Mohawk River Canoe Trip

August 5, 2015

A short field guide by Kurt Hollocher

The trip

This is a short, 2-hour trip on the Mohawk River near Rexford Bridge. We will leave from the boat docks, just upstream (west) of the south end of the bridge. We will probably travel in a clockwise path, first paddling west toward Scotia, then across to the mouth of the Alplaus Kill. Then we'll head east to see an abandoned lock for a branch of the Erie Canal, go under the Rexford Bridge and by remnants of the Erie Canal viaduct, to the Rexford cliffs. Then we cross again to the south bank, and paddle west back to the docks. Except during the two river crossings it is important to stay out of the navigation channel, marked with red and green buoys, and to watch out for boats. Depending on the winds, we may do the trip backwards.

The river

The Mohawk River drains an extensive area in east and central New York. Throughout most of its reach, it flows in a single, well-defined channel between uplands on either side. Here in the Rexford area, the same is true now, but it was not always so.

Toward the end of the last Ice Age, about 25,000 years ago, ice covered most of New York State. As the ice retreated, a large valley glacier remained in the Hudson River Valley, connected to the main ice sheet a bit farther to the north, when most of western and central New York was clear of ice. As the Hudson Valley glacier receded north, the valley was filled by Glacial Lake Albany, into which the Mohawk River flowed. The lake lasted from about 15,000 to 12,600 years at its highest levels, and progressively drained to vanish about 10,500 years ago. At that time, the Mohawk River drained much of the southern ice sheet margin, including the eastern Great Lakes region. Summer meltwater flows carried enormous amounts of water and sediment east, with the sediment having been deposited as a delta in Glacial Lake Albany. That delta had a top elevation of about 300 feet.

As the glacier continued to melt back, removal of its weight allowed the once-covered land to rebound, or rise. Uplift of land was fastest first to the south. That, plus the mass of the delta itself, forced the Mohawk River to flow northward, where it originally passed through what are now Ballston and Saratoga Lakes. Later, as the axis of most rapid uplift shifted north, the Mohawk was deflected south through Ballston and Round Lakes. Eventually, the course shifted again to its current path through the Rexford cliffs, the deep cliff-lined channel for which was probably eroded around 10,000 years ago.

The Alplaus Kill that we will see flows east out of the highlands to the northwest of the Rexford area, and then turns south through the abandoned Mohawk River channel. It is amusing, to me anyway, that the Alplaus Kill flows the opposite direction through the channel than the Mohawk River did. It is a situation where a small stream flows in a channel much bigger than it could possibly have eroded by itself in the time that it had.

The rocks

The rocks exposed here are part of the Schenectady Formation, which is made of alternating layers of gray sandstone and gray shale. The rock units are Late Ordovician in age, or about 450 million years old. They were deposited in a sedimentary basin, a narrow seaway between North

America to the west and the Taconic volcanic arc that was approaching from the east. Subduction of oceanic crust beneath the arc permitted the arc to advance toward North America, and also fueled the volcanic chain. The remains of the volcanic arc are exposed in central Massachusetts and western New Hampshire, but the sedimentary basin is here in the Schenectady area, and other regions extending far to the north and south.

When it was active and advancing onto the North American margin, the Taconic arc was exposed above the ocean surface. Eroded sediment was carried by streams and rivers to the arc coast. Fine-grained materials like clay were carried away by ocean currents, and these slowly settled out onto the ocean floor over long periods of time. The clay layers on the ocean floor eventually transformed to rock: fine-grained gray shale. The coarser sediment accumulated on the arc ocean margin, the same way it does today at the edges of all landmasses. Once in a while, triggered by an earthquake or a storm, some of the accumulated coarse sediment would slide downhill, underwater and westward, from the arc into the narrow ocean basin. As it slid, it mixed with water to form a dense, fluid slurry called a turbidity current. That flowed down the slope, and spread out onto the ocean floor where it settled out as sand layers. Those sand layers are now sandstone layers in the Schenectady formation.

