

DUNES  
Learning  
CENTER

*“Where Nature Nurtures Knowledge”*

# **Frog in the Bog Program Teacher Packet**

Dear Teacher,

You hold in your hands the blueprint for a great experience for you and your students. Contained in this packet are activities and background materials to help prepare for your trip to the Dunes Learning Center.

By making use of these materials, you can make this whole experience a rich part of your curriculum. Curriculum standards in science, social studies, language arts and mathematics are supported by the activities included in all Dunes Learning Center programs.

The suggested lessons to prepare for your visit included in this packet will require about six hours of class time. You can spread that out over the month between now and when you visit the Learning Center. Post-visit lessons, depending on your pre-visit choices, will take about three hours or more. Your students may get interested in projects that could extend into several weeks. The order in which the activities are placed is important, as concepts and skills build upon each other.

You will notice, in the “Teaching Suggestions” portion of many activities that there are suggested questions you may want to ask your students, followed by words or phrases in parentheses. The parenthetical remarks are intended as possible responses students may provide. If a question doesn’t make sense to your students, having these possible responses may help you rephrase the question or clarify it for them.

As a learning center, we are especially interested in how we might improve any aspect of the materials or support we provide. We encourage you to send us any comments you have regarding this packet as you work through it.

If you have questions, please call the Dunes Learning Center at (219) 395-9555, extension 3 and ask for the Education Director. We want your trip to the Dunes Learning Center and its integration into your curriculum to be one of the highlights of your school year.

We want you to have fun and make the most of this trip to the Dunes Learning Center.

Sincerely,

The Dunes Learning Center Staff

# **Dunes Learning Center**

## **Frog in the Bog Teacher Packet**

### **Table of Contents**

About the Journal	4
Pre-Visit Activity 1: Choose an Organism	5
Pre-Visit Activity 2: Preparation for Ecosystem Investigations ( <b>Required</b> )	6
Pre-Visit Activity 3: Time Traveling	9
Pre-Visit Activity 4: Exploring Artifacts	12
Post-Visit Activity 5: Analysis of Ecosystem Investigations	14
Post-Visit Activity 6: Champions of Our Town	19
Post-Visit Activity 7: Earth Day Every Day	21
Post-Visit Activity 8: Who's Spawning?	24
Appendix A: Ecosystem Investigations Academic Standards	26
Appendix B: Walk Through Time Academic Standards	28
Appendix C: The Salmon Game Academic Standards	30

## About the journal

The journal has several objectives ranging from scientific to aesthetic, from team data collection to personal response.

First and foremost, the journal should be a personal space for students to record data, feelings, ideas, questions and observations through drawing or writing. This means that you should discuss, with your students, the issue of privacy related to the journal. In some classrooms, this works best by having the student share only when and what he or she chooses to share. In other classrooms, the teacher is the only person allowed to look into another student's journal. Your agreement with students on this issue will have a profound effect on their spontaneous enthusiasm for recording their personal responses.

You can download an electronic copy of the student journal from our web site at <http://www.duneslearningcenter.org/forms/index.htm>. We can also email you a copy. We recommend using light colored or white paper stock for a front and back cover (we have found that the colored folders bleed their dye into students' clothing when they get wet). Pages are formatted to allow you to punch holes along the left-hand margin. Using loose-leaf metal rings or heavy string to hold each journal together may allow pages to be added or removed.

In this packet are student pages you can print off and use that are separate from pages included in the student journal. *If a pre-visit activity utilizes a page in the student journal, the pre-visit activity will list the journal under "Materials needed."* If you wish, you can add the additional pre-visit pages to the student journal before or after your visit to the Indiana Dunes National Lakeshore. If you add in the pages before your visit, please make sure the students use colored pencils or crayons for this work. **Moisture damages watercolors and markers** and it is possible for the journals to get wet during your visit.

During your time at the Dunes Learning Center, students will be given specific times to work in their journals. When they have personal journal time, they may work in their journals, writing and drawing as they wish. At other times, they will be working on pages with specific questions or investigations to carry out.

After you return to school, students can use their journals as a data resource for compiling a total picture of Indiana Dunes National Lakeshore ecosystems, correlating their predictions and results, developing stories, poems, books, skits, videos and presentations for parents and other students. The post-visit activities provided in this packet can help you wrap up their Dunes Learning Center experience. Post-visit pages may be added to the back of the student journal, and can help complete an Indiana Dunes portfolio of student work.

## **Pre-Visit Activity 1: Choose an Organism**

**Quick summary:** Students choose an organism of the Indiana Dunes National Lakeshore to research prior to their visit. They learn what to look for, where to look, and an interesting fact about their organism.

**Rationale:** Students need personal commitment to their education. Focused research helps empower them to make sense of their experiences and establish connections with the land. This activity corresponds to the “Dance of the Dunes” that students will experience almost immediately upon arrival at the Dunes Learning Center. They will also use this information to develop some predictions about the ecosystems they will encounter.

**Disciplines included:** science, language arts

**Approximate time required:** Instructional time: about 5 to 10 minutes; student research time: 30 to 60 minutes

### **Materials needed:**

- Student journal pages 2 & 3: Choose an Organism
- Books and/or Field Guides about plants, animals and the land
- Audio tapes of bird songs and night sounds
- Colored pencils or crayons

**Preparation:** The first list includes organisms that can be observed (or signs of them observed) during all parts of the year. The second list includes organisms that are common in the National Lakeshore, but may only be observed or during certain seasons.

Decide how much time to allow for research. This activity can overlap with the “Preparation for Ecosystem Investigations”. If there is time, students can use additional library or classroom resources including books, tapes or computers and could even visit a local nature center.

