

Ice Age

NATIONAL SCIENTIFIC RESERVE • WISCONSIN

ADMINISTRATION/INFORMATION

Ice Age National Scientific Reserve was established on May 29, 1971, as a unit of the U.S. Department of the Interior's National Park Service to be administered by the State of Wisconsin, Department of Natural Resources. The director of the State Bureau of Parks (Pyare Square Building, 4610 University Avenue, Box 450, Madison, Wisconsin 53701) is in overall charge of the operation of the National Scientific Reserve.

State of Wisconsin / Department of Natural Resources

**National Park Service
U.S. DEPARTMENT OF THE INTERIOR**

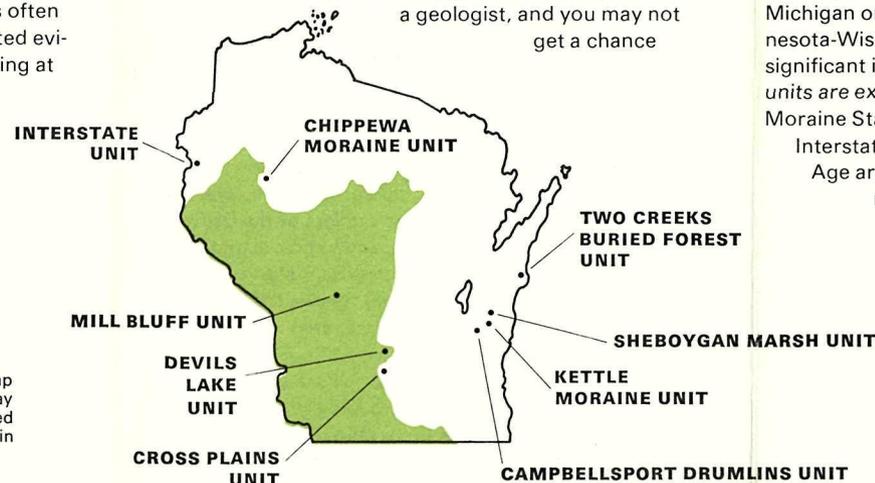
Fly over southeastern Wisconsin at moderate height; then observe the landscape at ground level. You'll notice that certain distinctively shaped hills and ridges occur repeatedly, and in patterns that rule out the possibility of random distribution. These recurring landforms are mementos of the Wisconsin glaciation, the most recent major episode in Earth's geological history. Because each was shaped by the ice sheet under a special set of conditions, it is fairly easy for students of glacial geology to recognize them. For example, you should be able to identify some of the drumlins—the most familiar of Wisconsin glacial features. Just imagine a half of a hard-boiled egg (cut lengthwise) laid on its flat surface; stretched out to about 1,000 meters (3,300 feet) in length, half that in width, and about 25 meters (80 feet) in height; and covered with grass and trees. This is an approximation of a drumlin.

Drumlins are deposits of rock and clay laid down and streamlined by the moving ice of the glacier. It is often possible, from their alignment and from associated evidence, to determine which way the ice was moving at the time they were made. Typically, the small end of the "egg" points in the direction of ice flow. The State of Wisconsin has about 5,000 drumlins and thousands of other landforms recognizable as having been born of the ice sheet. Much of the State's scenic interest lies in these landforms and the life communities that have developed on them.

The (green) area of the map shows that part of present-day Wisconsin that was not covered by any stage of the Wisconsin ice sheet.

The great sequence of events that did so much to shape the landscape of the northern half of North America and Europe spanned perhaps 1,500,000 years. The Wisconsin stage, the latest series of glacial advances and retreats, began possibly 70,000 years ago and ended only 10,000 years ago. In fact, we can't even be certain that we are not still in the Ice Age, merely enjoying a warm period between two glacial advances.

This knowledge, strangely, is only about a century old. Until the mid-nineteenth century no one could account satisfactorily for drumlins, kames, eskers, kettles, moraines, and other such phenomena. It was the great Swiss naturalist Louis Agassiz who announced to a skeptical world the bold new theory of continental glaciation. Today it is universally accepted and is the focus of a whole branch of geologic investigation. You may not be a geologist, and you may not get a chance



to fly over Wisconsin, but you can get a good introduction to ice-age geology by visiting the areas set aside as the Ice Age National Scientific Reserve.

