutters, and slopes.
     - Leave everything the way you found it. Don’t pick plants or take rocks home.
     - At the lakeshore, DO NOT throw rocks under any circumstances.
   - **Group Breakouts.** Educator will ask the class to gather into six groups, each with an assigned chaperone (teachers may wish to do this in advance). **Chaperones must stay with their group throughout the program.**
   - **Walk to Elemental Matters Overlook.** Educator will lead group to Elemental Matters overlook and ask students to sit on the benches.
4.)  Elemental Matters: Spring Season and Data collection (20 minutes)

  - Students can use binoculars to look at trees for animals and see how this landscape is different from the ravine they explored in the autumn visit.
  - Ask students how the vegetation along the bluff area is different from the ravine.

  - “Biodiversity” is the measure of characteristics of plant and animal life in a defined area
  - “Adaptation” is the adjustment of change in behavior, physiology, and structure of an organism in order to become more suited to an environment
  - Educator will explain that in each of the three areas at the Preserve visited by the students (bluff, lakeshore, and ravine), the class will focus on studying the biodiversity that is present.
  - Educator will remind students to keep their eyes open for evidence of animals as they walk.

- Soil Profile. Educator will show the soil profile sample and explain:
  - The different layers of soil (parent material, subsoil, topsoil)
  - Soil affects the plants and animals that reside in an area and how humans interact with land
  - What do students remember about erosion and how it affects people, plants and animals?

- Weather meter operations review. Meters will allow the class to track several major abiotic factors. Temperature, humidity, light, and wind.
  - Educator will remind students and chaperones how to operate the weather meters.
  - NOTE: One foot candle = 10.764 lux.
    Each Weather Meter Kit has a table with examples of light measurements in various situation.

- Record biotic data on Page 20-21 of journals. Additional data can be recorded on page 22.
  - Students should work in their assigned groups with their chaperone to use the weather data monitors. Chaperones can assist students as they work.
  - Students should record data on page 5 in their journals, in the appropriate categories under “Site #1 (Ravine)” in the “Abiotic Factors and Weather Data Collection Table.”
  - After weather data, students should list the abiotic factors they observed elsewhere in the ravine in the “Biotic Factors and Weather Data Collection Table” on page 20-21 of their journals.

- Walk down bluff stairway to lakeshore

5.)  Beach: Data Collection, biodiversity and endangered plants (25 minutes)

- Explorations at the lakeshore: Page 25 of journal.
  - Direct students to work with their small groups and take a section of the beach to explore for signs of wildlife. Students should record their observations on pages 20-21 as they explore.
  - Students can use their binoculars to look for waterfowl in Lake Michigan and birds in the trees on the bluff. Educator will explain that this area of the Lake Michigan coastline is part of a major flyway for birds, so in the spring and fall one can often observe many migrating birds making their way to warmer climates for the season.
  - NOTE: Some schools have requirements that students maintain a certain distance away from open water. Educator should work with the teacher to adapt the lakeshore exploration as needed and make sure to inform the chaperones of such requirements.

- Weather Data Collection
  - Educator will instruct the student group selected to collect weather data at Site #2 (on the lakeshore) to use the meters to measure air temperature, light, wind, and humidity.
  - This group of students should work with their chaperone to do the experiments.
  - Students should record data on page 20-21 in their journals, under “Site #2 (Beach)” in the “Biotic Factors and Weather Data Collection Table.”
• Collect Water Quality data from Lake Michigan. Remind students that the PCS Tester is an expensive piece of equipment.

• Optional Nearshore Habitat discussion
  o Educator may consider explaining the nearshore habitat to students. The shallow waters along the shore are home to numerous fish species because here they have access to the food and shelter they need to survive. Some species of fish, like the white sucker, will swim up the ravine streams around this time of year to spawn (nest and lay eggs). When their babies hatch they live in the ravines for several months before returning to the lake in the late summer.
  o Educator should ask students:
    ▪ Is this an example of biodiversity?
    ▪ How is it an example of adaptation?

