

THE GEOLOGIC ORIGIN OF THE SAVANNA AND PRAIRIE RIVER PORTAGES

Notice has previously been called to the fact that the adoption of the Savanna Portage as one of the most important links in the chain of communication between the upper Mississippi and the St. Lawrence valleys was due to the physical fact that here the waters of these two great river systems probably approach each other more closely than at any other point.¹ The student of physiography is naturally led to seek in the records of this region's geologic past the reason for the close proximity of the headwaters of these two river systems. Fortunately in this case there is an answer to his questions—an answer which reveals in striking manner the intimate relation existing between physiography and history and which tells a dramatic story of the results of the clash of natural forces in the days when our world was young.

All who are familiar with the topography of the region west and northwest of Duluth will recall that its most striking feature is the series of rocky hills rising steeply above the waters of Lake Superior to the height of eight hundred feet with a slope as great in some places as a thousand feet to the mile. Beyond this to the north and west lies a fairly level-topped plateau. The steep slope or escarpment which bounds the plateau on the southeast probably follows a fault line, but it is remarkably fresh and uneroded for an exposure subjected to the processes of weathering and stream erosion during what is even in geologic reckoning a very long period of time. This fact also raises a question, the answer to which is found in the book of nature as is that to the first one raised above.

¹ Irving H. Hart, "The Old Savanna Portage," *ante*, 8: 117.

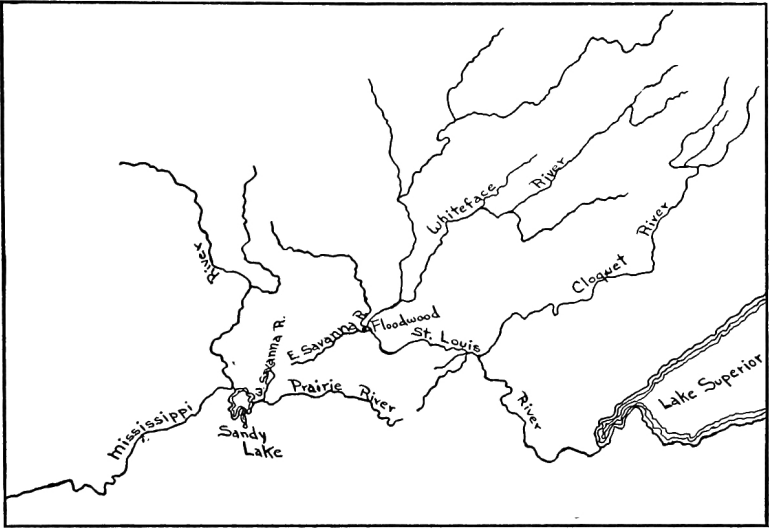
The following quotation, taken from a publication of the United States Geological Survey, gives the answer to both these questions.²

The streams of the Duluth escarpment descend very steeply to Lake Superior; few of them head more than 4 or 5 miles from Lake Superior . . . the greatest distance being 12 to 14 miles, in contrast with lengths of 30 to 75 miles on the north and northeast shores of Lake Superior. Many of them have as steep an average grade as 150 to 250 feet to the mile . . . the general average being 80 to 160 feet to the mile. No one of these rather tumultuous streams has cut a significantly deep valley in the face of the escarpment and most of them have only cut short gorges with small rapids and waterfalls.

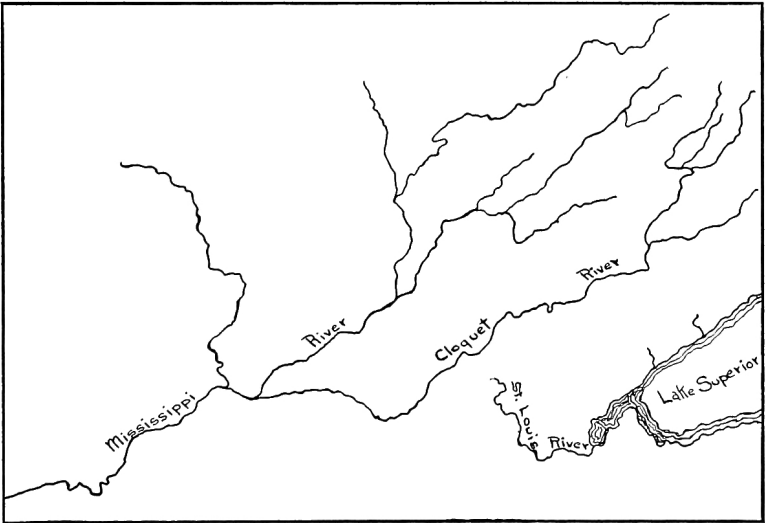
Quite in contrast with these steep-graded, rapidly falling streams of the escarpment are the leisurely flowing streams of the plateau surface above. The Cloquet, the upper St. Louis, and various other rivers have an average slope of about 8 or 10 feet to the mile. It is well established that a rapidly flowing stream with a steep grade is able to deepen its valley rapidly and to extend its headwater area so that it encroaches upon the area drained by an adjacent leisurely flowing stream . . . capturing and diverting the latter or some portion of its headwaters. Stream captures or piracies, as they are called, of this kind are common. We should expect, then, that in the course of stream development for a great length of time several of the swiftly flowing streams of the escarpment would have extended their headwaters back to the region drained by the leisurely flowing streams of the plateau surface and captured part or all of these drainage systems. The fact that many of the large streams have not done so is evidence of their youth.

