

# IOWA GEOLOGY 1993



NO. 18



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## COVER:

Ancient forms of life are a fascinating part of Iowa's geological record. Shown are armored fish, cephalopods, bryozoan, and (inside back cover) crinoids. Opportunities to find and identify fossil remains exist statewide in rock strata, glacial deposits, and river gravels. See "Fossils" pp. 14-19.

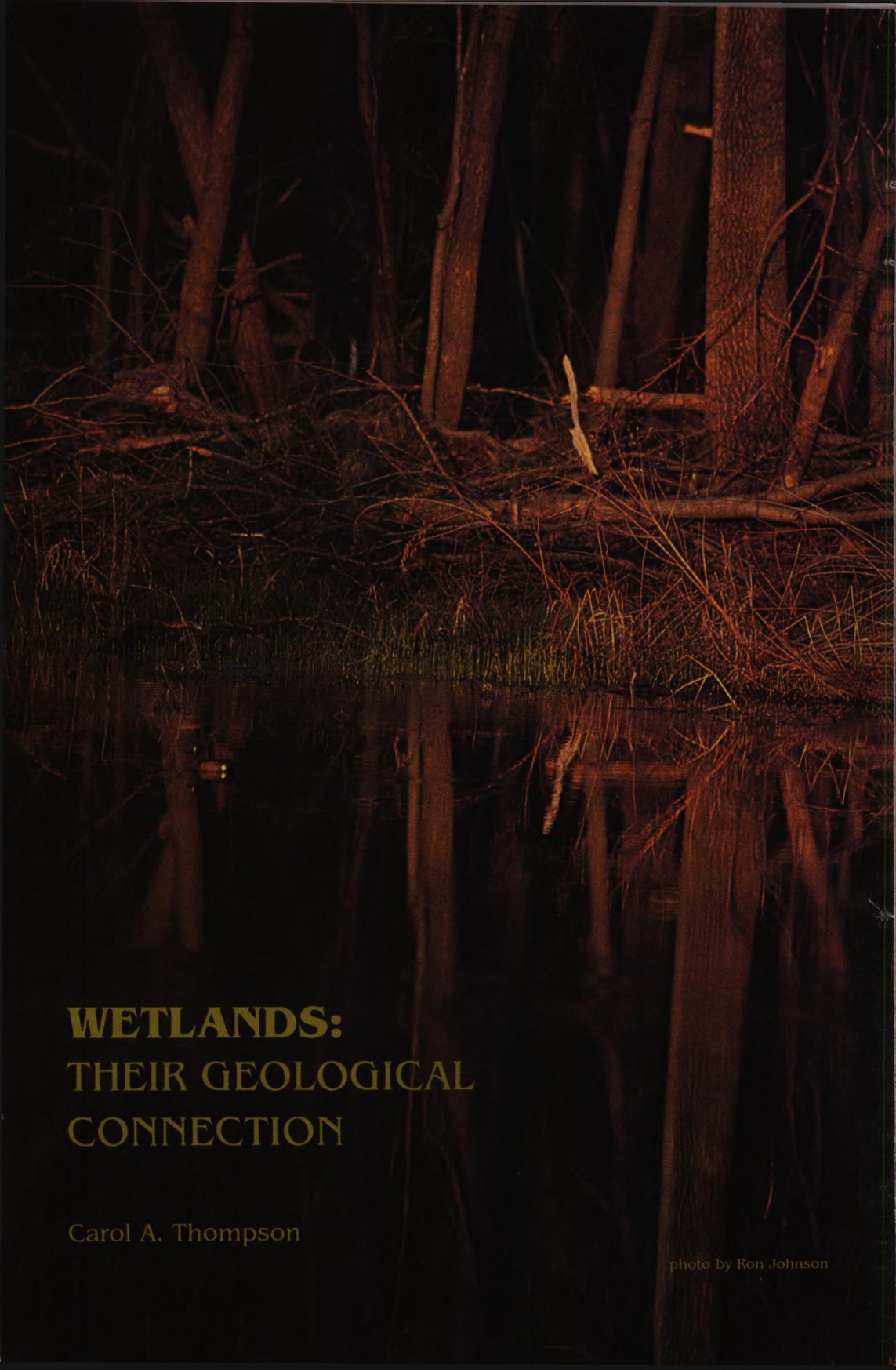
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# Contents

Wetlands: Their Geological Connection	2
Global Geologic Phenomena and their Effects in Iowa	6
Uses of Geologic Materials by Prehistoric Cultures	8
Fossils	14
Meteorites in Iowa's History	20
Aquatic Life and Cold-Water Stream Quality	22
The Fickle Nature of Iowa's Water Supply	24
Environmental Concerns...Geological Survey Evaluations	26
Comment on Current Events	28



**WETLANDS:  
THEIR GEOLOGICAL  
CONNECTION**

Carol A. Thompson

photo by Ron Johnson

**T**hink of a wetland, and one pictures a watery area with cattails, rushes, and waterfowl. Now think of the scientists who study wetlands, and botanists or biologists probably come to mind. Geology is seldom mentioned in the context of wetland studies, yet geology plays a critical role in understanding wetland dynamics. Three characteristics make wetlands unique -- vegetation, soils, and hydrology. The vegetation is dominated by plants adapted to wet conditions; the soils are developed in water-saturated materials; and sites are either saturated, periodically flooded, or contain permanently standing water.

Hydrology may be the single most important factor in the establishment and maintenance of specific wetland types. For example, wetlands receive water from various sources: precipitation, surface water runoff, and groundwater. Each source is characterized by a certain water chemistry, which in turn affects the type of vegetation and diversity of species. The permanence of a water source determines the type of soil that develops, which also influences the type of vegetation present. Understanding the hydrology of a wetland is important to decisions involving its future and to evaluat-

ing trade-offs involved in protection, development, and mitigation. Wetlands are often valued in functional terms; for instance, does the wetland reduce flooding, does it recharge groundwater, or does it improve water quality? To address these questions and provide adequate wetland evaluations requires an understanding of why wetlands occur in a particular place and where the water comes from. These are fundamentally geologic questions.

