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Frank Reckendorf
Iowa State University

Keith M. Hussey
Iowa State University

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the logistical support, without which this study would not have been possible.

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An Unusual Case of Stream Piracy

FRANK RECKENDORF¹ AND KEITH M. HUSSEY¹

Abstract. An unusual case of stream piracy took place in the recent past through the Franklin Bluffs on the Arctic Coastal Plain of Alaska. The Sagavanirktok River and Hawk Creek occupied opposite positions on the sides of a ridge, with the result of a rapid lowering of the divide between them. Loss of cementation (by thaw) of the gravels in the formation separating them continued until the higher flowing Hawk Creek burst through the ice-free gravels of the ridge to join the Sagavanirktok River about one-half mile upstream from its former junction.

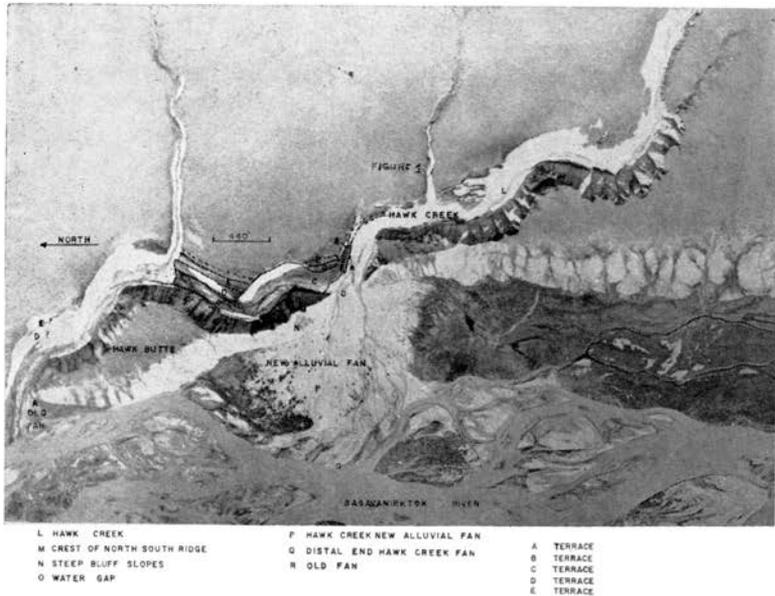
An unusual case of stream piracy took place in the recent past on the Arctic Coastal Plain of Northern Alaska. It is unusual in that it could have taken place, as it did, only in an area of continuously frozen ground such as is peculiar to the high latitudes.

The piracy took place through the Franklin Bluffs; a prominent scarp along the eastern side of the Sagavanirktok River Valley between latitudes 69° 40' and 70° 00'. The bluffs form one of the most outstanding relief features on the Coastal Plain. They range up to better than 500 feet above the river at the location of Bruce Benchmark. A broad, flat upland extends eastward from the bluffs. The western slope of the upland is divided into a number of small drainage basins which drain into the Sagavanirktok. One such basin extends through the bluffs, dividing them into a Southern and a Northern Section. The break is located just north of the former junction of Hawk Creek² (Fig. 1-L) with the Sagavanirktok.

The example of piracy in question occurred near the northern

¹ Iowa State University, Ames, Iowa.

² Proposed name for the pirated stream.



end of the Southern Section. At this location, the upland has been reduced to a very narrow ridge (Fig. 1-M). The lower reaches of Hawk Creek parallel the east side of the northern end of the Southern Section, and the Sagavanirktok River occupies a similar position along its western side.

The Tertiary Sagavanirktok formation³ is exposed along the entire extent of the bluffs. It is comprised of: a lower lignitic shaley unit; a middle sandy, silty unit; and an upper sandy, gravelly unit. The gravels range up to two feet in maximum diameter, but the predominant size is in the pebble class.

Where the material of the Sagavanirktok formation is protected from summer atmospheric conditions, it is frozen solid. However, since it is coarse-grained, any meltwater resulting from thaw drains quickly through the thawed section. The result is a completely unconsolidated gravel, free to flow down the steep face of the bluffs (Fig. 1 and 2). Inasmuch as both the Sagavanirktok River and Hawk Creek have the capacity to remove the unconsolidated gravels delivered to them by mass wasting, it is easy to visualize the sequence of events which narrowed the divide between them. As the ridge was narrowed, the vegetation mat, which covers the tundra in that area, was completely removed by slumpage down the opposing slopes. This removed

³ Gyrc, George, Patton, W. W., Jr., and Payne, T. G. (1951). "Present Cretaceous Stratigraphic Nomenclature of Northern Alaska." Journal of Washington Academy