• Endangered Plants discussion and sketching (Page 25 of journal)
  o Show a sample of sea rocket (*Cakile edentula*). If plant is not available, Educator can use the laminated picture instead. “This plant can withstand the pounding of waves and blowing sand. Its seed pod floats on the water.”
  o Explain how marram grass (*Ammophila brevigulata*) and other dune grasses help to stabilize the shifting sand and soil. “They have long roots which protect them from the wind. Once dune grass takes hold of an area, new plants can begin to colonize the area because the sand is more stable for them to grow.”
  o Educator should reference the “Words of the Day” and ask students how the sea rocket and marram grass relate to “Adaptation” and “Biodiversity.”
  o Students should take time to practice sketching plants. Later in the day, each student will “interview” a plant through sketching and writing. Sketches can be done on page 21 of the journals.
  o Educator may wish to pass out the laminated endangered and threatened plant identification sheets to chaperones for this activity. Chaperones can help their groups explore the endangered and threatened plants on the beach, using the sheets as a reference and returning them to the Educator at the end of the activity.

• Educator should instruct students to be very careful when walking on the lakeshore and to avoid stepping on plants. Chaperone can remind students to step carefully if needed.
  o Students can use binoculars to look at trees for animals and see how this landscape is different from the ravine they explored in the autumn visit.
  o Educator should ask students how the vegetation along the bluff area is different from vegetation seen near the ravine.

6.) Lunch and Relaxation Time on the Lakeshore (25 minutes)

• Lunch.
  o Educator will gather class at the grassy area near *Lake Prism* for the lunch break. Students can sit on the ground to eat. In the event of rain or damp ground conditions, Educator can lead the class back up the stairs to the *Elemental Matters* overlook for the lunch break.
  o Educator should give class a five minute warning to wrap up lunch.
  o Teachers and/or chaperones must collect all lunch garbage in a bag and carry it out to the bus for disposal. Trash and recycling cans are located in the parking lot near the bus pick-up point.

• Relaxation time. Educator will inform students that if they finish lunch early, they can choose to sketch or write in their journals, or just relax.

• As a large group, leave the Lakeshore along the path north, toward the ravine.
7.) Earthbark Prism: Interview with a ravine plant (25 minutes)

- **Introduction.**
  - Educator will begin this activity with trivia. “Who was the father of Taxonomy?” [Answer: Carl Linnaeus, 1707-1778, a Swedish botanist] “He invented a system to classify plants and animals and gave them names in a system we call binomial nomenclature.”
  - Educator should mention that there are many ephemerals, or plants with a short life cycle, blooming during spring in ravines, and that students will be “interviewing” some of these plants during this activity.

- **Use Plant ID cards.** Educator will show the students one of the ravine plant identification card sets as an example. Each chaperone will use the ravine plant identification card sets to help their group do the activity. Educator will show the students how the plants are named on the identification cards. “The scientific name is in Latin: first word = genus, second word = species. Refer back to a plant in bloom and say that the scientific name is *Polygonatum* (genus) *biflorum* (species), which belongs to the plant family *Liliaceae* (lily). The common name is Solomon’s seal.”

- **Flip to Journal pages 28-31.**
  - Educator will instruct students to work with their groups and chaperones to answer the journal prompts on pages 28-31. Educator should recommend that students consider writing a poem about their plant in addition to answering the prompts.
  - Educator will explain to students that all observations should be done using their eyes or their binoculars. They are not allowed to pick any part of the plant or to go off-trail or up the ravine slopes. Chaperones can remind students again of this during the activity, if needed.

- **Educator will select a plant for each group.**
  - Chaperones will help each group search for their plants. Groups may have to walk up and down the ravine to find different plants in bloom, but students should not go past the bench on the ravine trail. Students can sit down on the road to work on their journal prompts. Colored pencils are available for students to use for their sketches.
  - When activity is completed, chaperones should help retrieve the ravine plant identification card sets and colored pencils from the students, and place the materials back in the Educator’s backpacks.

