| **Indiana Dunes**  **Education** | National Park Service  U.S. Department of the Interior  **Indiana Dunes National Lakeshore**  **Education Department** | National Park Service Logo |
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**Pinhook Bog**

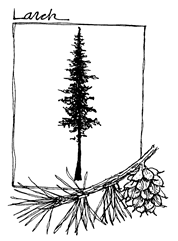
**Summary:**

Indiana’s true quaking bog is a special geologic feature of this region which preserves a large variety of plants with extraordinary adaptations for survival. Hike into a strange and unique world of the bog. See insect eating plants and tamarack trees; walk on a boardwalk that is placed upon a floating mat of sphagnum moss. This hike will help you understand and appreciate the diversity of ecosystems in Northwest Indiana.

**Objectives:** students will be able to

At the end of this program, participants will be able to:

1. Describe how the bog was formed.
2. Describe what conditions are necessary for the bog’s continued existence.
3. List three bog plants and explain an adaptation of each one.
4. State the importance of preserving natural habitats such as Pinhook Bog.



**What to expect on during your trip:**

1. Group arrives at the Dorothy Buell Memorial Visitor Center and follows the ranger to Pinhook Bog or meets the ranger at the bog. Please specify when you schedule your program.

2.After the group is safely in the bog parking lot, a brief introduction is given, and the tour begins.

3. The program (hike portion) is about an 1 hour in length. The bog trail is very short, only about ¼ of a mile in length. But there are many things to see along the way. Students will be engaged in exploration activities to learn about the special features of the bog.

**Setting:**

Pinhook Bog

**Grade:**

6th – 12th grade.

**Ratio of students to ranger:**

Ratio of students to ranger: 15 per ranger is ideal; due to staffing limitations, we will try to accommodate more with the teacher’s help.

**Safety Issues:**

The trail is a plastic boardwalk which is floating. Boots and sneakers that can get wet and dirty are the recommended footwear. Poison sumac, a tree which can cause an itchy rash upon skin contact, grows in the bog along the trail. Participants will be shown this tree and cautioned to avoid it.

**Background Information:**

What is a bog? - Doug Wilcox, who did extensive research at Pinhook Bog, believes it is the only true bog in Indiana. It derives its water from rain and the surrounding small watershed. The impermeable clay layer in the bottom of Pinhook prevents groundwater containing dissolved calcium-bicarbonate from entering the bog and neutralizing the mineral poor, acidic water.

Sphagnum moss plays a central role in developing the acidic water by releasing acid ions. The poorly oxygenated, acidic water is probably the single most important factor in allowing peat to form. This process limits the vegetation to the distinctive species that grow in the bog. (Wilcox, memo) Pinhook's unique environment is the home of 27 rare plants that are on the State of Indiana endangered, threatened, rare, or watch lists. (Stewart, Pavlovic. 1993). Most of these plants are not acid loving; rather they are limited to growing in bogs because of their inability to compete successfully against other species in other environments. (Wilcox, 1982)

How did Pinhook bog form? When the Wisconsin Glacial ice sheet retreated from this area 14,000-15,000 years ago, numerous large ice blocks were buried by the rock debris carried by the glacier.. When the ice blocks melted, they gave rise to several groups of kettle-hole lakes. The ice block that formed Pinhook Bog was grounded in glacial till of sand and clay. This clay layer isolated the kettle-hole lake from the groundwater.

About 4,200 years ago, submerged and floating plants colonized the water just below the surface. (Wilcox, Simonin) The submerged plants limited the wave action allowing reeds and grasses to grow in the shallows. Sphagnum moss filled the open areas between the plants and formed a mat. Utilizing logs and other solid objects, the mat thickened as it extended over the open water. The thickened mat supported herbaceous plants and eventually trees and shrubs.

The dead plant material sloughed from the bottom of the mat cannot decompose in the low oxygen and mineral poor, acidic water. This material transforms into peat at the bottom of the lake. The peat deposits became thick enough to ground the older portions of the mat to the bottom of the shallow portions of the lake. The floating mat continued to grow across the surface of the lake until the open water area was eliminated. The lake water is trapped under the mat. (Wilcox, 1982)

**Prerequisite Classroom Activities:**

Prior to your visit to Indiana Dunes National Lakeshore, please take a moment to read through the information listed below. We suggest that you do one or more of the described activities with your class in order to prepare them for the lessons and experiences they will have during their field trip.

A list of vocabulary words and plants to research has been provided to prepare students for their visit to the bog. If there is a special topic or area that you want the ranger to cover during the presentation, please contact the park’s scheduling office, and every effort will be made to accommodate your request.

