



Environmental Resources

From Animal Extinction to Ozone

First Documented Animal Extinction

Martha, the world's only surviving passenger pigeon, died at the Cincinnati Zoological Garden at 1 p.m. on September 1, 1914 at age 29. It was the world's first documented extinction, and the only one for which an exact time is known. The event helped raise international awareness about humanity's impact on the environment and led to efforts to preserve other endangered species of animals and plants.



The fate of the passenger pigeon (*Ectopistes migratorius*) showed that natural resources, no matter how abundant, could be irreversibly damaged when used unwisely. It challenged long-held beliefs that Nature's bounty was inexhaustible.

Passenger pigeons once may have been the most numerous birds on Earth. Some population estimates put the number of passenger pigeons in North America at 5 billion in the 19th Century. They may have accounted for 30% of all the birds in North America. Passenger pigeons looked like mourning doves, but were bigger and flew fast – at an amazing 60-70 miles per hour. "When an individual is seen gliding through the woods and close to the observer, it passes like a thought," wrote John James Audubon, the great bird expert. "And on trying to see it again, the eye searches in vain. The bird is gone."



The birds were spectacular, with a slate blue head and rump, slate gray back, dark red breast, a white and gray tail, and red eyes. Males were more brightly colored than females. They lived in hundreds of millions of acres of primary forest that once covered North America east of the Rocky Mountains. Passenger pigeons flew in great flocks that sometimes were more than one mile wide, almost 300 miles long and so dense that a flock might darken the sky for hours or days on end.

They nested and roosted in immense colonies that were easy for people to exploit, and gave the impression that passenger pigeons were inexhaustible. A single tree might have 100 nests, where both parents took turns brooding a single egg. A single nesting colony could cover up to 850 square miles of forest. Hunters could kill hundreds in a few minutes, or trap tens of thousands in a day's work. Modern communications technology – the invention of the telegraph -- contributed to the passenger pigeon's extinction. When people spotted a flock of passenger pigeons, they alerted hunters in other towns who swooped down on the flock. Loss of habitat was another factor in the extinction. When settlers cleared land for farming, they unknowingly destroyed the passenger pigeon's home.

With the rapid development of agriculture, the loss of forest habitat effectively reduced the number of passenger pigeons. Over-hunting, however, was also a big factor. Some hunters shot the birds for meat, which they ate. Some of the birds were shipped to city markets in the East, where people regarded pigeon meat as a delicacy. Other hunters, however, did it for sport. In this era before states limited the number of animals that an individual hunter could take, and when hunters were not conservation minded, sport often became excess. There were even organized contests with prizes for the person who killed the most birds. In one, a hunter had to kill at least 30,000 birds to qualify for a prize. Some used an early version of the machine gun, and others set off dynamite to blast birds out of trees.

The last known wild passenger pigeon was shot in 1900, and a few others lived on in captivity. By 1910, Martha was the only survivor, named after the wife of George Washington. The Cincinnati Zoo donated her body to the Smithsonian Institution in Washington, DC.



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Rowland: Friend of the Environment

F. Sherwood Rowland, a native of Delaware, Ohio, shared the 1995 Nobel Prize in Chemistry for his critical role in discovering the global environmental threat of a now-banned family of industrial chemicals. "The three researchers have contributed to our salvation from a global environmental problem that could have catastrophic consequences," said the Royal Swedish Academy of Sciences, which awards the chemistry prizes.



They focused public and scientific attention on the "ozone layer," the Achilles heel of the biosphere, and the depleted area of that protective chemical now known as the "ozone hole." In addition, the research helped to establish atmospheric chemistry as a major field of research, sparking hundreds of new studies on the thin layer of gases that allows life to exist on Earth.

Everyone knows that Earth's atmosphere contains oxygen -- O_2 -- a molecule consisting of two atoms of the element bonded together. That's the oxygen that people and other animals breathe, and plants release in photosynthesis. The atmosphere also contains tiny amounts of another gas made from oxygen. That's ozone -- O_3 -- that has three oxygen atoms. Most of it exists in a layer whose center is about 12 miles above Earth's surface. If all the ozone in the atmosphere were spread over Earth's surface, the layer would be only 3 mm thick.



