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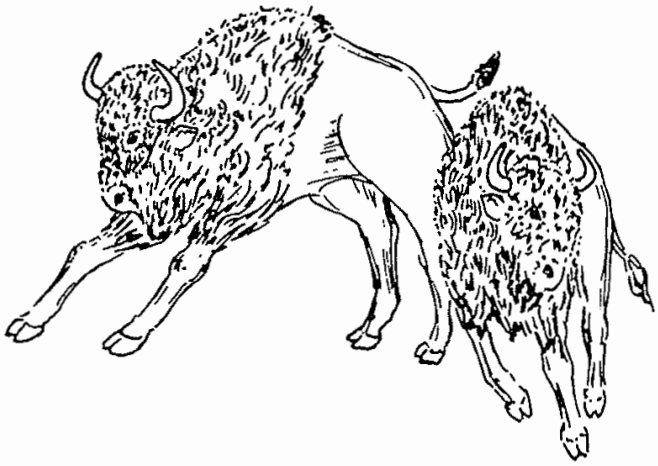
UPLAND GROOVES IN BENNETT COUNTY, SOUTH DAKOTA

by J. C. Harksen, 1968



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UPLAND GROOVES IN BENNETT COUNTY, SOUTH DAKOTA[1]

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During a geological mapping program of the South Dakota Geological Survey in the Tertiary area of southwestern South Dakota, the writer discovered shallow upland grooves at four separate locations (fig. 1). The grooves are all located on the loess-mantled uplands of Bennett County (see Harksen, in press), a semi-arid region on the extreme northern edge of the High Plains.

Zakrzewska (1965) published on valley grooves present in the High Plains of northwestern Kansas. About 50 sites, mostly in valley fill along intermittent streams, were examined and the grooves described averaged half a mile in length, one to four feet in depth and from 10 to 200 feet wide.

The hypothesis advanced by Zakrzewska as best explaining the nature and distribution of the valley grooves is that they are recent settling lines developed over shattered zones in the crust of the earth in which many parallel joints or fault lines have a persistent northeast or eastward trend, and which are now followed by intermittent streams. Also advanced as a lesser possibility was the hypothesis that the valley grooves represent either wagon trails or animal trails.

The writer, after reviewing the literature and examining the upland grooves of Bennett County, believes that these grooves are remnants of animal trails, presumably bison, which were formed before the arrival of the White Man in the northern Great Plains. The writer also believes that these upland grooves, or more specifically bison trails, may have been formed by the same processes which formed the valley grooves of northwestern Kansas.

The upland grooves of Bennett County are found at four separate locations (A, B, C, and D, fig.1), and all of the grooves are cut in loess which is of late Pleistocene or Recent

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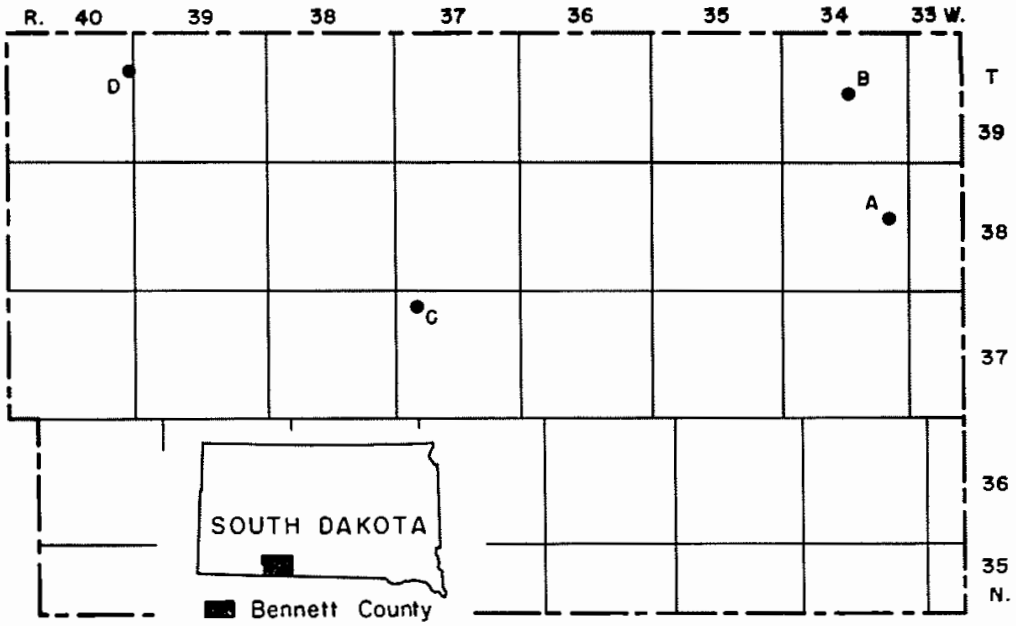