Ice Age National Scientific Reserve is a unit of the National Park System administered by the Wisconsin Department of Natural Resources. This cooperative planning and development effort is concerned with a nationally significant glacial landscape and its human and natural history. Geologists have found that many of Wisconsin's most outstanding Ice Age features had been removed or partially destroyed by man. The late Raymond Zillmer, a Milwaukee lawyer who studied and enjoyed these glacial landforms over the years, felt that those remaining should be preserved. The efforts of Zillmer and others resulted in passage by Congress in 1971 of legislation providing for such protection.

The Ice Age National Scientific Reserve consists of nine separate units located across the State from Lake Michigan on the east to the St. Croix River on the Minnesota-Wisconsin border. Each unit possesses features significant in the story of Wisconsin glaciation. Four units are existing State Parks or Forests: The Kettle Moraine State Forest, and Devils Lake, Mill Bluff, and Interstate Parks. Lands for the five undeveloped Ice Age areas are currently being acquired. In the near future, each of the nine units will have new or expanded interpretive facilities and services.

A SUGGESTED TOUR ROUTE

The close proximity of the Campbellsport Drumlins to the Kettle Moraine and Sheboygan Marsh offers you an opportunity to enjoy a leisurely scenic tour of three of the nine Ice Age units.

State Highway 67 joins the Campbellsport Drumlins with the Kettle Moraine Ice Age unit 26 kilometers (16 miles) to the east. County Trunk P through the village of Glenbeulah at the north end of the Kettle Moraine takes you to the Sheboygan Marsh unit.

CAMPBELLSPORT DRUMLIN UNIT

Ten kilometers (6 miles) west of the Kettle Moraine unit, off Wis. 67, the farmlands swell into long, rounded hills marking the location of the Campbellsport Drumlin Ice Age unit. Bordered by County Trunk Y on the south and County Trunk V to the east, this area is easily reached via Wis. 41 or 45 and Wis. 67.

The Campbellsport unit, like much of southeastern Wisconsin's farmland, is dotted with the elongate, rounded hills known to geologists as drumlins. Scientists have long recognized these features and have identified nearly 5,000 in Wisconsin. They cannot, however, agree to their origin, except to say that they tend to lie parallel to the direction of movement of the glacial ice.

The drumlins northwest of Campbellsport are not the highest, longest, or the most perfectly formed drumlins in Wisconsin. They do, however, offer an opportunity to view a number of different drumlins closely concentrated in one area, and to see how man has used them.

Early settlers cleared the drumlin hillsides and used the timber to build their barns and farmhouses. Crops

were planted between the hills and on their gently sloping sides. Livestock grazed on the steeper slopes, and the hilltops were often left wooded to provide firewood and fenceposts. Modern farm machinery now allows farmers to till more of this land, but many of the drumlins still wear forested caps.

Eventually three scenic overlooks along a self-guiding tour route will be developed at the Campbellsport Drumlin unit. This route will include interpretive signs to help you better understand the drumlins and their part in the glacial story.

While overlooks and exhibits have not yet been constructed, roads in the area offer an opportunity for a leisurely scenic drive. Along the way you'll see the patterns of man's use of the land.

As you view the rounded contours of the drumlins, try to imagine this landscape when it was covered by hundreds of meters of glacial ice.



WE'RE JOINING THE METRIC WORLD

The National Park Service is introducing metric measurements in its publications to help Americans become acquainted with the metric system and to make interpretation more meaningful for park visitors from other nations.

Superlative among the Ice Age units from the standpoint of variety, abundance, and magnitude of its glacial features is the northern unit of the Kettle Moraine State Forest. Located 80 kilometers (50 miles) north of Milwaukee, this Ice Age area can be reached easily via U.S. 45 and Wis. 67 from Milwaukee or Fond du Lac, or via Wis. 23 from Sheboygan. The Kettle Moraine Scenic Highway provides access to and circulation through the State Forest.

The famous Kettle Moraine was formed as the ice of the Green Bay lobe and the Lake Michigan lobe came together. Blocks of ice buried within the deposited material melted to form the numerous kettles that dot the surface and give the rugged interlobate moraine its name.