- **Students from each group should share something they learned about their plants.** To wrap up, Educator will ask each group to summarize some highlights from their observations.
  - What kind of conclusions can we make from our observations?
  - What do you think are some of the adaptations of your plants?
  - Would you say the ravine has a high degree of biodiversity?
  - The more biodiversity we have in an ecosystem, the better the flow of energy and the healthier the ecosystem is overall.

8.) Between Mouth of Ravine and Soil is Alive: Ravine Observations (20 minutes)

- **Educator will begin this activity with trivia:**
  - How many species of ants do we know as a group?
  - How many species of ants are there in the world? [Answer: According to the Field Museum Ant Blog, there are over 14,000 named ants!]
  - How many species of ants live in the Preserve? [Answer: At least 19 have been identified at the Preserve]
  - Is this “Biodiversity? [Answer: Yes!]
  - Is this “Adaptation? [Answer: Yes!]
Educator will explain that there is a lot of biodiversity at the Preserve: “Openlands researchers have observed a lot more than just ants. Since this is a stopover point for thousands of birds every year, if we are quiet we may see a red-tailed hawk, red-headed woodpecker, or Eastern bluebird. Even if you don’t see an animal, can you find specific places where they might live? Use your binoculars as you walk to look for evidence of animals.”

**Walk up the ravine in small group clusters.** Students use their binoculars for wildlife and other nature observations along the way. Chaperones can use the wildlife identification card sets to engage their groups with wildlife observations as they walk.

**Record Observations of Bartlett Ravine on pages 26-27.** This is a good point for students to write general observations about what they see, hear, and smell in the ravine. Small groups should stay together. Students are welcome to use colored pencils to add detail to sketches.

- **Chaperones should use the chaperone guide to help prompt students during this time.**

### 9.) Soil is Alive: Wrap up (15 minutes)

**Data Collection – final iteration.**

- Educator will instruct the student group selected to collect weather data at Site #1 (in the ravine) to do experiments with the meters to measure air temperature, light, wind, and humidity.

- **This group of students should work with their chaperone to do the experiments.**

- Students should record data on page 20-21 in their journals, under “Site #1 (Ravine)” in the “Biotic Factors and Weather Data Collection Table.”

- When students are done journaling and collecting weather data, Educator will wrap up the wildlife observation activity: “Did your group determine how biodiversity is observed in the ravine? How many animals did you see?”

- Chaperones can help collect the wildlife identification cards and place them in the Educator’s backpacks before moving to the next stop.

**Data sharing - Pages 22-25 of journal.**

- Educator will help groups disseminate the weather data they have collected from sites #1, 2, and 3 throughout the day. All students should use this information to finish filling out the “Biotic Factors and Weather Data Collection” table on page 21 in preparation for the follow-up discussion.

- Once students have filled out their table, chaperones should help the students in their groups discuss the following questions with each other. Students should also answer the questions on page 23 in their journals.

  - Why are there differences at the three locations?
  - How were the results different from the fall?

**Wrap up Discussion: Arc of Nature.** When students have completed writing in their journals, the Educator will invite the students to observe the Arc of Nature mural and interpret the mural’s symbolism: “What do you see and what does that represent here at the Preserve?”

- Educator presents final program wrap-up with these 5 important messages:
  1. Preservation is a priority but this site is open to the public for all to enjoy.
  2. Varying degrees of biodiversity of the wildlife found at the Preserve, depending on location.
  3. Continuous restoration efforts are being done, so if they come back again with friends or family the bluff, ravine, and lakeshore will probably look different, especially during another season.
  4. Reiterate that students can return with family and friends to further enjoy the Preserve.
10.) Return to Bus: Final departure (15 minutes)

- **Return to Bus**
  - Educator will guide group along the bus trail to the bus pick-up point at the Patten Road trailhead. Educator will help load the students on the bus.
  - Chaperones should help Educator gather binoculars, colored pencils, and any other materials.
  - Remind teachers to gather journals for the post-visit lesson and for the spring portion.
  - Educator will ride with the class back to the Midwest Young Artists building.

- **At the Building** - Facilitate second restroom break, and thank teacher & chaperones. Toss garbage.