Figure 1 Index map of Bennett County, South Dakota, showing the locations of the four areas (A, B, C, D) where upland grooves are known to occur.

age. Two of the localities (A and B) are on loess-mantled High Plains remnants of the Ogallala Group, while localities C and D are on loess-mantled bedrock of the Arikaree Group.

The upland grooves at point A of figure 1 are the best developed of all four sites and are shown in detail in figure 2. This particular locality is on the drainage divide between the north and south forks of the White River, the highest part of this general region.

The highest concentration of grooves is found in sec. 14, T. 38 N., R. 34 W. (see fig. 2). The grooves fluctuate greatly in both width and depth, being widest and deepest on the ridges and obscured or removed in the valleys. Individual grooves can be traced for distances up to one mile. Viewed from the air the grooves are smoothly undulating curves which cross, separate, and merge. A photograph of two of the grooves is shown in figure 3.

The grooves have a preferred orientation of northeast-southwest. This orientation is at right angles to most of the smaller streams in western South Dakota and in the immediate area (see fig. 2) where the stream orientation is generally northwest-southeast (White, 1961). In contrast the valley grooves studied by Zakrzewska (1965) were oriented with the general stream direction.

When the author first observed the grooves on the air photos they were interpreted as a fault system. However, at pres-

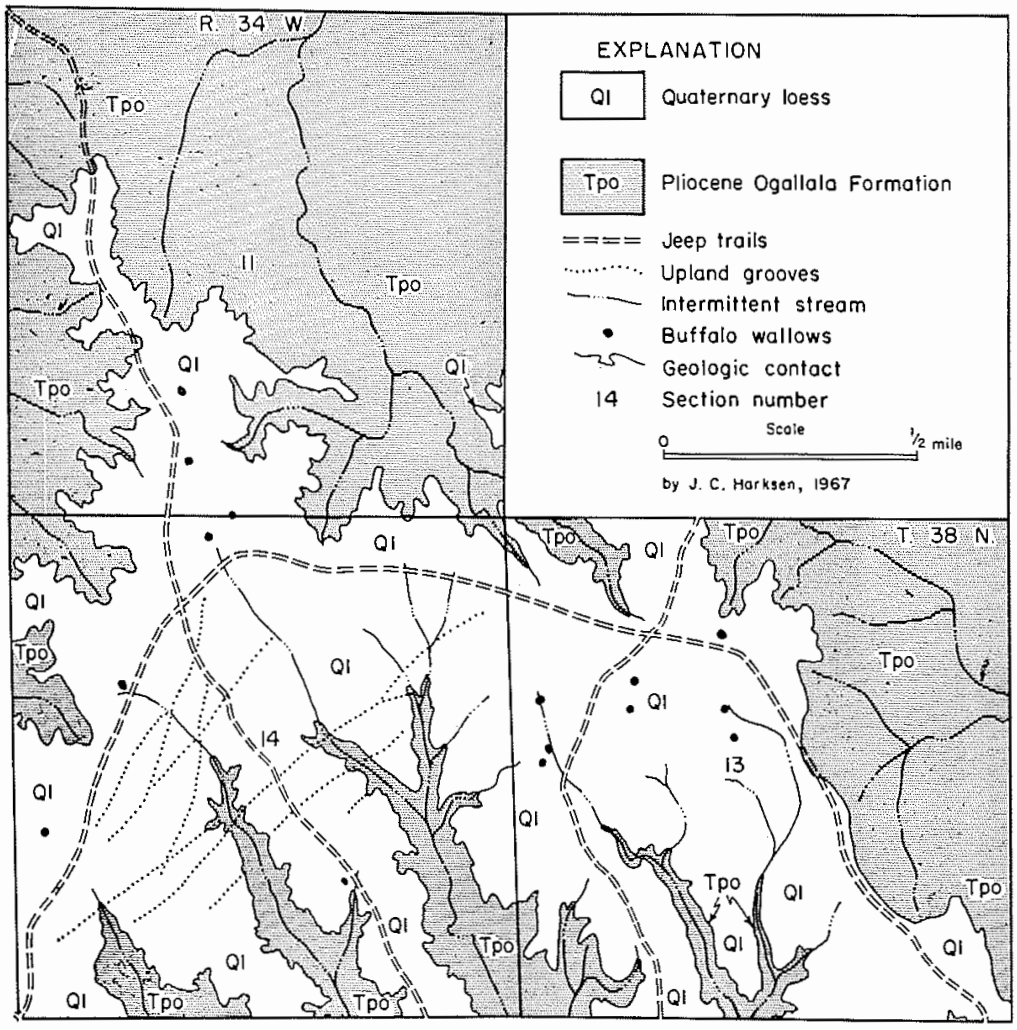

Figure 2 Geologic map of a part of Bennett County, South Dakota, showing the location of upland grooves and buffalo wallows. This area is point "A" of figure 1.

ent there is only one fault of any magnitude known in Bennett County and this fault is at least 6 miles from any of the upland grooves. Field work has shown that the ground surface on both sides of any particular groove lies at the same elevation.

Associated with the grooves are many small, elliptical depressions (see fig. 4). These depressions range from 47 to approximately 200 feet in length and hold water for a short time after heavy precipitation. These depressions are thought to be enlarged buffalo wallows. Johnson (1901, pl. 133) shows a picture which he labeled as being a typical buffalo wallow. Fenneman (1931, p. 14) printed the very same picture and said the depression was caused by local settling of the sediments. Apparently there is some controversy over just what constitutes a buffalo wallow.

The buffalo wallows of Bennett County are thought to be either much larger than common or have been enlarged since formation by the downward percolation of surface water (see Johnson, 1901, p. 703-704), and/or by deflation (see Fenneman, 1931, p. 16). The deflation hypothesis is supported by the fact that the long dimension of these elliptical depressions is oriented with the prevailing wind direction of north-northwest.