Aside from the diverse sizes and shapes of the kettles, many other splendid examples of glacial features created by ice and water action are present. Here are found some of the world's finest examples of moulin kames. These are conical hills formed when material is washed by streams into holes in the glacial ice. Many

moulin kames here are further accentuated because they rise from a broad, flat, plain formed by sediments that inwashed between the two moraines.

Winding through parts of the Kettle Moraine Ice Age unit is Parnell Esker, one of the best known examples of this glacial feature—a sinuous ridge formed by water running beneath the ice sheet. Portions of other eskers not destroyed by erosion or by man's activities can also be seen here.

For a long time, Indians lived here, foraging, hunting, and fishing. Early settlers found the flat inwash land between the rugged, forested hills valuable for farming.

In recent years, the area has been increasingly important for recreational purposes, and the State of Wisconsin has been acquiring land for Kettle Moraine State

SHEBOYGAN MARSH UNIT

Just west of the small Town of Elkhart Lake, lying 30 kilometers (19 miles) west of Sheboygan via Wis. 23 and 67, is a marsh-covered area of thousands of hectares, once the site of a large glacial lake. Sheboygan Marsh County Park comprises almost one-half of this environment. A rich source of wetland plant and animal life, it also demonstrates the effects of man's efforts to control and use a rich marshland.

As the ice of the Green Bay lobe moved southeasterly, it caused the formation of a large basin. Glacial Lake Sheboygan was formed in this basin by water from the melting glacier. This same melt water carried sediment which (in combination with sediment carried into the basin by the Sheboygan River following the glacier's retreat) gradually filled the Lake. Today a large marsh overlying more than 30 meters (100 feet) of sediment is all that remains of Glacial Lake Sheboygan.

Indians, attracted by the good hunting and fishing and plentiful plant foods, settled in the area. Later, farmers attempted to drain the flat marshland for agricultural uses. Remnants of their canals remind us of their failures. A dam within the county park controls the marsh water level, and natural succession continues.

Interpretive facilities are not yet available, but a community-oriented picnic, boating, and fishing area is near the dam off County Trunk P immediately west of Elkhart Lake. Future development will include nature trails to facilitate observation of the marsh's abundant plant and animal life. Exhibits on a high hill overlooking the marsh will tell how the glaciers formed Lake Sheboygan and how the lake became a rich marshland.

FEES

Entrance and use fees are charged at some units of the Scientific Reserve. Both the Federal Golden Eagle and Golden Age Passports and Wisconsin Department of Natural Resources Admission Stickers are honored in payment of these fees.

Forest. Thousands come each year to camp, hike, fish, or just enjoy the varied landscape.

Interpretation of Ice Age features is an important part of the State forest program. Roadside markers along a self-guiding auto trail tell part of the glacial story. The Glacial Hiking Trail winds over and past many significant features. Naturalists present programs on glacial history along with other programs of human and natural history.

Information about these trails and interpretive programs, as well as the recreational facilities of the area, may be obtained at the State Forest Headquarters at Mauthe Lake, 11 kilometers (7 miles) south of Dundee off County Trunk G.

Additional interpretive displays and exhibits, an Ice Age Visitor Center, and increased naturalist programs are planned for the future.

Two areas, one in eastern and one in southern Wisconsin, designated as units of the Ice Age National Scientific Reserve, are as yet undeveloped but display striking evidences of glacial action. On the shore of Lake Michigan 26 kilometers (16 miles) north of Manitowoc on Wis. 42 is the Two Creeks Buried Forest. Twenty kilometers (12 miles) west of Madison, easily reached by U.S. 14 or Wis. 151, is Cross Plains.

TWO CREEKS BURIED FOREST UNIT

This area is world famous among geologists for the evidence it contains of advances and retreats of the Wisconsin glacier.

During an interglacial period, a forest of spruce, hemlock, and associated plants grew along the shore of Lake Michigan. A later period of glacial advance covered and preserved the vegetation in a layer of glacial clay, sand, gravel, and boulders. Erosional forces uncovered this organic layer; by carefully examining the soil above and below it, scientists discovered much about the most recent period of glaciation. Radiocarbon dating shows that this forest was alive 11,850 years ago. Water-deposited materials indicate that twice after the ice retreated this land was covered by waters about 100 meters above the present-day levels of Lake Michigan. This adds to our knowledge of the effect of glaciers and their melt water on levels of the Great Lakes.