### **Teaching suggestions:**

1. Ask your students what kinds of organisms they expect to see in the Indiana Dunes National Lakeshore.
2. Tell them that each of them is going to become the class expert on an organism that lives in the National Lakeshore. Direct them to page 2 of their journals. Let them know it is all right for more than one person to choose the same organism, but encourage variety. Students can work together or separately.
3. Show them the resources that you have, both from the pre-visit kit and others you have collected.
4. Give them a deadline for finishing their research and then give them time to complete the work before visiting the Learning Center.

## **Pre-Visit Activity 2: Preparation for Ecosystem Investigations (Required)**

**Quick summary:** Students are introduced to some ecosystems of Indiana Dunes National Lakeshore through videos and reading. They make predictions about the data they will collect while at the National Lakeshore.

**Rationale:** As scientists, students make predictions about places before they go to observe. This helps them compare and analyze their data later. Here, they make qualitative predictions (drawings) and quantitative predictions (filling in chart).

**Disciplines addressed:** science, art (See Appendix A for standards met by the Ecosystems Investigations)

**Approximate time required:** one hour to an hour and fifteen minutes

### **Materials needed:**

- Video: *Child of the Northwest Wind* (11 min)
- Book: [Chicago Wilderness: An Atlas of Biodiversity](#)
- Teacher Packet (page 16): Soil Samples
- Student journal (page 7): Practice Ecosystem Investigation Prediction Chart
- Bag of soil
- Several rolls of clear tape, about ½ inch wide
- Video player and monitor
- Scratch paper and colored pencils/crayons (to include in the student journals) OR butcher paper with markers (to post around the classroom)

**Preparation:** The student journal contains the Practice Ecosystem Investigation Prediction Chart (page 7). Make a copy of the Soil Samples page (page 16 in this packet) for each student.

Decide how your students will be divided for activities in the National Lakeshore. They will need to be in groups of thirteen or less. They should work in these groups or subdivisions of these groups for this in-class activity. Groups of three to five would be best for this activity. (Note that this activity group size is different than cabin groups.)

### *Background on Ecosystems of Indiana Dunes National Lakeshore*

The diverse communities of the National Lakeshore provide a rich classroom for environmental learning. A little background about these communities may better prepare you and your students for your experiences. You will find this information most pertinent to share with your students following the video, *Child of the Northwest Wind*.

Text and photo references below are from a book included in your pre-visit kit:

Chicago Wilderness: An Atlas of Biodiversity, by Jerry Sullivan (CW). There are several additional books in your pre-visit kit that you may use to show graphics, charts, and give descriptions of the ecosystems found in the National Lakeshore.

In our daily lives, most of us ignore our interactions with the living organisms on the planet. We are also quite unaware of our interactions with the land. Despite our lack of awareness, these interactions occur continuously. Spending a few days specifically observing these interactions makes us more aware of their presence. Plants and animals (including humans) do interact with each other and with the land on which they live. “A specific biological community and its physical environment interacting in an exchange of matter and energy” is defined as an **ecosystem**.

Ecosystems are complex living communities. They are shaped by the soil, rock, water, the shape of the land surface, climate, weather, prevailing winds, location relative to other major land forms (such as large bodies of water, mountain ranges, deserts, large forests or open prairies), as well as the living creatures themselves. The interaction of microorganisms, fungi, plants, and animals with the physical environment and each other makes each ecosystem a dynamic system, subject to changes in relative population size of different species.

There are many different ecosystems in the Indiana Dunes National Lakeshore. Each ecosystem is quite unique and distinct from the others. Each of these ecosystems also has a rare community of plants and animals interacting with the land, since most of the land in this region has been converted to other human uses. We will be visiting and studying five ecosystems in detail: **open beach, foredune, oak savanna, wetland and eastern deciduous forest**.

On the **open beach**, within the waves’ reach, where there has been little time for plants to take hold, there are still large areas of bare sand. The most common plant is a stiff beach grass called Marram Grass. Plants and animals that live here must be adapted to grow in sand, dry conditions, unbroken winds and harsh, bright sunlight. Summer temperatures at the sand surface can be over 120° F., so only animals that burrow under the sand live here.

Sand dunes are formed by wind. As the sand blows, it is caught by plants and begins to pile up into a small dune. As the dune grows, sand tends to blow off of the portion of the dune that faces the wind, and to settle onto the more sheltered face of the dune. This movement of sand causes the dune to become taller, and can cause the dune to shift its position as well.

The dunes closest to the water are called **foredunes**. The plants there must also tolerate extremes of heat, cold and dryness, but the plants slow the wind-driven movement of the sand, allowing the dune to build over time. The movement of the sand is not stopped however, and wind action causes the position of these dunes to change over time. Occasional large storms from the north can send waves up into the foredunes. [Diagram p. 48 & photo p. 49: CW]

The **oaks** of the **savanna** keep the soil surface from getting intensely hot. Thus they help create an open woodland environment where a greater number of different kinds of plants can grow. The oaks can grow there because a small amount of dead plant parts have remained on top of the

sand. These dead plant parts hold moisture and allow plant roots to get nutrients not available from the sand. [Diagram PP 24-26: CW]

The **eastern deciduous forest** has many different kinds of trees, most of which drop their leaves in winter. The soil there is made of much smaller particles than the sand. These smaller particles hold water longer than sand, and also provide some of the minerals plants need. The many leaves of the tall trees make the forest shady and cool and protect the soil from heavy rains, high winds and drying sun. [Text p. 29: CW]

The **wetland along the Cowles' Bog trail** is similar to the forest in the way the taller trees protect the soil and smaller plants. However, the Bog holds much more water – all year long. The diverse numbers of plants that grow here thrive in a very wet environment. As plants die, they decay in the water, adding more nutrients and minerals and encouraging more plants to grow. [Photo p. 35: CW]

These five ecosystems illustrate the diversity of the Indiana Dunes National Lakeshore. It's not made up of just one kind of ecosystem -- there are many different ecosystems within the Park. That's diversity!