Iowa's wetlands can be defined on the basis of their hydrology and landscape position. Forested wetlands are commonly associated with backwater sloughs or oxbow ponds along river bottomlands throughout the state. These riparian wetlands are a result of natural stream meandering processes and are linked to flooding cycles. As such, they are one of the more dynamic wetland systems and are dominated by periodic surface-water flows, with smaller contributions from groundwater sources.

Marshes in Iowa usually occur in basins along floodplains or in upland areas, particularly in the recently glaciated landscapes of north-central Iowa. Depending on a basin's depth and the nature of its surrounding sediments, these wetlands can be fed by surface water and rainwater, which results in ephemeral wetlands, or they can

*Marsh, Dallas County*



Bill Ohde

**Forested wetland, Louisa County**

receive significant groundwater inflow, which is typical of more permanent wetlands. The hydrologic relationships can change even on a seasonal basis. In some wetlands, groundwater enters one portion, flows through the wetland, and exits along the other side. During wet periods, these basins act as discharge points, with groundwater flowing to the wetland. During drier periods, however, a few wetlands will change flow direction, recharging water to the ground until they dry out. All these interactions take place through the wetland sediments, which exert a profound influence on the rate of groundwater movement. Iowa's wetland restoration efforts have been directed primarily at marsh lands and generally have been successful.

Wet meadows and wet prairies typically do not have standing



Carol Thompson

*(Left): Wet meadow, Emmet County*



Carol Thompson

**Fen, Dickinson County**

water most of the year, but they are characterized by waterlogged sediments. The hydrology of these sites is among the least understood of any wetland class. Many sites are located on low-gradient slopes and are affected by surface water flooding as well as groundwater seepage. This class of wetlands may be the most threatened in Iowa, and restoration efforts generally have been unsuccessful.

Fens are Iowa's most unique wetland type. They are found primarily along the margins of the freshly glaciated landscapes in north-central Iowa and scattered throughout northeastern Iowa. These wetlands are sustained by groundwater flow and include saturated peat deposits, often in mounded positions along hillslopes and stream terraces. The water is highly mineralized compared to



Carol Thompson

**Marsh, Palo Alto County**

most wetlands, and, as a result, fens contain numerous state-listed rare and endangered species. Because of their unique hydrology, fens are unlikely candidates for restoration projects, and the few that still remain need to be protected.

With each passing year, more people are realizing the value associated with the preservation of natural wetland systems. These sites are recognized not only for their recreational and wildlife benefits, but increasingly for their importance as part of the natural hydrologic cycle. The management and restoration of Iowa's wetlands needs to be a cooperative venture among all segments of the state's scientific community. ❖

# GLOBAL GEOLOGIC PHENOMENA and their EFFECTS IN IOWA



**Brian J. Witzke**

Iowa lies thousands of miles from volcanic eruptions in the Philippines or ocean currents off the coast of Peru. However, we are not immune from the effects of such distant natural processes, particularly the influence they may exert on climate worldwide. Iowa's agricultural economy is significantly impacted by changes in climate, experiencing hardships during drought years as well as exceptionally wet years. The global climate system is driven by incoming solar energy and the absorption or reflection of such energy in a complex interplay between land, sea, and air on the

rotating globe. These aspects of climate are affected by natural geologic processes that have operated over the immense span of earth history.

The June 1991 eruption of Mount Pinatubo in the Philippines was the largest volcanic eruption of the century. A huge amount of volcanic dust and gas from this eruption was injected into the upper atmosphere and circulated worldwide, producing vivid sunsets. Of greater importance, the dust shroud reduced the amount of sunlight reaching the ground resulting in a slight reduction of global temperature and a modifica-

tion of climate. It is intriguing to consider the possibility that Iowa's notably wetter and cooler summer weather since 1991 may have been influenced by Pinatubo.

The pattern of ocean and atmospheric circulation off the coast of Peru produces upwelling of cold nutrient-rich water and fertile fishing grounds. However, winds and ocean currents fluctuate every few years and weaken the coastal upwelling in an event known as El Niño. Winds, currents, and air and sea temperatures adjust across vast areas of the Pacific in response to El Niño events, temporarily altering large-scale weather patterns. Some scientists believe that they may produce weather anomalies thousands of miles from the tropical Pacific. It is probable that El Niño events affect Iowa's weather as well.

Geologic studies have provided strong evidence that the Earth's general climate has fluctuated over millions of years between so-called "greenhouse" and "icehouse" worlds. In a greenhouse world, global temperatures are warmer, moderate climates become widespread, and subfreezing conditions may even be absent in polar areas. Icehouse worlds are characterized

by strong temperature contrasts between equator and poles, and continental glaciers and sea pack-ice become notable at high latitudes (as in the modern world). Explanations for these large-scale variations have focused on changes in the atmospheric content of greenhouse gases, most notably carbon dioxide ( $\text{CO}_2$ ). As a general rule, the more  $\text{CO}_2$  in the atmosphere, the warmer the global climate.

Human activity, especially the burning of fossil fuels, destruction of forests, smog, and landuse patterns, can increase the output of  $\text{CO}_2$  and other greenhouse gases and produce changes in the Earth's reflected heat and light that affect global climate.

Geologic processes have exerted considerable influence over global climate, and we can reasonably expect that recent geologic events also will produce climatic modifications. The full consequences of human activity on global climate and environments are not known, but studies of ancient geologic systems and contrasting episodes of greenhouse and icehouse conditions that are preserved in the geologic record may provide some useful answers.