Future plans include an archeological dig to reveal the buried organic materials. Exhibits will show how the environment was changed during glacial periods, the present distribution of some of the plants buried here, and how and why the lake levels changed.

CROSS PLAINS UNIT

This area provides striking evidence of the glacier's farthest venture into the Driftless Area, an "island" of nearly 4,000,000 hectares (9,600,000 acres) in Minnesota, Iowa, Illinois, and Wisconsin that was apparently never covered by ice. Its high bluffs, rugged cliffs, and well drained river valleys are in marked contrast to much of Wisconsin's topography. The area provides a glimpse into the past; much of Wisconsin looked like this before the visits of the glaciers.

At Cross Plains, where the glacier's movement ceased, the end moraine is relatively thin and rests on bedrock. At one point just a few meters from the moraine are sculptured limestone outcrops that would have been destroyed had glacial ice covered them—clues indicating the line of farthest glacial advance.

Located above Wisconsin's Black Earth Creek Valley, this area also provides evidence of the formation of small marginal proglacial lakes and marginal drainageways. One of these drainageways actually cut back under the ice sheet itself, forming a deep gorge running north and south through the unit.

The entire unit remains in private ownership and is not yet open to the public. In the future, exhibits will explain the glacial story. An interpretive trail will allow visitors to view the end moraine, sculptured limestone formations, and glacial drainageways, and will provide a splendid view of the Driftless Area and the Black Earth Creek Valley. A self-guiding auto and biking tour from Madison to Cross Plains will follow the end moraine closely, with views of both glaciated and unglaciated landscape.

To see the contrast between the Driftless Area to the west and the glaciated lands to the east and north, drive west from Madison on Wis. 151, west on County Highway PD, Shady Oak Lane, and Timber Lane, and then north to Cross Plains along Cleveland Road.

Driving from Milwaukee or Madison to northwestern Wisconsin via Interstate 94, the leisurely traveler can make side trips to four units of the Ice Age National Scientific Reserve. Devils Lake, Interstate, and Mill Bluff are State parks already famed for their glacial formations. Chippewa Moraine, less known, lies partly within the Chippewa County Forest and is as yet undeveloped. Unusual landscapes and outstanding scenic beauty reward those who make these short detours.

DEVILS LAKE UNIT

Nowhere in Wisconsin is the dramatic force of continental glaciation more apparent than at Devils Lake. Situated 5 kilometers (3 miles) south of Baraboo and only 32 kilometers (20 miles) from the popular Wisconsin Dells area, this unit of the Ice Age is served by Wis. 159 and 123 from the north, Wis. 113 from the north and east, and South Shore Drive from the west. Major access along these highways is from U.S. 12 1.5 kilometers (1 mile) west of Devils Lake and from Int. 90-94 interchanges 20 kilometers (12 miles) east and north of the unit.

Millions of years before the Ice Age, the ancient Wisconsin River cut a gorge, more than 250 meters (800 feet) deep, through the ancient quartzite of the Baraboo Range. Later, ice of the Green Bay glacial lobe spread around these hills, damming both ends of the narrow gorge with ice and moraine and creating the Devils Lake Basin.

For many years the ice sheet slowly struggled up the slopes of the Baraboo Hills. During this time, melt water pouring off the two glacial fronts carried tons of sediments into the large lake then filling the gorge. Today, Devils Lake lies atop a hundred meters (325 feet) of this glacial debris, and its morainal dams form broad hills at either end of the gorge. If you view the morainal dams forming Devils Lake and realize that the Wisconsin River now flows about 15 kilometers (9 miles) to the



east, you can appreciate how huge the glaciers were.

The vegetation within Devils Lake State Park is varied. Remnants of plants now associated with more northern climes are found in cool, sheltered areas, while on the dry, high bluffs prairie species grow. This variety of vegetation attracts an outstanding array of birds and other animals.

