HIKING FIELD TRIP GUIDE for GLACIAL LANDFORMS in Chippewa Moraine Ice Age National Scientific Reserve, New Auburn, WI

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Stop 1. Interpretive Center (0.0 mile)

The landscape surrounding the Interpretive Center formed approx. 18,000 yrs. ago when a glacier called the Chippewa Lobe of the Laurentide Ice Sheet advanced from the northeast to a point 1.5 miles southwest of the Center. Rapidly flowing ice overrode more slowly moving ice near the glacier margin and carried sediment up into the ice. As the ice melted, thick, red, sandy **supraglacial sediment** accumulated at the glacier surface (Fig. 1). This debris was deposited at the ice margin as the glacier melted and formed the **Chippewa Moraine.** Streams flowing away from the melting glacier deposited sand and gravel and formed **outwash plains** that slope gently away from the moraine

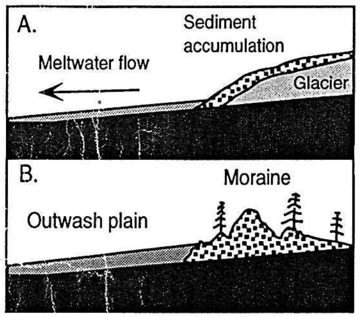

Figure 1. Moraine and Outwash Plain Formation. *A. Glacier margin stabilizes and sediment is carried up into glacier where it accumulates on ice at the margin. Meltwater flowing away from ice deposits sand and gravel. B. Ice melts, moraine and outwash plain remain. Outwash plain is located southwest of the Interpretive Center.*

(Fig. 1). The ice margin retreated from this area approx. 15,000 yrs ago, and glaciers disappeared from Wisconsin approx. 10,000 yrs. ago.

This guide will explain glacial landforms located in the Chippewa Moraine Ice Age National Scientific Reserve. Stop numbers are keyed to the trail map on the other side of this page. Running mileage for the circle route around the Interpretive Center is provided (with the Interpretive Center as the starting point). Hiking this circle route takes 1.5-2 hrs.

Stop 2. Kettles and hummocks (0.4 mi)

This stop is located on a bridge between two depressions. The depressions (called **kettles**) and surrounding hills (called **hummocks**) formed through the process of topographic reversal (Fig. 2). Ice was insulated where the sediment cover was thickest, resulting in different rates of melting and the development of debris-covered hills on the ice surface.

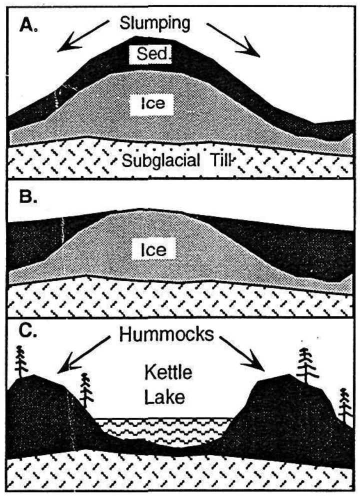

Figure 2. Topographic Reversal
A. Supraglacial sediment (Sed.) slumps down a hill on ice surface. B. Exposed ice in center melts rapidly. C. All ice has melted. A kettle filled with water remains where ice was thickest. Hummocks surround the kettle.

Supraglacial sediment slumped off the ice hills into low areas (Fig. 2). When the ice melted, a depression (kettle or kettle lake) was located where the "hill" formerly was present on the ice surface. Low areas on the former ice surface are marked by hummocks (hills). Thus "**topographic reversal**" has occured. *Most of the lakes in the Chippewa Moraine are kettle lakes, and most of the hills are hummocks.*

Kettle lakes are slowly filling with sediment and decaying plant matter. The kettle north of the trail has been filled completely. The valley between the two kettles is a ditch cut by the logging industry for dragging timber from lake to lake during the late 19th and early 20th centuries.