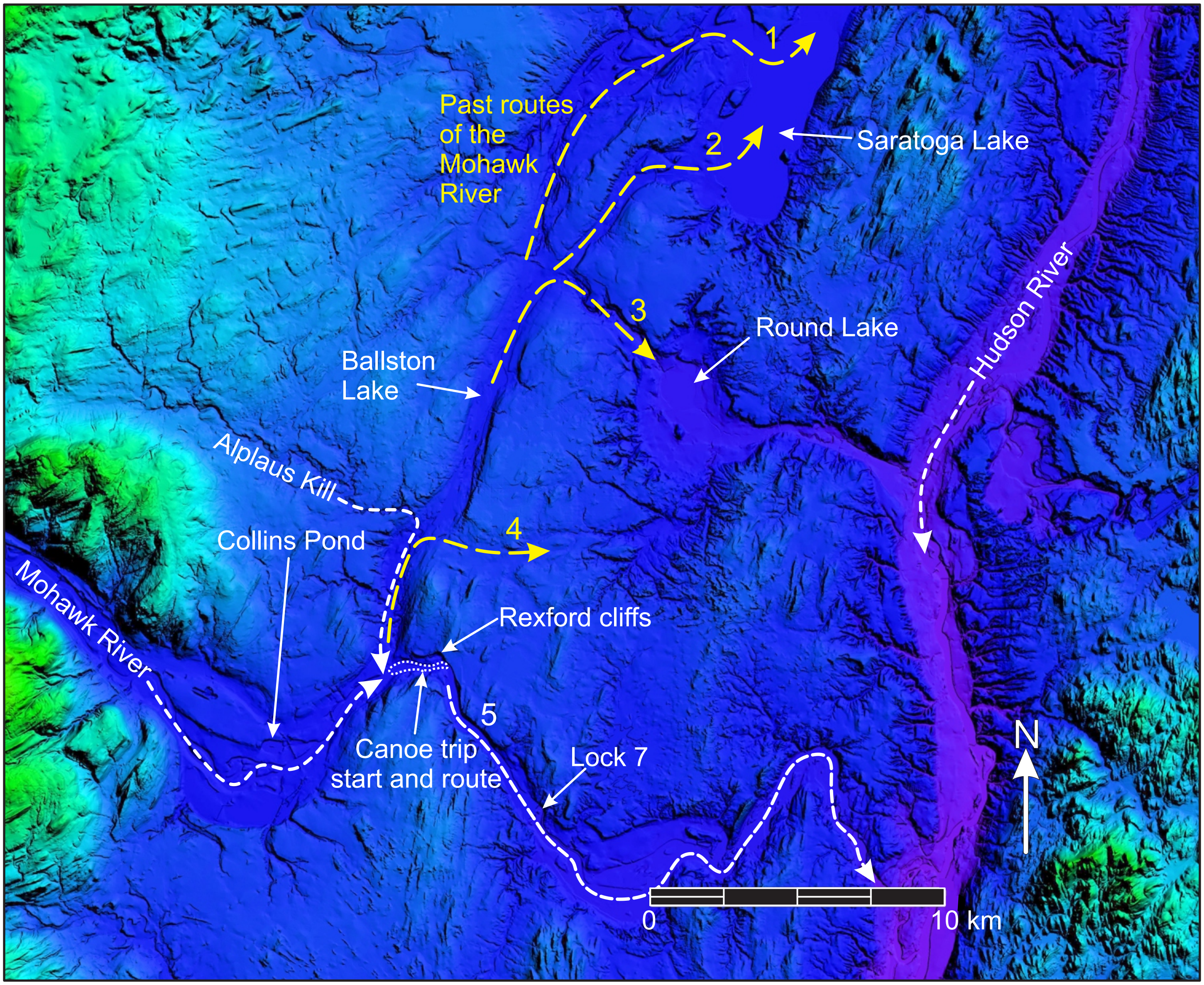
Under water at the time, there was a slow, gentle rain of clay, building up the shale layers. Once in a great while, a turbidity current would sweep through and quickly deposit a sand layer. Then, clay would continue settling out till the next turbidity current. Because the time between turbidity current events varied a lot, the thickness of the shale layers also varies. Because the landslides that formed them were different sizes, and happened in different places along the arc shoreline, the sandstone layers have different thicknesses too.