# USES OF GEOLOGIC MATERIALS BY PREHISTORIC CULTURES

E. Arthur Bettis III  
William Green\*

Modern society relies heavily on geologic materials for survival. Many of these materials are processed so that their natural form is no longer evident and their geologic origin not apparent. Prehistoric Native Americans also depended on geologic materials for survival. However, their use of various minerals, deposits, and landscape elements did not alter these materials to the extent that modern technology does. Ancient Iowans used geologic materials for everyday tools as well as in symbolic and ceremonial contexts. In many instances, these uses reflect a pervasive Indian view of unity with the environment.

Native Americans have lived in Iowa for more than 11,000 years. Until about 2,500 years ago, small bands lived by hunting game and gathering wild plants. These

people, referred to as Archaic cultures, relied on stone, bone, shell, and wood for tools, and they made containers, rope, and clothing from vegetation and animal hide. Some Archaic groups built hide or mat-covered huts with floors dug into the earth.

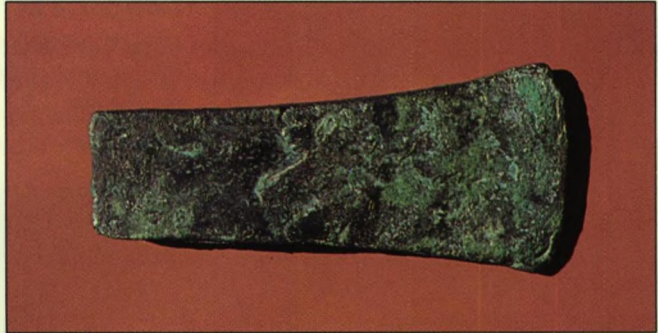
About 2,500 years ago, Native Americans (Woodland cultures) began cultivating native plants in the rich soil along Iowa's streams to supplement their hunting and gathering. They also began to make pottery from local clays, and soon afterward they established trade networks for exotic items such as marine shell, obsidian (volcanic glass), copper, and mica. The following pages show some of these imports as well as local geologic materials used by Native Americans.

*\*William Green is the State Archaeologist of Iowa.*



(Left): Mineral and rock material traded into Iowa between 100 B.C. and A.D. 300 includes **mica** from the Appalachians, **bematite** from the upper mid-west, **callinite** from southwest Minnesota, **copper** from the Lake Superior region, and **obsidian** from the Yellowstone National Park area.

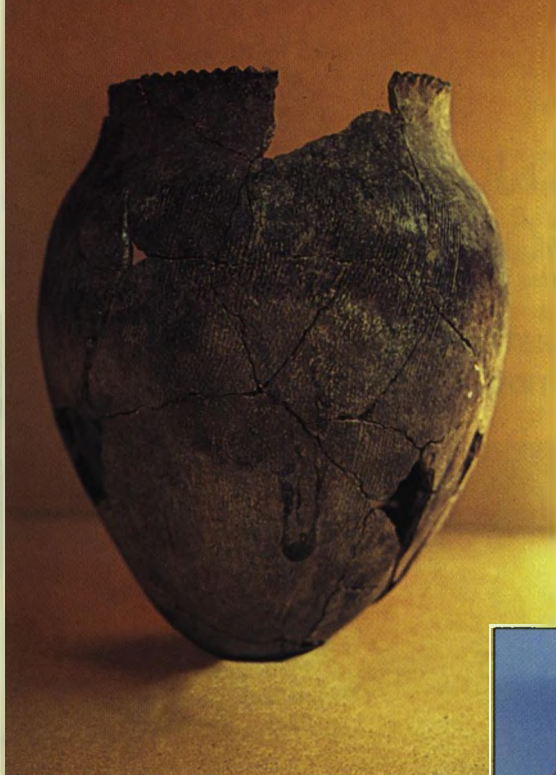
This rare **copper celt** (right) from a southeastern Iowa site was probably used for ceremonial purposes by a person of high status (Woodland culture).



**Projectile points** were made from chert (flint), a form of silica present in many Iowa rock units. Smaller points were used on arrows and larger points on spears, darts, or knives.

**Stone tools** (right) were ground from igneous and metamorphic rocks collected from glacial deposits or stream gravels. Durable axes (top) and celts (bottom two) were attached to wooden or bone handles and used to break firewood, smash large bones, and girdle trees.





**Pottery** clays were obtained from stream deposits or shale bedrock. Tempering materials such as sand, crushed rock, and burned clam shell strengthened the ceramic vessels. The surface of the large vessel (left) from northwest Iowa (ca. A.D. 400) has been roughened by twisted cords; the smaller vessel (below) from northeast Iowa (ca. A.D. 600) has crescent-shaped designs on the body and (close-up) twisted-cord or fabric impressions on the rim.

Dave Benn



Ceremonial and religious objects were made from a variety of materials. This **platform pipe** (right), dating to ca. A.D. 100, is a bird effigy from southeast Iowa made from a northern Illinois claystone.





Images of humans, animals, and other forms were carved on sandstone cliffs and cave walls and on resistant outcrops of reddish Sioux Quartzite. A notable figure found on rock faces across northern Iowa is that of a thunderbird or a human portraying a hawk or eagle. **Petroglyphs** such as these probably had ceremonial importance (A.D. 1100-1200).

Around A.D. 1400 to 1700, Indians in Iowa engraved elaborate depictions of bison (right), birds, and other creatures on flattened and polished **catlinite tablets**. Catlinite (also called "pipestone") is a soft claystone unit within the Sioux Quartzite Formation.



(Left): This eastern Iowa **platform pipe** was carved from a crystal of calcite (ca. A.D. 100).

