| **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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**A Grain of Truth**

Summary:

Observe howling winds and powerful waves creating, shaping, eroding and moving sand dunes. Hike approximately one mile along beach and foredune trails to see and learn about the processes of glaciation, erosion, and dune building. Take time to sit and use your senses to experience the beauty of the dunes. The specific activities and interpretive techniques used will be adapted to the experience and abilities of the group and special circumstances that may exist on the day of the program. In the page-top banner:

Objectives: students will be able to:

1. Describe the role of glaciers in the formation of Lake Michigan.

2. Explain how waves, wind, and plants help form and shape the dunes.

3. Describe what they observed, heard and felt while exploring the dunes and beach.

4. Give examples of how humans can help protect the dunes.

5. List at least three plants found on the dunes.



**Setting:** At West Beach for 1.5 hrs. The trail is about one mile in length and requires stair climbing. Restrooms and picnic shelters are available.The beach is life-guarded during the summer.

**Age/grade:** 4th-12th grade

**Ratio of students to ranger:** 30 is ideal; groups can be large to staffing limitations

**Safety issues:** Poison ivy, seasonal excessive heat or cold, safety on stairs.

**What to expect during your field trip:** Group arrives at West Beach ofor the program.The program is completely outside.Students will be engaged in exploration activities to learn about the special features in the dunes. After the conclusion, the group is welcome to have lunch in the nearby picnic shelter.

Background Information:

GEOLOGY OF THE DUNES: The first dunes of Indiana were formed approximately 15,000 years ago when the last of the Ice Age glaciers swept down from the North. As the climate warmed, the southward movement of the glacier was halted, and a glacial deposit called a moraine was formed. This moraine acted as a dike holding back the water of the melting glacier forming what is now Lake Michigan. Waves, wind and plants have all combined to bring sand to the southern and eastern shores of Lake Michigan and begin the dune building process. The process of dune building that began over 15,000 years ago is still continuing today. Through the dynamic process of succession, a variety of biological communities succeed one another on the dunes of West Beach. Each community changes the physical and biological environment making conditions suitable for the next community.

The shoreline of the new lake first stood at 640 feet elevation, but this was only temporary. The increasing influx of meltwater from the melting ice to the north soon caused the lake to breach its moranic dam near what is now the southwest part of Chicago. As water passed out of the opening in the moraine and down the Des Plaines and Illinois valleys, the level of Ancestral Lake Michigan fell. A new, lower lake level was established when the down-cutting of the Des Plaines River was stabilized by a boulder-rich zone with the Valpariaso Moraine. The new lake level, which stabilized at 620 feet was also only temporary. When the boulder field near southwest Chicago was breached, the lake began to lower again until a third level at 605 feet was reached. This resulted because the downcutting of the Illinois River and its tributaries virtually ceased when the river reached bedrock. This third lake level was to be the last stage of Ancestral Lake Michigan.

By this time, the glaciers had completely left the Lake Michigan Basin. A new drainage was opened at the Strait of Mackinac, to the north, which was lower than the outlet at Chicago and continues to be the principal drainage of the lake up to the present. Geologists refer to the three lake levels of ancestral Lake Michigan as the following:

Glenwood: 640 feet elevation

Calumet: 620 feet

Tolleston: 605 feet

At each of these lake stages, beaches and their accompanying foredunes are preserved. The transition to modern day Lake Michigan was a gradual one involving numerous rises and falls of the lake level. Even today the lake level is not fixed, as can be seen by a two to three foot rise during the past several years. The mean average level of Lake Michigan over the past 100 years is about 585 feet elevation.

Since there is a greater quantity of organic material in the soil progressing from beach to oak forest, the soil is more capable of holding moisture.

The vegetation controls the amount of sunlight striking the ground. As the plants grow, they create shade, which modifies the light and moisture conditions on the ground. Trees are sometimes observed with unusual bent or twisted growth patterns resulting from their competition for available sunlight.

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. 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.

Great Lakes in My World:

The attached activities are from the “Great Lakes in My World” curriculum guide, produced by the Alliance for the Great Lakes. You can find more information about the curriculum guide and how to order it on the Alliance’s website: www.greatlakes.org

“Dune Journey”, pg. 98 (3rd-6th grade)

“Sand Study”, pg. 105 (3rd-6th grade)

“Moving Sand”, pg. 110 (4th-8th grade)

Other possible activities:

Activity 1) Students pretend they are a grain of sand and write a story on how they would travel across Lake Michigan to West Beach or Mt. Baldy.