**Teaching suggestions:**

1. Show your students the Practice Ecosystem Investigation Prediction Chart. Ask them about the titles at the top of each unshaded column. What do they think each of these places will be like? Discuss their ideas briefly.
2. Tell students to look for these ecosystems while viewing the included video.
3. Review the five ecosystems. What did the video show about each one? Make a chart on the board with the name of each ecosystem at the top. List as many characteristics as students can think of for each ecosystem. Add to their descriptions with characteristics from the "Background on Ecosystems of Indiana Dunes National Lakeshore," above and from the books included in your kit.
4. Then ask each student to draw one of the ecosystems on scratch paper or butcher paper. (Allow about five minutes.)
5. Move students into small groups now. Have students show each other their drawings and talk about why they chose that ecosystem to draw.
6. Let them discuss answers to the questions on page 7 of their journals in their small groups. Each student should record his or her own predictions on the chart. Instruct students to record their predictions in the row next to the heading given with the question. You can have the students rate on a scale, from 1 to 5, or have them choose one ecosystem and explain why they chose that particular ecosystem as the windiest, warmest, etc.

**Wind speed:** Which ecosystem will be the windiest?

**Temperature:** Which place will be warmest?

**How Long Does a Puddle Last:** Which place would have the longest lasting puddles?

**Plants:** Which place do you think will have the greatest number of different kinds of plants?

**Animals:** Which place do you think will have the greatest number of different kinds of animals living in it or visiting it?

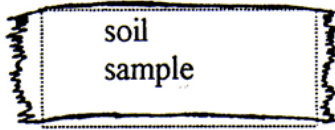
7. When students have finished, ask the following question of the whole class and let them work for a few minutes with their group. Have them write their ideas on a scrap piece of paper. What kind of evidence will you look for, if you don't see the animals themselves?

8. Read aloud with the students the instructions on the Soil Samples page. Students will add their soil samples to the scratch paper or butcher paper on which students have drawn their ecosystems. Let them practice taking soil samples with the soil included in the kit.

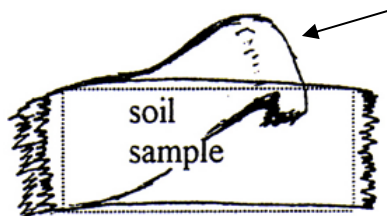
## Soil Samples

Here's how to collect a soil sample:

1. Stick a strip of clear tape about 3 cm long over the box marked "soil sample."



2. Now, stick a second strip of tape, about the same size, over the first one, with one end folded under.



3. Practice taking a soil sample on this page.



a) Get a pinch of soil.

- b) Lift up on the turned over part of the second tape. ***Be sure to leave one end still attached!***

- c) Sprinkle your soil in the middle of the first piece of tape. Push the soil into a little pile, so the upper tape will have a place to stick!



- d) Put the second piece back down to secure your sample.

## **Pre-Visit Activity 5: Time Traveling**

**Quick Summary:** Class discussion provides an introduction into the different groups of people who have lived in the Indiana dunes region and how each group valued the land.

**Rationale:** When they visit the National Lakeshore, students will be learning about how different groups of people have lived and worked in this area and how each group used and valued the land around them. Students need to recognize the different values each group of people had about the environment.

**Disciplines included:** history, social studies (See Appendix B for standards met by the Walk Through Time)

**Approximate time required:** 20-30 minutes of discussion and work in their journals.

### **Materials needed:**

- Student journal page 5, “Walk Through Time at the Indiana Dunes National Lakeshore”
- Chalkboard or large piece of paper
- Book from pre-visit kit entitled, The Indiana Dunes Story
- Large pieces of paper for drawing
- Markers or crayons.

### **Teaching Suggestions:**

1. As background reading for yourself, read chapters 4 & 5 in “The Indiana Dunes Story” found in your pre-visit kit.
2. First ask the students to name some groups of people who might have lived in the Indiana Dunes area before now. Write their list of suggestions on the board. Then ask the students to open their journals to the “Walk Through Time” page which lists five time periods from the 1700’s to the present and the types of people who lived in the area. Compare the students’ list to this page.
3. Briefly discuss each of these groups of people and how they lived. What tools did they use? How did they make a living or survive in the dunes? Have the students answer the questions on their journal page about how each group used the land.
4. Ask the students to break into small groups and give each group a larger piece of paper, markers or crayons. Have each group draw a picture of the dunes from the point of view of a different historical group – Potawatomi Indians, European fur traders, early farmers, industrialists and the National Park Service. After the students finish their drawings, have them share their work with the other groups and explain them.
5. In conclusion, ask the students what values each group of people might have had about the land and the environment. Define value for them if necessary as what something is worth to someone, how important it is to them and how they use it. Ask them how the value of the dunes has changed over time.

## Pre-Visit Activity 6: Exploring Artifacts

**Quick summary:** Students watch a video and explore some hands-on materials in preparation for encounters with creatures, plants and environments of the National Lakeshore.

**Rationale:** These are brief encounters to familiarize students with organisms and situations at the National Lakeshore using some hands-on materials. The video pertains to the “Salmon Game” that students will be playing during the Cowles Bog Hike. These activities give the students a preview of the hands-on exploration they will be immersed in during their Dunes Learning Center experience.