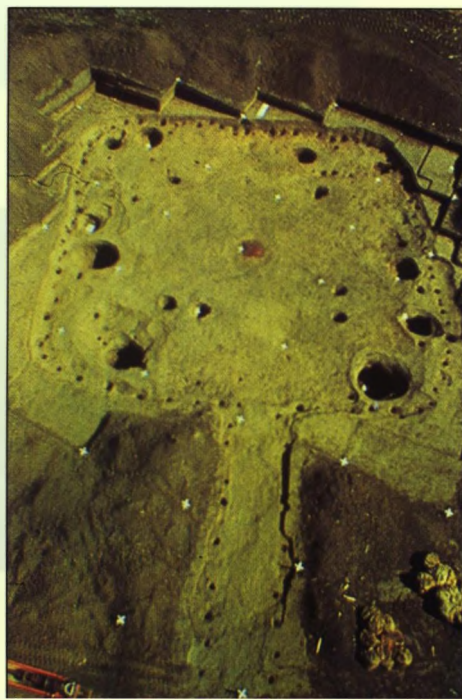
Utilizing easily tilled soils in river valleys and in the Loess Hills, Iowa's ancient farmers raised **food crops**, as shown by the tiny seeds of goosefoot (left) and a 2.5" corn cob (below). Both were recovered from 800-year-old storage pits.



(Above): Reconstructed **earth lodge** in Mills County. (Below): An excavated floor shows an extended entrance, interior storage pits, a central fire pit, and the location of support poles and wall posts (A.D. 1000-1300).



(Above): People of the Mill Creek (A.D. 1000-1300) and Oneota (A.D. 1100-1700) cultures grew crops in mounded rows, as shown in these rarely preserved **ridged field patterns** in O'Brien County. Note sets of parallel ridges.



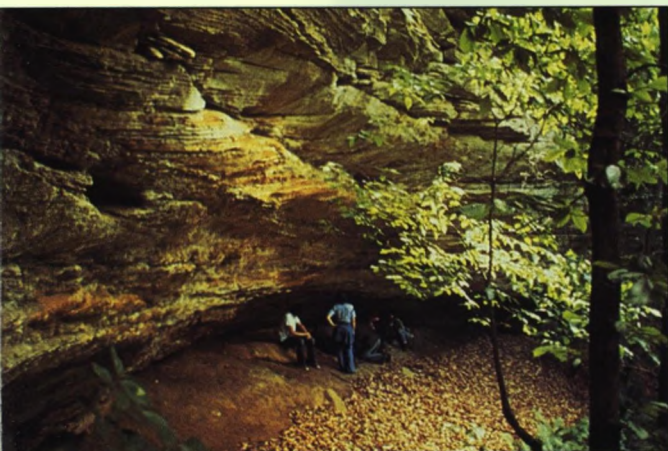


*At the **fish weir** near Amana, stream cobbles were arranged across the Iowa River channel. Fish could be speared or netted as they passed through the narrow downstream opening of the “V.”*

*Woodland groups built **burial mounds** on high ridges or on terraces overlooking junctions of river valleys. Mounds may have also served to mark hunting territories, and as spiritual links with the Earth (Fish Farm Mounds State Preserve, Allamakee County).*



Jean Prior



Photographs on p. 9 by Paul VanDorpe  
Photo setups by Patricia Lohmann

Other non-credited photos from  
Office of the State Archaeologist,  
The University of Iowa

*For questions concerning artifacts or possible archaeological sites contact Office of the State Archaeologist, Iowa City.*

*Protective, overhanging ledges along valley walls (**rockshelters**) were frequently inhabited by Native Americans (Wildcat Den State Park, Muscatine County).*

# FOSSILS

Jean C. Prior

Many people have their beginning interest in geology stimulated by finding fossils. Holding the shell of a sea-dwelling organism found in an Iowa rock, far from the nearest ocean, makes us think about the vast changes that have occurred over the Earth's surface and the great length of geologic time that has passed. Studying fossils helps us appreciate the history of life on Earth. They provide a link between geology and biology that is valuable to the study of global changes and how life adapts. Fossil remains also are an important tool in dating different rock layers, and in comparing the sequence of strata from place to place across broad areas.

Iowa has many well known fossil-bearing rock formations, and fossils from around the state have found their way into museums around the world. These pages help to identify a few of Iowa's many fossils that may be found by careful observation of road cuts, quarries, stream banks and other exposures of earth materials.



**Brachiopods** (above): These shells are among the most common fossils found in Iowa. Brachiopods lived inside the protective cover of two hinged shells, attached to the floor of warm, shallow seas that once covered the state. These eastern Iowa specimens are about 375 million years old (Devonian).

## Gastropod

(right): Shells of marine animals are often preserved as fossils. This coiled shell from Winneshiek County was inhabited by a snail. The sluggish, bottom-dwelling mollusk scavenged or grazed the ancient sea floor about 440 million years ago (Ordovician). The snail moved on a flat muscular foot and could withdraw inside its shell for protection.



## Fish jaw

(right): This jaw belonged to a 2 to 3 ft-long placoderm, a primitive fish partly covered by bony plates that gave it an armored appearance (see cover). The black color of this 375 million-year-old (Devonian) specimen from Black Hawk County results from mineralization of the fossil bone.



**Stromatoporoid** (above): "Stroms" are extinct organisms related to sponges. They constructed skeletons of lime and lived in various shaped colonies that resembled layered mats, branches, and rounded masses. This Floyd County specimen, with its prominent nodes, lived 370 million years ago (Devonian).

**Crinoids (right):** Crinoids lived anchored to the sea floor by flexible, rooted stems. Segments of the rounded stems are commonly found as fossils. Famous localities in Iowa include the LeGrand and Burlington areas.



**Crinoid (right):** Often called "sea lilies," crinoids are actually animals related to starfish. This 350 million-year-old (Mississippian) specimen from Marshall County shows the arms, which in life would filter sea water for food particles (inside back cover).