Ozone may be distant and rare, but it plays a key role in allowing life to exist on Earth. Ozone forms a protective shield in the upper atmosphere that absorbs most of the sun's dangerous ultraviolet (UV) radiation before it reaches the surface. UV is the reason why too much exposure to sunlight can cause sunburn. UV radiation has other bad effects on living things. Without a protective ozone layer in the atmosphere, modern animals and plants could not exist.

Rowland and atmospheric chemistry pioneers Paul Crutzen and Mario Molina discovered how ozone forms and decomposes through chemical processes in the atmosphere. They also showed how sensitive the ozone layer is to gases that modern society produces as part of important commercial and industrial processes.

In 1974, Rowland, of the University of California at Irvine, and Molina published a landmark study in the journal *Nature* showing that chlorofluorocarbon (CFC) gases, or "freons" were destroying the ozone shield. Billions of pounds of CFCs then were used to force the contents out of aerosol spray bottles; in air conditioners and other cooling systems; to make plastic foams; and in scores of other applications.

Their conclusion made scientists' jaws drop in amazement, and stirred widespread disbelief among people who made CFCs and products that depended on them. That's because everyone thought CFCs were chemically inert, and totally harmless. In addition, CFCs were used in essential products, and there were no easily available alternatives. Rowland and Molina showed that the CFCs in a can of hair spray or underarm deodorant could gradually travel to the ozone layer. Intense ultraviolet light then broke CFCs apart, leaving chlorine atoms that took part in chemical reactions that destroyed ozone.

In addition to the science, Rowland became a vocal advocate for a CFC ban. The research led to the Montreal Protocol, a treaty in which the world's countries agreed to a phase-out and ban further uses of CFCs.

Today's aerosol sprays, air conditioners, and many other products once dependent on CFCs, use ozone-safe ingredients. Still, the effects of decades of CFC release linger, with an ozone hole developing over Antarctica every spring. Large amounts of ozone were destroyed in that big area.

Without this brilliant, brave Ohio chemist and other pioneering atmospheric scientists, that hole could be allowing intense UV radiation to pour down on cities elsewhere, increasing the risk of skin cancer and other health problems.

Find out more...

- U.S. Environmental Protection Agency - Science of Ozone Depletion (<http://www.epa.gov/ozone/science/index.html>)



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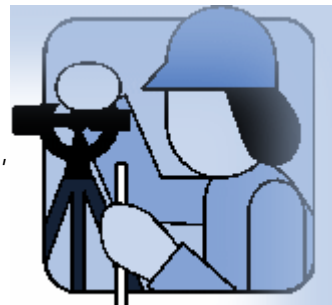


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The Seven Ranges Survey

Thomas Hutchins, the first Chief Geographer of the United States, in 1785 did a landmark survey of public lands near East Liverpool. Known as the "The Seven Ranges" survey, it became the model for the American rectangular survey system which later was used throughout the West.



The Continental Congress was planning ahead, at the time, planning future expansion into Ohio. Hutchins was hired to plot seven blocks of land called ranges in this new territory. Beginning at the point where the Ohio River reaches Pennsylvania, Hutchins ran a line west 42 miles and then determined north and south lines, resulting in six mile-square checkerboard patterns of land. The Seven Ranges now covers Jefferson, Harrison, Monroe and Belmont counties, and most of Carroll County along with portions of other surrounding Ohio counties.

The Seven Ranges



Prior to his experience as a surveyor - indeed prior to the American Revolution - Hutchins served in the British army and participated in the French and Indian War. He refused to fight against his fellow Colonists during the Revolution, however, and in 1780 he resigned his commission.

Find out more...

