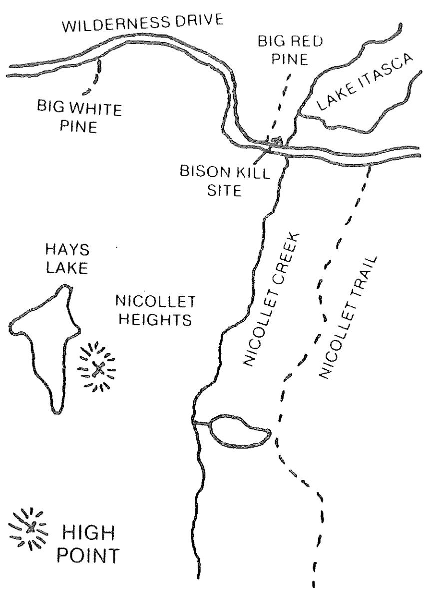
Ice and Water Sculpt the Landscape of Itasca State Park

Geographically, Itasca State Park is noted for being the headwaters of the Mississippi River, which officially begins in the north end of the north arm of Lake Itasca at an elevation of 1,475 feet above sea level. The maximum topographic relief (difference between highest and lowest elevation) of the park is approximately 300 feet. Many isolated hills within the park boundary rise to elevations of more than 1,600 feet above sea level, for example Nicollet Heights (1,600 feet), Aiton Heights (1,675 feet), and Okerson Heights (1,665 feet). At least one point in the park - just west of the beginning of Howard Creek in the south-central part of the park (High Point) - reaches an elevation of 1,700 feet.

Geologically, the park has several features of interest to the casual observer, not the least of which are the linear shape of Lake Itasca, the main body of water in the park, and a multitude of smaller lakes within the park boundary. To account for the origin of these and other surface features of Itasca State Park, it is necessary to consider the past geologic history of northwestern Minnesota. Therein lies the key to the origin of the topographic elements of the park and its surrounding areas.

Most of Minnesota lies in a region once invaded by the



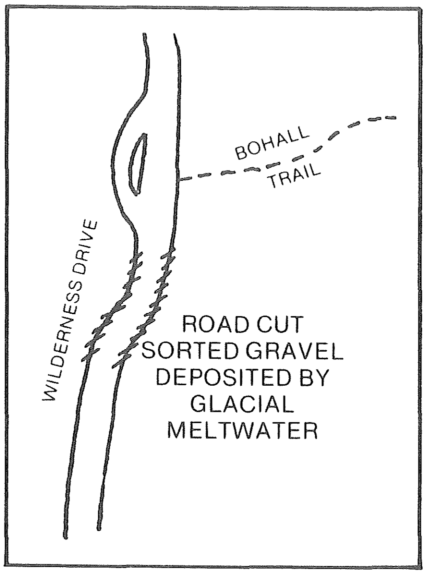
continental glaciers of the Great Ice Age, technically known as the Pleistocene Epoch. The present land surface is a direct result of those glaciers. Recent dating based on the radioactive carbon in plant remains associated with the ice edge indicates that the last glacial activity occurred about 20,000 years ago in the Itasca area.

This position of the glacier front during periods of climatic stability is marked by an end moraine, a belt of hummocky terrain usually termed "knob and kettle" topography. The knobs are mounds of debris deposited directly by the ice near the glacier's margin or by melt-water streams flowing on or under the glacier surface.

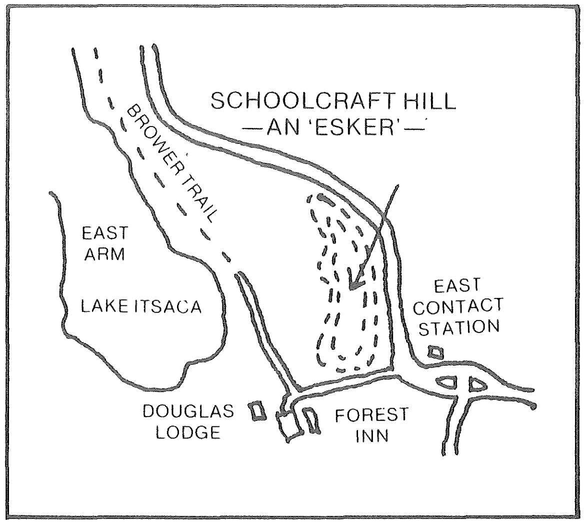
The kettles are depressions, usually filled with water, formed by stagnant ice masses buried or partially buried under glacial debris. Melting of such an ice mass long after retreat of the active ice front leaves a depression on the surface which, when filled with water, becomes a post-glacial lake. Other kettles are formed simply by chance distribution of the knobs in such a manner that depressions develop among them.

Occasionally, the position of kettles is determined by a river valley that existed prior to the advance of the ice or a valley eroded by a subglacial stream. Such valleys were filled with one or more masses of stagnant ice. A single elongate lake or a chain-of-lakes resulted.

Itasca State Park lies in the Itasca moraine, which was formed by ice that entered the state from Manitoba to the northwest. Much of the moraine consists of water-washed sand and gravel desposited by streams derived from the melting ice front. Among several good exposures of the water-washed material is one just south of the intersection of Wilderness Drive and the Bohall Trail. The road cut at the point consists of gravel containing some limestone pebbles. The absence of finer sand and silt is explained by the sorting action of glacial melt water. Wherever boulders and other stones appear in an unsorted matrix of silt and sand, the material was probably deposited directly by the glacier without the subsequent action of melt water.



The retreat of the ice from the Moraine left many lakes of varying size. Many of these lakes, now in their dying stages, are now swamps. Most are scattered at random throughout the park and seem to bear no relationship to the pre-glacial terrain. However, a special case can be made for Lake Itasca and for Elk and Mary Lakes, which lie south of the west and east arms of Lake Itasca respectively. The position of these three lakes (and of others located southward along the same trend) was probably governed by a drainage system that was formed



by erosion beneath the ice. The great outwash plain south of Park Rapids is composed of sediment eroded by these subglacial streams.

Other evidence of the last glacier can be found just east of the east arm of Lake Itasca, between the lake shore and the Park Drive (called Schoolcraft Hill). There, an elongated ridge, 50 to 60 feet high and trending in a north-south direction, marks the position of a former subglacial river. Water flowing in an ice tunnel deposited sand and gravel on its floor, and the roof of the tunnel was melted as the stream bed built up. Final melting of glacier ice left the tunnel deposit as a ridge with steep slopes on each side. The deposit is actually sediment formerly in contact with the ice-walls. Such a ridge, technically known as an *esker,* is regarded by glacial geologists as a feature associated with stagnant glacier masses. Had the glacier been moving, the ice-tunnel would have been destroyed before the ice completely melted, or perhaps not even formed.

A few smaller lakes in the park are credited to the work of beavers which impounded the water behind dams they built on small streams. Much swampy land along the streams in the park is attributed to beaver dams downstream.

Itasca State Park is another example of an area in Minnesota full of natural features, particularly those of geologic interest, which await the interpretation of the careful observer and imaginative thinker.

This leaflet was modified from The Minnesota Volunteer article "Geology of Itasca State Park," by Dr. James H. Zumberge.