- **After the Bus Departs**
  - Educator should scan the backpack for missing items and restock using the supply bin.
  - Educator should email the completed daily log to Openlands within one week of the visit.

**Indoor Extension Activities for Inclement Weather**

These extensions may complete the final hour of the visit if inclement weather requires the visit to be cut short. If rain is expected, the Educator should try to collect weather data at all three data sites prior to the bus arrival, so that the data can be used for the extension activities. The Educator will also need to collect 5-6 plant samples for the activities. Students should sit in small groups with their chaperones once inside the building.

**Duration:** Replaces 1 hour of the outdoor program

1. **Analyze weather data:**
   - **Turn to the “Biotic Factors and Weather Data Collection Table” on pages 16-17 of the student journals.** Share the collected data with the class and have the students complete the table.
   - **As a class, discuss differences between weather data collection sites.** Ask students to answer the questions on pages 18-19 of their journals.

2. **Modified “Interview with a Ravine Plant” Activity:**
   - **Educator will distribute one native plant sample, hand lenses, and colored pencils to each group.**
   - **Students will use the hand lens to observe the plant in detail, use colored pencils to sketch the plant, and then complete the journal prompts on pages 22-25.**
   - **Educator will go around to each group and ask them to report back on what the name of the plant is, what the students think the adaptations of the plant are, and a few facts about the plant.**

3. **Recap the site visit.** Ask students what they will remember about the Preserve (other than it rained). Ask each student to write a short paragraph on page 28 of their journal, describing something they saw or summarizing the weather data collection and ravine plant activity.

**Acknowledgements**

This script was written by Julyne Segar, contracted Curriculum Specialist for Openlands, and revised by John Cawood, Openlands Education Program Coordinator.
Students use digital weather meters to collect data for classroom analysis
Appendix 1: Program Standards

<table>
<thead>
<tr>
<th>Code or category</th>
<th>Grade</th>
<th>Descriptions</th>
<th>Eco Explorations Program Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Expectation HS-ESS2.2</td>
<td>9-12</td>
<td>Analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems.</td>
<td>X X X</td>
</tr>
<tr>
<td>Performance Expectation HS-ESS2.3</td>
<td>9-12</td>
<td>Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.</td>
<td>X X X</td>
</tr>
<tr>
<td>Performance Expectation HS-ESS2.7</td>
<td>9-12</td>
<td>Construct an argument based on evidence about the simultaneous coevolution of Earth systems and life on Earth.</td>
<td>X X</td>
</tr>
<tr>
<td>Performance Expectation HS-ESS3.4</td>
<td>9-12</td>
<td>Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.</td>
<td>X X X</td>
</tr>
<tr>
<td>Performance Expectation HS-LS.2.1</td>
<td>9-12</td>
<td>Use mathematical and or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.</td>
<td>X X</td>
</tr>
<tr>
<td>Performance Expectation HS-LS.2.6</td>
<td>9-12</td>
<td>Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable condition, but changing conditions may result in a new ecosystem.</td>
<td>X X X</td>
</tr>
<tr>
<td>Performance Expectation HS-LS.2.7</td>
<td>9-12</td>
<td>Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.</td>
<td>X X X</td>
</tr>
<tr>
<td>Performance Expectation HS-LS.2.8</td>
<td>9-12</td>
<td>Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce.</td>
<td>X X</td>
</tr>
<tr>
<td>Performance Expectation HS-LS.4.5</td>
<td>9-12</td>
<td>Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.</td>
<td>X X X</td>
</tr>
<tr>
<td>Performance Expectation HS-LS.4.6</td>
<td>9-12</td>
<td>Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.</td>
<td>X X X</td>
</tr>
<tr>
<td>Performance Expectation HS-ESS3.5</td>
<td>9-12</td>
<td>Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.</td>
<td>X</td>
</tr>
<tr>
<td>Practice</td>
<td>K-12</td>
<td>Asking questions</td>
<td>X X X</td>
</tr>
<tr>
<td>Practice</td>
<td>K-12</td>
<td>Developing and using models</td>
<td>X X</td>
</tr>
<tr>
<td>Practice</td>
<td>K-12</td>
<td>Planning and carrying out investigations</td>
<td>X X X</td>
</tr>
<tr>
<td>Practice</td>
<td>K-12</td>
<td>Analyzing and interpreting data</td>
<td>X X X X</td>
</tr>
<tr>
<td>Practice</td>
<td>K-12</td>
<td>Using mathematics and computational thinking</td>
<td>X X</td>
</tr>
<tr>
<td>Practice</td>
<td>K-12</td>
<td>Constructing explanations and designing solutions</td>
<td>X X X X X</td>
</tr>
<tr>
<td>Practice</td>
<td>K-12</td>
<td>Engaging in arguments from evidence</td>
<td>X X</td>
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<tr>
<td>Practice</td>
<td>K-12</td>
<td>Obtaining, evaluating, and communicating information</td>
<td>X X X</td>
</tr>
<tr>
<td>Crosscutting Concept</td>
<td>K-12</td>
<td>Patterns</td>
<td>X</td>
</tr>
<tr>
<td>Crosscutting Concept</td>
<td>K-12</td>
<td>Cause and Effect</td>
<td>X X X</td>
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<tr>
<td>Crosscutting Concept</td>
<td>K-12</td>
<td>Scale, proportion, and quantity</td>
<td>X X X X X</td>
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<tr>
<td>Crosscutting Concept</td>
<td>K-12</td>
<td>Systems and system models</td>
<td>X X X X X X</td>
</tr>
<tr>
<td>Crosscutting Concept</td>
<td>K-12</td>
<td>Energy and matter</td>
<td>X X</td>
</tr>
<tr>
<td>Crosscutting Concept</td>
<td>K-12</td>
<td>Structure and function</td>
<td>X X X</td>
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</table>
### Crosscutting Concept