The Erie Canal

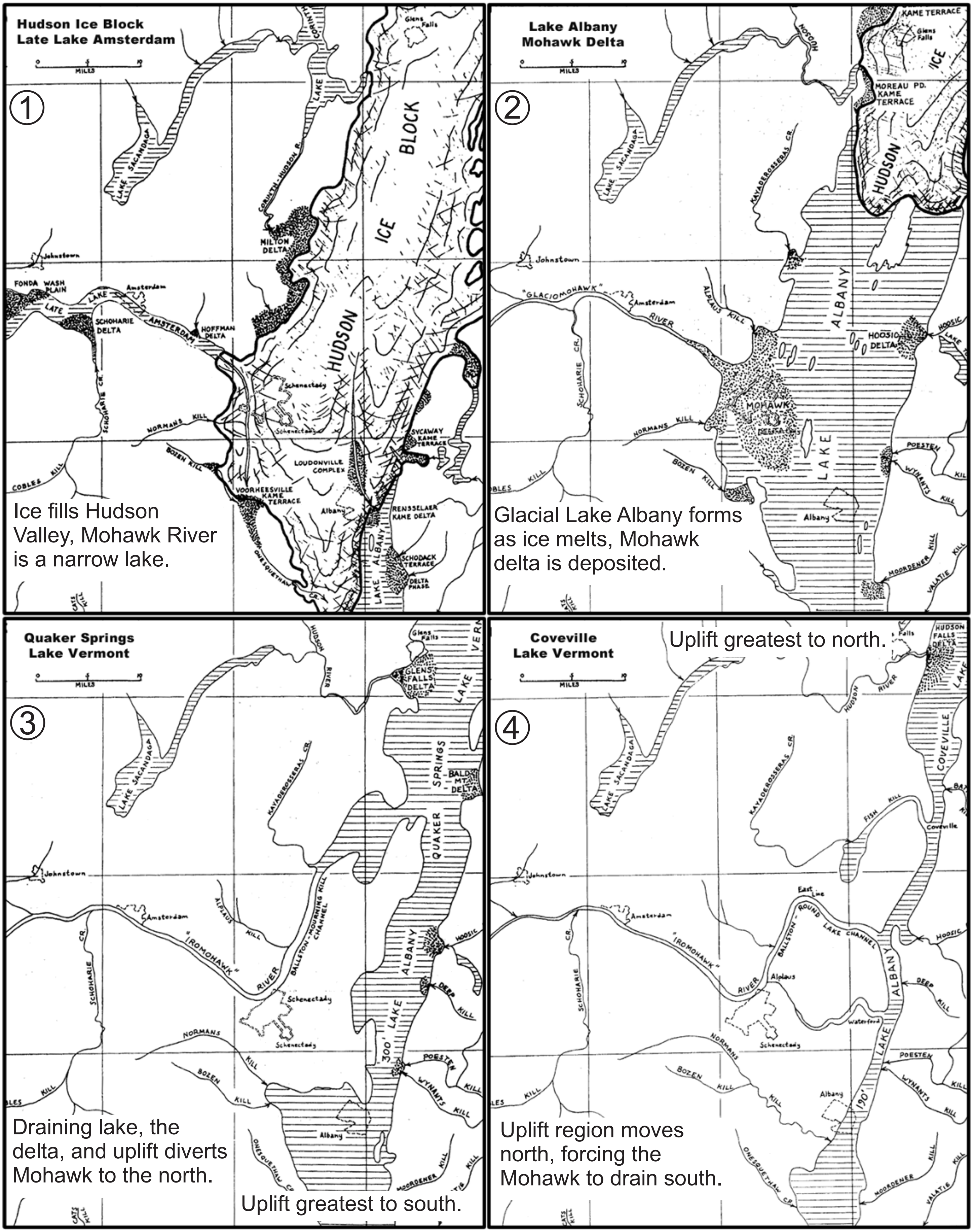
Before the Erie Canal was built, the Mohawk River was much narrower and shallower than it is now. There were rocks and logs exposed, and rapids were common. Now, because of the Lock 7 dam a few miles downstream to the east, our canoe route is basically on a lake. The lake extends upstream all the way to Lock 8 in Rotterdam. Intermediate between these two river states (wild and lake), the first Erie Canal was built. The system consisted of a series of low dams to impound water to reliable and useful levels, and then used that water to fill canals that were built to the sides of the river.

