

Article

Henry Chandler Cowles

Ecologist, Educator, and Conservationist

For the complete article with media resources, visit:

<http://education.nationalgeographic.com/news/henry-chandler-cowles/>

BY MARY SCHONS

Friday, January 21, 2011

[Henry Chandler Cowles](#) (1869-1939) was a University of Chicago [botany](#) professor and [conservationist](#). His studies of plant life in the [Indiana Dunes](#) made Cowles one of America's most [notable](#) early [ecologists](#).

Cowles was born on February 27, 1869, in Kensington, Connecticut. His love of nature started when he was a child. His mother taught him the names of flowers and trees on their walks together, and he raised flowers and vegetables on the family farm.

Cowles earned a degree from Oberlin College in 1893 and spent a year as a natural science teacher at Gates College in Nebraska before arriving at the University of Chicago as a [graduate student](#) in 1895.

[Ecology](#) in the 1890s was a relatively new area of study. German [zoologist](#) Ernst Haeckel coined the word "ecology" in 1866. In addition to this new scientific field, [Charles Darwin's](#) *On the Origin of Species* (1859) and Charles Lyell's *Principles of Geology* (1830-1833) were causing scientists to think about the relationships between animals, plants, and their [environment](#) in new ways.

Indiana Dunes

In 1896, Cowles traveled to the southern [shore](#) of [Lake Michigan](#) to see the Indiana Dunes for the first time.

[Sand dunes](#) are formed when grains of sand are blown by the [wind](#) into mounds or ridges. Dunes are among the least stable landforms on Earth. Because changes to the dune ecology happen so fast, plants must [adapt](#) quickly to a new environment, Cowles noted.

Plants "are [obliged](#) to adapt themselves to a new mode of life within years rather than centuries, the [penalty](#) for lack of [adaptation](#) being certain death," said Cowles.

For an ecologist, the dunes around Indiana's Lake County and Porter County were an ideal [laboratory](#) for studying the relationships between plants and their environment.

Cowles traveled back and forth from Illinois to northwest Indiana to observe the dunes in all seasons. He saw that dunes moved steadily away from the shore due to wave action and the westerly winds blowing across Lake Michigan.

As he walked farther inland, Cowles noticed that different types of plants grew in the sand dunes. The sand dunes closest to the beach only supported the hardiest plants, such as marram and sand reed grasses. When these plants died, the decomposing matter created conditions favorable to other types of plants, such as bladderworts and cottonwood trees. More plants, roots, and rotting plant matter led to an even greater variety of plants, like juniper bushes and pine trees.

Plant Succession and Climax Formation

Between 1899 and 1901, Cowles published three landmark papers. He observed that the shape of the land, or [topography](#), and the type of [soil](#) have an enormous influence on the type of plants that grew there. These findings introduced ecologists to two important ideas: plant succession and climax formation.

In [plant succession](#), one plant community will create the conditions ideal for other plants to replace, or succeed, it. Every stage of plant succession is more stable than the one that came before.

"Each species affects the soil in a way disadvantageous to itself and thus paves the way for different species to replace it," said Cowles.

This process of plant succession led to Cowles' second important theory: [climax formation](#). A climax formation is the most stable plant community created by plant succession. All plant successions are headed toward the establishment of a climax formation.

A climax formation will stay the same unless something destroys the plants or changes the shape of the land. [Forest fires](#) and human activity can change the shape of the land. Plant succession will usually start all over again, ultimately leading to a climax formation.

In the dunes, the climax formation is an oak forest. The sand dunes near the beach give way to beach grasses, which give way to cottonwood trees, which give way to pine trees. Ultimately, pine trees give way to an oak forest.

Cowles compared the plants from the Lake Michigan dunes with plants from dunes in the Chicago area. Then, he compared these dunes with dunes in Connecticut, Montana, northern Michigan, and Tennessee. The climax formation pattern was the same in all dune [ecosystems](#).

The Botanical Gazette published Cowles' [PhD](#) thesis, "The Ecological Relations of the Vegetation on the Sand Dunes of Lake Michigan," in 1899.

Working Ecologist

After 1901, Cowles concentrated on teaching at the University of Chicago, where he spent the next 30 years. His best-known class was a course called Botany 36. Groups of 15 students visited Lake Michigan, Lake Superior, and Lake Huron. Some classes traveled as far as California, Oregon, Washington, and British Columbia, Canada, to study local plant communities.

In 1913, Cowles led a group of German scientists on an ecological tour of the United States. Cowles said, "As there was so much to see in the brief time that we had to see it in, I asked these people who had come here to indicate what they wanted to see in the United States in two months. There were three or four things that all of them mentioned as highly worth seeing, even in the briefest trip to the United States. They were the Grand Canyon, Yosemite, Yellowstone Park, and the fourth was the Lake Michigan dunes."