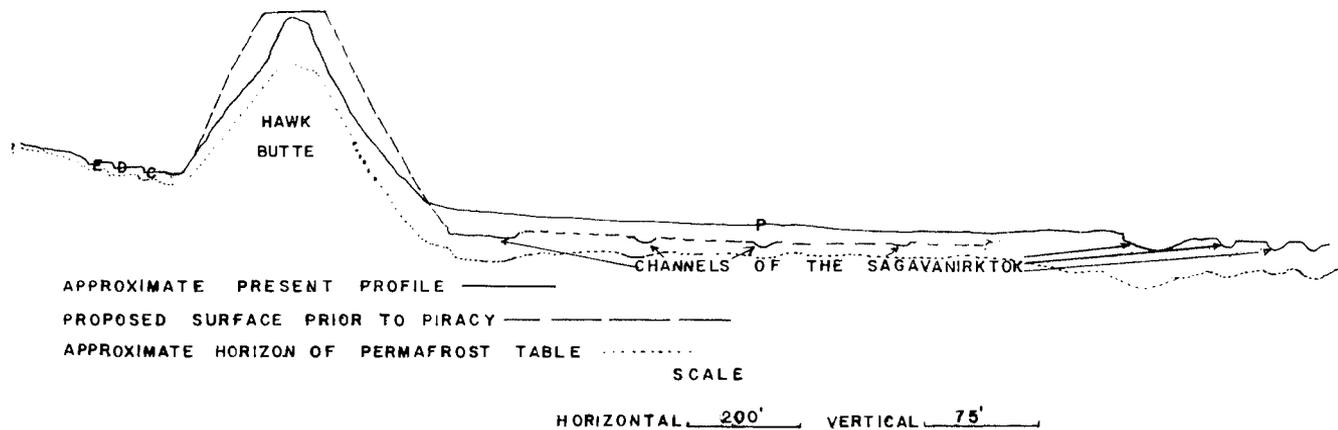


Fig. 2. Schematic cross section north of water gap.

the insulation effect of the mat, and thus allowed thaw to proceed to a much greater depth than was before possible. The net result was a rapid lowering of the divide, and further loss of cementation (by thaw) of the gravels. This continued until the higher flowing Hawk Creek (Fig. 2-C) burst through the ice-free water-saturated gravel of the ridge to join the river about a half-mile upstream from its former junction.

Something of the magnitude of the spectacle that must have been produced by the break-through is preserved in the following morphologic features: the water gap (Fig. 1-0); the alluvial fan (Fig. 2-P); and terraces A and B (Fig. 1). The water gap measures 200 feet wide and is 200 feet deep. The alluvial fan, that formed outside the water gap, measures 510 yards across and 375 yards from the apex at the water gap to its truncated distal end against the river (Fig. 1-Q). There are numerous boulders in the fan, some of which approach 2 feet in maximum diameter. Furthermore, the sizeable and swift Sagavanirktok (Es-kimo term for swift river) was forced from its old channel against the base of the bluffs 375 yards to the west, to its present site, by the building of the fan.

Evidence that a similar act of piracy took place in the more distant past in the same vicinity is found in the association of terraces, old channels, and an old fan. There are at least five different terrace levels (Fig. 1 A-E) Two of them are very small post-piracy remnants, formed by Hawk Creek as it shifted to the west during the rapid channel deepening. These are terraces A and B in Figure 1. They show how the thaw-weakened gravels influenced the direction of channel migration to the west, but they have no other significance in the piracy story. The other terraces (C, D, and E) (Fig. 1) all present pre-piracy channels of Hawk Creek. They extend essentially north-south to the east of, and paralleling, Hawk Butte (Figs. 1 and 2). Terrace C was the valley flat of Hawk Creek just prior to the piracy. It is floored by coarse alluvium, which obviously was derived from the upper gravelly section of the Sagavanirktok formation. The two terraces (D and E) to the east are older. They, too, are underlain by coarse alluvium but they are mantled by a thicker layer of vegetation mat, which is an indication of their greater age. Terrace D is separated from terrace C by a five-foot scarp, and from terrace E by a four-foot scarp (Fig. 2). There is also a four foot scarp on the east side of the oldest terrace (E) separating it from the upland which rises gradually to the east. The older terraces (C, D, and E) are marked by channel scars that are as much as three feet deep.

All three terraces (C, D, and E) are truncated by the chan-

nel of Greyling Creek,⁴ which was formerly a tributary of Hawk Creek. Since the piracy, it has lowered its channel, cut channels through the old fan formed by Hawk Creek (Fig. 1-R), and formed its own fan.

Further evidence that some pre-Hawk Creek drainage formerly drained the area is found in the remnants of the two older terraces to the north of Hawk Butte. This drainage joined the Sagavanirktok River just south of the southern end of the Northern Section of Franklin Bluffs. Piracy, in a manner similar to that previously described, took place at the north end of Hawk Butte. This piracy cut off the area drained by Hawk and Greyling creeks from the larger system, just as the most recent piracy has separated the Hawk Creek drainage area from that drained by Greyling creek. The Sagavanirktok River, in its eastward migration, has removed much of the evidence of the older and larger drainage system that existed in the low area between the two sections of the bluffs. Continued similar migration of the river will some day remove Hawk Butte and the terrace remnants to the east of it. Thus will be destroyed the evidence which today so graphically portrays the sequence of events that resulted in the piracy.

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The Structure and Stratigraphy of the Skvor-Hartl Area, Southeast Linn County, Iowa

VERNE E. DOW¹ AND STEWARD D. METTLER¹

Abstract. An area in southeast Linn County, Iowa is discussed in which a number of geological units from the Coralville limestone (Devonian) through the Silurian are exposed in a very small area.

A map is included which shows the outcrop pattern and axis of the major structural feature, a sharp narrow northeast-southwest trending syncline. Smaller folds, and at least one fault are indicated.

The study was based on exposures and a number of scores.

⁴ The tributary of Hawk Creek is here named Greyling Creek.

¹ Concrete Materials and Construction Division, Martin Marietta Corporation.