**Disciplines included:** science, critical thinking (See Appendix C for standards met by the Salmon Game)

**Approximate time required:** 40 minutes

### Materials needed:

- Video: *Wastewater -- An Environmental Resource*
- Mammal skins
- Zebra mussel shells
- Sand, magnet and lenses from plastic boxes
- Crinoids

**Preparation:** If you have a table or counter space, make these into learning stations that students can visit on their own. Or, circulate the materials around the classroom, with students working in small groups.

### Teaching suggestions:

1. The short video on wastewater is an uplifting look at East Chicago. Students will be playing a game at the National Lakeshore based on the life cycle of the salmon shown in the film.
2. Quite a few mammals live in the National Lakeshore. Some of them live in only one or two of the ecosystems we will visit. Others can be found everywhere. Challenge your students to design an animal that could be comfortable in all the conditions at the National Lakeshore.
3. Zebra mussels are one species of many that have been introduced to the Great Lakes and the surrounding land. Have students look carefully at these because they may be able to find more on the beach. Zebra Mussels are one of the “Management Dilemmas” your students may be exploring during their Dunes Learning Center experience.

If you and your students would like to learn more about zebra mussels and other aquatic exotic species, you can borrow a trunk with a ten-activity curriculum guide for free. To locate the closest trunk, contact:

Robin Goettel  
Illinois-Indiana Sea Grant Program  
University of Illinois, 65 Mumford Hall  
1301 West Gregory Drive  
Urbana, IL 61801  
(217) 333-9448 [r-goettel@uiuc.edu](mailto:r-goettel@uiuc.edu)

4. The sand that makes up the dunes along Lake Michigan is composed of many different minerals. Looking at the sand with a magnifier will reveal many colors and shapes. A strong magnet held against the outside of the bag will separate the iron bearing particles. How many different minerals can students find in this sand sample?

5. There are many different kinds of rocks along the Lake Michigan shore. Some of them were brought hundreds of miles by the glaciers that carved out the lake basin. Others are from nearby rock formations, some of which are deep under the lake. Some of these rocks reveal evidence of a much different body of water, long, long ago. Tiny fossils provide evidence that a shallow salt sea once covered this area. The crinoid fossils included in the kit are from the stalk of an aquatic animal that looks a bit like a flower. It attaches itself to the sea floor and its upper flower-like part has waving “arms” that collect floating food. The stalk is made up of a stack of disks like the one included. Crinoids have been around for about 500 million years. Challenge students to find crinoids when they visit the beach.

## **Post-Visit Activity 5: Analysis of Ecosystem Investigations**

**Quick summary:** Students have completed investigations of some Ecosystems of Indiana Dunes National Lakeshore through videos, reading, predicting and hands on study. The predictions they made can now be analyzed by comparing them with the actual data they collected. *This activity is particularly important if your schedule does not include the “Ecosystem Wrap-up.”*

**Rationale:** Students require guidance to make connections and develop a broad picture of the incredible diversity of Ecosystems at Indiana Dunes National Lakeshore. In this activity, they have time to reflect, discuss and compare their findings.

**Disciplines included:** science, critical thinking

**Approximate time required:** 60 to 75 minutes

### **Materials needed:**

- Student journals (page 8): Ecosystem Investigation Chart
- Student journals (pages 9-13): Ecosystem Drawings and Descriptions
- Student journals (page 7): What Will the National Lakeshore Be Like?
- Hand lens or dissecting scope to look at soil samples

**Preparation:** Make sure each student has the data filled in on their Ecosystem Investigation Chart. This can be done by posting the master chart for your group, or having students work together to fill in any missing data.

Choose which questions in #2 you will assign students. If one parameter (such as sky condition) remained the same throughout, skip that question. Use the master page and cut questions apart to give a copy of their question to each group.

### **Teaching suggestions:**

1. Prior to visiting the Indiana Dunes National Lakeshore, your students made predictions based on these questions. They recorded their predictions on page 7 of their journals, What Will the National Lakeshore Be Like? Have your students look at this page now.

**Wind speed:** Which ecosystem will be the windiest?

**Temperature:** Which place will be warmest?

**How Long Does a Puddle Last:** Which place would have the longest lasting puddles?

**Plants:** Which place do you think will have the greatest number of different kinds of plants?

**Animals:** Which place do you think will have the greatest number of different kinds of animals living in it or visiting it?

2. Assign small groups of students to work through the charts in their journals and compare their predictions with their actual data. Have them use questions like the following list. Assign each group one question to discuss. Have them develop a graph, drawing, model or skit to show their explanation to the rest of the class. If one parameter (such as sky condition) remained the same throughout, skip that question. Tell students that the suggested answers in parentheses do not include all possibilities. Give them about 15 to 20 minutes to complete the assignment.

- a) How did the sky conditions change throughout your investigations? (may have increased or decreased clouds, precipitation stops or starts)
- b) Where was the windiest place? Why do you think it was windiest? (could be time of day, vegetation, landforms, how close you were to the lake)
- c) Where was the air warmest? Why was it warmer? (could be wind, amount of shade, how close you were to the lake, sky conditions, time of day...)
- d) Where was the soil surface warmest? Why? (could be amount of shade, color, plants, moisture, sky conditions, time of day, season...)
- e) Where was the underground soil the warmest? Why? (moisture, soil type, season, plants...)
- f) Where was the water warmest? Why? (season, time of day, recent weather, vegetation, currents,...)
- g) Where did the puddle last the longest? Use a magnifier to look at your soil samples. Do you see any clues about why this soil kept the water sitting so long? (particle size, dead plant material, had been walked on a lot...)
- h) Which place had the greatest number of different kinds of plants? Why do you think that is so? (soil, moisture, time since disturbance...)
- i) Which place had evidence of the greatest number of animals living or visiting there? Why do you think this is so? (could be actual -- more micro habitats, food or water or shelter available, time since last disturbance; OR could be that evidence was more available, such as mud or smooth sand for tracks, etc.)
- j) How did the eastern deciduous forest change from the first time you visited to the second time? What caused the changes? (time of day, weather, animal activity...)