It would, of course, have been easiest to build the canal on the same side of the river along its whole length. Unfortunately, because of the terrain that wasn't always practical. In places like Rexford a viaduct was built to get the barges from one side of the river to the other without fuss or delay. The canal leading out of Schenectady to the east was quite a bit higher than the river at Rexford, because it was fed by water impounded far upstream. A stone viaduct was built next to the bridge, with two locks on the north side of the viaduct to lower east-traveling barges down closer to river level.

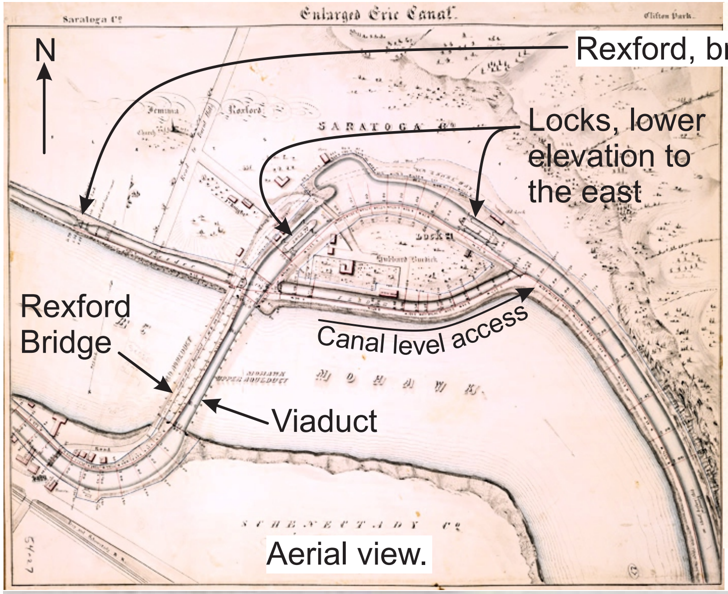
Just west of the Rexford Bridge, on the north side of the river, is an abandoned lock, seemingly alone and unconnected to the viaduct and canal system. It actually was the gateway from the Mohawk River at that point, into the Erie Canal. Barges would enter the lock, travel east along a short branch canal under the bridge, under the viaduct, and into the canal just below and east of the pair of locks at the north end of the viaduct. At that time, the lonely lock was one of a large number that gave access to branch canals at different points all along the Erie Canal system, used for local distribution of barge traffic.



Shaded relief map of the local area, emphasizing the Mohawk River and its channel migration since the last Ice Age. The numbers 1-5 represent the sequence of river channels, 1 being at about 11,000 years ago, and 5 being the current channel. The sequence of channels was forced on the Mohawk River as Glacial Lake Albany drained, and as land uplift to the north tilted the land. Uplift to the north tilted the land south, causing the Mohawk to find other, more southerly ways to the Hudson River. The canoe trip route is also shown, and some landmarks. Map is courtesy of Joan Ramage, Lehigh University.