Stop 3. Kettles and hummocks(1.5 mi)

Two kettles have coallesced to form a larger kettle lake. The high ridges surrounding the kettles are excellent examples of hummocks. See Stop 2 for process of formation.

Stop 4. View of Interpretive Center Ice-walled-lake plain (1.6 mi)

Rising above the kettle lake to the north is the ice-walled-lake plain (IWLP) on which the Interpretive Center is located. A detailed discussion of IWLP formation is found in Stop 7. The hilltop is a former lake bottom that rises >120 ft above the landscape in the foreground. This implies that the glacier ice was at least 120 ft thick while this IWLP was forming.

Stop 5. Esker (2.9 mi)

This sediment of the trail follows a 15 ft-high, winding ridge that is called an esker. The **esker** formed as meltwater flowed south-southwest through a subglacial tunnel and/or ice-walled stream to the former ice margin (Fig. 3), which was located approx. 1/4 mile southwest of this point. The stream transported sand and gravel, but some sediment was deposited in the stream bottom. When the ice melted, a ridge marked the location of the former stream. This ridge is an esker. Meltwater flowed in a radiating manner across the land where it exited the tunnel at the ice margin. As water velocity decreased, sand and gravel was deposited in a fan-shaped outwash plain that slopes away from the moraine (Fig. 3).

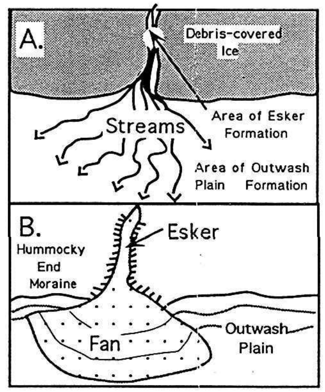

Figure 3. Esker & Outwash Plain Formation. *A. Meltwater flows through a subglacial tunnel and/or ice-walled channel. Stream deposits sediment in the tunnel and at the ice margin as water velocity slows. B. Esker and outwash fan remain after ice melts.*

Stop 6. Kettle lake and hummocks

This is a good example of irregular topography observed in the Chippewa Moraine. South of the trail is a kettle lake. The hills surrounding the lake are hummocks. See Stop 2 to read about how these features formed.

Stop 7. Ice-walled-lake plain

The broad, flat plain on which you are standing is an ice-walled-lake plain **(IWLP).** This feature formed in a lake surrounded by stagnant, debris-covered ice (Fig. 4). Water melted all ice beneath the lake. Mudflows and streams carried supraglacial sediment, sand, and gravel into the lake. Much of the sediment was deposited near the shore to form a rim (Fig. 4). Silt and clay were deposited in the deeper, calmer water offshore to form a flat plain. When the surrounding ice melted, the lake drained and a thick sediment accumulation was left behind as a raised plain. An IWLP is characterized by a broad flat area of higher elevation, sometimes surrounded by a gravelly rim, located in an otherwise hummocky terrain.

A dry, meandering stream valley 10-40 ft deep trends east-northeast across this IWLP. The head of the valley is located at the southernmost extent of the IWLP and it "hangs" 70 ft above the landscape to the south. This observation and the valley size suggest that the valley formed as meltwater flowed across the IWLP shortly after the lake drained.

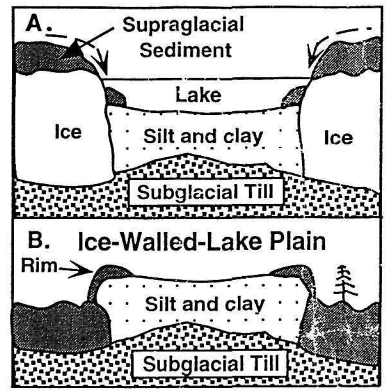

Figure 4. Ice-Walled-Lake-Plain Formation *(cross-sectional view). A. Lake surrounded by ice. Supraglacial sediment slumps off ice into lake. B. Ice-walled-lake plain with raised outer rim remains perched above surrounding hummocky moraine after ice has melted.*

