FACT SHEET

This information has been compiled by:
The Watershed Center
Grand Traverse Bay
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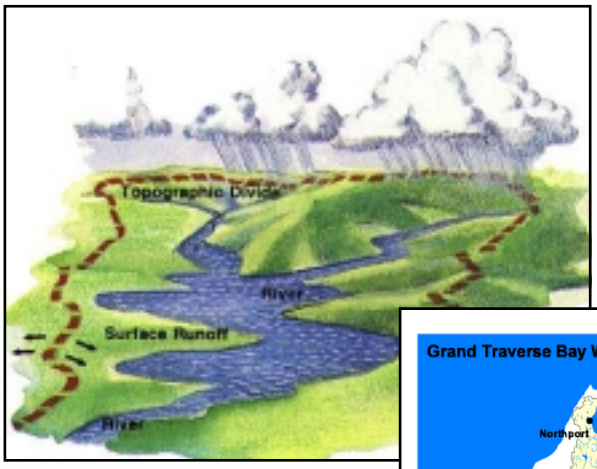
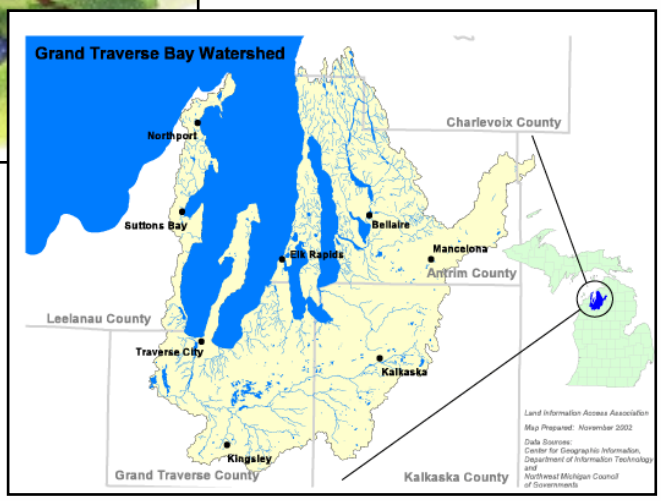
WATERSHED BASICS:
Definitions, Geology, and Hydrology

What is a watershed?

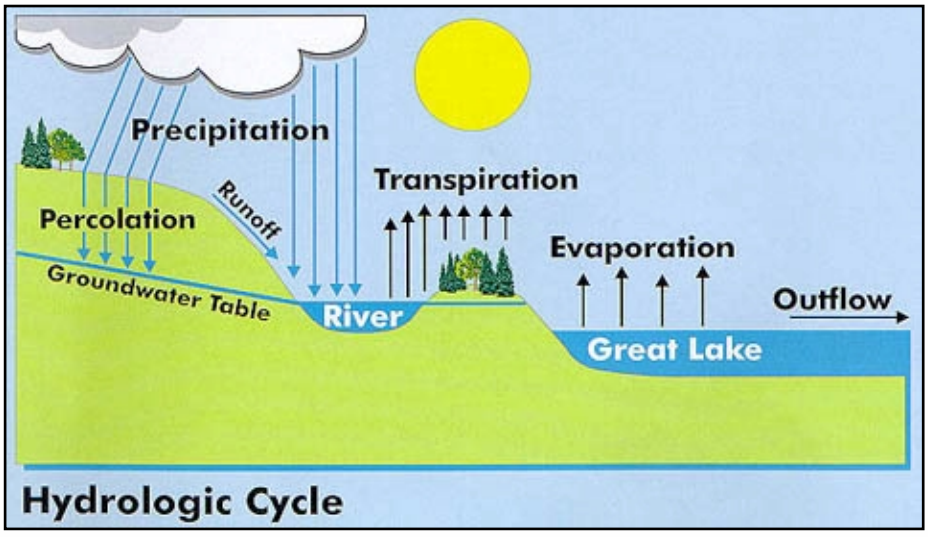


A ***watershed*** is an area of land that captures rainfall and other precipitation and funnels it to a lake or stream or wetland.



The **Grand Traverse Bay watershed** itself is defined as the area of land that captures rainfall and other precipitation and funnels it to Grand Traverse Bay.

The Water Cycle



Water, a renewable resource, is continually recycled and returned to the ecosystem through the hydrologic cycle. Moisture is carried into the Great

