



Fall Fanfare

Summary

Autumn is a time of many changes in the dunes. Search for evidence of the changing season. Learn of fall activities and adaptations that plants and animals use to prepare for winter. Discover how and why they change. Students will explore the dunes and forest on this outdoor program.

Objectives

Students will be able to:

1. Discuss how the National Park Services helps to protect the plants and animals found in special places such as the Indiana Dunes National Lakeshore.
2. Describe the natural processes which cause leaves to change colors and fall off the trees in the fall.
3. Describe at least two methods of seed dispersal.
4. Explore a natural area during the fall and search for signs of the changing season.
5. List at least two animals found at the dunes and discuss their adaptations for the changing season.



What to Expect during Your Field Trip

1. The group arrives at either the Douglas Center or Kemil Beach to meet their ranger.
2. The two hour outdoor program involves an exploratory hike along a one mile, easy to moderate trail.
3. Students will be engaged in hands-on exploration activities along the way, looking for signs of the changing season.

Setting: Educators can choose from two locations. Kemil Beach is located in Beverly Shores, and students hike the Dune Ridge Trail. The Douglas Center is located in Miller, and students hike the Miller Woods Trail. Restrooms are located at both locations. Picnic facilities are available at the Douglas Center.

Grade: 1st through 6th grade

Ratio of Students to Ranger: 30 to 1; total of 90 if three rangers are available. Please provide one adult chaperone for every ten students for safety purposes.

Safety Issues: Rangers will lead the program in all weather conditions except thunderstorms or extreme cold. Therefore, students should dress for the weather and recognize that temperatures can fluctuate between their school and the park. Students should wear good hiking shoes. The Dune Ridge Trail and the Miller Woods Trail are both sandy with some dune climbing. Poison ivy and stinging insects can be found at both locations.

For More Information: See the park's education website at www.nps.gov/indu/forteachers/. Contact the park's scheduling office at (219) 926-7561, ext. 243.

Background Information

Reasons for the Seasons: In the northern half of the world, September 22nd is the first day of autumn this year. The hot days of summer are cooling off, and each day is shorter than the last. Trees will soon turn brilliant colors and it will be time to think about hot cocoa and warm coats in the morning. Far to the south, across the equator, spring has arrived. The world seems filled with new life and new hopes, and it's time to find swimming suits and baseball gloves and plan summer trips.

The reason for these changes has to do with the earth's yearly trip around the sun. Part of the year the earth's north pole points away from the sun and part of the time toward it. When the north pole points toward the sun, the sun's rays hit the northern half of the world more directly and it is summer. But when the north pole is pointed toward the sun, the south pole is pointed away. So the sun's light hits the earth at a less direct angle, spreading the warmth over a larger area, and it is winter.

Many people mistakenly think the seasons are caused by how far the earth is from the sun. However, the earth's orbit about the sun is very close to circular, and the distance of the earth from the sun only differs by about 3% during the year. Not only that, but we are actually closest to the sun on about January 2nd, and the farthest on about July 4th, the opposite of hot and cold weather in the northern hemisphere. The angle at which sunlight hits the Earth is a much larger factor.

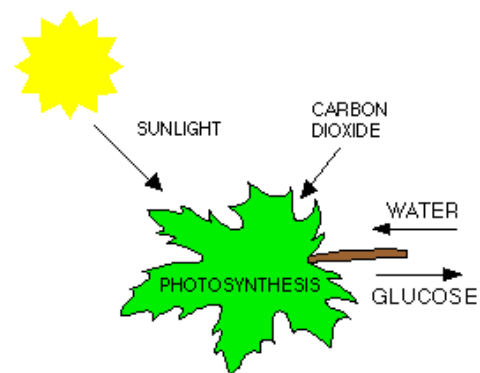
Another significant factor, though, is that summer is even warmer and winter is colder because of the length of our days and nights. In the summer daylight lasts longer and nighttime is shorter. In winter the days are shorter and the nights longer. That means there is more time for the sun to warm us during long summer days. And short winter days have long, cold nights.