The largest stream in the region, however, seems to have already done just what would be expected . . . and it is natural that the largest stream should be able to do this first. St. Louis River, cutting back at a point near the end of the escarpment where it is rather low, has been able to extend its headwater region northwestward until it has captured the southwestward-flowing Cloquet and the southwestward-flowing stream that forms the present headwaters of the St. Louis itself. These captured streams had been a part of the leisurely drainage system of the plateau surface, and, it seems certain, were within the Mississippi basin. . . . Indeed, a large valley extending southwestward from the town of Floodwood, where the St. Louis now turns abruptly to the southeast, indicates that this is probably the latest elbow of capture at which the piratical St. Louis

² Charles R. Van Hise and Charles K. Leith, *The Geology of the Lake Superior Region*, 112 (United States Geological Survey, *Monographs*, vol. 52—Washington, 1911).



PRESENT DRAINAGE SYSTEMS OF THE ST. LOUIS AND MISSISSIPPI RIVER HEADWATERS



ANCIENT DRAINAGE SYSTEMS OF THE ST. LOUIS AND MISSISSIPPI RIVER HEADWATERS

[Maps redrawn from Van Hise and Leith, *Geology of the Lake Superior Region*, 113.]

has been able to divert to the Lake Superior-St. Lawrence drainage system a large headwater tributary of [the] Mississippi River, as it had previously diverted the Cloquet, another Mississippi headwater.

The Duluth escarpment is relatively fresh and uneroded because in all probability the tremendous cataclysm of nature which so markedly changed the relative levels of these two contiguous areas is comparatively recent and the carving of the surface of the escarpment by stream flow is a process still comparatively young.

Reference to the first of the two maps accompanying this article, which represents the present drainage systems of the region northwest of the head of Lake Superior, shows the St. Louis River with its right-angled turn from southwest to southeast near Floodwood, with the East Savanna flowing into the main stream at the same point. The remarkable fact should be noted that the flow of this tributary is directly opposite to that of the stream which it now feeds, a physiographic characteristic extremely uncommon. The second map given herewith offers a graphic explanation of this anomaly. Before the "piratical St. Louis" had cut its way back to this point the present valley of the East Savanna was the channel of a much larger stream flowing in the opposite direction, and forming what was then perhaps the main headwater of the Mississippi. Still earlier the St. Louis had captured and diverted the waters of the present Cloquet River, which at first probably, as did then the White Face River, flowed west and south into the Mississippi. The valley of the Prairie River approaches at its present head another smaller stream now flowing into the St. Louis from the southwest. The direction of flow of this little stream, like that of the East Savanna, has been reversed.

The two old stream valleys of the two Savannas and of the Prairie and the unnamed little stream near its head are the routes of the Savanna and the Prairie River portages. Ages before man had first appeared on earth, nature, "mov-

ing in mysterious ways its wonders to perform," had carved out for him these two passageways for his later use in trade and transportation. Nothing in this old world of ours ever just happens. Every fact in life, every event in history, every physical feature of the world around us is a result of causes, sometimes revealed but more often hidden in the obscurity of the past. It is gratifying sometimes, as in this case, to be privileged to discover some of these causes.

To the lover of Sandy Lake, this story from the book of the world's past lends to the lure of its beauty and the romance of its history the additional charm of ageless wonder.

IRVING HARLOW HART

IOWA STATE TEACHERS COLLEGE
CEDAR FALLS, IOWA



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