| Grade | Stability and change | X | X | X | X | X |

### Disciplinary Core Idea

<table>
<thead>
<tr>
<th>Grade</th>
<th>Life Sciences</th>
<th>X</th>
<th>X</th>
<th>X</th>
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</table>

| Grade | Earth and Space Sciences | X | X | X | X | X |

| Grade | Engineering, Technology, and Application of Sciences | X | X | X |

### Common Core English and Language Arts Standards

<table>
<thead>
<tr>
<th>Code</th>
<th>Grade</th>
<th>Standard</th>
<th>Eco Explorations Program Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>W.11-12.1</td>
<td>11-12</td>
<td>Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.</td>
<td>Fall Pre-Visit: X</td>
</tr>
<tr>
<td>W.11-12.2</td>
<td>11-12</td>
<td>Write informative and explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.</td>
<td>Fall Site Visit: X</td>
</tr>
<tr>
<td>W.11-12.3</td>
<td>11-12</td>
<td>Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.</td>
<td>X</td>
</tr>
<tr>
<td>W.11-12.10</td>
<td>11-12</td>
<td>Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.</td>
<td>Fall Pre-Visit: X</td>
</tr>
<tr>
<td>L.11-12.4</td>
<td>11-12</td>
<td>Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11-12 reading and content, choosing flexibly from a range of strategies.</td>
<td>Fall Site Visit: X</td>
</tr>
<tr>
<td>L.11-12.6</td>
<td>11-12</td>
<td>Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.</td>
<td>X</td>
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</table>

### Common Core Mathematics Standards

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<th>Code</th>
<th>Grade</th>
<th>Standard</th>
<th>Eco Explorations Program Activities</th>
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</thead>
<tbody>
<tr>
<td>HS-MD.B5</td>
<td>9-12</td>
<td>Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.</td>
<td>Spring Site Visit: X</td>
</tr>
<tr>
<td>HS-MD.B5b</td>
<td>9-12</td>
<td>Evaluate and compare strategies on the basis of expected values.</td>
<td>X</td>
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</tbody>
</table>
Appendix 2: Memorandum of Understanding

This Memorandum of Understanding (MOU), signed by the school principal and participating classroom teachers, acknowledges that each signatory is committed to the program elements listed below. The MOU must be completed and on file prior to any school participating in the Eco-Explorations program.

