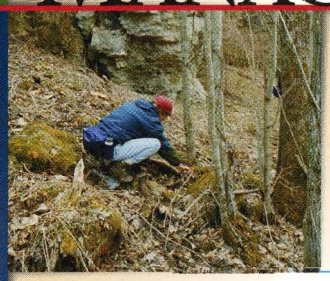
MANAGING IOWA HABITATS



Rare Species of Northeast Iowa's Air-Conditioned Slopes

Steep slopes and sharp cliffs hugging the many streams and rivers characterize this region. It is easy to see why this area has been called the "Switzerland of Iowa."

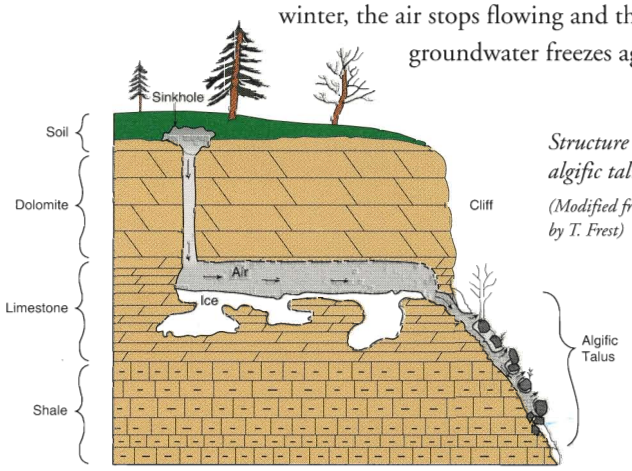
Visitors to the northeast portions of Iowa and adjacent areas in Minnesota, Wisconsin, and Illinois will notice a stark contrast in the landscape compared to other portions of these states. Steep slopes and sharp cliffs hugging the many streams and rivers characterize this region. It is easy to see why this area has been called the "Switzerland of Iowa." Scientists refer to this region as the "Driftless Area," because its high elevation, relative to its surroundings, allowed it to escape glaciation during the last portion of the most recent Ice Age, about 12,000 to 14,000 years ago.

Along with this topography, there are unusual habitats. Northeastern Iowa contains a very special habitat called ***algific talus slopes.*** *Because of unusual geology, these slopes remain cool throughout the year, naturally "air-conditioned."*

What is an algific talus slope?

Peculiar underlying geology created the algific talus producing cold air (**algific**) slopes of loose rock (**talus**) unique to this region. The term 'algific talus slope' was coined by Terrence Frest, who identified most of the slopes known today. These slopes were formed around 20,000 years ago.

A typical algific talus slope consists of a cliff made of dolomite, a permeable type of rock, over a layer of thin limestone and then solid shale. The dolomite allows water to seep into the rock, often through depressions called sinkholes, forming underground caves or crevices in the limestone layer. At the base of many of the cliffs, overlying the caves, are piles of loose rock left from the erosion of the cliffs. The structure of these slopes sets up an unusual air-flow system, often termed "nature's air conditioning." In the spring, the warmer air and water seeping into the slope slowly melts the frozen groundwater in the cave. This cooled air then passes out through the talus, keeping it cool for most of the summer. When outside temperatures cool again in the winter, the air stops flowing and the groundwater freezes again.



Structure of a typical algific talus slope.
(Modified from diagrams by T. Frest)

IOWA STATE UNIVERSITY
University Extension

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A typical algific talus slope in northeast Iowa.

(Photo by T. Danielson)

