Champlain Basin Landscape

While there is rock that is close to 1 billion years old in the region, the story of the Champlain regional landscape really begins between 700 and 554 million years ago (mya) with the rifting and spreading that created the Iapetus Ocean.

Deposition of sediment on the continental margin of Laurentia provided the materials out of which the rocks of the Champlain Valley would eventually form. These rocks are Cambrian (540 to 490 mya) and Ordivician (490-440 mya) in origin.

Some 500 mya the Iapetus Ocean began to close. The first page in your packet reviews a possible sequence of tectonic activity that could have created the Taconic Mountains to the south and Green Mountains to the east.

Notice that there was a small sea to the west of a volcanic island arc before Laurentia and what is now North Africa collided. The island arc collided with the ancestral North American plate 470 to 440 mya resulting in the Taconic Orogeny complete with folding and thrust faulting. The Champlain Thrust resulted from this activity. The upper plate of the Champlain Thrust is exposed at Mt. Philo (Charlotte, VT) and Snake Mountain (Addison, VT).

During the Silurian and early Devonian (435 to 380 mya) sediment deposited in the ocean east of the volcanic island arc provided the material for the rock of the Connecticut Valley Trough, now on the east side of Vermont.

By the mid- Devonian (360 mya) the two continents had collided resulting in the Acadian Orogeny. There are few rocks in Vermont younger than those formed during the folding, faulting and metamorphism of the Acadian Orogeny.

Following continental collision, the super-continent Pangea existed for some 250 my. During this time "Vermont" was part of the continental interior. About 185 mya, Pangea began to break apart due to rifting, and the modern Atlantic Ocean began to form just to the east and south of Vermont. Minor fractures and some dikes provide evidence for this rifting in Vermont.

Millions of years of erosion have left the hard schist and granite of the Taconic and Acadian Orogenies behind. The mass of the larger, soft rock mountains that sat above New Hampshire to our east have eroded and formed the modern continental shelf.

The modern Adirondak Mountains began to uplift about 20 mya. This process continues today. We think that there is a hot spot below the Adirondaks.

The last 3 million years have been characterized by a sequence of glaciers. The most recent Wisconsin glacier covered the region with up to 1 mile (approximately 1.6 kilometers) of ice.

As the glacier retreated about 12,500 years ago, it blocked the drainage to the north and the large Lake Vermont formed. This lake drained to the south through the Hudson River valley. About 10,000 years ago, the glacier retreated far enough to allow sea-water to mix with the lake water

through the Saint Lawrence valley to the north, and this large estuary, the Champlain Sea, drained to the north leaving marshes at the south end of the region. Extensive fresh water marshes remain today at the south end of Lake Champlain.

The waters of the region shifted between fresh and brackish several times before, glacial rebound brought the Champlain Valley drainage above sea level preventing the mixing of sea water and resulting in today's smaller Lake Champlain. A measurable trace of glacial rebound continues today.

Between 6,000 and 4,000 years ago a warm climate (the hypsithermal interval) brought a number of mid Atlantic species through the Hudson River basin into the Champlain Valley. We see remnants of these species today.

Canadian species are present in the Northeast Kingdom of Vermont and along the highest ridges. Atlantic coast species are more prevalent in eastern Vermont in the upper valley of the Connecticut River, and mid western species have found there way through the Great Lakes and the Saint Lawrence basin into the northern part of Lake Champlain.

Most recently, humans, and particularly European settlers have impacted the landscape significantly. I will leave this part of the story to others. It is all of these stories that connect us to this region and give it a powerful sense of place. We sit in a remarkable valley at the cross roads of geological, biological and human events.

Glossary

Tectonic- movement of the great plates on the earth's surface.

Rift- separation of tectonic plates.

Drift- movement of continental plates along the surface.

Orogeny- mountain building.

Uplift- the rising of mountains during orogeny.

Iapetus- an ocean that existed before the modern Atlantic ocean.

Pangea- a super continent formed roughly 400 million years ago when all the major continents collided with each other.

Green Mountain Schist- a rock formed by metamorphosis of sea floor materials.

Thrust fault- when the bedrock is compressed it can crack, and one piece is pushed up over the other.

Dike- a sheet of intrusive material that cuts through pre-existing rock along a fracture line.

Coral- a marine animal that builds a cast, or "house," of calcium carbonate to live in.

Reef- an elevated region constructed of calcium carbonate casts and shells.

Continental Shelf- a shallow region off of the Atlantic coast.

Mantle- region of molten, or semi liquid hot rock below the earth's crust.

Magma- molten rock.

Granite- a rock formed when magma cools below the surface.

Hot Spot- a region of the mantle where a plume of hot magma is rising.

Glacier- large sheet of ice

Glacial rebound- rising of land after being compressed by the weight of a glacier.

Estuary- a body of coastal water which is moderately salty because fresh water is mixed with sea water.

Marsh- a wetland without trees.

Hypsithermal Interval- A uniquely warm period of time.

mid Atlantic region- states that lie to the south of New England: New Jersy, Pennsylvania, Maryland.