Many people believe the scenery at Devils Lake to be the most spectacular in Wisconsin. More than 1.5 million persons come each year to camp in the park's 450 campsites, to hike on the trails, and to swim, fish, or sail on Devils Lake. Others picnic or simply enjoy the beauty of the 2064-hectare (5100-acre) State Park. Interpretive exhibits in the park nature center explain the geologic history and the formation of Devils Lake. Naturalist programs and guided walks allow visitors to learn more of the park's geologic, glacial, and natural history. Information on these services may be obtained at park headquarters at the north end of the lake. Future facilities and services will include a new interpretive center, trails, and self-guiding hiking and tour routes which will expand the park's interpretive program.

MILL BLUFF UNIT

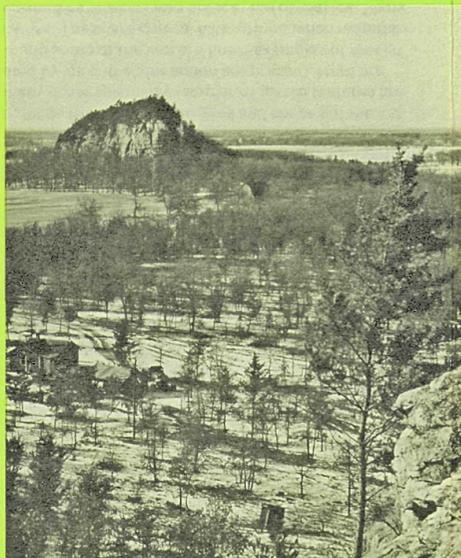
One of the most startling of the Ice Age units is Mill Bluff. Rising abruptly from the relatively flat terrain of the Camp Douglas area along Int. 90-94 are towering rocky buttes that capture the imagination of passing travelers. Two U.S. 12 and 16 interchanges of Int. 90-94—at Oakdale, 5 kilometers (3 miles) west, and at Camp Douglas, 3 kilometers (2 miles) east—provide easy access to the unit's north-south bisecting access and circulation road, County Trunk W.

Once small rocky islands in a now-extinct glacial lake, the imposing buttes of the Mill Bluff Ice Age unit are landmarks to travelers of Wisconsin's Interstate system just as they were to settlers following the flat lands of the lake bottom. Together, the remnant glacial lake and its hardened sandstone islands provide an interesting story. Blocking the channels of rivers and streams as they moved, glacial ice sheets formed temporary lakes throughout Wisconsin. Ice of the Green Bay lobe moving against the highlands of the Driftless Area blocked the channel of the Wisconsin River, forming one such lake now known as Glacial Lake Wisconsin.

This glacial lake eventually covered 460,000 hectares (1,150,000 acres) to a depth of 20 to 25 meters (60 to 80 feet). The wave action and currents of its waters eroded materials from sandstone outliers of the Driftless Area, depositing tons of suspended glacial materials in the lake. Some stacks of hardened sandstone, however, did not erode as readily. They survive today as islands rising from the flat plain that marks the old lake bed.

Indians, early explorers, and pioneers used these bluffs as trail guideposts; and, to avoid the uneven topography of the Driftless Area, railroad and highway builders used the flat land of the old lake bed.

Mill Bluff State Park protects the bluffs and spires of this area and offers limited opportunities for camping, picnicking and swimming. Hiking trails wind through



the island remnants of Glacial Lake Wisconsin. From atop these spires, the broad lake bed, features of the Driftless Area, and other bluffs may be seen.

Future interpretive displays will help visitors understand the formation of this large lake. New and improved trails will provide a means to explore the old lake bed and view the steep-walled buttes and rocks.

CHIPPEWA MORAINE UNIT

A short 10-kilometer (6-mile) drive north of the Town of Bloomer along State Highway 40 takes you to a woodland of jumbled hills set with more than 300 kettle lakes, ponds and pools standing above the surrounding cultivated plains. This is the Chippewa Moraine Ice Age unit, an unusual landscape formed by the advancing Chippewa lobe of the Wisconsin glacial epoch.