Activity 2) Students study a map of the world and find other areas which have sand dunes. Compare the differences and similarities between these areas and the southern shore of Lake Michigan.

Activity 3) Students make a list and discuss the uses of sand by humans.

Activity 4) Students make a poster which urges people to protect the dunes of Indiana.

Activity 5) Students research one of the common plants of the dunes listed below. They should find out what it looks like, what kind of plant it is (tree, shrub or flower) and if it has any special adaptations for survival.

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Vocabulary and Common Plant Listing:

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

beach – the sandy, pebbly, or rocky shore of a body of water.

decompose – to cause chemical disintegration of organic matter

dune – a ridge or hill of wind-blown sand.

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 melt water 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.

panne – a pond that is located within a dune complex.

rhizome – a rootlike, usually horizontal stem growing under or along the ground that sends out roots from its lower surface and leaves or shoots from its upper surface.

sand – loose, granular, gritty particles of worn or disintegrated rock, finer than gravel and coarser than dust.

Plants common to the dunes:

Beach Community:

Bugseed

Russian thistle

Seaside spurge

Sea-rocket

Winged pigweed

Foredune Community:

Artic Bearberry

Common milkweed

Cottonwood tree

Fragrant sumac

Hairy puccoon

Hop tree

Horse mint

Jack pine

Little Bluestem grass

Marram grass

Pasture rose

Poison ivy

Prickly pear

Riverbank grape

Sand cherry

Sand cress

Sand thistle

Wormwood

**Illinois Content Standards:** The program “A Grain of Truth” can assist teachers in meeting the following Ilinois standards in science. For more questions on the program and how it can help supplement your classroom curriculum, please contact the park’s education specialist at 219-926-7561, ext. 235.

**State Goal 11**: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.

Know and apply the concepts, principals and processes of scientific inquiry.

**11.A.2b** Collect data for investigations using scientific process skills including observing, estimating and measuring.

**State Goal 12**: Understand the fundamental concepts, principals and interconnections of the life, physical and earth/space sciences.

Know and apply concepts that explain how living things function, adapt and change.

**12.A.2a** Describe simple life cycles of plants and animals and the similarities and differences in their offspring.

Know and apply concepts that describe how living things interact with each other

and with their environment

**12.B.2a** Describe relationships among various organisms in their environments (e.g., predator/prey, parasite/host, food chains and food webs).

**12.B.2b** Identify physical features of plants and animals that help them live in

different environments (e.g., specialized teeth for eating certain foods, thorns for protection, insulation for cold temperature).

**12.B.3a** Identify and classify biotic and abiotic factors in an environment that affect population density, habitat and placement of organisms in an energy pyramid.

**12.B.3b** Compare and assess features of organisms for their adaptive, competitive and survival potential (e.g., appendages, reproductive rates, camouflage, defensive structures).

**12.B.4a** Compare physical, ecological and behavioral factors that influence interactions and interdependence of organisms.

**12.B.5a** Analyze and explain biodiversity issues and the causes and effects of extinction.

Know and apply concepts that describe the features and processes of the Earth and

its resources.

**12.E.2a** Identify and explain natural cycles of the Earth’s land, water and atmospheric systems (e.g., rock cycle, water cycle, weather patterns)

**12.E.2b** Describe and explain short-term and long-term interactions of the Earth’s components (e.g., earthquakes, types of erosion).

**12.E.5** Analyze the processes involved in naturally occurring short-term and long-term Earth events (e.g., floods, ice ages, temperature, sea-level fluctuations).

**State Goal 13**: Understand the relationships among science, technology and society in historical and contemporary contexts.

Know and apply the accepted practices of science.

**13.A2c** Explain why keeping accurate and detailed records is important.

**13.A.3c** Explain what is similar and different about observational investigations.

Know and apply concepts that describe the interaction between science, technology

and society.

**13.B.2a** Explain how technology is used in science for a variety of purposes (e.g. sample collection, storage and treatment; measurement; data collection, storage and retrieval; communication of information).

**13.B.2e** Identify and explain ways that technology changes ecosystems (e.g., dams highways, buildings, communication networks, power plants).

**13.B.2f** Analyze how specific personal and societal choices that humans make affect local, regional and global ecosystems (e.g., lawn and garden care, mass transit).

**13.B.3c** Describe how occupations use scientific and technological knowledge and skills.

**13.B.3d** Analyze the interaction of resource acquisition, technological development and ecosystem impact (e.g., diamond, coal or gold mining; deforestation).

**13.B.3e** Identify advantages and disadvantages of natural resource conservation and management programs).

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

**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