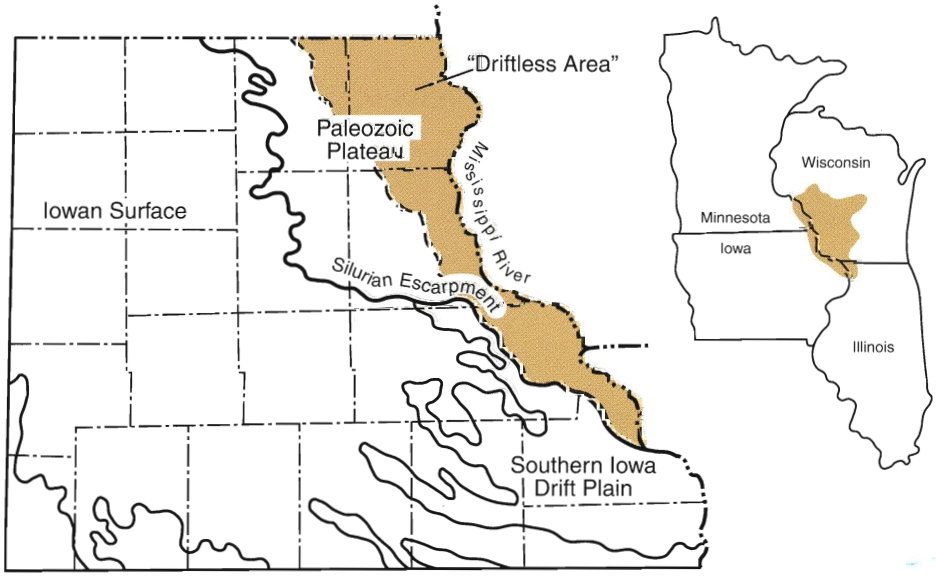
Because of the cool temperatures and moist conditions on the slopes, rare species... live on the algific talus slopes, making this community an unusual combination of species found nowhere else on Earth.

As a result, temperatures on these slopes are maintained in a narrow range throughout the year, from about 15° to 50° F (-10° to +10° C). This is quite mild compared to normal Midwest temperatures in this area of -20° to 85° F (-28° to +33° C). In fact, solid ice can sometimes be found on the slopes well into June.

There are more than 300 known algific slopes in an area that includes portions of Iowa, Minnesota, Wisconsin, and Illinois. The vast majority (240) of these slopes are found in Iowa. Some of them are in poor condition, however, due to damage from grazing livestock, logging, quarrying, and other human activities. Conservation efforts to protect this unique, but fragile habitat are vitally important.

Over 300 algific slopes exist in counties in the four-state region of Iowa, Minnesota, Wisconsin, and Illinois.

The unusual character of this region makes it a refuge for many species of plants and animals that are either isolated from the rest of their geographic ranges or unique to this region. Because of the cool temperatures and moist conditions on the slopes, rare species and those disjunct, or separated, from northern ranges, live on the algific talus slopes, making this community an unusual combination of species found nowhere else on Earth.



In northeastern Iowa, most, but not all, algific slopes are located in a geological region known as the Paleozoic Plateau or "Driftless Area." Areas of similar geology also exist in adjacent southeast Minnesota, southwest Wisconsin, and northwestern Illinois.

(Taken from Smith 1984, used with permission).

Rare plants of algific talus slopes

Plants growing on algific talus slopes are unusual for this part of the country. Thick layers of mosses, ferns, and liverworts can be found on the coldest portions of the slopes. Yellow birch, paper birch, mountain maple, and balsam fir are tree species found here. Yews are common shrubs on these slopes. Unusual herbaceous plants include moschatel, showy lady's slipper, bunchberry, and the northern monkshood. All of these plants are usually found much farther north.

Northern monkshood, Aconitum noveboracense, *grows on several slopes.*

(Photo by B. Danielson)

A particularly good example of this unusual distribution is the golden saxifrage. These plants are entirely separated from the rest of the species in Canada. Disputes often arise over whether the separated populations represent two different species or whether they are the same species. John Pleasants and Jonathan Wendel at Iowa State University studied the amount of genetic difference between the Iowa golden saxifrage and its Canadian relatives. They found that the two groups are very similar, despite being separated from each other since the retreat of the last glacier 12,000 years ago.

Due to the ruggedness of the landscape, which makes agriculture and development difficult, this region also has some of Iowa's highest quality forest remnants. The old trees help to shade and insulate algific talus slopes, protecting them from hot summer sun. The cold microclimate found on these slopes allows the unusual plants to grow there.

Iowa golden saxifrage, Chrysosplenium iowense, *is a rare plant which can be found on some slopes.*

(Drawing by D. Friedrick)

The cold microclimate found on these slopes allows the unusual plants to grow there.

