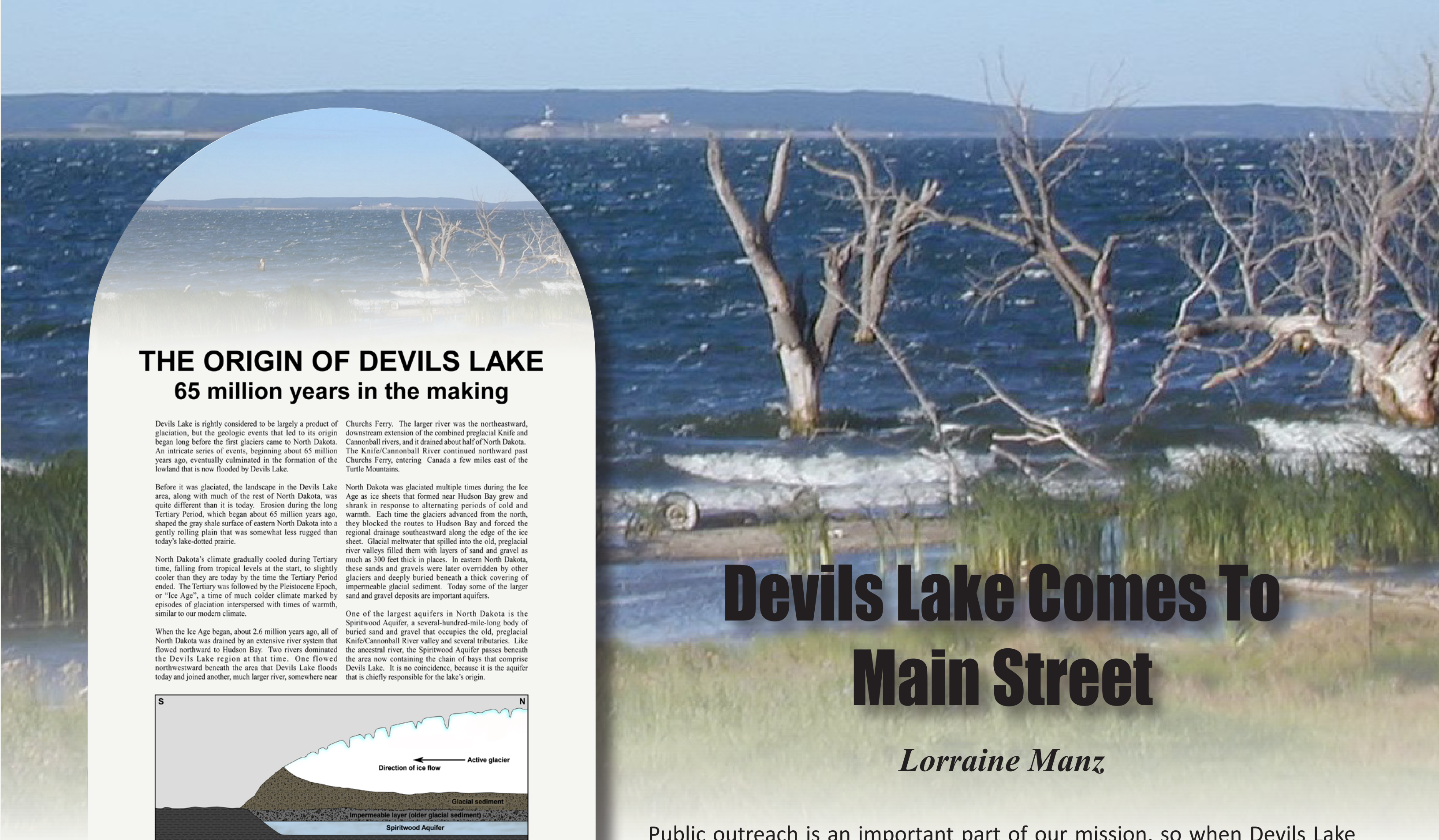
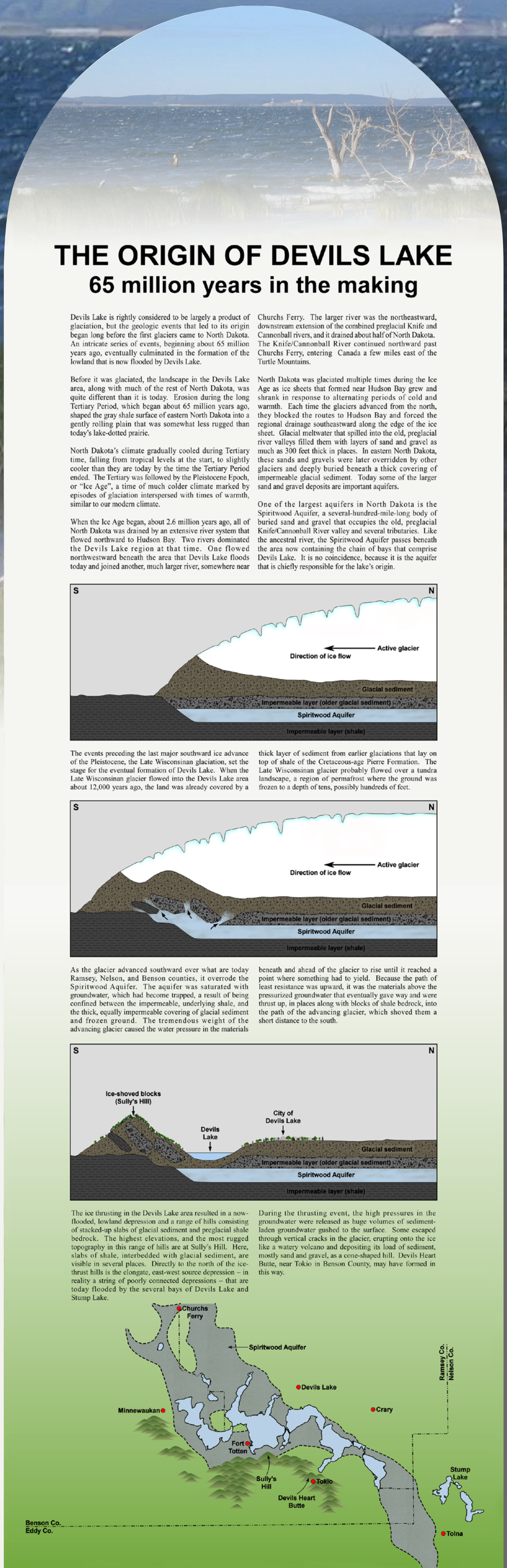