3. Have each group present their ideas.

4. In whole class discussion, ask this question:

Were any of these ecosystems alike? How?

Challenge your students to develop a Venn diagram that shows how the ecosystems

were the same or different. They could use 5 overlapping circles.

5. Ask students to make an entry in their journal, answering the following final question. Have them use a page that was not used before or give them a new sheet to add.

Why should Indiana Dunes National Lakeshore include/protect all these Ecosystems?

Optional extension: Have students choose a location for an Ecosystem Investigation near the school. Compare this data to the data from the Indiana Dunes National Lakeshore.

If you have access to the Internet, your students can compare their data with other students' data -- taken at other times of the year. Also, your students can display the data they collect from sites near your school on the Learning Center web page ([www.duneslearningcenter.org](http://www.duneslearningcenter.org)).

Another option: The next three pages contain addresses and brief descriptions of other national parks that have residential learning centers. Your students can contact these other centers by mail or Internet to find out more about their programs or possibly correspond with students who have visited there.

## **NATIONAL PARK SITES WITH RESIDENTIAL LEARNING CENTERS**

To learn more about other national parks, contact students who have visited those parks recently. Each of these national and international parks provides environmental education programs to school groups. They would love to hear from you and learn about your experience at Indiana Dunes National Lakeshore, and in return, they might share information about their parks. You can contact the students through the education centers either by e-mail or by the regular post. All addresses are provided if they are available. Each of the parks also has a web site that offers information about the plants and animals that can be found there.

**CUYAHOGA VALLEY ENVIRONMENTAL EDUCATION CENTER**  
**CUYAHOGA VALLEY NATIONAL RECREATION AREA**  
3675 Oak Hill Road  
Peninsula, OH 44264  
E-mail: [info@cveec.gov](mailto:info@cveec.gov)  
Web site: <http://www.nps.gov/cuva/cveec.htm>  
Attn: Resident program coordinator

*CVEEC operates a 4-day residential program for 4th-8th grade students, many of whom are from Akron and Cleveland, Ohio. The park is located along the Cuyahoga River, and the Center's program focuses on the watershed ecosystem.*

**WOLF CREEK & HOWLAND HILL OUTDOOR SCHOOLS**  
**REDWOOD NATIONAL PARK**  
1111 Second St.  
Crescent City, CA 95531  
Web site: <http://www.nps.gov/redw/odschool.htm>

*Redwood National Park in California operates two outdoor schools where students learn about the ancient forests first hand.*

LOOP ROAD ENVIRONMENTAL EDUCATION CAMP & HIDDEN LAKE EDUCATION CENTER  
EVERGLADES NATIONAL PARK  
40001 State Road 9336  
Homestead, FL 33034-6733  
Web site: <http://www.nps.gov/ever/ed/camp.htm>

*Everglades National Park operates two education camps targeting 4th-6th grade students. Their three-day programs immerse students in the variety of wildlife and ecosystems within the park.*

TETON SCIENCE SCHOOL  
GRAND TETON NATIONAL PARK  
P.O. Box 68  
Kelly, WY 83011  
E-mail: [tss@wyoming.com](mailto:tss@wyoming.com)  
Web site: <http://www.nps.gov/grte>

*The Teton Science School has been in operation for many years providing educational opportunities for teachers, children, and park visitors within the Grand Teton National Park in Wyoming.*

POCONO ENVIRONMENTAL EDUCATION CENTER  
DELAWARE WATER GAP NATIONAL RECREATION AREA  
RR 2, Box 1010  
Dingmans Ferry, PA 18328  
E-mail: [peec@ptd.net](mailto:peec@ptd.net)  
Web site: <http://www.peec.org>

*The Pocono Environmental Education Center runs a year-round educational facility for children and adults and is located within Delaware Water Gap National Recreation Area.*

GREAT SMOKY MOUNTAINS INSTITUTE AT TREMONT  
GREAT SMOKY MOUNTAINS NATIONAL PARK  
9275 Tremont Rd.  
Townsend, TN 37882  
E-mail: [gsmmit@igc.apc.org](mailto:gsmmit@igc.apc.org)  
Web site: <http://www.nps.gov/grsm/tremont.htm>

*The Institute at Tremont offers an array of environmental education programs for schools, and students travel far and wide to attend the residential center. Check out their web site to see what students have been doing at Tremont.*

NORTH CASCADES INSTITUTE

NORTH CASCADES NATIONAL PARK  
2105 State Road 20  
Sedro-Woolley, WA 98284  
E-mail: [nci@ncascades.org](mailto:nci@ncascades.org)  
Web site: <http://www.ncascades.org/nci>

*Located in the heart of the Pacific Northwest, the North Cascades Institute offers environmental education programs for children and adults.*

KAMPINOS NATIONAL PARK  
38 Tetmajera St.  
05-080 Izabelin  
Poland  
Web site: <http://www.mos.gov.pl/kzpn/en/en9.htm>

*Kampinos National Park is located near Warsaw, Poland. It is the sister park to Indiana Dunes National Lakeshore and shares many of its characteristics. Staff at Kampinos operates an environmental education center for students in their area.*

## **Post-Visit Activity 6: Champions of Our Town**

**Quick summary:** Students discuss ways to protect or enhance the ecosystems in their own community. They take on a project that can involve everyone.

**Rationale:** The “Walk Through Time” activity provided models for students to think about and imitate. By applying what they learned about ecosystems, disturbance, land use and artistic inspiration, they can begin to make their own community a better place to live.