Diagrams showing Glacial Lake Albany and development of the Mohawk River channel as the lake drained and as the land adjusted to the removal of the weight of overlying ice. Modified from: http://www.vizettes.com/kt/upstateny-history/historical/iromohawk.htm.



Aerial view.

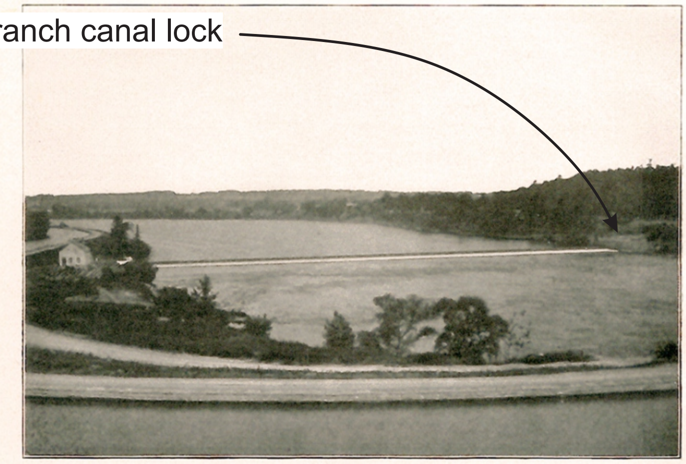
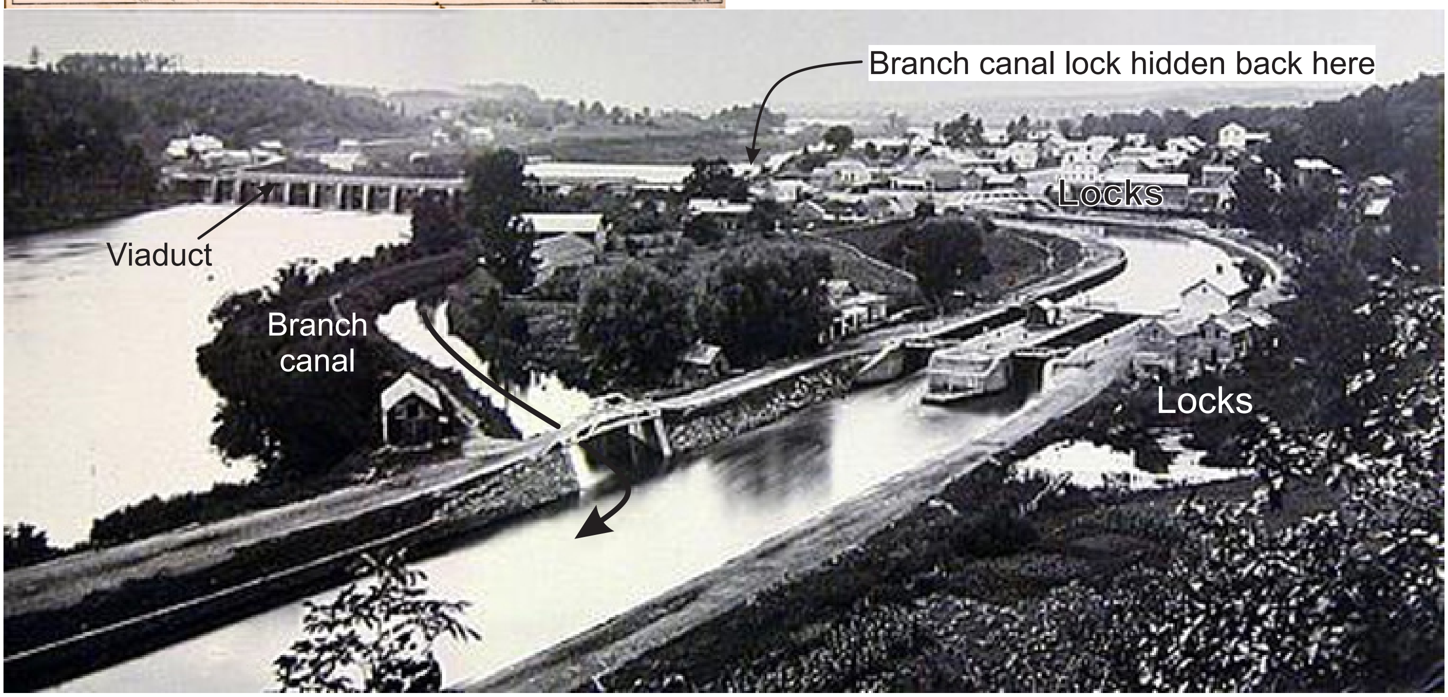