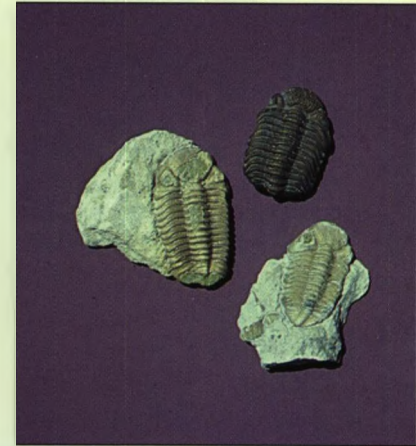
**Colonial corals:** Bottom-dwelling corals lived in reef-like communities in warm, clear, tropical seas covering Iowa. Many species were colonial, living together in a mass of individual skeletons of lime, resembling a honeycomb. Distinctive colonial forms from eastern Iowa include the "chain coral" (left), *Pachyphyllum* (below), and *Lithostrotionella* (right). They were especially abundant in Devonian and Silurian seas, 375 to 425 million years ago.



**Solitary coral (right):** Corals also lived alone in curved, cone-shaped skeletons unattached to other individuals. This fossil "horn coral" housed the animal's soft tissues, including tentacles which filtered food particles from sea water.



**Trilobites (right):** Prized by collectors, whole trilobites usually display a three-lobed, oval-shaped, segmented skeleton, often with distinct eyes. They belong to an extinct group of bottom-dwelling, hard-shelled arthropods that scavenged the sea floor. These Scott County specimens are 375 million years old (Devonian).



**Bryozoan (right):** "Moss animals" were also colonial, filter-feeding organisms that inhabited the sea floor. A well known bryozoan (*Archimedes*) consisted of concentric rows of lace-like fronds attached to a corkscrew-shaped axis (see cover). The preserved core is seen in this Lee County specimen (340 million years old, Mississippian).



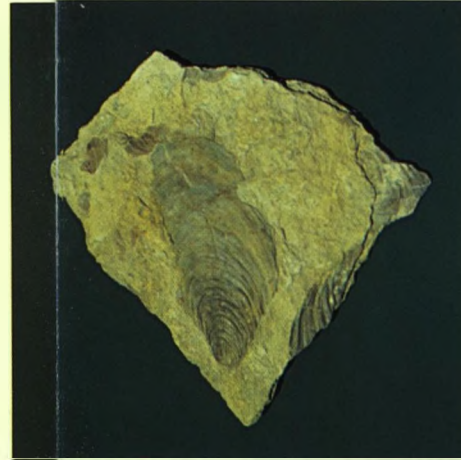




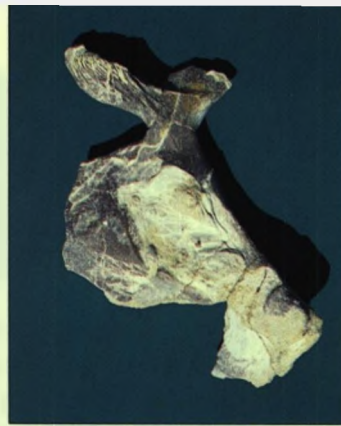
This coiled cephalopod (left) is a 365 million-year-old (Devonian) specimen from Butler County, and a distant relative of the chambered nautilus seen in today's oceans.



**Cephalopods:** These squid-like animals lived in chambered shells and could propel themselves by ejecting water from a tube near their head (see cover). The shell's partitions were filled with gas, enabling the animal to regulate its buoyancy. These straight-shelled cephalopods (right), from Marion County are 300 million years old (Pennsylvanian).

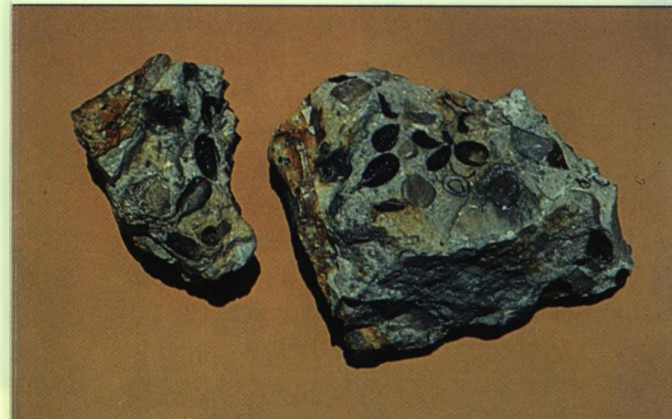


**Clam shell (left):** Like gastropods and cephalopods, clams are also mollusks that live in a protective shell. This Plymouth County specimen lived on a sea floor 90 million years ago (Cretaceous). Clams were abundant in these waters, the last of the great inland seaways to cover Iowa.



**Amphibian pelvis (above):** This pelvic bone belonged to a 3 to 4 foot-long proto-anthracosaur, a rare, primitive amphibian that lived 330 million years ago (Mississippian) and was found in Keokuk County.

**Seeds (right):** These black fossil seeds are from Scott County. They grew at the end of a frond on a fern-like tree about 300 million years ago (Pennsylvanian).



**Seed-fern leaves and scale-tree trunk (right):** The fossil foliage of seed ferns (small fossils) was found in Dallas County, and the scale-tree (Lepidodendron, large fossil) in Muscatine County. About 310 million years ago, these plants were common in the coastal swamps that produced Iowa's coal deposits (Pennsylvanian).

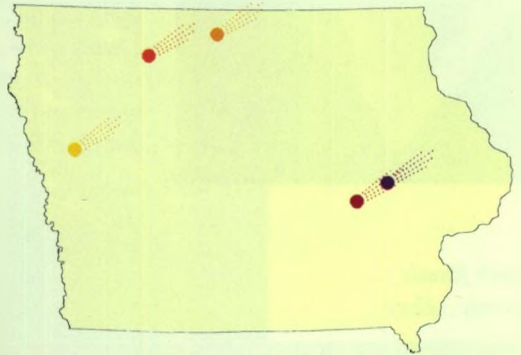
Photographs on pp. 14-19 by Paul VanDorpe  
Photo setups by Patricia Lohmann



**Mastodon (left) and mammoth (right) teeth:** Tooth shapes of these 15,000 year-old molars indicate mastodons browsed tree branches, while mammoths grazed grasses. Fossils of these extinct Ice Age (Pleistocene) creatures resembling elephants have been widely found across Iowa.

