GEOLOGY OF NEWPORT STATE PARK

The geologic history of Newport State Park can be broadly divided into three stages: (1) ancient, (2) glacial, and (3) post-glacial. The ancient geologic history of the park entails the origin and geologic setting of the underlying rocks found in the park. The glacial and post-glacial history considers the effects that glaciation had on park. Therefore, this brochure presents the highlights of these three stages of geologic history observed in the park.

ANCIENT GEOLOGIC HISTORY

The rocks outcropping at various places in the park are primarily fossiliferous dolostone of middle Silurian age, a subdivision of the Paleozoic Era, and are commonly known as the Niagara Dolostone. Dolostone is a sedimentary rock consisting of crystals of the mineral dolomite. The Niagara Dolostone is Silurian (438 to 408 Ma years before the present). Where does this rock unit fit into the overall age of the earth and the geologic time scale?

Based on radiometric dates obtained from numerous meteorite samples and assuming that all the celestial bodies of the solar system had a common origin, the earth is 4.5 Ga ± 250 Ma years old (i.e., 4.5 billion years ± 250 million).

Geologists divide the geologic time of the earth into:
Cenozoic Era (66.4 Ma ± 3 Ma years before present to the present),
Mesozoic Era (245 Ma ± 20 Ma old years before present to 66.4 Ma ± 3 Ma years before present),
Paleozoic Era (570 Ma ± 35 Ma years before present to 245 Ma ± 20 Ma years before present), and
Precambrian Eon (beginning of the earth to 570 Ma ± 35 Ma years before present).

Precambrian-aged rocks are located about 6,000 feet below the surface at Newport State Park. During early Paleozoic time (Cambrian, Ordovician, and Silurian time), waters of a shallow ancient, worldwide ocean, the Iapetus Ocean, transgressed (i.e., moved onto) and regressed (i.e., moved off) the highly weathered and eroded surface of the Precambrian-aged protocontinental mass of North America several times. In early Ordovician time the ocean floor started doming upward in what is now central Wisconsin and subsiding to form a basin in what is now Michigan.

Wisconsin was close to the equator, about 2 degrees south of the equator during middle Silurian time. These conditions are indicated by the presence of numerous solitary and reef-forming corals and other invertebrate fossils in the dolostone that have living counterparts found today in marine waters lying within 15 degrees north and south of the present day equator.

ORIGIN OF THE BEDROCK

Calcite ($CaCO_3$) crystals (i.e., sediment grains) were initially precipitated chemically and biochemically on the sea floor (i.e., the floor of the Iapetus Ocean) of a clear, warm, relatively shallow sea with normal salinity about 420 to 425 million years ago. Magnesium-rich solutions passed through these sediments after deposition and before lithification (i.e., process that converts newly deposited sediments into sedimentary rocks), which eventually transformed most of these calcareous sediments into dolomite crystals. Dolomite consists of calcium (Ca^{+2}) and magnesium (Mg^{+2}) ions and carbon dioxide (CO_3^{-2}) anions, giving dolomite a chemical formula of $CaMg(CO_3)_2$. Lithification of these dolomitic crystals resulted in rock layers known as dolostone, the Niagara Dolostone.

Geologists have subdivided the Niagara Dolostone into smaller rock units, based on slight differences in composition and fossil content. These subdivisions are from youngest to oldest: Engadine Dolostone, Cordell Dolostone, Schoolcraft Dolostone, Hendricks Dolostone, and the Bryon Dolostone. The Engadine and Cordell dolostones outcrop in Newport State Park.

The Engadine Dolostone is brownish gray on a fresh surface, medium bedded, white weathering dolostone, but not very fossiliferous. The Cordell Dolostone is a buff-colored, wavy-bedded dolostone that is quite fossiliferous. Pentamerid brachiopods (*Pentamerus)*, tabulate corals (*Favosites* and *Halysites*), and tube-like corals (*Syringopora*) are the most common. *Favosites* and *Halysites* are commonly known as the "honeycomb" and "chain" corals, respectively.

The Silurian sea floor sloped gently from present day Newport State Park towards the center of present day Michigan, as part of a structural basin. Coral and algal reefs developed along the lip of this basin. Sediments deposited on the Silurian sea floor at present day Newport State Park were deposited in a fore reef environment.

A good exposure of the Cordell Dolostone and associated fossils occurs along the Lake Michigan shoreline next to Lynd Point Trail. The Engadine Dolostone overlies the Cordell Dolostone on the Lynd Point Trail.

GLACIAL HISTORY

During the Great Ice Age, called the Pleistocene Epoch by earth scientists, glacier ice of a vast ice sheet called the Laurentide Ice Sheet covered much of Canada and entered the northern United States many times. This period of geologic time began about 1.6 million years ago. Each of these glacial ages was separated by an interglacial warm period during which climatic conditions were somewhat similar to those of today. The last major episode of glaciation is called the Wisconsin Glaciation or the Wisconsin Age. It began about 100,000 years ago and is considered to have ended 10,000 years ago.

The southern margin of the Laurentide Ice Sheet was largely controlled by the landscape over which the ice advanced, and lobes or tongues of ice flowed generally southward, following structurally controlled bedrock lowlands, including the Lake Michigan and Green Bay basins. Both the Lake Michigan and Green Bay lobes undoubtedly played a significant role in the glacial history of Newport State Park. Even though the park was probably glaciated many times, there is virtually no direct evidence for that history. Indeed, most of the details of that history will never be known; in fact, very little is actually known about the glacial history of Door County for over 99 percent of Pleistocene time. The absence of glacial sediments older than about 18,500 radiocarbon years is undoubtedly due to the great erosional power of glacier ice. Any ice-deposited sediments were simply eroded during one or more subsequent glacial advances, transported by the ice, and deposited farther south.

The last ice advance into northern Door County for which there is conclusive evidence occurred about 18,500 radiocarbon years (22,000 calendar years) ago