- [Seven Ranges History](http://www.ohiohistorycentral.org/ohc/history/path/places/svnrngs.shtml)
(www.ohiohistorycentral.org/ohc/history/path/places/svnrngs.shtml)
- [Official Ohio Lands Book](http://www.auditor.state.oh.us/StudentResources/OhioLands/ohio_lands.pdf)
(www.auditor.state.oh.us/StudentResources/OhioLands/ohio_lands.pdf)
- [Seven Ranges - TNGENWEB](http://www.tngenweb.org/tnland/seven-ranges)
(www.tngenweb.org/tnland/seven-ranges)

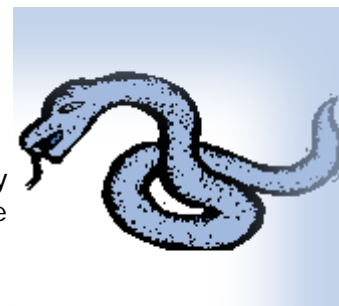


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Serpent Mound

The Serpent Mound is one of North America's most spectacular effigy mounds, and the first privately funded archaeological preserve in the United States. It is located in Adams County. The Mound is the largest serpent effigy known and stretches about a quarter of a mile long. Effigy mounds are earthworks that resemble animals such as reptiles and birds. Similar effigy mounds can be found in Scotland and Ontario, Canada.



Serpent Mound Photo
Ohio Historical Society

Coincidentally Serpent Mound is near the center of a unique geological structure that was created when a cataclysmic explosion occurred sometime after the Mississippian Period ended, 325 million years ago. Scientists believe a meteor struck the area. The force of the explosion must have been immense. Immediately after impact, the center rebounded, lifting Ordovician rocks 950 feet above their normal positions. In contrast, an outer ring of younger Mississippian sandstone and shale was depressed nearly 400 feet. As these sandstones are harder than the surrounding rocks, erosion has resulted in a circle of hills clearly visible from

the air. Since land use depends on the different types of exposed rocks, the terrain here has a great impact on area agriculture. The high center of limestone and shale is mostly given over to pasture, while a surrounding inner ring on Silurian dolomite supports crops. The hilly outer rim of sandstone and shale is forested.

Serpent Mound effigy was originally surveyed by Ephraim Squier and Edwin Davis in 1846. They eventually published a map to the spot, and brought wider attention to mounds that can be found throughout the United States. Several decades later in 1886, Harvard University archaeologist, Frederic Ward Putnam, excavated Serpent Mound. Even more recently excavations have surfaced wood charcoal that was carbon-dated to the Fort Ancient Culture, about 1000-1550 AD. Like many effigies, the head of the serpent lines up with the sunset of summer solstice. In 1900, Harvard University turned Serpent Mound over to the Ohio Historical Society, which has maintained it as a state memorial ever since. The Serpent Mound is open to the public for viewing at the Serpent Mound museum, which opened in 1967.



Find out more...

- Serpent Mound (www.ohiohistory.org/places/serpent)



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Davey: Father of Tree Surgery

John Davey, of Kent, became the "Father of Tree Surgery" when he established the Davey Institute of Tree Surgery. "Tree surgery" is the imaginative name for providing care that saves the lives or improves the looks of ornamental trees and shrubs. Trees catch diseases, get injured in storms and accidents, develop decayed spots, and encounter other health glitches. "Tree surgeons," specialists in tree care, are their doctors. Tree surgeons apply medicine, splints, braces, fill cavities, prune, top, trim, fertilize, and tend to trees in other ways.



John Davey (1846-1923), of Kent, Ohio, invented this occupation from scratch after immigrating to the United States from England in 1870. In 1909 Davey and his son, Martin, founded the Davey Tree Expert Company. Martin later was elected mayor of Kent, Governor of Ohio, and a member of the U. S. Congress. Father and son also opened a school in Kent, the Davey Institute of Tree Surgery, that was the nation's first to teach scientific principles of tree care. Those steps planted the seeds of the modern company, whose name is synonymous with tree surgery almost everywhere.



In 2002, the Davey Tree Expert Company's branches in 43 U. S. states and 6 Canadian provinces sold \$320 million worth of services. Davey tree surgeons do everything from battling insects chewing the leaves in Aunt Emma's backyard in Peoria to tending golf courses to overseeing the grounds of Arlington National Cemetery outside Washington, DC. These tree surgeons are even into transplants, often called upon to move big, valuable trees to new locations. The company's work is so good that it has few competitors. Over the years, Ohio's gift of scientific tree care has assured the good health and good looks of millions of trees and shrubs.