Devils Lake Comes To Main Street

Lorraine Manz



THE ORIGIN OF DEVILS LAKE

65 million years in the making

Devils Lake is rightly considered to be largely a product of glaciation, but the geologic events that led to its origin began long before the first glaciers came to North Dakota. An intricate series of events, beginning about 65 million years ago, eventually culminated in the formation of the lowland that is now flooded by Devils Lake.

Before it was glaciated, the landscape in the Devils Lake area, along with much of the rest of North Dakota, was quite different than it is today. Erosion during the long Tertiary Period, which began about 65 million years ago, shaped the gray shale surface of eastern North Dakota into a gently rolling plain that was somewhat less rugged than today's lake-dotted prairie.

North Dakota's climate gradually cooled during Tertiary time, falling from tropical levels at the start, to slightly cooler than they are today by the time the Tertiary Period ended. The Tertiary was followed by the Pleistocene Epoch, or "Ice Age", a time of much colder climate marked by episodes of glaciation interspersed with times of warmth, similar to our modern climate.

When the Ice Age began, about 2.6 million years ago, all of North Dakota was drained by an extensive river system that flowed northward to Hudson Bay. Two rivers dominated the Devils Lake region at that time. One flowed northwestward beneath the area that Devils Lake floods today and joined another, much larger river, somewhere near Churchs Ferry. The larger river was the northeastward, downstream extension of the combined preglacial Knife and Cannonball rivers, and it drained about half of North Dakota. The Knife/Cannonball River continued northward past Churchs Ferry, entering Canada a few miles east of the Turtle Mountains.

North Dakota was glaciated multiple times during the Ice Age as ice sheets that formed near Hudson Bay grew and shrank in response to alternating periods of cold and warmth. Each time the glaciers advanced from the north, they blocked the routes to Hudson Bay and forced the regional drainage southeastward along the edge of the ice sheet. Glacial meltwater that spilled into the old, preglacial river valleys filled them with layers of sand and gravel as much as 300 feet thick in places. In eastern North Dakota, these sands and gravels were later overridden by other glaciers and deeply buried beneath a thick covering of impermeable glacial sediment. Today some of the larger sand and gravel deposits are important aquifers.