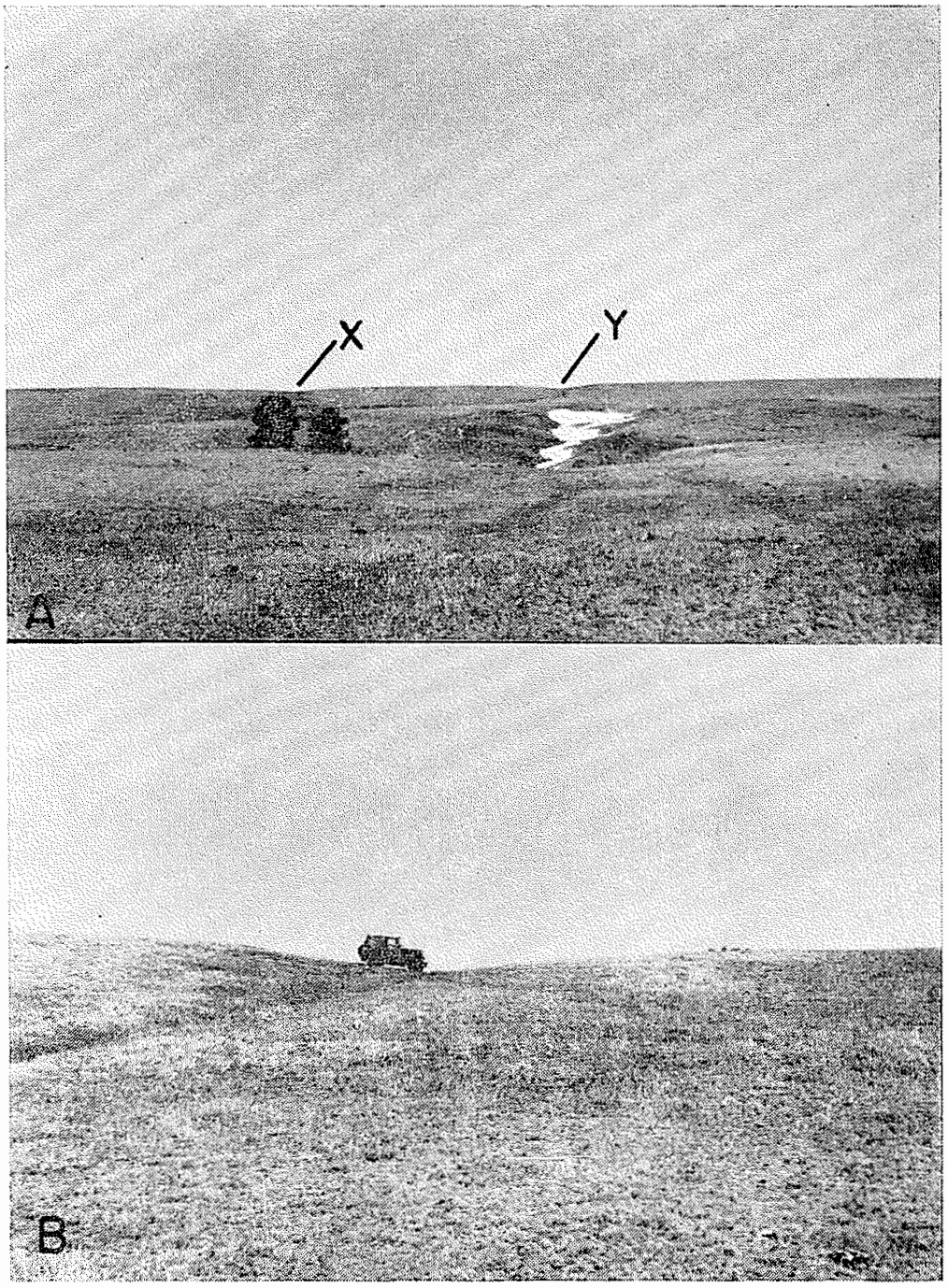

Figure 3 Upland grooves. A. Photograph showing two upland grooves (X and Y). B. Photograph showing a jeep parked in groove "Y" of figure 3A.