A federally endangered species which was believed to be extinct until rediscovered in 1972, the Iowa Pleistocene snail currently survives on less than 30 algific talus slopes in Iowa and Illinois.

The Iowa Pleistocene snail, Discus macclintocki, *lives only on algific talus slopes.*

(Photo by B. Danielson)

Rare animals of this special habitat

The Iowa Pleistocene snail is, perhaps, the most famous of the plant and animal residents of the algific talus slopes of northeast Iowa. A federally endangered species which was believed to be extinct until rediscovered in 1972, it currently survives on less than 30 algific talus slopes in Iowa and Illinois. This land snail is only about 5 mm (¼ inch) in diameter and is usually light brown in color, although a few olive-colored individuals have been observed. Its scientific name, *Discus macclintocki,* describes its flat, disc-like shape and pays tribute to Dr. Paul Macclintock, an expert in Pleistocene geology from the University of Chicago. The Iowa Pleistocene snail comes out from deep within the talus during the early summer to mate and lay a few eggs, usually in clutches of three. These snails take at least one year to mature and may live for five years or more, eating decaying maple and birch leaves found on the slopes.

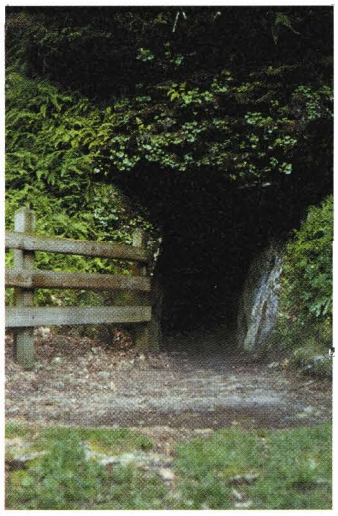
Besides the Iowa Pleistocene snail, many other land snails make their homes on these slopes. Eight additional species have been proposed for endangered species status: frigid ambersnail, Minnesota Pleistocene ambersnail, Iowa Pleistocene ambersnail, bluff vertigo snail, Midwest Pleistocene vertigo snail, variable Pleistocene vertigo snail, Briarton Pleistocene vertigo snail, and Iowa Pleistocene vertigo snail.

The forests surrounding these slopes are important for many other interesting animal species. For example, many migratory bird species spend time here during the summers. Rare birds including the Canada warbler (also called the northern wood warbler) and the Louisiana waterthrush have been seen around the algific talus slopes, although they are not dependent on the algific habitat, per se. In addition, cliffs that are often associated with these slopes may serve as nesting grounds for bald eagles.

Five-lined skinks also have been reported from this region. These reptiles are appropriately named for the stripes on their backs. Their distribution in Iowa is separated from the rest of the species' range in eastern North America.