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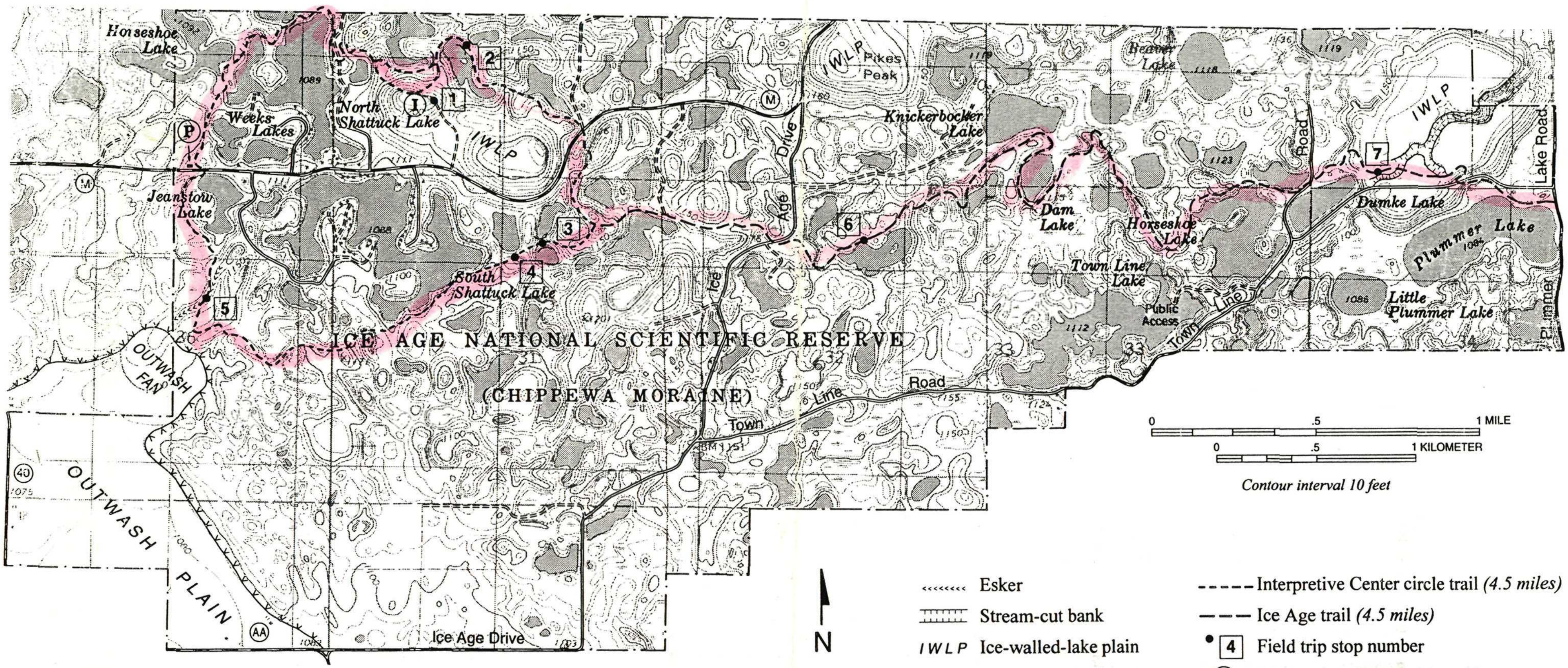

Base from Marsh-Miller Lake and Bob Lake quadrangles, Wisconsin, (U.S. Geological Survey, 7.5-minute series, topographic, 1975).

Cartography by D.L. Patterson, Wisconsin Geological and Natural History Survey
March 1995

- Esker
- Stream-cut bank
- *IWLP* Ice-walled-lake plain
- Former glacier margin
- Reserve boundary
- Footbridge
- Interpretive Center circle trail *(4.5 miles)*
- Ice Age trail *(4.5 miles)*
- 4 Field trip stop number
- (I) Interpretive Center with parking
- (P) Parking lot
- Lake