The longest day is in the middle of summer, June 21st or 22nd north of the equator. That's called the *summer solstice*. The shortest day is in the middle of winter, around December 21st or 22nd, north of the equator. That's called the *winter solstice*. But right in between summer and winter, this year on September 22nd, day and night are each 12 hours long. This is called the *autumnal equinox*. It is the first day of autumn north of the equator, and the first day of spring in the southern half of the world. In between winter and summer there is another equinox, called the *vernal equinox*. Just like the

autumnal equinox, day and night are the same length. Only this change is the first day of spring north of the equator, and the start of autumn to the south. (by Becky Bray, NASA)

Fall Colors: Every autumn we revel in the beauty of the fall colors. The mixture of red, purple, orange and yellow is the result of chemical processes that take place in the tree as the seasons change from summer to winter.

During the spring and summer the leaves have served as factories where most of the foods necessary for the tree's growth are manufactured. This food-making process takes place in the leaf in



numerous cells containing chlorophyll, which gives the leaf its green color. This extraordinary chemical absorbs from sunlight the energy that is used in transforming carbon dioxide and water to carbohydrates, such as sugars and starch. Along with the green pigment are yellow to orange pigments, carotenes and xanthophyll pigments which, for example, give the orange color to a carrot. Most of the year these colors are masked by great amounts of green coloring.

But in the fall, because of changes in the length of daylight and changes in temperature, the leaves stop their food-making process. The chlorophyll breaks down, the green color disappears, and the yellow to orange colors become visible and give the leaves part of their fall splendor.

At the same time other chemical changes may occur, which form additional colors through the development of red anthocyanin pigments. Some mixtures give rise to the reddish and purplish fall colors of trees such as dogwoods and sumacs, while others give the sugar maple its brilliant orange. The autumn foliage of some trees show only yellow colors. Others, like many oaks, display mostly browns. All these colors are due to the mixing of varying amounts of the chlorophyll residue and

other pigments in the leaf during the fall season.

Other Changes Take Place

As the fall colors appear, other changes are taking place. At the point where the stem of the leaf is attached to the tree, a special layer of cells develops and gradually severs the tissues that support the leaf. At the same time, the tree seals the cut, so that when the leaf is finally blown off by the wind or falls from its own weight, it leaves behind a leaf scar.

Most of the broad-leaved trees in the North shed their leaves in the fall. However, the dead brown leaves of the oaks and a few other species may stay on the tree until growth starts again in the spring. In the South, where the winters are mild, some of the broad-leaved trees are evergreen; that is, the leaves stay on the trees during winter and keep their green color.

Only Some Trees Lose Leaves

Most of the conifers - pines, spruces, firs, hemlocks, cedars, etc. - are evergreen in both the North and South. The needle- or scale-like leaves remain green or greenish the year round, and individual leaves may stay on for two to four or more years.

Weather Affects Color Intensity

Temperature, light, and water supply have an influence on the degree and the duration of fall color. Low temperatures above freezing will favor anthocyanin formation producing bright reds in maples. However, early frost will weaken the brilliant red color. Rainy and/or overcast days tend to increase the intensity of fall colors. The best time to enjoy the autumn color would be on a clear, dry, and cool (not freezing) day. Enjoy the color, it only occurs for a brief period each fall. *(by Carl E. Palm, Jr., SUNY University)*

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 has been provided to prepare students for their visit to the park. 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.

Materials: Leaves, paper clips, small shapes of cardboard, paper for recording observations, composting materials, cloth or socks, paper bags, scissors

Activity 1: Have students draw a picture of their favorite fall scene and then describe why they chose this scene.

Activity 2: Have students bring to class family photos of members performing various "fall tasks" for discussion.

Activity 3: Sit near a tree with falling leaves. Have students describe the way leaves fall.

Activity 4: Fall days bring shorter days. To learn the effects of lack of sunlight on plant leaves, have the students choose a small shrub or tree with leaves that are easily reached. Cut out circles and squares of cardboard, and attach them to several leaves with paper clips. After a few days, remove the cardboard and have the class observe the lighter-colored spot on each leaf where the cardboard deprived the leaf of light. Engage the students in a discussion of the effects of sunlight deprivation.

Activity 5: To help students understand the differences between deciduous and evergreen trees, ask the students to bring in leaves and needles from their yards and neighborhoods. Have the students observe as many things as possible that indicate that fall is approaching. Have them discuss their observations. The discussion might include:

- How many different colors did they observe?
- Which trees had the brightest colors?
- Was there much leaf litter on the ground? What color were these leaves?
- Describe what might be happening to the ground leaves. Why are these changes taking place?
- How do the evergreen tree leaves (needles) differ from the deciduous leaves?
- Were evergreen leaves (needles) on the ground?
- Why do leaves change colors?