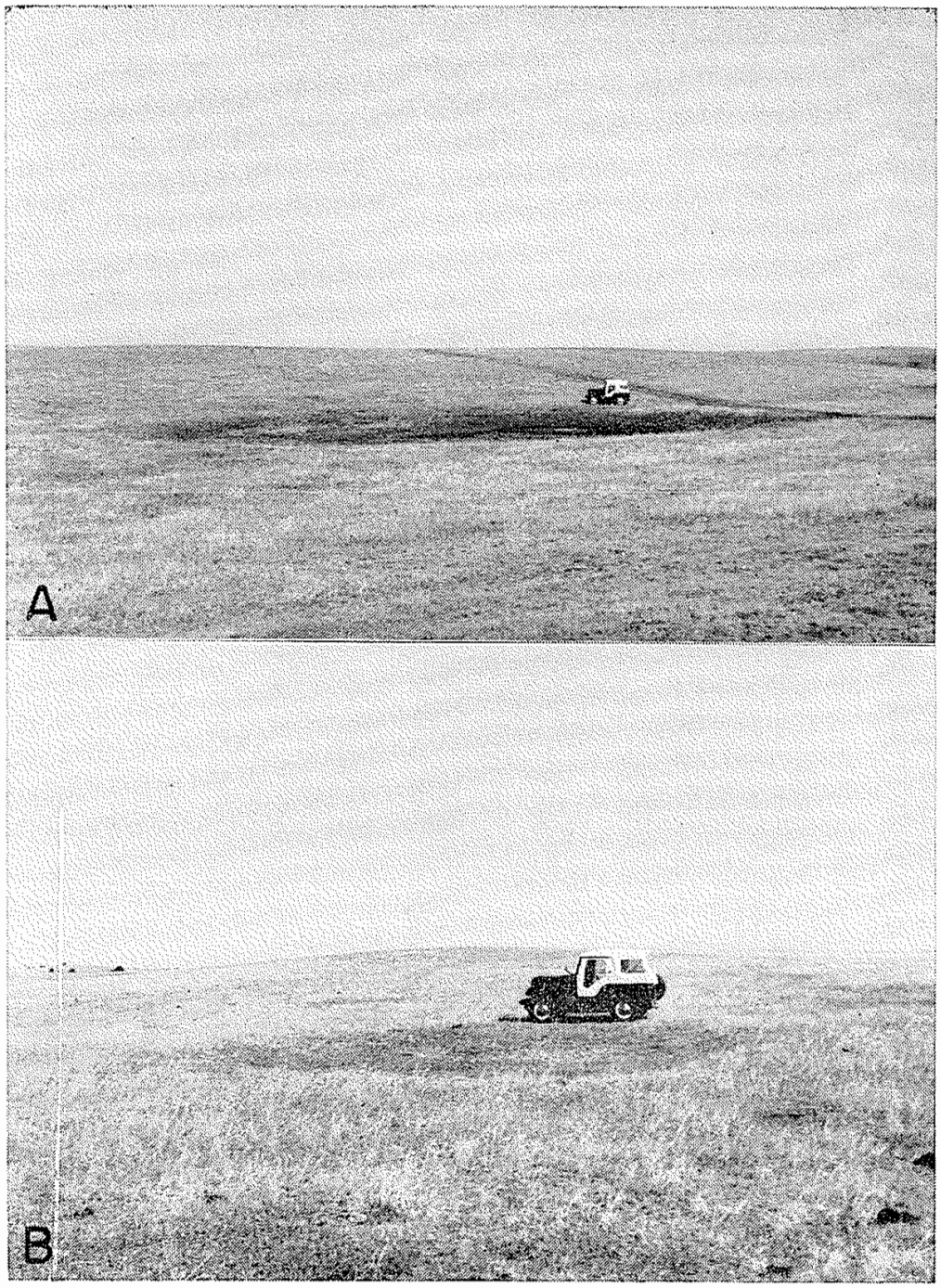

Figure 4 Buffalo wallows. A. A typical buffalo wallow which has been enlarged through the action of wind and downward percolation of water. B. The smallest buffalo wallow found in this area. This depression, with the long diameter oriented with the prevailing wind, has a maximum diameter of 47 feet.

To the author it would seem that the most logical explanation for the grooves is that they are ancient animal trails made by the bison.

While at present there are only about 22,000 living bison on the North American continent, it is estimated that in 1800 they numbered 60 million (Fish and Wildlife Service, 1965). Prior to the European invasion of North America the bison ranged from Great Slave Lake, Northwest Territories, Canada, to Mexico and east to Florida and New York. However, their major range was from Great Slave Lake to Texas in a band from the Rockies east to the Mississippi River. South Dakota would have marked the approximate center of the population.

The westward expansion of the United States systematically reduced the bison population with the result that by 1800 the bison east of the Mississippi River were gone. Throughout the nineteenth century the hunting pressure increased dynamically with the result that the bison were essentially exterminatd by 1883. In 1900 the bison population stood at an all-time low — less than 300 individuals (Fish and Wildlife Service, 1965).