# METEORITES IN IOWA'S HISTORY

Raymond R. Anderson



On most clear, moonless nights, patient skywatchers can see a meteor, a streak of light produced by a piece of interstellar material entering the Earth's atmosphere at high speed. If the piece is large enough, it may actually fall to the ground and then is called a meteorite. Iowa's largest meteorite impact occurred in southern Pocahontas County, just north of Manson, 66 million years before the state was inhabited.

## ● MARION METEORITE

The first historic Iowa meteorite fell south of Marion in Linn County just before 3:00 p.m. on February 25, 1847, the day that legislation

*These pieces of the Amana Meteorite, from an old exhibit of*

*numbered specimens, show their darkened crusts, rounded edges, and pitted surfaces. Photos courtesy of State Historical Society of Iowa.*

establishing the University of Iowa was signed into law in Iowa City, which was then the State Capitol. Residents of Iowa City were alarmed by the series of loud explosions to the north. The largest fragment is on display in the Old Capitol Building.

### ● **AMANA METEORITE**

Just before 10:30 p.m. on the wintery evening of February 12, 1875, a brilliant fireball dazzled people from Omaha to Chicago and St. Paul to St. Louis. Accounts compiled by C.W. Irish, an Iowa City civil engineer, described the blinding light and loud explosions from what he called the "Detonating Meteor." Over 800 pounds of fragments were recovered south of the Iowa River and southwest of Homestead in Iowa County.

### ● **ESTHERVILLE METEORITE**

Residents of Estherville in Emmet County received an extra-terrestrial visitor at 5:00 p.m. on May 10, 1879. An exploding meteorite roared to Earth along a seven-mile path from south of Superior in Dickinson County to north of Estherville. Three large fragments (weighing 431, 152, and 101 pounds) and hundreds of smaller pieces were recovered. A monument near Estherville commemorates the event.