FIG. No. 30.—N. Y. STATE DAM ON MOHAWK RIVER AT REXFORD FLATS, SARATOGA COUNTY, N. Y.

View northwest from the south end of the viaduct.

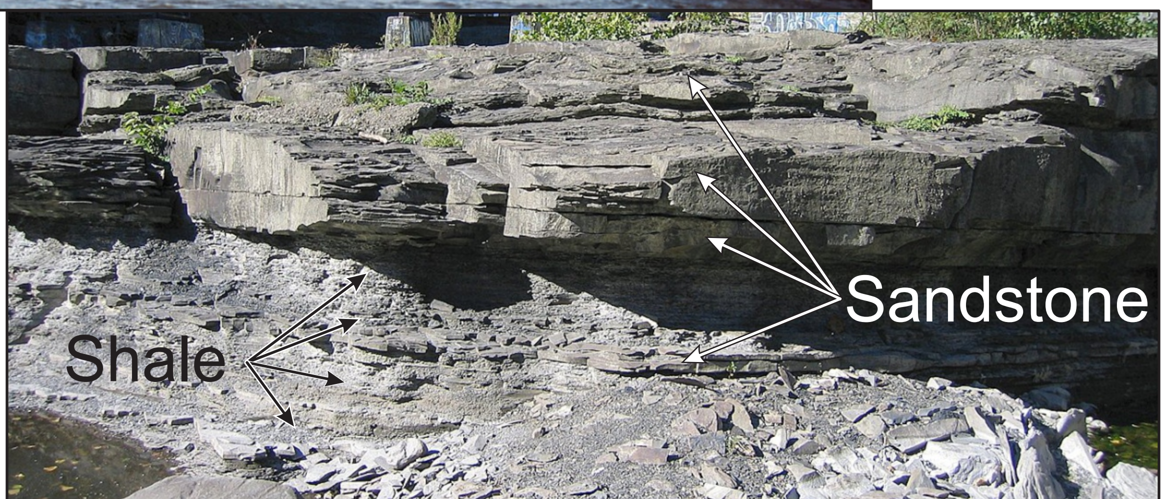


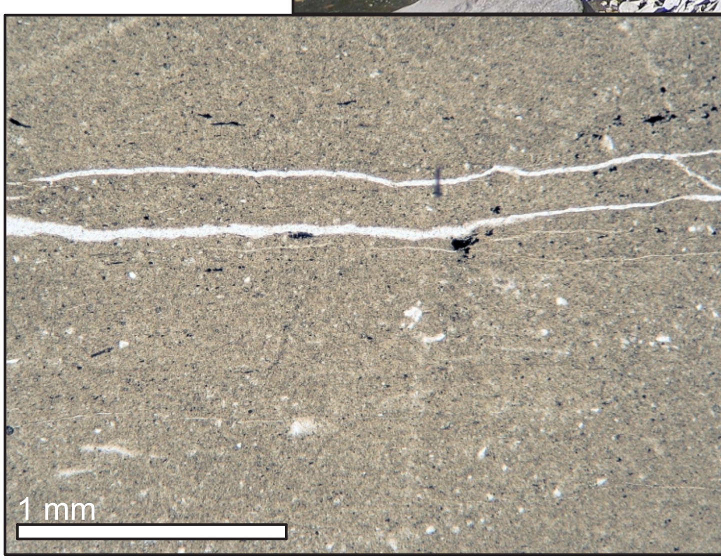
View to the west from the cliffs on the north side of the river, just downstream (east) from Rexford Bridge.