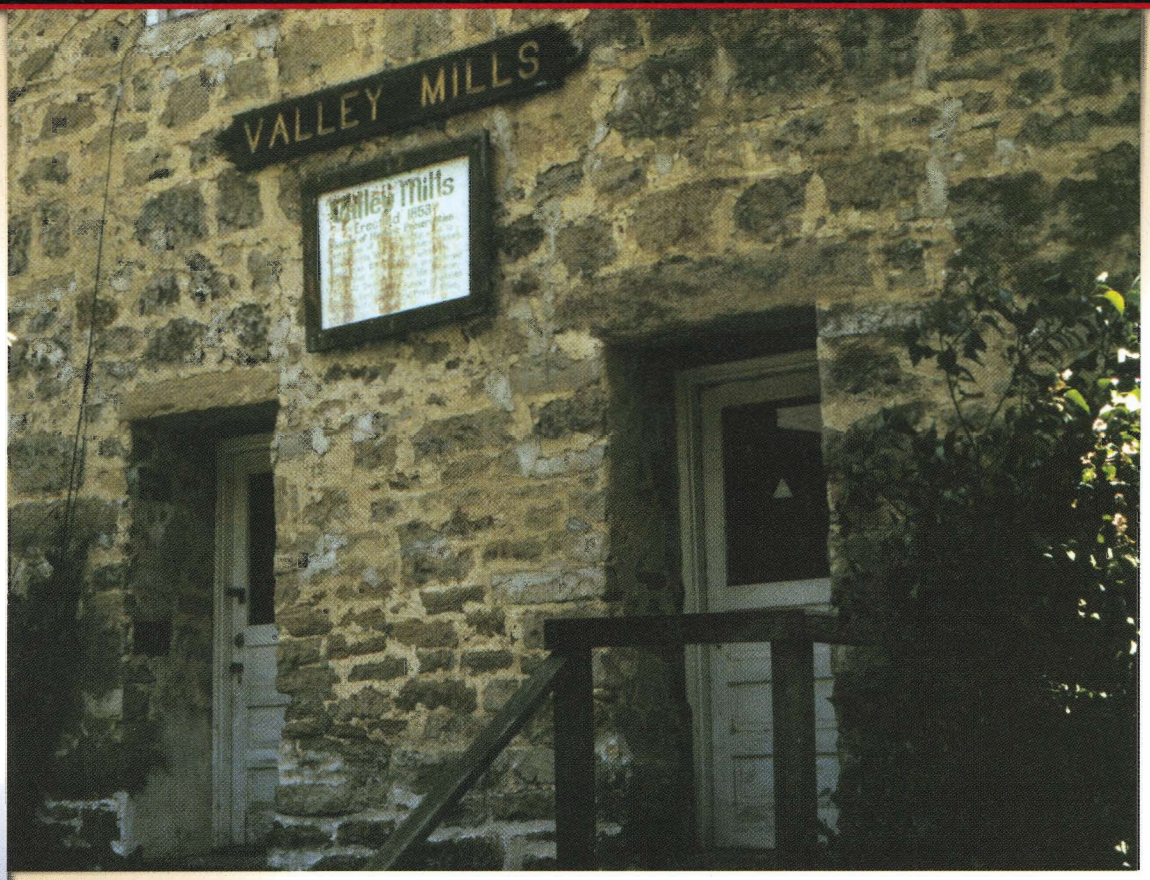
Fish and other aquatic organisms also are affected by the geological history of the region. For example, the slimy sculpin is found in the streams of this region, cut off from the rest of its range in Lake Superior and Lake Michigan.

Caves in this region also show interesting species of flatworms, isopods, mites, and spiders. A study of the invertebrates in local caves indicates that some of these species may have survived underground in the caves through the glaciation of the late Pleistocene when the land above ground was uninhabitable. This would make these species much older than most of the other animals of the region, which are believed to have moved into the area as the glaciers retreated.



An ice cave on an algific talus slope.

(Photo by T. Anderson)



An old mill in Clayton County, Iowa.
(Photo by T. Anderson)

Human history in the region

Prehistoric peoples lived in this region of Iowa as evidenced by the mounds that remain in such places as Effigy Mounds National Monument. These mounds were built around 1000 BC to 1700 AD. Other cultures which left a mark on this region include the Oneota (Upper Iowa) and the Ioway. The influence of the Winnebago tribes pushed into this region by expanding white settlement can be seen in places named after their Chiefs: Waukon, Decorah, and Winneshiek.

The first white settlers in the region found an area of forests along the waterways separated by prairies along the ridge tops. Zebulon Pike explored the Yellow River during his journey up the Mississippi in 1805. Some of the first Europeans to the area were trappers and missionaries. The Winnebago Mission School was set up on the Yellow River as early as 1835. Settlers moved into this region in large numbers by the 1840s. Mills for cutting lumber and grinding grain were common along streams in this region where the running water provided power to turn the stones. Today only a few old mills can still be seen in some locations, such as Valley Mill near Garnavillo. Farming was essential to the survival of most of these settlers, and today raising dairy cattle and growing corn and soybeans continue to be the major industries of this region.

Farming was essential to the survival of most of these settlers, and today raising dairy cattle and growing corn and soybeans continue to be the major industries of this region.

What is being done to learn more about these slopes?