**Disciplines included:** social studies, science, art, language arts, possibly mathematics

**Approximate time required:** several days: one hour first day, additional time depends on project chosen.

**Materials needed:**

- Student journals
- Other materials depend on project chosen

**Preparation:** Read over the teaching suggestions. Think about the limits that you want/need to impose on students -- time, distance, cost, materials, etc. With these decisions made, you'll be ready to discuss students' project ideas.

**Teaching suggestions:**

1. Ask students to recall their encounters with the characters from the “Walk Through Time”. They may remember more about the activity than the character, but that’s all right. You want them to think about the ideas and the concerns that person expressed.

2. Invite students to think of roles for themselves: What kind of work could you do in our community? List their ideas on the chalkboard. For now, list everything, whether achievable or not. If students have trouble getting started on this list, ask more specific questions, such as:

- What could we do that might reduce the negative effect of land use on an ecosystem? Remind them about the ecosystem you mapped before your trip. For example, if trash blows into a small wetland from the picnic area, maybe your class could sponsor a wetland clean-up day to pick up trash.
- What places in our community could we feature in artwork? Perhaps they know of an inspiring tree, or the shadows on the buildings make interesting shapes at certain times of day. Your class might develop art work for an art show, a series of community posters or a calendar illustrated with scenes featuring locations in your community.
- What ecosystems in our community could we investigate? How would data from a local ecosystem compare with the data we gathered at the Indiana Dunes National Lakeshore? What plants and animals live in these local ecosystems? Students could use these results for a science fair project, Earth Day display or as the basis for art work.

- What disturbances could we research or improve? What kinds of disturbances affect natural ecosystems in our community? What kinds of animal signs can we find in local ecosystems? If human caused disturbances have a negative effect, is there something we could do to change one of them? For example, if soil from a bare slope washes into a local stream each time it rains, students could plant a mixture of grass and wildflowers or prairie plants.

3. After your list has eight to ten items, go back over the list with your students. Make suggestions to them about which ideas represent possible projects for the class. Help them consider time, cost, and distance to the location, how to include everyone in the project and what kind of support they might need for their project.

Narrow the list to three choices. Have each student choose the project they would most like to accomplish, write the name of that project on a slip of paper and hand it in without showing it to anyone. Tally the results. The project with the most votes is the project everyone will do.

4. Discuss and plan the strategy needed to complete the project. Some of the steps you may need to include:

- Information gathering or research
- Fund raising or donation of supplies
- Scheduling
- Individual and group responsibilities
- Advertising or publicity

5. As your students work on the project, be sure that the local newspaper knows about their work. They may want to do a feature article, publicize your event or even publish students' work.

6. Let the Learning Center know what your students are doing. We will feature your students' project on our web page and display items on the bulletin board in the dining hall.

## **Post-Visit Activity 7: Earth Day Every Day**

**Quick summary:** Students write persuasive essays and give oral presentations on an environmental topic of their choosing.

**Rationale:** At the Dunes Learning Center, the students engaged in practices to minimize their impacts on the landscape and the dunes region. Students practiced “Leave No Trace” principles on the Cowles Bog Hike, recorded Food Waste in the cafeteria, and may have created a solution for a management dilemma the National Lakeshore faces. This activity will build upon these experiences by persuading others to engage in practices that make every day Earth Day!

**Disciplines included:** English, language arts

**Approximate time required:** several days: one or two for researching and writing the persuasive essay and a third day for oral presentations.

**Materials needed:**

- “You have the power to change the world” page
- Computer lab or library; access to the internet for research

**Preparation:** Read over the teaching suggestions and the “You have the power to change the world” page. Set a timeline for student research, student writing, and a date for oral presentations.

**Teaching suggestions:**

1. Ask the students to recall ways in which they helped the environment while at the Dunes Learning Center. Did they pick up litter on Cowles Bog beach? Did they earn the Karner Blue Butterfly award for zero food waste? Did they pack-out everything they packed-in on the Cowles Bog hike (including their own toilet paper?) Did they turn out lights when leaving their cabins?
2. Generate a list of simple actions all students can take to minimize their own negative impacts on the land, individually or in groups.
3. Read over the “You have the power to change the world” page with your students. Ask each student to become an expert on one of the six ideas listed, or have them generate their own topic.
4. The students’ task will be to convince others, through a persuasive essay, to engage in the activities listed. If possible, block off time in your school’s computer lab or library for students to research facts related to the earth-friendly actions that help support the case for why others should engage in these activities. Set a time line for student research and for writing their persuasive essays. Set a date for oral presentations to be given.

## **You have the power to change the world**

Just about everything you do has an effect on the environment. More and more kids all over the world are doing positive things for the environment. You can be sure that when millions of kids all start to do things for the environment, the entire world will notice. So what are you going to do?

Here are some ideas you can start with at your own home.

### **Cut down your use of energy**

- Turn off electric lights and appliances when no one is in a room.
- Keep windows and doors closed when heating or cooling your house.
- Turn down the heat at night or when no one is at home.
- Decide what you want from the refrigerator before you open it.
- Encourage your family to use fluorescent or compact fluorescent light bulbs. They use less energy and last ten times longer than most incandescent bulbs.
- When you boil water on the stove, leave the lid on the pot.

### **Watch your use of water**

- Take shorter showers (five minutes or less).
- Turn off the faucet while brushing your teeth and while washing dishes.
- Fill the dishwasher full before running.
- Turn off faucets all the way, and report any leaky faucets.
- Place a plastic jug filled with water in your toilet tank to reduce the amount of fresh water that goes down the drain each time you flush. Your parents can help you with this.
- Don't pour unknown chemicals or hazardous chemicals down the drain.

