Geological history found in Minnesota's parks

Geology Of Baptism River State Park

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The mouth of the Baptism River is one of the most beautiful points along the Minnesota coast of Lake Superior and it is fortunate, indeed, that the Department of Conservation has been able to establish a park in this area to preserve this choice bit of shore for public use. This section of the coast has the great Palisades to the southwest and the Little Palisade to the east (see map) within the park boundary and is therefore somewhat more rugged than most of the coast.

The Baptism River has its headwaters far to the north and, as it drains about 135 square miles, sufficient water has flowed along its course to carve out a deep valley. The presence of glacial lake clays indicates that the valley existed before the last glaciation. The stream flows over rock ledges for much of its lower course and uneven resistance to erosion has led to the formation of several falls, rapids, and finally the pool at the mouth that is almost enclosed by rock cliffs.

For several miles in each direction from the mouth of the Baptism the coast is faced by almost continuous rock outcrops, mainly of lava flows of different kinds. These belong to the series of Kewaenawan flows that extend from Duluth to Grand Portage and also on Kewaenawan Point on the south shore of Lake Superior. It should be noted that these flows did not pour out of volcanoes but probably from great fissures located under the present site of Lake Superior.

The Great Palisades is composed of a dense red porphyritic rock apparently part of a very thick lava flow. If examined carefully the rock may be seen to consist of visible grains of quartz and red and white feldspar in a dense groundmass. It is properly called a rhyolite porphyry. The rock is conspicuously jointed, so that wave erosion maintains vertical cliffs, as the fractured blocks above fall in when those below are torn away by the waves.

Examination of the rock along the base of the cliff may be made only by boat. There it is found that the red
flow is underlain by dark basalt flows with the usual amygdaloidal tops. Natural archways have been cut along the softer flows so that it is possible to row a boat entirely beneath the rock. Winchell called these "purgatories." Three separate flows may be recognized beneath the west end of the cliff but eastward the dip of the rhyolite brings it down below water level. It should be noted that all the lava flows dip gently toward Lake Superior.

The exposures of red lava flow continue east along the shore from Great Palisades a short distance and then a dark gray diabase intrusive lines the flat beach with a higher abandoned gravelly beach just inland. This diabase has about the same composition as the basalt lava flows but it was intruded into the pre-existing flows and cooled slowly. The diabase in turn gives way to a basalt flow for a short distance and then at a small, sharp point a diabase and granite dike cuts off the basalt flow with diabase continuing east of the dike. Just as the south park boundary basalt again makes up the rock around the small bay, but at the point south of the mouth of the river, the red rhyolite type of flow rock again appears and forms the shore outcrop and Little Palisades Cliff around to Crystal Bay.

The stretch of coast from the Great Palisades to Crystal Bay probably furnishes as excellent a display of variation in the kind of rock (see map) in the outcrops as will be found along any similar length for the entire Minnesota coast. The lava flows alternate from dark basalts to light red rhyolite and these in turn were invaded by molten material to form dikes and sill-like intrusives.

At the mouth of the Baptism the low cliffs are composed of rhyolite but along the pool a basalt flow extends beneath the red flow and the basalt forms the rock outcrops back beneath the bridge of Highway 61. Three lava flows may be counted just west of the bridge with a diabase dike cutting across the rocks and the river. For a distance of about 750 feet there occurs a complex of flows and broken rock or breccia with fragments of rhyolite, basalt, amygdaloidal basalt and boulders of anorthosite (feldspar). Nine flows have been counted from the bridge to a point just beyond the old bridge where the outcrops are lacking for a short distance upstream.