Several research projects have been conducted to better understand the unique habitat of these algific talus slopes and the species that reside there.

Margaret Kuchenreuther, formerly of the University of Wisconsin, Madison, now at the University of Minnesota, Morris, studied northern monkshood on several slopes. She examined the life history of this plant and learned that it reproduces through seeds and vegetatively through tubers. This dual strategy makes it resilient to the difficult environment in which it lives.

Due to the rarity and extreme fragility of the slopes' ecosystems, protection of these unusual environments is critical to their survival.

Tom Cottrell at Luther College in Decorah, Iowa is studying the plant communities on some of the algific slopes in Winneshiek County in northeastern Iowa. He is especially interested in how the arrangement of the plant community corresponds to the range of temperatures across the slopes.

The authors of this article are investigating the genetic diversity of the Iowa Pleistocene snail. Isolated populations of animals are subject to inbreeding and reduced genetic exchange with other populations which can be detrimental to the survival of the population. By determining the amount of variation within the snail populations, we hope to help evaluate the health of these remaining populations. Also, by comparing different populations, we are able to determine the genetic relationship among the populations, which is useful information in the management of any endangered species.

What is being done to protect these slopes?

Due to the rarity and extreme fragility of the slopes' ecosystems, protection of these unusual environments is critical to their survival. Although some natural phenomena (tornadoes, rock slides, tree falls, and wild animals) may occasionally do some damage, human-induced disturbance is both the most damaging and the easiest to prevent. Grazing domestic animals, harvesting timber, quarrying, road-building, and spraying pesticides have severely damaged several slopes. Even recreational hiking activity can do serious damage, and, in fact, has been responsible for the extinction of at least one *Discus macclintocki* population.

Restorations of damaged slopes are extremely difficult at best. Compacted soil at the air vents and clogged sinkholes change the pattern of air flow. Restoring that flow is virtually impossible.

A researcher studying the Iowa Pleistocene snail uses wooden boards placed on the slopes to attract snails.

(Photo by T. Danielson)

The slopes are best admired from a respectful distance or through photographs so that they may be preserved for the organisms that depend on them for survival.

Many public agencies and private organizations are involved in preserving these unique areas. The U.S. Fish and Wildlife Service has established an Algific Slope Refuge to protect this habitat. The Nature Conservancy and the Departments of Natural Resources of several states have purchased slopes and manage them for the conservation of the unique assemblage of species which reside there.

Scientific names of algific talus slope species

Bald eagle	*Haliaeetus leucocephalus*
Balsam fir	*Abies balsamea*
Bluff vertigo	*Vertigo meramecensis*
Briarton Pleistocene vertigo	*Vertigo brierensis*
Bunchberry	*Cornus canadensis*
Canadian warbler	*Wilsonia canadensis*
Five-lined skink	*Eumeces fasciatus*
Frigid ambersnail	*Catinella gelida*
Iowa golden saxifrage	*Chrysosplenium iowense*
Iowa Pleistocene ambersnail	*Novisuccinea n. sp. Minnesota B.*
Iowa Pleistocene snail	*Discus macclintocki*
Iowa Pleistocene vertigo	*Vertigo iowaensis*
Louisiana waterthrush	*Seiurus motacilla*
Midwest Pleistocene vertigo	*Vertigo hubrichti hubrichti*
Minnesota Pleistocene ambersnail	*Novisuccinea n. sp. Minnesota A.*
Moschatel	*Adoxa moschatelliana*
Moss	*Rhytidiadelphus triquetris*
Mountain maple	*Acer spicatum*
Northern monkshood	*Aconitum noveboracense*
Paper birch	*Betula papyrifera*
Showy lady's slipper	*Cypripedium reginae*
Slimy sculpin	*Cottus cognatus*
Variable Pleistocene vertigo	*Vertigo hubrichti variabilis*
Yellow birch	*Betula lutea*
Yew	*Taxus candensis*

An algific talus slope owned by the U.S. Fish and Wildlife Service.

(Photo by T. Anderson)

Many public agencies and private organizations are involved in preserving these unique areas.

For more information

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