Bison feed almost entirely on grasses, although when food is scarce they feed on other types of vegetation such as sagebrush (Hall and Kelson, 1959). While both sexes are big, the bulls are immense, often weighing upwards of a ton. The head, neck, and forequarters are covered with thick, shaggy hair while the rest of the body is covered with shorter, smoother hair. In the spring the bison shed their thick winter coats and for the remainder of the summer they are at the mercy of flies and other

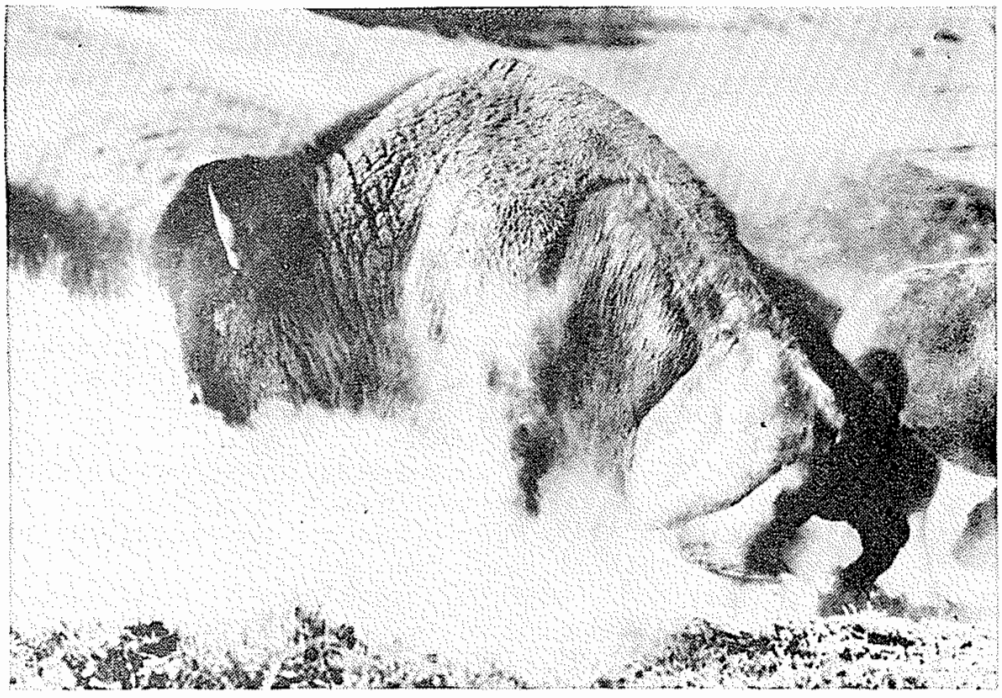

Figure 5 Bull bison rising to his feet after wallowing in the dust. Photograph courtesy of the United States Department of the Interior, Fish and Wildlife Service.

insects. To escape from these tormentors the bison wallowed in the dust. This resulted in "buffalo wallows," shallow circular depressions in the prairie which are usually a foot or more deep and seven to fifteen feet across (O'Connor and Goodwin, 1961; Fish and Wildlife Service, 1965). Figure 5 shows a bull bison wallowing in the dust.

The bison herds had separate winter and summer ranges which were estimated to be on the order of 300 miles apart. The bison, even while on the summer or winter range, were nomadic animals, spending only a few days in any one place before moving on a few miles with their ponderous, plodding gait. Even while remaining in one area, the bison made regular trips to water.

The bison, like cattle, wore trails across any area which they traversed with regularity. Sixty million bison making yearly migrations, weekly changes of range, and daily trips to water must have worn a great many trails across the face of North America.

It would seem that the most logical explanation for the valley grooves of Kansas (Zakrzewska, 1965) and the upland grooves of South Dakota would be that they are ancient bison trails. This hypothesis is further strengthened by a United States Geological Survey news release (anonymous, 1967) which called attention to the fact that on aerial photographs old cattle drive and stage coach trails resemble rock fractures. It is hoped that future research in the Great Plains will shed more light on this interesting problem. ⍓

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