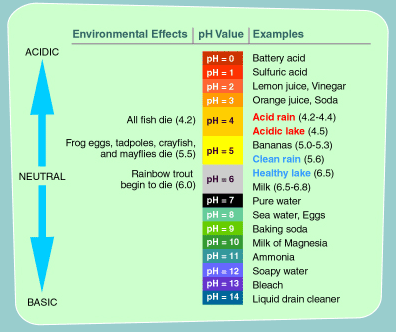
SCIENCE ACTIVITY:

Materials: Small potted plants, orange juice, paper for recording observations, aquariums, aquarium filter system and litmus paper.

Experiment with the pH scale, testing common items with litmus paper. Some examples of items to test would be tap water, vinegar, ammonia, lemon juice or a water and baking soda solution. Have students read their results. Compare the results of their tests to the pH scale provided and discuss the types of environments that are healthy for certain organisms.

Take some small living plants and water them for a few weeks with orange juice to simulate the pH of the bog water. Keep a few plants which are only given water as the control group.

Have the students keep a record of the plants’ growth, measuring size, observing general appearance, etc. Again use the pH scale included in this packet to discuss the effects of low pH on plant life.



Plants common to Pinhook Bog to Research:

Pitcher plant (Sarracenia purpurea)

Bladderwort (Utricularia geminiscapa)

Round-leaved sundew (Drosera rotundifolia)

Rusty cotton grass (Eriophorum virginicum)

Orange fringed orchid (Habenaria ciliaris)

White pine (Pinus strobus)

Pink lady’s slipper (Cypripedium acaule)

Poison sumac (Rhus vernix)

Mountain holly (Nemopanthus mucronata)

Downy highbush blueberry (Vaccinium atrococcum)

Large cranberry (Vaccinium macrocarpon)

Small cranberry (Vaccinium oxycoccos)

Tamarack (Larix laricina

Buttonbush (Cephalanthus occidentalis)

Sphagnum moss (Sphagnum) over 14 of 28 species in Indiana are in the bog. 3 of the 28 are only found in Pinhook.

**Vocabulary:**

glacier – a large body of ice moving slowly down a slope or valley or spreading outward on a land surface. Usually carrying, pushing, or depositing loose rock and other debris and eroding land forms along the way. The perennial snowfield, on which falling snow is converted to a granular icy mass through the pressure of successive snowfalls and through the freezing of seasonal meltwater becomes solid ice, and flows plastically downward to form the body of the glacier. This grows or shrinks according to whether snowfall exceeds the rate of melting or not.

kettle lake – a steep-sided lake without surface drainage especially in a deposit of glacial drift.

adaptation – something that a plant or animal has or does that enables it to survive.

carnivorous plant – subsisting on nutrients obtained from the breakdown of animal protoplasm.

decompose – to cause chemical disintegration of organic matter

pH – used in convenience in expressing both acidity and alkalinity usually on a scale of 0 to 14 on which 7 represents the value for pure water at neutrality. Values less than 7 represent increasing hydrogen-ion concentration and increasing acidity. Values greater than 7 represent decreasing hydrogen-ion concentration and increasing alkalinity.

bog (see “What Is A Bog” above)

**Indiana Content Standards:**

The Pinhook Bog program can assist teachers in meeting the following Indiana standards.

**Sixth Grade**

Science

Life Science

**SCI.6.3.1 2010**

Describe specific relationships (i.e., predator and prey, consumer and producer, and parasite and host) between organisms and determine whether these relationships are competitive or mutually beneficial.

**SCI.6.3.2 2010**

Describe how changes caused by organisms in the habitat where they live can be beneficial or detrimental to themselves or to native plants and animals.

**SCI.6.3.3 2010**

Describe how certain biotic and abiotic factors—such as predators, quantity of light and water, range of temperatures and soil composition—can limit the number of organisms an ecosystem can support.

**Seventh Grade**

Science

Earth and Space Science

**SCI.7.2.4 2010**

Explain how convection currents in the mantle cause lithospheric plates to move and cause fast changes like earthquakes and volcanic eruptions and slow changes like the creation of mountains and formation of new ocean floors.

Physical Science

**SCI.7.1.3 2010**

Recognize and explain how different ways of obtaining, transforming and distributing energy have different environmental consequences.

**Eighth Grade**

Science

Earth and Space Science

SCI.8.2.6 2010

Identify, explain and discuss some effects human activities (e.g., air, soil, light, noise and water pollution) have on the biosphere.

**SCI.8.2.8 2010**

Explain that human activities, beginning with the earliest herding and agricultural activities, have drastically changed the environment and have affected the capacity of the environment to support native species. Explain current efforts to reduce and eliminate these impacts and encourage sustainability.