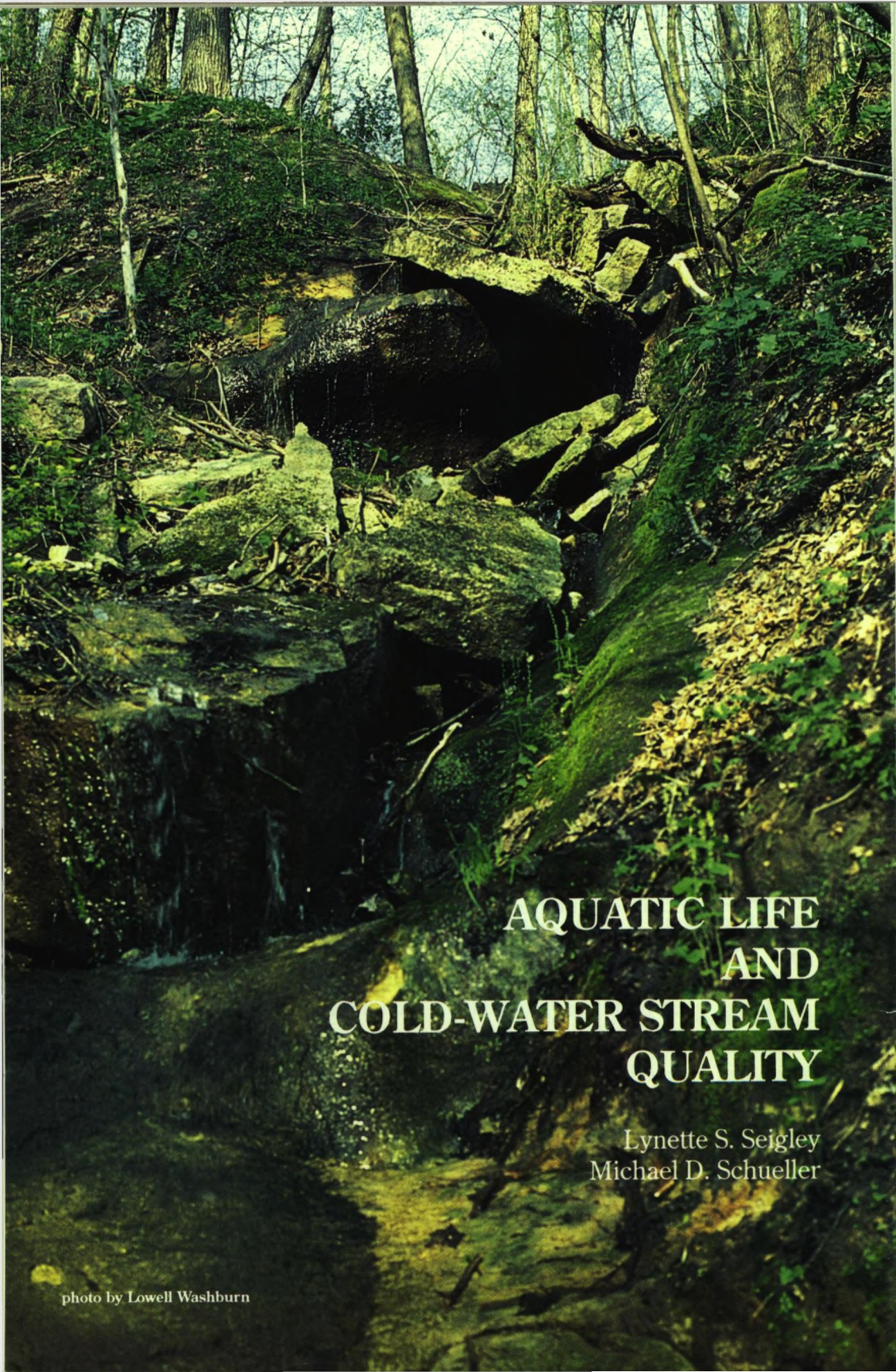
### ● **FOREST CITY METEORITE**

Late in the afternoon of May 2, 1890, a meteorite sounding like heavy cannon fire, throwing off sparks, and trailing black smoke exploded about 11 miles northwest of Forest City in Winnebago County. The fall was observed from Sioux City to Grinnell and Mason City, and as far away as Chamberlain, South Dakota, 300 miles from the Winnebago County impact site. Rock fragments showered an eight square-mile area, and local residents reported a smell of sulphur. As with Iowa's other meteorites, fragments now are widely distributed in museums and private collections.

### ● **MAPLETON METEORITE**

The fall of the Mapleton Meteorite was not observed. The 108-pound specimen was discovered northeast of Mapleton in Monona County on June 17, 1939, by a farmer cultivating corn. Coincidentally, an article about meteorites appeared in the July issue of *National Geographic* and helped him determine its identity. The meteorite was eventually purchased by the Field Museum of Natural History in Chicago.

*If you find a rock that you suspect might be a meteorite, contact a college or university geology department or the Geological Survey Bureau in Iowa City.*



**AQUATIC LIFE  
AND  
COLD-WATER STREAM  
QUALITY**

Lynette S. Seigley  
Michael D. Schueller

photo by Lowell Washburn

**T**iny aquatic organisms are playing a large role in water quality studies of northeast Iowa streams. The bottom-dwelling fauna are important in tracking improvements in water quality as land management practices are changed in the Sny Magill watershed of northeast Clayton County.

Shallow bedrock in northeast Iowa supplies groundwater to about 85 cold-water streams in this part of the state (photo left: a spring feeding Sny Magill Creek). Because of the cool temperatures, these special streams are suitable for trout and are stocked by the Iowa Department of Natural Resources (DNR) for recreational fishing. This reliance on continuous stocking, however, indicates that the streams have a limited ability to support naturally reproducing trout populations.

Excessive sediment and chemical pollutants are two factors that degrade fish habitat and stream quality. An effective method of monitoring and measuring the water quality is to examine its bottom-dwelling (benthic) fauna. The tiny invertebrates live in small areas, and cannot move easily if stressed by their environment.

Streams with good water quality generally have benthic communities



composed of pollution-intolerant species such as caddisflies, mayflies (illustrated), and stoneflies. Impaired water quality is indicated by the pollution-tolerant midges, snails, and worms. Such organisms fit well into water quality studies as they are easy to identify, easily sampled, and their removal from a stream has no adverse impact on the remaining biota.

The Sny Magill Project is supported in part by the Environmental Protection Division and the Fisheries and Geological Survey Bureaus of the Iowa DNR, as well as the U.S. Environmental Protection Agency. The goal is to monitor improvements in water quality that result from a 50% reduction in sediment and a 25% reduction in nutrients delivered to Sny Magill Creek. Early sampling results indicate only slight impact by pollutants on the biota. As additional land-use practices are implemented, researchers expect to see improved habitat and water quality, along with increased numbers of aquatic organisms and diversity of the benthic communities. ❖



*Michael D. Schueller is a limnologist for the University Hygienic Laboratory in Iowa City.*

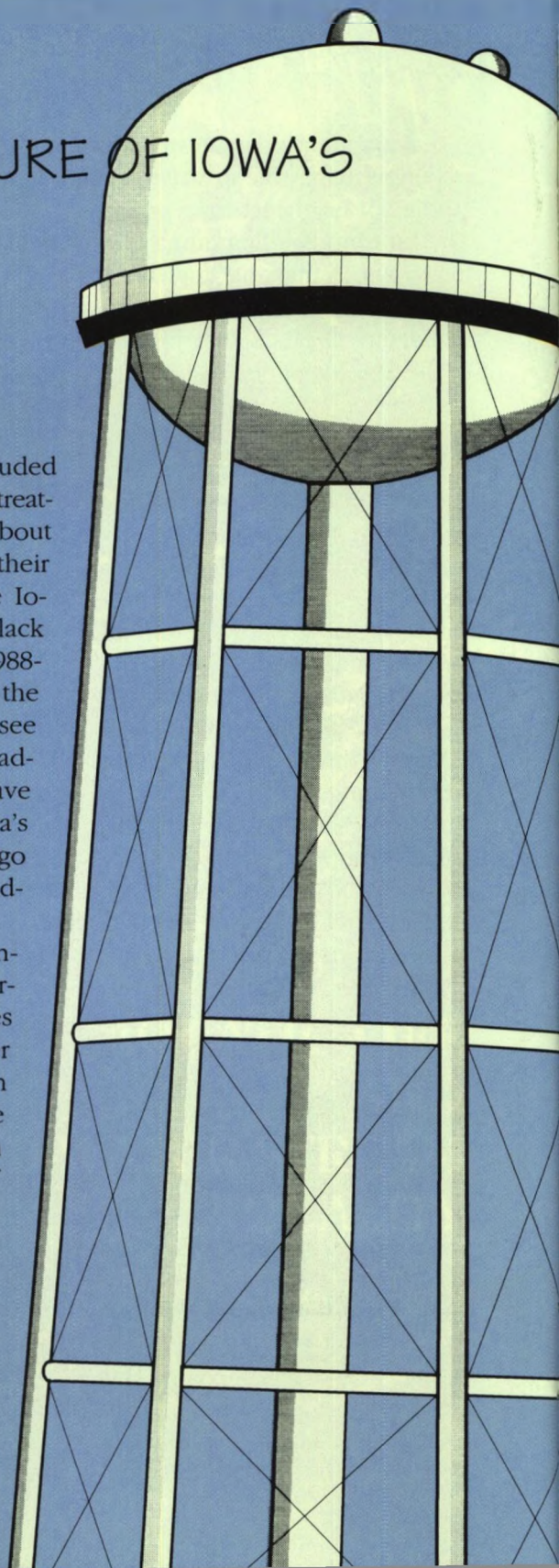
# THE FICKLE NATURE OF IOWA'S WATER SUPPLY