The Ecological Society of America (ESA) was a result of the 1913 meeting. An offshoot of the ESA later became

the [Nature Conservancy](#). Today, the Nature Conservancy is a [nonprofit organization](#) dedicated to preserving [wildernesses](#) and natural [habitats](#).

After [World War I](#), an Indiana state park was established in Cowles' honor. On December 2, 1965, 56 acres of Porter County, Indiana, were [designated](#) Cowles Bog National Natural Landmark. [Congress](#) authorized the creation of Indiana Dunes National Lakeshore in 1966.

VOCABULARY

Term	Part of Speech	Definition
adapt	<i>verb</i>	to adjust to new surroundings or a new situation.
adaptation	<i>noun</i>	a modification of an organism or its parts that makes it more fit for existence. An adaptation is passed from generation to generation.
botany	<i>noun</i>	study of plants.
Charles Darwin	<i>noun</i>	(1809-1882) British naturalist.
climax formation	<i>noun</i>	stable, sustainable community of plants established over time in a specific area. Also called climax vegetation.
concentrated	<i>adjective</i>	items gathered closely together in one place.
Congress	<i>noun</i>	legislative branch of the government, responsible for making laws. The U.S. Congress has two bodies, the House of Representatives and the Senate.
conservation	<i>noun</i>	management of a natural resource to prevent exploitation, destruction, or neglect.
decompose	<i>verb</i>	to decay or break down.
designate	<i>verb</i>	to name or single out.
disadvantage	<i>verb</i>	to deprive of equality or justice.
ecologist	<i>noun</i>	scientist who studies the relationships between organisms and their environments.
ecology	<i>noun</i>	branch of biology that studies the relationship between living organisms and their environment.
ecosystem	<i>noun</i>	community and interactions of living and nonliving things in an area.
environment	<i>noun</i>	conditions that surround and influence an organism or community.
forest	<i>noun</i>	ecosystem filled with trees and underbrush.
forest fire	<i>noun</i>	uncontrolled burning of a woodland area.
graduate student	<i>noun</i>	person who pursues a college or university degree program beyond the basic bachelor's degree.
habitat	<i>noun</i>	environment where an organism lives throughout the year or for shorter periods of time.
Henry Chandler Cowles	<i>noun</i>	(1869-1939) American ecologist and conservationist.
Indiana Dunes	<i>noun</i>	landscape and ecosystem formed by sand dunes along the shore of Lake Michigan. Part of the Indiana Dunes is protected as part of the Indiana Dunes National Lakeshore.

indicate	<i>verb</i>	to display or show.
laboratory	<i>noun</i>	place where scientific experiments are performed. Also called a lab.
Lake Michigan	<i>noun</i>	(58,051 square kilometers/22,400 square miles) one of the Great Lakes of North America, bordered by the U.S. states of Illinois, Indiana, Michigan, and Wisconsin.
Nature Conservancy	<i>noun</i>	environmental organization dedicated to protecting ecologically important land and waters.
nonprofit organization	<i>noun</i>	business that uses surplus funds to pursue its goals, not to make money.
notable	<i>adjective</i>	important or impressive.
oblige	<i>verb</i>	to require or promise.
penalty	<i>noun</i>	punishment.
PhD	<i>noun</i>	(doctor of philosophy) highest degree offered by most graduate schools.
plant succession	<i>noun</i>	process of one plant community dying off and creating conditions for a new type of plant community to replace or succeed it.
sand dune	<i>noun</i>	mound of sand created by the wind.
shore	<i>noun</i>	coast.
soil	<i>noun</i>	top layer of the Earth's surface where plants can grow.
stable	<i>noun</i>	building where horses or other animals are kept.
topography	<i>noun</i>	study of the shape of the surface features of an area.
wilderness	<i>noun</i>	environment that has remained essentially undisturbed by human activity.
wind	<i>noun</i>	movement of air (from a high pressure zone to a low pressure zone) caused by the uneven heating of the Earth by the sun.
World War I	<i>noun</i>	(1914-1918) armed conflict between the Allies (led by the United States, the United Kingdom, and France) and the Central Powers (led by Germany and Austria-Hungary). Also called the Great War.
zoologist	<i>noun</i>	person who studies animals.

For Further Exploration

Articles & Profiles

- Chicago Wilderness Magazine: Henry Chandler Cowles

Websites

- National Park Service: Indiana Dunes National Lakeshore
- Ecological Society of America: Explore Ecology as a Career



© 1996–2015 National Geographic Society. All rights reserved.