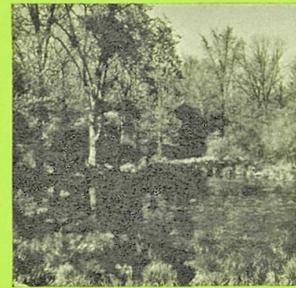
Travelers on Int. 94 may reach this Ice Age unit by exiting on U.S. 53 north to Bloomer. There, Wis. 40 north will take you to County Trunk M. A drive east on County M routes you through the heart of this hilly, forested, lake-dotted area.

While to the east the Green Bay and Lake Michigan lobes moved down the lowlands into Illinois, the Chippewa lobe moved more slowly, retarded by the massive northern Wisconsin highlands.

Driving north from Chippewa Falls along U.S. 53 you'll see scenic, wooded hills that rise from a flat outwash plain, marking the end moraine of the Chippewa lobe. Unlike the higher hills of the interlobate moraine in the Kettle Moraine Ice Age unit, the features here are those of a stagnant or "dead-ice" moraine.

As the ice lay stagnant, many cracks, crevasses and breaks formed in its surface. Debris carried in melt water filled many of these fissures, forming a variety of ridges. The breaking, "rotten" ice, covered by debris, later melted to form kettles. Many small, shallow kettles now mark this moraine, producing a curious knob-and-swale topography.

One of the most interesting features of the dead-ice moraine are ice-walled lake plains. The features began as moulin kames—conical piles of debris under the ice. As the glacier melted down and thinned, large holes opened in its surface. Water pouring into these holes dumped great amounts of debris, often filling them to the surrounding ice surface. Lakes formed as the under-ice drainages were blocked. Filled by inwashing debris,



they became flat lake beds. When the glaciers melted completely, circular hills with flat or dish-shaped tops appeared. Within the Chippewa Moraine are several of these large, elevated inwash plains.

As the moraine formed, melt waters carried sediment off its front, forming a large outwash plain. Farms now occupy the flat land of this outwash, providing a contrast to the wooded hills of the moraine.

At present there are no facilities at Chippewa Moraine; but more than 400 hectares (1,000 acres) of the Ice Age unit lie within the Chippewa County Forest, affording opportunities for hiking and other recreational activities. Although land acquisition has begun, most of the unit's remaining 1,200 hectares (3,000 acres) are still privately owned. Please respect the rights of property owners while exploring this land.

In the future an interpretive center, exhibits, and displays will explain the dead-ice moraine of this Ice Age unit and its features. Hiking trails and a self-guiding auto and biking tour will provide opportunities to view firsthand many of the unit's glacial features.

and leaving undrained, rolling lands. This layer of debris, varying from a few centimeters to a hundred meters or more, is the legacy of the glaciers.

The glaciers did not advance and retreat in one continuous movement. During a period of thousands of years the glacial ice moved slowly forward, stopped, retreated, and moved forward again. Suspended material would be deposited at the glacier's outer edge as the front melted and slowed. During periods of glacial advance much of this same material was lifted and pushed into ridges or moraines.

Materials were deposited at the leading edge of the ice sheets, forming *end moraines*—bands of hills marking the farthest points of the glacial advance across the State.