Along the south side of the river above the old bridge the bank is composed of conglomerate and shale which is, no doubt, interbedded with the lava flows although the contacts are not exposed. Upstream at a point nearly half a mile northwest of the highway bridge the river swings in a sharp horseshoe bend (see map) with high banks of red glacial lake clay. Beyond this bend to the northeast is a small outcrop of flow number 10 counting from the bridge.
The west side of the river is composed of a bluff of diabase with numerous anorthosite inclusions. The east bank has scattered outcrops of basalt flows (No. 11 and 12). From a point just north of the section line between sections 10 and 15, outcrops of lava flows line both banks of the river. It appears that flows 11 and 12 extend parallel to the river for some distance but flows 13 and 14 may be observed lying above 12 on the west side of the pool below the lower falls. The falls here are in three steps, the highest is over the hard portion of flow 13; the middle falls just above is over flow 14; and the upper over flow 15. The total drop is about 60 feet. These falls like those at Gooseberry State Park were formed by the wearing out of the soft amygdaloidal top of a lava flow causing the massive rock of the flow above to fall off developing a cliff.

Upstream from the lower falls the river continues over a rocky bed with a high hill of diabase containing anorthosite inclusions on the west side. Along the river flows 16, 17, and 18 are exposed in rapid succession opposite the diabase hill. The High Falls drop about 60 feet over a red rhyolite flow (No. 19) and this rock extends upstream for over a quarter of a mile and beyond the park boundary.

If the Baptism River is followed northward from the park boundary flows 19 and 20 are found within a short distance. At the north line of section 10 a network of red granite dikes cut the flows and a short distance above the river plunges 70 feet over a diabase dike to form Kettle Falls.

A dike is formed by molten material (magma) forcing its way in along a fracture in the pre-existing rock. Often, as at Kettle Falls the attitude is nearly vertical and thus a wall-like mass of very solid rock is formed. The river is ponded above by this rock and is not able to erode the softer rocks but below the dike erosion has cut away the less resistant lava flows up to the dike wall.

Flows 21, 22, and 23 occur immediately above and then outcrops end for some distance upstream. It is safe to say that there are not many places where 23 lava flows may be counted along a stream within a distance of two miles. During low water it is an enjoyable hike for anyone interested in geology.

East of the Baptism River the outcrops continue but it is possible to follow the shore for only a short distance until the big rhyolite flow of the Little Palisades is encountered. A red flow continues a short distance from the Baptism River mouth but is cut abruptly by a diabase dike which trends at right angles to the shore and forms a sharp but small point. To the east a second point projects parallel to it but is composed of basalt flow.
It is estimated that 11 or 12 flows occur along the shore here within a quarter of a mile. They dip beneath the rhyolite of Little Palisades, and the lake in accordance with the prevailing dip all along the north shore. If the south shore of Lake Superior on Kewaenawan Point is examined similar lava flows will be found dipping to the north. Lake Superior therefore is a great depression in the rocks, or a syncline, as the geologist would say.

Another interesting point in this area is the high rock hill behind the Olgen Hotel. A trail winds to the top whence a marvelous view of the coast is obtained. After admiring the view and getting back to normal breathing the explorer will note the excavation of the old Crystal Bay quarry where the anorthosite (feldspar) rock was once quarried, apparently under the impression that it was corundum. The rock on the way up to the tower is the familiar red rhyolite of the palisades but the hill where the quarry is located is composed of diabase with very large masses of anorthosite (practically pure feldspar rock) included within it. The anorthosite has large spots consisting of the mineral olivine with feldspar.

If space permitted other interesting geologic features could be described for the Baptism area but the explorer may take pleasure in finding these without help.

QUETICO-SUPERIOR SAVED

By the time The Conservation Volunteer reaches the reader it is anticipated the roadless area bill will have been signed by the President, insuring the Quetico-Superior wilderness area, on the boundary between Minnesota and Ontario, protection against commercial invasion. The U. S. Senate sent the bill to the White House June 9.

The legislation calls for an appropriation of $500,000 to buy up private lands within the forest area in order to keep out resorts and other commercial enterprises. Cook, Lake and St. Louis counties will receive annually, in lieu of taxes, three-fourths of one percent of the appraised value of the land acquired under the act.

The bill was sponsored by Senators Thye and Ball and Representative Blatnik, all of Minnesota. Conservation Commissioner Chester S. Wilson spearheaded the drive to secure passage of the legislation.