Donivan L. Gordon

Victims of the 1993 floods included the City of Des Moines. The water treatment plant was inundated, and about 250,000 people were cut off from their water supply for 14 days. While Iowans were still remembering the lack of water during the drought of 1988-89, they were enduring impacts of the other extreme. Count on it, we'll see dry times again and will have to adjust. Since the late 1980s, there have been many changes in the way Iowa's communities and rural residents go about the business of insuring an adequate water supply.

On average, Iowa could be considered a water-rich state. But averages tend to gloss over the extremes generated by fluctuating weather conditions and the differences in groundwater distribution across the state. The dividing line between the more water-abundant part of Iowa and the less abundant portion can be drawn roughly along the Des Moines River. To the east more supply alternatives exist, and to the west fewer are present.

Water supply options in east-





ern Iowa include three regional bedrock aquifers, sands and gravels within the overlying glacial deposits, alluvial materials along major rivers, and the rivers themselves. Western Iowa relies on one regional rock aquifer (mostly in the northwest), alluvial sources, and minimal supplies from glacial deposits. Most of the major bedrock aquifers in eastern Iowa are also present in the west. The critical difference between them is groundwater quality. Across most of eastern Iowa these aquifers produce good quality water. West and southwest of the dividing line, the water is highly mineralized and non-drinkable. More reliance is placed on water supplied from alluvial and glacial deposits.

With this in mind, it is not difficult to understand the water supply scenario that develops as the state dries out. In the west, shallow wells in glacial deposits (a principle source for small communities and farms) dry up; streamflow diminishes (alluvial aquifer yields decline); and water-supply emergencies develop. The necessity of hauling water for entire communities and for livestock during the drought of 1988-

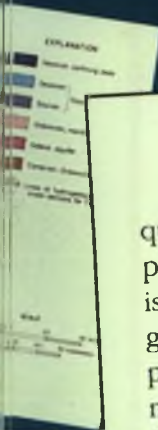
89 stimulated many towns and farmers to hook up to regional and rural water-distribution systems.

Even in less extreme times, chronic water problems exist because of natural variations in quality from aquifer to aquifer and region to region. Human activities and land management practices also can degrade water quality. Where groundwater is more vulnerable, contamination problems have forced the abandonment of once reliable shallow supplies. Deeper wells solved the problem in some areas, but in others, drilling deeper was not an option and rural water systems were the only solution. Household water-treatment units also are available, but they are expensive and usually only feasible for food preparation and drinking.

Iowa, water rich? Perhaps -- if we learn to deal with the extremes in quantity and quality of our water supply, and become better stewards of our valuable, but vulnerable water resources. ❖








**F**or years the Geological Survey Bureau has answered questions about finding groundwater resources in various parts of Iowa. More recent concerns about environmental issues, coupled with the passage of legislation to safeguard groundwater supplies, now brings additional requests from people involved with protecting this resource. They need more detailed information about a greater variety of subsurface geologic and hydrologic conditions, including how well groundwater supplies are protected from potential sources of contamination .

Our clients include environmental engineers, research scientists, concerned citizens, and regulatory agencies, as well as drillers. They may need to determine the geologic materials around and beneath sanitary landfills, septic systems, waste disposal sites, underground storage tanks, and occurrences of petroleum contamination. They also may be planning monitoring and remediation strategies, measuring the presence of agricultural chemicals in the environment, conducting environmental audits of property prior to ownership transfer, or investigating water-quality responses to changes in land management practices. These evaluations all require information about soils and shallow earth materials; depth to and type of bedrock; location of sinkholes, quarries, and underground mines; water-table characteristics; direction of groundwater movement; aquifers in use; water-quality data; and records of surrounding water wells.



The Geological Survey Bureau staff cooperates with other agencies in a variety of research projects. We also review and evaluate the geology and hydrology of numerous environmentally sensitive conditions around the state. Information thus gathered becomes integrated into paper files, computer data bases, publications, and contract reports, as well as into our collective expertise. As this knowledge increases, so does our ability to serve the public's need for reliable, up-to-date, geological information.

*Comment on  
Current Events . . .*

*Widespread flooding during the summer of 1993 was the most significant geologic event many of us have witnessed in our lifetime. The prolonged rainfall, overflowing rivers, and rising groundwater tables reached most Iowans in one way or another. As water levels rose, the geologic shaping of Iowa's landscape was accelerated, and the process became national news. Collapsed slopes, scoured bedrock surfaces, and tons of freshly deposited silt and sand remain to remind us of the flood's force.*

*Geologists sometimes have trouble conveying the value and interest in their work to larger segments of society. There are problems of scale, time, and relevance to overcome. Events such as this year's floods are inevitable encounters with the Earth's periodic, natural, long-term functions -- something that midwesterners in the relatively stable continental interior don't have to confront very often. The floods directly impacted people and sharpened human awareness of geological processes. In the flood's aftermath, visitors have flocked to the marvelous exposures of fossil-bearing limestones below the Coralville Lake emergency spillway in Johnson County. Currently Iowa's most popular "museum," these ancient sea floors, uncovered by the surging floodwaters, were visited by 250,000 people in the first three months after the water receded, leaving little doubt about the public's interest in geology and its effects.*

*Jean C. Prior  
Editor*





IOWA DEPARTMENT OF NATURAL RESOURCES