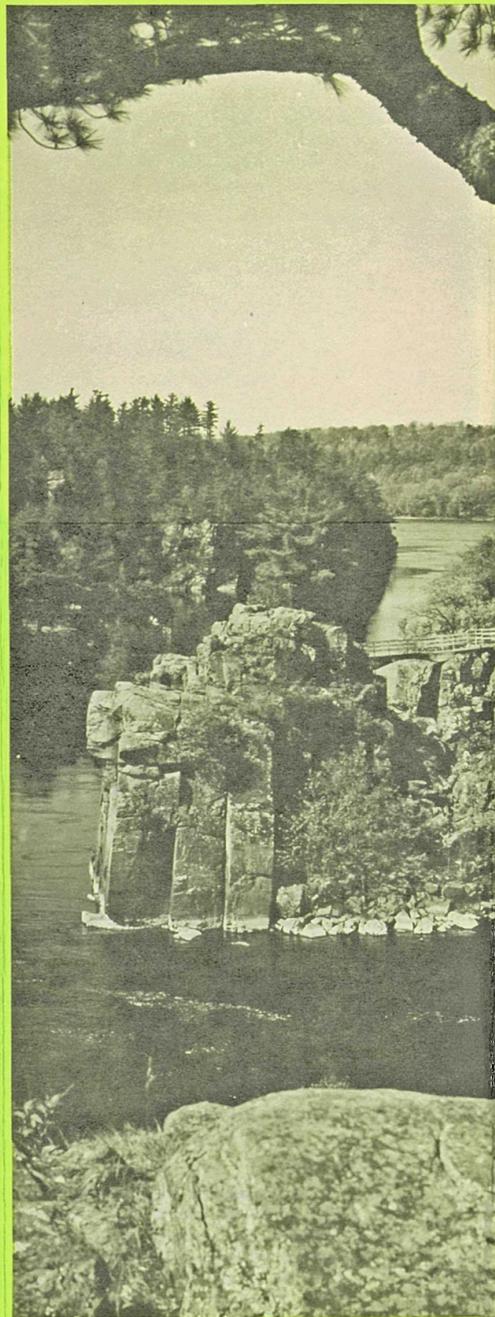
Although the end moraine is no longer a continuous band of hills because of erosion by rain, frost, wind, and running water, it is useful to scientists in their studies of glacial movements.

At some points within the moraines, large blocks of ice buried under a layer of debris melted and the soil above caved in, creating a depression, or *kettle*. Today, Wisconsin's glacially formed landscape is dotted with lakes, ponds, marshes, and swamps marking these kettles.

Water from melting glaciers created many features. As melt water running along the surface of the ice sheet cascaded off the glacial face or plunged into holes in the ice sheet, the sand, gravel, and rocks carried by the water formed conical hills known as *kames*. Water running beneath the ice mass deposited glacial debris to form long, sinuous ridges we call *eskers*.

Few of these relatively fragile formations remain, because the ice or water quickly eroded them. Others

By visiting these four units of the scientific reserve, you can see various features left by glaciation, including (from left): Devils Lake and the glacial path through the bluffs in the southeast corner; rocky buttes rising abruptly from the plains at Mill Bluff; kettle ponds at Chippewa; the deep gorge of the St. Croix River and large potholes at Interstate Park.



INTERSTATE UNIT

The westernmost of the nine Ice Age units comprises an area of ancient lava flows, large water-formed potholes in the hard lava, and an outstanding scenic gorge of the St. Croix River, once a principal glacial drainage-way. Served by a system of existing State park roads joining U.S. 8 on the north and County Trunk S on the south, Interstate Ice Age unit lies 100 kilometers (62 miles) northeast of Minneapolis-St. Paul via Int. 35 and U.S. 8. Its landforms attest to the tremendous erosive force of glacial melt waters.

Before glacial ice moved into Wisconsin, the St. Croix River flowed farther west through Minnesota than it does today. Glacial deposits blocked the old river channel and melt water cut new drainage patterns near the river's present location.

To the north and east, the glacial ice scoured out the Lake Superior Basin. Ice blocked the eastern drainages of ancestral Lake Superior and melt waters filled it to almost 200 meters (650 feet) above its present level. We call this former vast inland sea Glacial Lake Duluth. For hundreds of years, waters of Glacial Lake Duluth flooded southward, down the St. Croix River Valley.

At St. Croix Falls, the river, using rocks as cutting tools, cut a narrow, steep-walled gorge through layers of sandstone and Precambrian lava. Water cascading through the gorge created whirlpools. Scientists believe that the Lake of the Dalles, located within this Ice Age unit, was once a gigantic whirlpool, and examination of its bottom materials have revealed clues about the plants and animals inhabiting the area after the glacier's retreat. Potholes of varying sizes were carved by rocks caught in these currents. Large potholes up to about 5 meters (16 feet) deep located high above the river attest to the tremendous volume of water that cut this gorge. Below the gorge the river cut a wide, deep valley for nearly 80 kilometers (50 miles) before joining the Mississippi River.



In 1900, the State of Wisconsin made the Dalles of the St. Croix its first state park. Later, Minnesota made its side of the river a state park and the two were designated Interstate Park. Three campgrounds, hiking trails, a swimming beach and the beauty of the river gorge and surrounding forested land attract many visitors to this Ice Age unit.