### **Cut down your amount of trash.**

You can do this by *Reducing, Reusing, and Recycling*.

- Don't litter!
- Buy things with less packaging.
- Check the labels of products and try to buy things that are made from recycled materials (rather than materials that can be recycled).
- Avoid materials that cannot be recycled (aerosol cans, juice boxes, Lunchables, styrofoam, etc.).
- If only buying one or two things, carry them in your hands instead of getting a bag.
- Reuse shopping bags. Even better than that, use a cloth bag.
- Pack your lunch in a reusable container, and even put your sandwich and snacks in reusable containers.

- Reuse things creatively. Make things out of things you might otherwise throw away. For example, make a flowerpot out of an old milk jug. Old clothes could make nice cleaning rags. You could decorate an old shoebox and use it to store things or wrap presents in. Newspapers can be used as wrapping paper.
- Use all sides of paper before recycling it.
- Recycle anything you can't reuse, such as: Aluminum (cans and foil), steel, tin, paper (newspaper, office paper, telephone books, magazines, etc.), cardboard, plastics, glass, and motor oil. If your town doesn't pick up recyclables, have an adult help you look in the phone book to figure out where you can take them.
- Recycle your old clothes by giving them to a friend or a needy person. You can donate various items to Goodwill or any other place similar to that in your area.

### **Save plants and animals**

- Don't feed wild animals.
- Don't buy products tested on animals.
- Treat all living things with respect.
- Don't pick or trample on plants.

### **Transportation**

- Carpool when possible.
- Combine several errands at once.
- Walk, bike, skate, or take the bus.
- Ask adults to keep their cars in shape to minimize polluting effects.

### **More ideas for eco-friendly living**

- Plant a tree.
- Clean up a street or park (get permission first).
- Compost.
- Buy organic and locally grown foods.
- Try to buy foods in season.
- Join an environmental group.
- Don't buy products from companies that are not environmentally responsible.

## Post-Visit Activity 8: Who's Spawning?

**Quick summary:** Students create graphs of mortality data based on the results of the Salmon Game played on Cowles Bog hike.

**Rationale:** Student data lacks meaning and context if it is not utilized to make larger statements about a system. Students will graphically portray the results of salmon survival and mortality from the simulation game they played at the Dunes Learning Center and use the data to predict how stable the “simulated” salmon system was. They will research actual survival and mortality data from salmon in Lake Michigan to compare the accuracy of the simulation.

**Disciplines included:** Science, mathematics

**Approximate time required:** two days: one to produce the graphs and a second for library research and comparison.

**Materials needed:**

- Student journal pages 15-16: The Salmon Game
- Computer lab or library; access to the internet for research
- Scratch paper or butcher paper for graphs

**Preparation:** Make sure all students have completed the salmon survivorship and mortality rates in their journals from the simulated “Salmon Game” on pages 15-16. If they haven't, using calculators or by hand, have the students finish the calculations.

**Teaching suggestions:**

1. Ask students to think back to the “Salmon Game” they played while on the Cowles Bog beach. Ask them to remember the factors that led to salmon mortality (the turbine, predators, and anglers).
2. Refer them to pages 15-16 of their journals showing the salmon survivorship and mortality before and after limits were imposed. Tell the students they will be making bar graphs to show how much each factor contributed to salmon mortality before limits were imposed. Where were the most salmon lost? Students can produce these charts on scratch paper or butcher paper, individually or in a group.
3. Next, relate the mortality factors as percentages. What percentage of salmon died in the turbine, from the predators, and from the anglers? This information can be portrayed in a pie chart. Students can produce these charts on scratch paper or butcher paper, individually or in a group.
4. Follow the same process as above for creating bar graphs and pie charts for salmon mortality after limits were imposed. When all graphs and charts are complete, compare them. How do the before limits graphs compare to the after limits graphs? Did the limits imposed reduce salmon mortality?

5. Next, tell the students the results they see are based on a simulation, or a game representing what happens to salmon in real life. But how accurate is the game at presenting the real mortality of salmon? Tell the students they will be researching the actual rates of mortality and survivorship in Lake Michigan and comparing those results to the data collected during the game.

6. When students have completed their library research, compare with the graphs and charts. Are the percentages of mortalities in our game accurate? If not, what in real salmon's life are the biggest barriers to survival? What is the actual percent survivorship of salmon on their spawning journey? The students can produce the same graphs and charts using actual salmon survivorship data and compare the simulated results to the actual results. Ask the students what would make the Salmon Game more accurate?

# Appendix A

## Ecosystem Investigations Academic Standards

### Cowles Bog Hike: Ecosystem Investigations

**Indiana Grade 4 Science Goal:** *[Students] study how the shape of the land changes over time and how natural resources are in limited supply.*

### **The Nature of Science Grade 4 Process Standard**

Students gain scientific knowledge by observing the natural and constructed world, performing and evaluating investigations, and communicating their findings.

- Make predictions and formulate testable questions.
- Plan and carry out investigations—often over a period of several lessons—as a class, in small groups or independently.
- Perform investigations using appropriate tools and technologies that will extend the senses.
- Use measurement skills and apply appropriate units when collecting data.
- Test predictions with multiple trials.
- Keep accurate records in a notebook during investigations and communicate findings to others using graphs, charts, maps and models through oral and written reports.
- Identify simple patterns in data and propose explanations to account for the patterns.
- Compare the results of an investigation with the prediction.

### **Standard 2: Earth Science**

#### **4th grade Core Standard:**

Observe, investigate and give examples of ways that the shape of land changes over time.  
(4.2.1, 4.2.2, 4.2.3)

#### **4th grade Standard 2: Life Science**

4.3.2 Observe, compare and record the physical characteristics of living plants or animals from widely different environments. Describe how each plant or animal is adapted to its environment.