These images show the Erie Canal configuration near Rexford at around 1900. Water from the Mohawk River upstream of Schenectady filled the canal to a high enough elevation so that here, downstream of Schenectady, the canal was able to cross above the river in a viaduct. Once north of the viaduct, barges were lowered nearly to river level by two locks. At that lower level, a branch canal and lock on the north side of the river permitted barges from the Rexford area to enter the canal. Images modified after http://www.eriecanal.org/MohawkAqueducts.html.

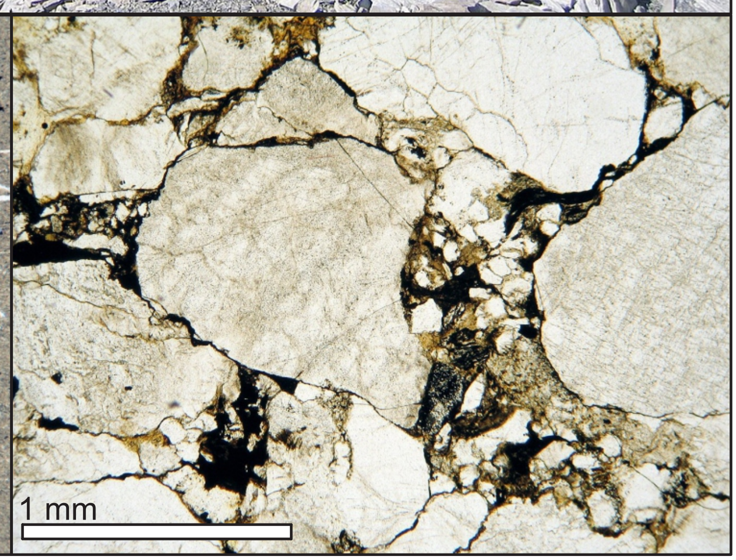
Looking downstream, northeast from the Rexford Bridge. Layers in the cliffs are sandstone and shale of the Schenectady Formation.

Closer view of the sandstone and shale. The shale weathers easily, forming small chips that wash away. The sandstone is more resistant, forming ledges. The sandstones are submarine landslide deposits. The shale deposited slowly, between landslides.

