Why study glaciers?

On a personal note: I visited Kenya Africa a number of years ago. I was amazed how much the African children knew about our Great Lakes. When they found out I was from Michigan they engaged me in a lengthy discussion about the Great Lakes. I remember thinking afterward "I'm not sure our students are as informed as these students from a distant land." To live in the midst of the natural splendor of Michigan and not understand the forces that shaped it, would be a terrible insult to our literacy. (Mr. John Clark, former science educator at Ithaca Public Schools)

TYPES OF GLACIERS (P 6-9)

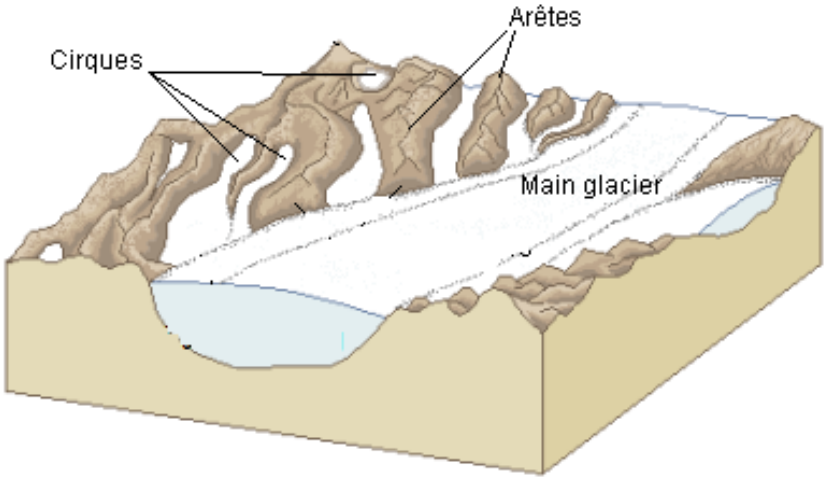
There are four main types of glaciers. Though we will work on identifying them, what is most important is that you realize not all glaciers are equal. The glaciers that we are primarily interested in understanding are those that shaped the geology of Michigan. In the United States, each of the four cold periods, called **glaciations**, is named for the state the glacier's ice reached. They are the ones described as continental glaciers.

ICE CAPS or **ICE SHEETS** are very large masses of ice that cover almost all the land features. They are also called **CONTINENTAL**. glaciers. They spread down from highland areas to lowlands. Today Greenland, Antarctica, and the seas surrounding them are covered with ice caps. Although ice caps take up one one tenth of the land surface, they hold over nine tenths of all the ice on Earth between them! A continental glacier is what covered Michigan long ago, and it happened at least 4 different times.

An **ALPINE**, **VALLEY**, or **MOUNTAIN** glacier begins as a mass of ice in the highlands and moves like a tongue of ice between two mountains. The largest valley glaciers today are found in the mountain ranges of the northern Andes, the Rockies, the Himalayas, and the Alps. Many African ranges also have large glaciers. The largest are on Mount Kilimanjaro and Mount Kenya.

PIEDMONT glaciers form when valley glaciers move onto the lowland plains and join together. A piedmont spreads out like a fan once it leaves a mountain valley. An example of this is the Malaspina Glacier in Alaska.

CIRQUE glaciers feed into valley glaciers. They are small masses of ice that develop in a rock hollow at the head of a valley or on a mountainside. The Matterhorn in the Swiss Alps was shaped by cirque glaciers.



Ice will continue to form at the head (start) of the glacier up in the highlands. The weight of the accumulating ice forces the glacier to move very slowly down the valley. The ice melts at the end of the glacier. This ice loss is called **ablation**. Usually a glacier grows and melts back in a balanced way. In some years, however, more ice **accumulates** than is lost through ablation. This makes the glacier grow larger and thicken. When there are many, many years of accumulation, that creates an ice age. Right now, most glaciers in the Earth are getting smaller each year because ablation is greater than accumulation. This is called **retreating**.

Alaska's Muir Glacier, pictured in August 1941 (left) and August 2004 *(NASA)*

Glaciers that are growing larger can also move faster. Glaciers move at different speeds, though it is not necessarily the largest ones that move fastest. Most move about 300 feet (100 meters) a year, mostly in summer. Sometimes they move fast for a short while. One glacier in Iceland was measured as moving 350 feet (107 meters) a day!

The Four Glaciations

In the United States, there have been four significant cold periods. The climate changes produced periods called **glaciations**, the condition of being covered by glaciers. The glaciations are named for a state that was reached by ice. The intervening warm periods (called **interglacial periods**) are named for localities where relics from them were studied. In North America the periods of glaciation and their names are given below:

First glaciation	Nebraskan	2,000,000 years ago
warmer interglacial period	Aftonian	
Second glaciation	Kansan	1,250,000 years ago
warmer interglacial period	Yarmouth	
Third glaciation	Illinoisan	500,000 years ago
warmer interglacial period	Sangamon	
Fourth glaciation	Wisconsin	40,000 years ago
Warmer interglacial period	Modern or Post glacial	

It is the last glaciation which sculpted the landscape of Michigan. We will look more at the details in the pages to follow. Suffice it to say, the immense amount of glacial drift inherited from the Ice Age has influenced the character of our soil and the development of agriculture in Michigan. It is hard for us to imagine the effects caused by the weight of an ice sheet two miles thick over much of North America. These continental glaciers placed 400 tons or more upon every square foot of the surface. The earth's crust sank under this load from 300 to 800 feet. The Great Lakes basin as we experience it today was formed under that great pressure. It is noteworthy that the Great Lakes basin has been rising ever since the glaciers melted back.