Records and Contact Information
The Eco-Explorations program is managed by John Cawood, Openlands Education Program Coordinator. Please direct all questions to John at 312-863-6276 or jcawood@openlands.org.

Please make copies of this signed document to keep as records for your school, and for each participating teacher if desired. Return original signed copy to John Cawood, Education Program Coordinator, Openlands, 25 E. Washington Street, Suite 1650, Chicago, IL 60602.

Openlands' Role
Openlands will provide the following to each participating classroom, an estimated value of $2,600 per class:

- Pre-visit and post-visit lessons in a comprehensive Program Guide
- Paid bus transportation to and from each on-site Eco-Exploration, with restroom stops
- Educator to guide teachers and students during each on-site Eco-Exploration
- Teacher training
- Supplies (including a take-home journal) for all on-site activities
- Substitute pay for high school teachers

Requirements for Participating Schools
Each participating teacher agrees to the following required elements of the Eco-Explorations program:

1. New Teachers Attend a Teacher Orientation Session (one per school year)
   - This is required of all new teachers. Teachers who do not attend an orientation will not be able to participate in the program.
   - Orientation sessions are hosted by Openlands staff and educators.
   - New teachers will attend an approximately two hour long meeting at the start of the school year. The meeting is held at the Preserve and Openlands' Highwood office.
   - Returning teachers who have previously participated in the program will attend a modified refresher orientation session at the start of the school year. The refresher orientation is designed to cover any new program changes while offering an opportunity for peer discussion about activity adaptations and extensions. The location of the refresher session will be determined by Openlands staff.

2. Complete All Pre-Visit and Post-Visit Lessons in the Classroom (four per school year)
   - There are four classroom lessons per school year that all teachers are required to complete. This includes a pre-visit lesson and a post-visit lesson for the autumn on-site Eco-Exploration, and the same for the spring visit.
   - Pre- and post-visit lessons are critically important because they provide students with a foundational knowledge of concepts applied in the on-site visits and help to synthesize the experience afterwards. Failure to complete the four lessons will negatively impact the quality of the experience.
   - Teachers are responsible for providing materials needed for each lesson, which are limited and generally available in most schools and households.
3. **Attend On-Site Eco-Explorations (two per school year)**
   - Teachers must attend an on-site Eco-Explorations visit with their classroom in the autumn, and then again in the spring each school year.
   - Openlands provides an educator for each on-site Eco-Exploration and Openlands staff will work with teachers to arrange each visit.

4. **Post-Visit Online Surveys (two per school year)**
   - Each teacher is required to complete two brief online surveys about their experience in the Eco-Explorations program per school year. This valuable feedback helps Openlands to continue improving the program.
   - Openlands staff will email a survey to each teacher within a few weeks of the end of the autumn portion of the program, and then again at the end of the spring portion of the program.

______________________________  ________________________________
Openlands Signature  Openlands Representative (Please print)

______________________________  ________________________________
Principal Signature  Principal Name (Please print)

______________________________  ________________________________
Teacher Signature  Teacher Name (Please print)

______________________________  ________________________________
Teacher Signature  Teacher Name (Please print)

______________________________  ________________________________
Teacher Signature  Teacher Name (Please print)

______________________________  ________________________________
Teacher Signature  Teacher Name (Please print)
Overview
We recommend teachers bring along these directions for each on-site visit to the Openlands Lakeshore Preserve. We provide detailed directions to the bus company prior to your visits, but it is helpful to plan for a backup. If you have any trouble with your buses, please contact John Cawood, Openlands Education Program Coordinator, at 312-863-6276 or on the cell phone number you were provided at the teacher orientation.

Directions to the Midwest Young Artists Building
Visits to the Preserve begin at the Midwest Young Artists building, a youth music school located nearby. Here students can begin with a restroom break and orientation to the day’s activities.