**High School**

Biology

Interdependence

**SCI.B.4.1 2010**

Explain that the amount of life environments can support is limited by the available energy, water, oxygen and minerals and by the ability of ecosystems to recycle the remains of dead organisms.

**SCI.B.4.2 2010**

Describe how human activities and natural phenomena can change the flow and of matter and energy in an ecosystem and how those changes impact other species.

**SCI.B.4.3 2010**

Describe the consequences of introducing non-native species into an ecosystem and identify the impact it may have on that ecosystem.

**SCI.B.4.4 2010**

Describe how climate, the pattern of matter and energy flow, the birth and death of new organisms, and the interaction between those organisms contribute to the long-term stability of an ecosystem.

Matter Cycles and Energy Transfer

**SCI.B.3.4 2010**

Describe how matter cycles through an ecosystem by way of food chains and food webs and how organisms convert that matter into a variety of organic molecules to be used in part in their own cellular structures.

**SCI.B.3.5 2010**

Describe how energy from the sun flows through an ecosystem by way of food chains and food webs and how only a small portion of that energy is used by individual organisms while the majority is lost as heat.

Evolution

**SCI.B.8.5 2010**

Describe how organisms with beneficial traits are more likely to survive, reproduce, and pass on their genetic information due to genetic variations, environmental forces and reproductive pressures.

**Extension or Follow-up Activity**

Class reflection paper or writing sample:

Ask each student to write a short essay, letter or story about what they learned on their field trip to Indiana Dunes National Lakeshore. Rangers love receiving mail from their students. Send the ranger the packet of essays from your class (or a copy of them), and your ranger will send your class a certificate from the dunes. Send your essays to:

Indiana Dunes National Lakeshore

1100 N. Mineral Springs Road

Porter, IN 46304

Attn: Your ranger’s name or just Education Department

If you are using this essay as a class assignment for a grade, we would like to suggest that each essay contain the following elements. Use the rubric below to score them.

\* The name of the park and the location of their field trip—for example: Douglas Center, Indiana Dunes National Lakeshore

\* Three facts they learned on the field trip about the habitats of the dunes.

\* A brief explanation of why Indiana Dunes is unique and therefore a national park.

\* At least two things the student can do to help take care of his or her national park.

\* Fill in the blank of this statement and provide an explanation:

I would like to learn more about \_\_\_\_\_\_\_\_\_\_ at Indiana Dunes.

\*\*\* For advanced groups, add the following element:

Tell the park rangers if you would like to bring your families and friends to the dunes and if so what would you do here and where would you go.

**Assessment:**

**Grading for Class reflection writing assignment:**

1. **Writing and organization**- ***4 points*** the writing sample is very well written and organized by the elements provided. It has a strong introduction, middle and conclusion. ***3 points*** the writing sample is well written and organized by the elements provided. It includes an introduction, middle and conclusion. ***2 points*** the writing sample is choppy and is not well organized. It lacks an introduction or conclusion. ***1 point***the writing sample is very short and unorganized.
2. **Grammar & Spelling-** ***4 points*** Mistakes in spelling and grammar are minor or non-existent. ***3 points*** Mistakes in spelling and grammar are minimal—about 4-5. ***2 points*** mistakes in spelling and grammar are numerous—5-10. ***1 point*** mistakes in spelling and grammar are more than 10.
3. **Facts and content**- ***4 points*** the writing sample demonstrates the student’s learning on the dunes program and includes three or more facts provided by the park staff. ***3 points*** the writing sample demonstrates the student’s learning and includes only two facts provided by the park staff. ***2 points*** the writing sample does not demonstrate much learning and only includes one fact provided by the park staff.***1 point*** the writing sample does not demonstrate any learning and does not include any facts provided by the park staff.
4. **National Park Service theme** - ***4 points*** the writing sample clearly demonstrates the student’s understanding of the role of the NPS in preserving the dunes by explaining why Indiana Dunes is such a unique treasure.***3 points*** the writing sample mentions the NPS and its role in preserving the Indiana Dunes. ***2 points*** the writing sample mentions the NPS and Indiana Dunes. ***1 point*** the writing sample does not mention anything about the NPS or its role at Indiana Dunes.
5. **Stewardship-** ***4 points*** the writing sample lists three things the student can do to assist in taking care of the Indiana Dunes. ***3 points*** the writing sample lists two things the student can do to assist in taking care of the Indiana Dunes. ***2 points*** the writing sample lists one thing the student can do to assist in taking care of the Indiana Dunes. ***1 point*** the writing sample does not list anything about what the student can do to take care of the Indiana Dunes.