flowing down the Kettle River from the Moose Lake outlet. As suggested above, the lag gravel underneath the sand barrens may have been deposited at the same time as the Chengwatana surface.

The Chengwatana surface is cut by a deeper channel that extends up the St. Croix River valley, indicating that the St. Croix valley is slightly younger than the Kettle River valley. This valley was cut by water from Lake Superior flowing out the Brule outlet. The potholes at International State Park were cut by this later event. The trace of the Chengwatana surface (fig. 16) grades to a level higher than the potholes. This indicates that the potholes were eroded not only by Lake Superior spillway water, but that they were also eroded during one of the latest phases of drainage.

These valleys were cut at the end of the Pleistocene between 12,000 and 9,000 BP, but the relationship of valley cutting to ice movements is difficult to interpret because the record of valley cutting is an erosional one. The movement of ice in and out of the Superior basin at the close of the Pleistocene indicates that water was ponded at high levels in the Lake Superior basin several times. Lake Superior would have existed and drained to the south before, in between, and after the advances that deposited the Barnum till (Wright, 1972) and the till of the Hanson Creek and Douglas Members (Need and Johnson, 1984). Additionally, smaller ice-marginal lakes (shown by Clayton, 1984) dammed against the retreating Superior Lobe may have had a significant enough discharge or hydraulic head to cut deep channels. The two or three flood events shown by the geomorphic and sedimentologic features in Polk County are certainly related to these drainage events, but an accurate correlation is not possible.

REFERENCES


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