A lot of hard work and personal sacrifice lays behind that achievement. John Davey worked long hours in low-paying jobs and sunk deep into debt while establishing tree surgery as a new occupation. People, of course, had cared for ornamental and fruit trees for thousands of years. But John Davey put tree care on a scientific foundation. To existing knowledge that accumulated over the centuries, Davey added his own personal observations. He wrote everything down in a book, a classic entitled "The Planting and Care of Trees" published in 1923. It made the knowledge available to everyone.

Find out more...

- [The Davey Tree Expert Company](http://www.davey.com/) (<http://www.davey.com/>)
- [Davey Tree Expert Company History](http://speccoll.library.kent.edu/reghist/history.html) (<http://speccoll.library.kent.edu/reghist/history.html>)

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TVA Model

Ohio's state legislature in 1914 passed a law called the Ohio Conservancy Act, which allowed formation of watershed districts, with self-taxing authority, to provide protection from disastrous floods. Projects sprung up statewide, and became models nationwide for flood control and regional rehabilitation efforts, including the enormous Tennessee Valley Authority (TVA) project.



The Ohio Conservancy Act was prompted by a huge flood in 1913 that caused extreme loss of life and property. The Upper Mississippi and Ohio River Valleys were hard hit. The Miami Valley of western Ohio was particularly impacted, with over 290 reported dead in the cities of Dayton, Troy, Piqua, and Hamilton.

After flood clean-up, citizens worked together to plan how to avoid such devastation in the future. The Ohio Conservancy Act allowed citizens living in a threatened area to work together to plan and manage their own local flood control project.



Find out more...

- [Tennessee Valley Authority Natural Heritage Project](http://www.tva.gov/environment/land/habitat.htm)
(<http://www.tva.gov/environment/land/habitat.htm>)
- [The Nature Conservancy](http://nature.org/)
(<http://nature.org/>)
- [U.S. Environmental Protection Agency - About Watersheds](http://www.epa.gov/owow/watershed/whatis.html)
(<http://www.epa.gov/owow/watershed/whatis.html>)
- [The 1913 Ohio Flood](http://www.tiffinohio.com/Flood/)
(<http://www.tiffinohio.com/Flood/>)
- [U.S. Army Corps of Engineers](http://www.usace.army.mil/)
(<http://www.usace.army.mil/>)
- [Miami Valley Conservancy District](http://www.miamiconservancy.org)
(<http://www.miamiconservancy.org>)



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First Municipal Weather Forecasting

Cleveland Abbe (1838–1916), a Cincinnati meteorologist, in 1869 established the first public weather service in America. Abbe also was the first official daily weather forecaster in the United States.



Abbe was born in New York and studied astronomy both in the United States and in Russia where he was a student and assistant at the Observatory at Pulkova. Later, Abbe served as director of the Cincinnati Observatory, and was the first to offer daily weather predictions, which he based on telegraphic reports. He organized, with the assistance of the Cincinnati Chamber of Commerce and the Western Union Telegraph Company, telegraphic weather reports, maps and daily forecasts. Later this daily weather forecasting became a service provided by the National Weather Service.

In the 1870's, Abbe launched the "Monthly Weather Review," and some twenty years later became editor of an expanded version of this publication under the same name. Abbe also published several reports and books, exploring meteorological research. Among his publications:

- "Treatise on Meteorological Apparatus and Methods" (1887)
- "Preparatory Studies for Deductive Methods in Storm and Weather Prediction" (1889)

Abbe was also a leader in the adoption of "standard time" in the United States. He died the year "standard time" was adopted, 1916.



Find out more...

- [Time Zones](http://en.wikipedia.org/wiki/Time_zone)
(http://en.wikipedia.org/wiki/Time_zone)
- [National Oceanic & Atmospheric Administration Abbe Biography](http://www.history.noaa.gov/nwsbios/abbe.html)
(<http://www.history.noaa.gov/nwsbios/abbe.html>)
- [National Weather Service](http://www.nws.noaa.gov/)
(<http://www.nws.noaa.gov/>)
- [Photo of Cleveland Abbe](http://www.photolib.noaa.gov/people/pers0073.htm)
(<http://www.photolib.noaa.gov/people/pers0073.htm>)