**THE LATEST ICE AGES**

The most recent ice ages took place in the Quaternary period. During this time, the Earth’s climate alternated between warmer and cooler periods, with large ice sheets covering vast areas of the Earth. These ice ages were characterized by massive glaciers, which advanced and retreated over millions of years, leaving a rich geological record in Manitoba.

**ANIMAL CROSSINGS**

During the last major glacial period, as water was expelled from the oceans, coastal lands provided a land bridge that allowed animals from Asia to migrate into North America. Many species, including mammoths, bison, and reindeer, crossed this land bridge and colonized the newly available land.

**MANEUVER, AT HOME...**

Manitoba went through many glacial intervals in the Quaternary period. As ice sheets advanced and retreated, they formed large glacial lakes and spillways. During periods when the lake level was high, the Assiniboine River valley was filled with water, forming a large glacial lake. This lake eventually drained through a spillway to the south, leading to catastrophic flooding.

**ICE MOVES OUT – HUMANS MOVE IN**

The end of the last ice age ushered in major environmental changes around the world. The retreating ice sheets allowed for the colonization of North America by early humans. The first people to reach North America came down the Bering Land Bridge, the same route used by animals to migrate between North America and Asia. As recently as 10,000 years ago, all had moved west to the coast, eventually leading to a widespread extinction of large land animals. To the north, humans hunted caribou, beaver, wolves, and bears. To the south, they became some of the first farmers in North America, roughly 7,500 years ago.

**FROM SPIWALLS TO VALLEYS**

When glaciers melted, their meltwater flowed downstream to form river valleys. These valleys evolved into the large river systems found in Manitoba today. The Assiniboine and Souris River valleys are prominent examples of such river valleys.

**What's the planet been up to in the past 2.6 million years?**

- **THE LAKE AGASSIZ STORY**
  - As the glaciers, or ice sheets, that covered Manitoba continued melting, water typically accumulated along the southern margins, forming glacial lakes. The largest of these lakes was glacial Lake Agassiz. Its size, shape, and depth were continually changing, due to fluctuations of the glacier’s margin. Lake Agassiz covered much of Manitoba for several thousand years, particularly the area that is now the Red River Valley.
  - The water from the rapidly melting glaciers carried huge amounts of sediment to the lake. Deltaic deposits formed along the southern shores, often more than 100 km wide.
  - The silt and clay that accumulated at the bottom of Lake Agassiz was up to tens of metres thick. The clay deposits, which form the current flood plain of the Red River Valley, have become one of the richest agricultural lands in Manitoba. This flat landscape, however, is vulnerable to extensive flooding from even a small rise in the river's water level. Many Manitobans experienced the devastating effects of flooding in the Red River Valley during the province’s 1997 flood.

- **SHORELINE TRACES 10 000-YEAR-OLD BEACHES**
  - Whenever the water level remained at a constant depth for a decade or so, a beach ridge or wave-cut cliff would form along the shorelines or islands. Many old sand and gravel beaches can be found across the province, but are best seen today as the nearly parallel ridges along the Manitoba Escarpment. The large beach ridges near Arden, just north of Brandon, are part of a Lake Agassiz shoreline that can be traced from north of Swan River to south of Morden and into the United States.

- **DELTA TO DUNES**
  - The Assiniboine delta – the best example of a glacial delta in Manitoba – extends from Brandon, where it’s composed of gravel, to Portage la Prairie, where it’s made up of sand. The sand dunes of south-central Manitoba (ex: Spirit Sands in Spruce Woods Provincial Park) started forming more than 10,000 years ago, as wind blew sands from the Assiniboine glacial delta into moving dunes – similar to modern deserts. The Spirit Sands dunes still shift today.

**Glaciers retreat – the last to leave – 11,000 to 7,000 years ago**

- **FROM SPIWALLS TO VALLEYS**
  - When glaciers melted, the meltwater followed its natural course towards Hudson Bay, pooling against the ice margins to form glacial lakes. The Assiniboine and Souris River valleys, for example, were once a single large basin.
  - Occasionally, an ice dam would break, causing a massive surge of water to flow downstream, greatly eroding and enlarging these downstream channels. Most of the large valleys in western

**Manitoba – the Quaternary**

- **THE LATEST ICE AGES**
  - The most recent ice ages took place in the Quaternary period. During this time, the Earth’s climate alternated between warmer and cooler periods, with large ice sheets advancing and retreating. During warmer (interglacial) periods, the glaciers retreated, uncovering the mountains and forming the polar regions, so they can be divided into ice ages.
  - The warmest periods were called interglacial periods, occurring repeatedly over the past 2.6 million years. During the coldest periods, massive glaciers (covering thousands of square kilometres in area, and millions of square kilometres in land area) advanced, which made it possible for ice to form in areas far from the poles. As the glaciers advanced they blocked meltwater, causing the water to pool against the ice margins to form glacial lakes. When glaciers prevented meltwater from following its natural course towards Hudson Bay, they accumulated along the southern margins, forming large glacial lakes. As the lakes melted, the water flowing out created the large river valleys found in Manitoba today.

- **ANIMAL CROSSINGS**
  - During the last major glacial period, as water was expelled from the oceans, coastal lands provided a land bridge that allowed animals from Asia to migrate into North America. Many species, including mammoths, bison, and reindeer, crossed this land bridge and colonized the newly available land.
  - As recently as 10,000 years ago, all species had moved west to the coast, eventually leading to a widespread extinction of large land animals. To the north, humans hunted caribou, beaver, wolves, and bears. To the south, they became some of the first farmers in North America, roughly 7,500 years ago.

- **MANEUVER, AT HOME...**
  - Manitoba went through many glacial intervals in the Quaternary period. As ice sheets advanced and retreated, they formed large glacial lakes and spillways. During periods when the lake level was high, the Assiniboine River valley was filled with water, forming a large glacial lake. This lake eventually drained through a spillway to the south, leading to catastrophic flooding.

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