Activity 6: Adopt a tree through the seasons. Take visits to the tree and take notes on its physical characteristics.

- How does the tree look now?
- How are the leaves shaped?
- What color are the leaves?
- Is the tree all alive or parts dead?
- Are there any animals living in it?
- What does the pattern of the bark look like?
- Does the tree have an odor?
- How long has the tree been growing there?



Activity 7: To help students identify varying methods of plant seed dispersal, ask them to collect plant seeds from their neighborhood or school grounds, which will be used as classification material. One way to collect is by dragging a cloth fabric or a dry flannel sock through a wooded area. Another is to attach strips of masking tape, sticky side up, to pants and walk through a wooded area. Can the students identify the means by which various plants disperse their seeds?

Activity 8: To help students develop an understanding of the decomposition process that occurs with forest floor litter, have the class build a compost pile. There are several books available such as *Save Our Planet* by D. MacEachern, published by Dell and *Usborne Science and Experiments: Ecology* by R. Spurgeon, published by Usborne

Activity 9: Make a fall color leaf collection. Put in extra effort and turn it into a Fall-Fashion show. Have students make templates shaped like the leaves of different trees they saw during their visit to the lakeshore or on the sojourns at school.

- The templates can be made of heavy paper, etc. Outline the shapes onto large paper bags and color the leaves accordingly.
- Make the bags into vests by drawing a straight line up the middle of the front or back of the bag.
- Carefully cut the bag along the line.
- On the bottom of the bag, draw a circle large enough to go around the neck. Keep the circles small and do not let it touch the edges of the bottom. Cut out the circle.
- Cut square holes in the side for arms (branches).
- Have the student try on the vest. You can make it fit better by trimming the bottom to make it shorter or by cutting the neck or armholes larger.
- Fringe or scallop the bottom of the vest in grass or humus.

Vocabulary

ADAPTATION – a trait of an organism which helps it to survive. An adjustment to environmental conditions; as an adjustment of a sense organ to the degree or quality of stimulation.

HIBERNATION - is a state of inactivity and metabolic depression in animals, characterized by lower body temperature, slower breathing, and lower metabolic rate.

MIGRATION - refers to directed, regular, or systematic movement of a group of objects, organisms, or people.

CHLOROPHYLL - is a green pigment found in most plants.

PHOTOSYNTHESIS - is the conversion of light energy into chemical energy by living organisms. The raw materials are carbon dioxide and water, the energy source is sunlight, and the end-products include glucose and oxygen.

SEED DISPERSAL – the methods by which a plant sends out its seeds for propagation.

DECIDUOUS TREES – trees which lose their leaves in the fall such as oaks, maples and beeches.

CONIFEROUS TREES – trees which produce cones and which typically do not shed their “leaves” or needles in the fall; pine trees are examples of coniferous trees.

GLUCOSE - a monosaccharide (or simple sugar), is an important carbohydrate in biology. The cell uses it as a source of energy and metabolic intermediate. Glucose is one of the main products of photosynthesis and starts cellular respiration in both prokaryotes and eukaryotes. The name comes from the Greek word *glykys* (γλυκύς), which means "sweet", plus the suffix "-ose" which denotes a carbohydrate.

ECOLOGY - is the scientific study of the distribution and abundance of living organisms and how the distribution and abundance are affected by interactions between the organisms and their environment.

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 fall ecology
- 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.

Assessment

Rubric for class reflection writing assignment:

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

Illinois Content Standards:

The Fall Fanfare program can assist teachers in meeting the following Illinois standards in science.

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

11.A.1a Describe an observed event

State Goal 12: Understand the fundamental concepts, principles and interconnection of the life, physical and earth/space sciences.

12.A.1a Identify and describe the component parts of living things (e.g., birds have feathers; people have bones, blood, hair, skin) and their major functions.

12.B.1a Describe and compare characteristics of living things in relationship to their environments.

12.B.1b Describe how living things depend on one another for survival.

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

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

13.A.1c Explain how knowledge can be gained by careful observation.