#### **4th grade SS Standard 3: Geography**

4.3.6 Describe Indiana’s landforms (lithosphere\*), water features (hydrosphere\*), and plants and animals (biosphere\*).

### **Grade 5: Science**

#### **Standard 3: Life Science Core Standard:**

Observe, describe and ask questions about how changes in one part of an ecosystem create changes in other parts of the ecosystem.

5.3.1 Observe and classify common Indiana organisms as producers, consumers, decomposers, predator and prey based on their relationships and interactions with other organisms in their ecosystem.

5.3.2 Investigate the action of different decomposers and compare their role in an ecosystem with that of producers and consumers.

*\*If Ecosystem Wrap-up is included in your school's schedule, the following standards apply:*

**Ecosystem Investigations Conclusion/Wrap-Up**

4<sup>th</sup> grade - Mathematics- 2011-12 NEW! GRADE 4 IN AND CCSS MATHEMATICAL PRACTICES

4.7.4a Solve problems, justify arguments, and make conjectures by using a variety of methods such as words, numbers, symbols, charts, graphs, tables, diagrams, tools, and models.

**GRADE 5 English Language Arts: 2011-12 NEW! INDIANA AND COMMON CORE ELA**

Reading Informational Text

5.2.1 b. Interpret graphics, diagrams, illustrations, charts, maps to answer specific questions.

5.2.4 a. Use specific details from the text along with prior knowledge to make conclusions that allow you to draw reasonable inferences.

5<sup>th</sup> grade- Mathematics- 2011-12 NEW! GRADE 5 IN AND CCSS MATHEMATICAL PRACTICES

5.3.7a Answer questions using information from a graph or diagram.

# Appendix B

## Walk Through Time Academic Standards

### 4<sup>th</sup> Grade: Standard 1: History

*Students will trace the historical periods, places, people, events and movements that have led to the development of Indiana as a state.*

#### **Chronological Thinking, Historical Comprehension, Analysis and Interpretation, Research**

4.1.15 Create and interpret timelines that show relationships among people, events, and movements in the history of Indiana. (Individuals, Society and Culture)

### 4<sup>th</sup> Grade: Standard 1: Historical Knowledge *American Indians and the Arrival of Europeans to 1770*

4.1.2 Identify and describe historic Native American Indian groups that lived in Indiana at the time of early European exploration, including ways these groups adapted to and interacted with the physical environment. (Individuals, Society and Culture)

**Example:** Miami, Shawnee, Potawatomi and Lenape (Delaware)

4.1.12 Describe the transformation of Indiana through **immigration** and through developments in agriculture, **industry** and **transportation**. (Individuals, Society and Culture)

**Example:** The impact of improved farming methods on Indiana agriculture; the development of Indiana's automobile industry such as the Studebaker and the Duesenberg; the glass industry; the Ball Brothers; **the growth of the steel industry in northern Indiana**; and immigrant influence on cities and coal mining regions of the state

### 4<sup>th</sup> Grade: Standard 3: Geography

4.3.9 Explain the importance of major transportation routes, including rivers, in the exploration, settlement and growth of Indiana and in the state's location as a crossroad of America.

### 4<sup>th</sup> Grade: Standard 4: Economics

4.4.3 Explain how both parties can benefit from trade\* and give examples of how people in Indiana engaged in trade in different time periods.

4.4.6 List the functions of money\* and compare and contrast things that have been used as money in the past in Indiana, the United States and the world.

### 5<sup>th</sup> Grade: Standard 1: History

5.1.6 Identify and discuss instances of both cooperation and conflict between Native American Indians and European settlers, such as agriculture, trade, cultural exchanges and military alliances, as well as later broken treaties, massacres and conflicts over control of the land. (Individuals, Society and Culture)

**5<sup>th</sup> Grade: Standard 3: Geography**

5.3.11 Describe adaptation and how Native American Indians and colonists adapted to variations in the physical environment.

**5<sup>th</sup> Grade: Standard 4: Economics**

5.4.8 Analyze how the causes and effects of changes in price of certain goods\* and services\* had significant influence on events in United States history.

**Example:** The price of cotton, **the price of beaver pelts** and the price of gold all are related to specific events and movements in the development of the United States.

# Appendix C

## The Salmon Game Academic Standards

**Indiana Grade 4 Science Goal:** *Students study how the physical characteristics of organisms affect survival and reproduction.*

4<sup>th</sup> grade -Mathematics- 2011-12 NEW! IN AND CCSS MATHEMATICAL PRACTICES SMP4. Model with mathematics.

\*4.6.3c Produce graphs from data collected to display results.

\*If graphs are produced in the classroom as a post-visit activity from salmon mortality data

4.7.4a Solve problems, justify arguments, and make conjectures by using a variety of methods such as words, numbers, symbols, charts, graphs, tables, diagrams, tools, and models

### Grade 5: Science

#### Standard 3: Life Science *Core Standard:*

5.3.1 Observe and classify common Indiana organisms as producers, consumers, decomposers, predator and prey based on their relationships and interactions with other organisms in their ecosystem.

### GRADE 5 English Language Arts: 2011-12 NEW! INDIANA AND COMMON CORE ELA

#### Reading Informational Text

5.2.1 b. Interpret graphics, diagrams, illustrations, charts, maps to answer specific questions.

5.2.4 a. Use specific details from the text along with prior knowledge to make conclusions that allow you to draw reasonable inferences.

### 5<sup>th</sup> grade- Mathematics- 2011-12 NEW! GRADE 5 IN AND CCSS MATHEMATICAL PRACTICES

5.3.7a Answer questions using information from a graph or diagram.