One of the largest aquifers in North Dakota is the Spiritwood Aquifer, a several-hundred-mile-long body of buried sand and gravel that occupies the old, preglacial Knife/Cannonball River valley and several tributaries. Like the ancestral river, the Spiritwood Aquifer passes beneath the area now containing the chain of bays that comprise Devils Lake. It is no coincidence, because it is the aquifer that is chiefly responsible for the lake's origin.

The events preceding the last major southward ice advance of the Pleistocene, the Late Wisconsinan glaciation, set the stage for the eventual formation of Devils Lake. When the Late Wisconsinan glacier flowed into the Devils Lake area about 12,000 years ago, the land was already covered by a thick layer of sediment from earlier glaciations that lay on top of shale of the Cretaceous-age Pierre Formation. The Late Wisconsinan glacier probably flowed over a tundra landscape, a region of permafrost where the ground was frozen to a depth of tens, possibly hundreds of feet.

As the glacier advanced southward over what are today Ramsey, Nelson, and Benson counties, it overrode the Spiritwood Aquifer. The aquifer was saturated with groundwater, which had become trapped, a result of being confined between the impermeable, underlying shale, and the thick, equally impermeable covering of glacial sediment and frozen ground. The tremendous weight of the advancing glacier caused the water pressure in the materials beneath and ahead of the glacier to rise until it reached a point where something had to yield. Because the path of least resistance was upward, it was the materials above the pressurized groundwater that eventually gave way and were thrust up, in places along with blocks of shale bedrock, into the path of the advancing glacier, which shoved them a short distance to the south.

The ice thrusting in the Devils Lake area resulted in a now-flooded, lowland depression and a range of hills consisting of stacked-up slabs of glacial sediment and preglacial shale bedrock. The highest elevations, and the most rugged topography in this range of hills are at Sully's Hill. Here, slabs of shale, interbedded with glacial sediment, are visible in several places. Directly to the north of the ice-thrust hills is the elongate, east-west source depression – in reality a string of poorly connected depressions – that are today flooded by the several bays of Devils Lake and Stump Lake. During the thrusting event, the high pressures in the groundwater were released as huge volumes of sediment-laden groundwater gushed to the surface. Some escaped through vertical cracks in the glacier, erupting onto the ice like a watery volcano and depositing its load of sediment, mostly sand and gravel, as a cone-shaped hill. Devils Heart Butte, near Tokio in Benson County, may have formed in this way.

Public outreach is an important part of our mission, so when Devils Lake City Engineer Mike Grafsgaarsd asked if we were interested in participating in a project associated with Governor Burgum's Main Street Initiative (https://www.nd.gov/living-nd/main-street-nd), we were happy to oblige.

Our task was to provide a brief, geologic history on the origin of Devils Lake using text and illustrations that would fit nicely on a 15- by 40-inch panel. The finished panel (left) will be part of a permanent educational display dedicated to the lake. The panel will be featured on one of four large monuments at the main intersection in downtown Devils Lake. The text and drawings are shown in a more readable format on the next few pages.

The approximately 300-square-mile Devils Lake basin is one of the largest and best-defined glacially excavated depressions in central North America. The panel explains how it is the product of a unique combination of geologic events that began at the bottom of an ancient seaway more than 65 million years ago, with the deposition of a thick sequence of marine shales. Erosion by wind and water; and ice-age glaciers that rerouted North Dakota's entire river system from north to south and shoved chunks of bedrock and frozen ground the size of city blocks around with effortless ease account for the rest. It's a good story – made all the more impressive when the sheer scale and results of all the action are in full view not far from where its readers are standing.

Note: The narrative that follows refers to Sully's Hill, a well-known landmark in the Devils lake area. Last November, the U.S. Senate voted unanimously in favor of a bill introduced by U.S. Senator Kevin Kramer (ND) to officially change the name of Sully's Hill to its traditional Dakota name of "White Horse Hill". The measure is currently awaiting ratification by the U.S. House of Representatives.