Street Address: 878 Lyster Road, Highwood, IL 60040
GPS Coordinates: 42°12’54.78” N, 87°48’58.04” W

To get there from Chicago:
- Take I-94 W and exit onto Half Day Road (Route 22).
- Turn right (east) onto Half Day and continue past Route 41. As you pass into the Highwood city limits east of Route 41, Half Day Road will turn into Prairie Avenue.
- Turn left at Green Bay Road when Prairie Avenue dead ends.
- Pass the stop sign at Highwood Avenue. Continue to the stop sign at Washington Street.
- Turn right onto Washington Street and then left at the stoplight onto Sheridan Road. Please note that Sheridan Road is also called Waukegan Avenue in parts of downtown Highwood.
- At the stoplight at Old Elm Road, turn right onto Simonds Way.
- Turn right at the stop sign onto Leonard Wood Avenue W.
- Leonard Wood Avenue W turns into Lyster Road if you continue straight. The Midwest Young Artists building will be on your right just before you reach Whistler Road.

To get there from northern Lake County:
- Take I-94 E and exit onto Townline Road (Route 60).
- Turn left (east) onto Townline Road and continue until it dead-ends at Route 41.
- Turn right onto Route 41 and take it to Old Elm Road.
- Turn left onto Old Elm and continue straight over the train tracks and through the stoplight at Sheridan Road to enter the Town of Fort Sheridan. Old Elm turns into Simonds Way just east of the stoplight.
- Turn right at the stop sign onto Leonard Wood Avenue W.
- Leonard Wood Avenue W turns into Lyster Road if you continue straight. The Midwest Young Artists building will be on your right just before you reach Whistler Road.

If you wish to add a bus tour of the historic Fort Sheridan parade grounds to your visit:
- Follow the directions above to enter the Town of Fort Sheridan, but then turn left at the stop sign onto Leonard Wood Avenue N. You can follow the circle all the way around to Whistler Road, and then turn right onto Whistler to head back to the Midwest Young Artists building. See the map on the following page for more information.
Dear Parent/Guardian,

Openlands partners with your school for the Openlands Lakeshore Preserve Eco-Explorations program. During this year’s program, we will be taking some photographs that include students. We would like to be able to share these photographs for publication purposes. By signing below, you approve the use of photographs with your child in them to be published.

I hereby authorize Openlands to use or distribute the name and positive photograph of my son/daughter/custodial child:

____________________________________________________________________________________
(Student’s Name – Please Print)

and any reproductions thereof in such a manner, for such a purpose, and in such publications as it or its assigns may from time to time determine and I hereby release and discharge said company and its assigns from any and all liability in connection with such publication and use.

As a parent or guardian of the above named person, I consent to the above release, signature thereto and to the uses therein set forth.

____________________________________________________________________________________
(Parent Signature)

____________________________________________________________________________________
(Student Signature)

____________________________________________________________________________________
(Date)

For more information about the Eco-Explorations program, please contact John Cawood, Education Program Coordinator, at 312-863-6276 or jcawood@openlands.org.
About Openlands

Founded in 1963, Openlands protects the natural and open spaces of northeastern Illinois and the surrounding region to ensure cleaner air and water, protect natural habitats and wildlife, and help balance and enrich our lives.

The Openlands Lakeshore Preserve

Located just 25 miles north of Chicago, the 77-acre Preserve is a designated Illinois Nature Preserve situated on more than a mile of Lake Michigan shoreline. Featuring extraordinary bluff, beach, and ravine ecosystems, the Preserve presents a rare opportunity to visit a unique natural resource, bringing to life the rich history of our region and linking it to today's critical environmental issues.

The Preserve is a model for outdoor learning, offering many conservation-focused educational opportunities for people of all ages and backgrounds, including site-specific interpretive artworks by regional artists, podcasts and interactive maps, the Eco-Explorations school program with elementary and high school level curriculum focused on the unique ecology of the ravines and bluffs; and volunteer and public educational program opportunities. Ecological restoration and biological monitoring programs demonstrate the critical role humans play in the stewardship of natural resources.

Contact Us

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Join Us! Become an Openlander today. Visit www.openlands.org to discover how you can help us create a greener, healthier tomorrow!