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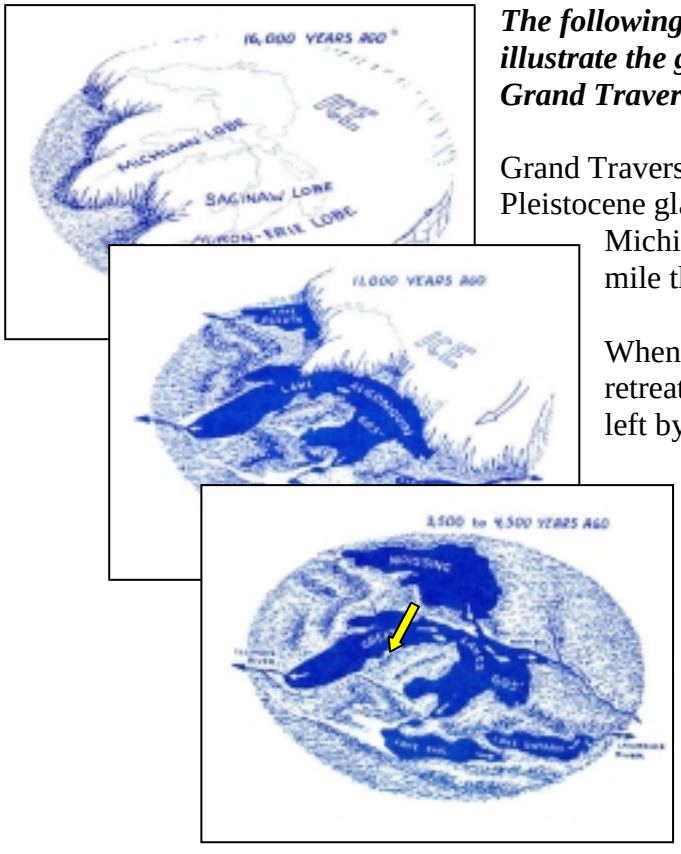
Lakes basin and as weather systems move through, they deposit moisture in the form of rain, snow, hail or sleet. Water enters the system as either ***precipitation*** directly on the lake surface, ***runoff*** from the surrounding land, groundwater, or inflow from upstream lakes. Precipitation falling on the land infiltrates into the ground through ***percolation*** to replenish the groundwater. When water accumulates below ground in the spaces between soil and rock, it is called ***groundwater***.

Water leaves the system through ***evaporation*** from the land and water surface or through ***transpiration***, a process where moisture is released from plants into the atmosphere. Water also leaves the system through groundwater outflow, consumptive uses (drinking water, industrial/agricultural uses, etc.), diversions, and outflows to downstream lakes or rivers. Ultimately, water flows out of each of the Great Lakes through their connecting channels and the St. Lawrence River to the Atlantic Ocean.

Geologic History of the Grand Traverse Bay Region

The Grand Traverse Bay region has a rich and complex geologic history. During the last glacial advance, glaciers carved deep valleys into the shale and limestone bedrock and deposited enormous sediment accumulations, some as thick as 1,197 feet. Sediment characteristics in the area vary widely, in some areas changing from thick, lacustrine clay to a coarse-grained moraine within a few hundred feet. Elevations range from a low of 484 feet above sea level to a high of 1,543 feet above sea level. Some of the highest and steepest sections in the area are located in the headwater areas of the Elk River Chain of Lakes and Boardman River.



The following text and drawings illustrate the geological history of the Grand Traverse Bay Region.

Grand Traverse Bay was formed by Pleistocene glaciers that moved across Michigan, covering the land one mile thick in places.

When the last of the glaciers retreated, water filled the valley left by the glaciers…

…forming the Great Lakes and the Grand Traverse Bay.

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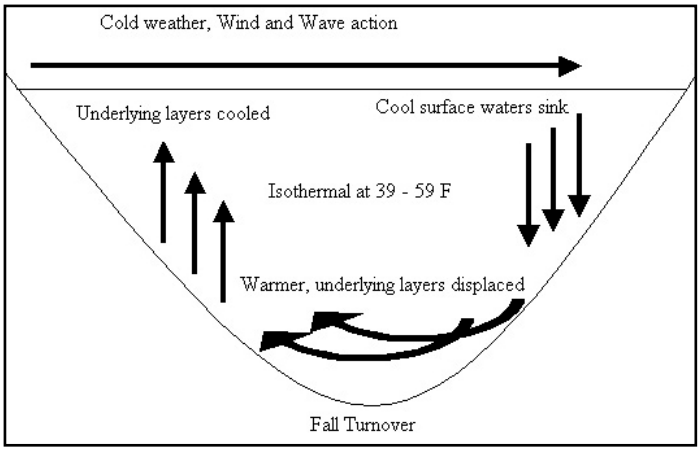
Seasonal Watershed Changes

In Michigan, most people are aware that sap in trees is frozen during the winter. It rises from roots in the spring to provide nourishment to the leaves during the summer. This annual event is similar to what happens in lakes.

During the fall, the top layer of water in a lake is cooled by the wind. Winds create currents which carry the cool, oxygen rich water from the top layer to the bottom of the lake. These currents also carry nutrients and decaying plants and animals. This mixing process is called ***fall turnover***.



Winter weather lowers the temperature of the upper layer of the lake until it reaches 32 degrees and the water freezes into ice. Even though the water near the surface is cold, it is warmer than the water near the bottom. This top layer is relatively high in oxygen and low in nutrients. In winter, the ice on top of the lake shuts off the supply of oxygen from the air, however, plants beneath the ice can still produce oxygen as long as sunlight can pass through. If the snow gets deeper than 12 inches, then very little sunlight penetrates, so the plants and microscopic animals use the oxygen dissolved in the water. In between the top and bottom layers is a middle layer where most of the fish live during the winter. Due to their differing densities, the layers of the lake do not mix during the winter months.

As spring begins, the ice cover on the lake melts and the spring winds mix the layers of water, much like stirring a spoon. The nutrient poor, oxygen rich top layer mixes with the nutrient rich, oxygen poor bottom layer. This causes the water in the entire lake to become saturated with oxygen from top to bottom. This process is called ***spring turnover***.

As spring progresses into summer, the upper lake layer warms faster than the deeper layer; temperature differences range between 5-20 degrees. If the lake is deep enough, then the layers stay separated.