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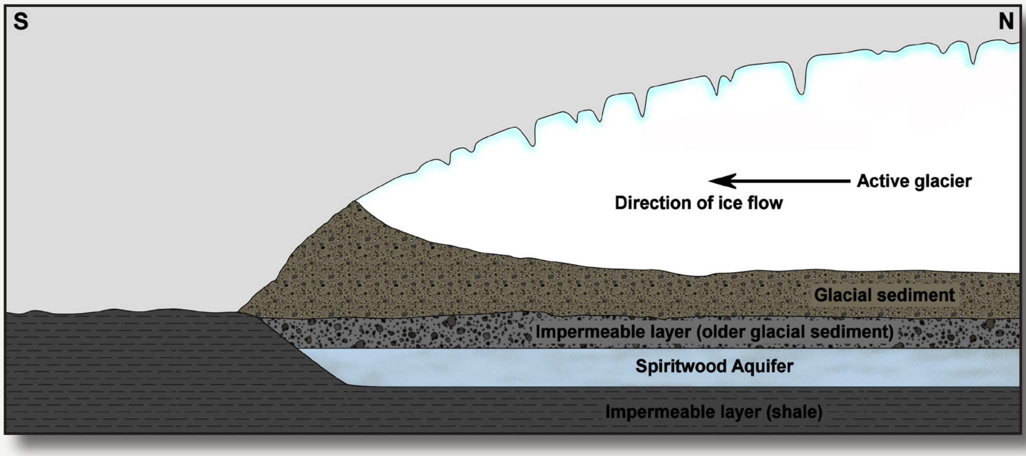

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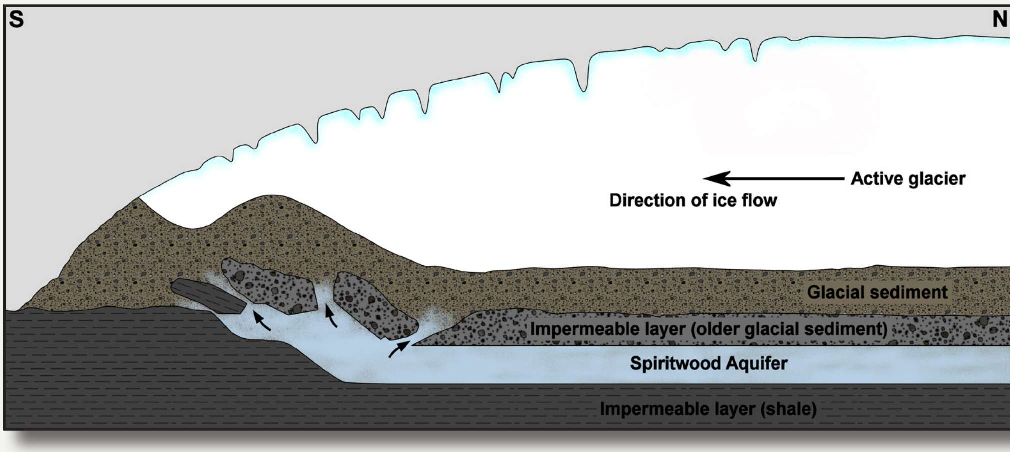

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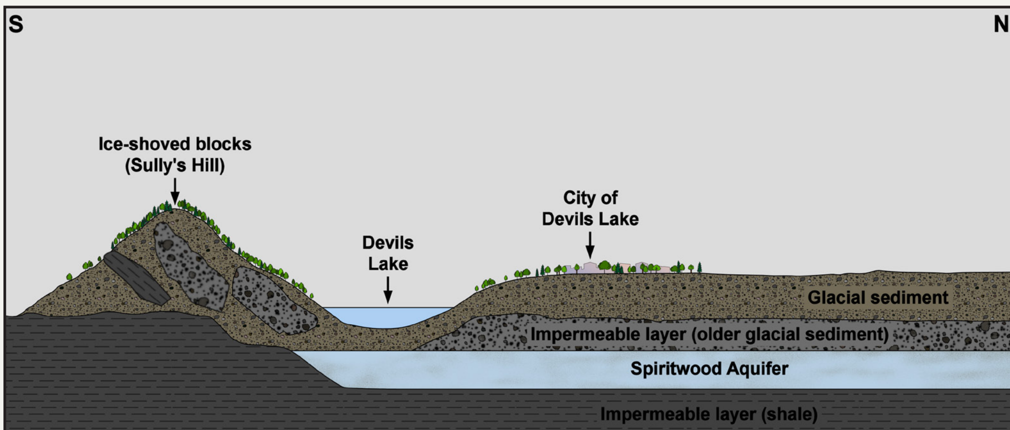

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