Ice Age interpretation at Interstate will complement and expand the park's present program. The creation of the Dalles through action of glacial waters will be the prominent story. Glacial movement in northwest Wisconsin and its effects will also be covered. Today, a number of hiking trails afford splendid views of the narrow St. Croix River gorge. Information on these trails and interpretive services may be obtained at park headquarters.

THE GLACIAL STORY

The Wisconsin of today is not the Wisconsin of the Ice Age. Each year we see the face of northern America altered by the cycle of the seasons. Green summers give way to the varying hues of autumn. In winter, fingers of ice form on shallow ponds and gently falling snowflakes cover the land in a blanket of white.

Spring arrives: warm breezes and sunlight thaw the snow and ice, and winter's grip is released to reveal the pastel hues of spring's rebirth.

But during a recent period of geologic time this land did not undergo such change. Great areas lay under thick layers of ice. For more than a million years, in at least four major periods of glacial advances, ice covered much of Canada and the northern United States.

These four glacial stages, Nebraskan, Kansan, Illinoian, and Wisconsinan, are named for their most southern advances.

The latest, Wisconsinan, stage covered much of the northern United States from the Atlantic coast to the Rocky Mountains, as recently as 12,000 years ago. Nowhere is the evidence of the glaciers better preserved than across Wisconsin. Myriad lakes and ponds, forested hills and ridges, and gently rolling to perfectly level farmlands remind us of the glacier's visit.

A Moving Ice Sheet . . .

To understand the changes the glaciers brought, we must first grasp their magnitude.

Over periods of thousands of years the cold of the arctic climates moved southward. Falling snow did not melt but accumulated year after year, and under its

own pressure it was changed to ice. In time this produced an ice sheet more than 1600 meters (1 mile) thick. The sheer mass of this ice produced pressures that caused it to spread outward. Year by year and meter by meter it moved across the land, engulfing soil and rock and incorporating them into its mass. Trillions of tons of materials were lifted, ground, and mixed together in glacial ice as they were carried southward.

Over the million years of the Ice Age, many meters of materials were removed from hills and bluffs; land was leveled and the enormous weight of the glaciers even caused the earth's surface beneath to depress.

Variations in topography and snowfall caused the massive ice sheet to move across the land at an uneven pace. While the glaciers could move more easily down river valleys and drainages, contact with massive hills slowed their movement as they laboriously crept up the slopes. Higher upland areas caused the ice sheet to separate into tongues or lobes of ice moving outward from the mass.

Four major lobes of the Wisconsin Glacier are recognized across the State: Superior, Chippewa, Green Bay, and Lake Michigan lobes.

Mark on the Land . . .

The glacial story of Wisconsin is told by remaining formations. We can only speculate about what Wisconsin looked like before the glaciers. Undoubtedly, much of it was well drained land like the southwestern portion of Wisconsin, an area left virtually untouched by glaciers and known today as the Driftless Area.

As glacial ice advanced southward, hills and bluffs often were sheared off right down to bedrock. As the glacial front retreated, however, glacial debris suspended within the ice was deposited, filling depressions

USING AND PROTECTING THE SCIENTIFIC RESERVE

Use the Ice Age National Scientific Reserve carefully and help us protect and preserve its resources.

Protect wildlife and leave shrubs and flowers for others to enjoy.

Be careful with fire. Build fires only in grills, fireplaces, or fire rings provided.

Place refuse in containers provided.

Keep pets on a leash and under physical control at all times.

Operate motor vehicles only where permitted.

Please remember that some lands in the Scientific Reserve are not in public ownership. RESPECT PRIVATE PROPERTY AND THE RIGHTS OF OTHERS.

SAFETY

The safety of you and those with you depends upon your judgment. Be careful at all times, and please impress safety precautions upon your children! Many of the units have rugged terrain, relatively isolated areas, and large bodies of water. Drive carefully.

When hiking, STAY ON DESIGNATED TRAILS. Swim only in authorized areas when lifeguards are on duty.

Always be careful with campfires and when using gas stoves and heaters.

If you injure yourself or become ill, contact the park office or nearest law enforcement agency office for assistance in securing proper medical attention.