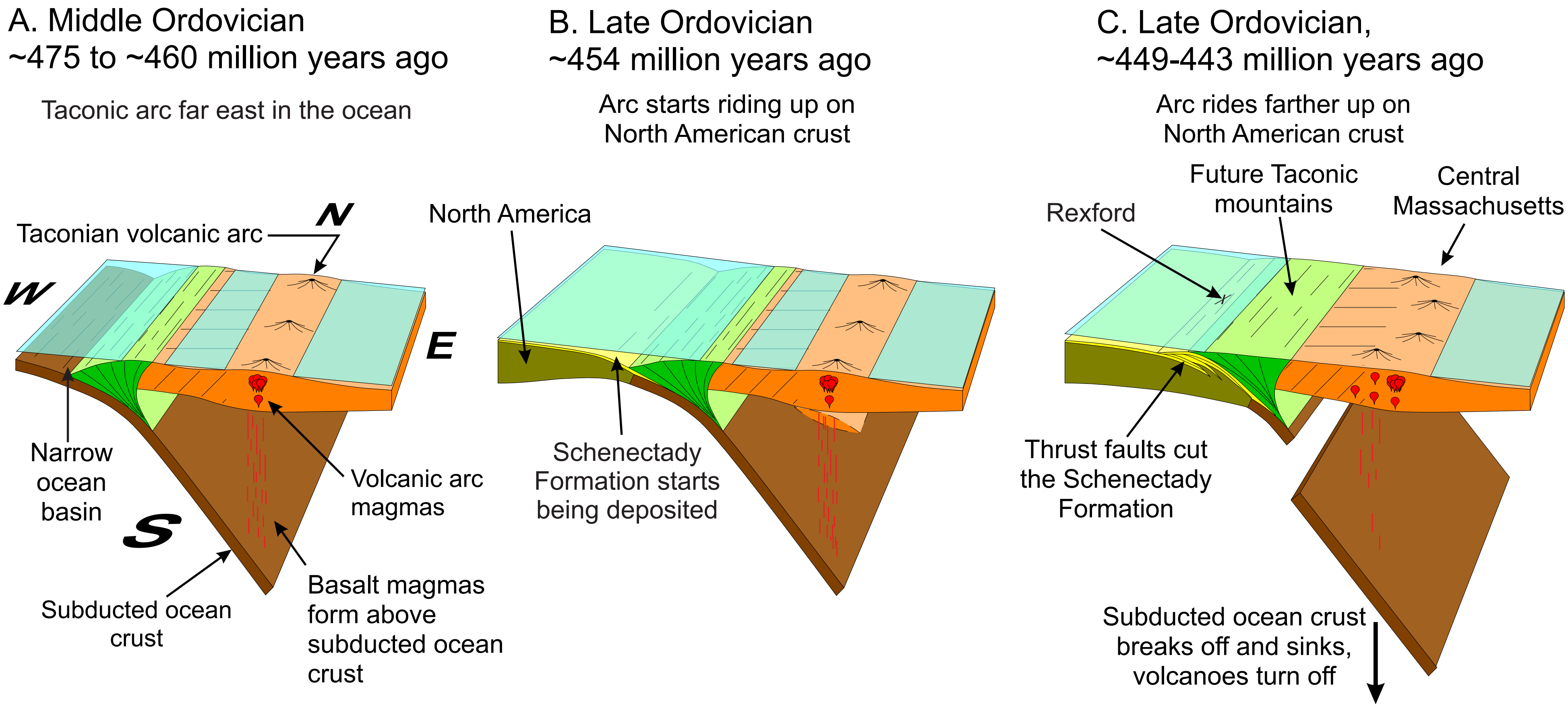




Thin section photomicrograph of shale. This 30 micron-thick slice of rock is thicker than most of the grains it is made of, so you can't see much more than a gray mess. White spots are larger quartz grains, black spots are organic material or pyrite, and the white lines are cracks that formed when the thin section was made.



Thin section photomicrograph of sandstone. The grains in this rock are much larger than the 30 micron thin section thickness. Most of the grains are quartz, with smaller quartz grains filling spaces in between. The dark stuff is organic material, iron oxides, and pyrite. The grains have a lot of angular points, showing they haven't been transported very far.



Tectonic cartoon showing development of the Taconic volcanic arc and its ultimate collision with North America. The processes shown here are the same that work in the world today to make chains of volcanic islands called volcanic arcs: subduction of oceanic crust, generation of magmas over the subducted slab, and rising of magmas upwards to feed arc volcanoes (A). The loss of ocean crust by subduction brings landmasses on either side of the ocean together (B), eventually causing them to collide. Here, as the collision began, the Taconic arc partly rode up onto the North American continental margin, pressing it down (C). Sediments accumulating on the edge of the arc occasionally cascaded down into deep water, as submarine landslides. As the loose material mixed with water, the landslides transformed into dense, fluid turbidity currents that flowed great distances and spread out onto the deep ocean floor. Those deposits are the gray sandstone layers we can see in the Rexford cliffs. In the long periods of time between landslides, fine-grained clay washed off the arc and gradually settled to form layers of shale. The Schenectady Formation, which makes up the Rexford cliffs, is therefore made of alternating layers of shale and sandstone.