BUFFALO RANGE AND FOOD HABITS OF BUFFALO IN WOOD BUFFALO PARK.

By
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Buffalo Range and Food Habits of Buffalo in Wood Buffalo Park

A. Physiognomy:

The physical geography of the Park has been adequately described by Soper (1938, 1941), Raup (1935, 1936, 1946) and Fuller (1957). A brief summary of their description is included here.

On the south and west sides of the park, the Birch and Caribou Mountains, erosion plateau of Cretaceous rock, provide the only major topographic forms. Between the Caribou Mountains and the Slave River, the Alberta Plateau slopes gradually to the north-east until it breaks off sharply as a gypsiferous limestone escarpment. Alluvial plains east of the escarpment have been built up by the deposits from the Athabasca, Peace and Slave Rivers. These plains are locally known as the Salt Plains. The salt (NaCl) has originated from underground deposits in the Alberta Plateau formation and has been retained in the soil of the plain because of poor drainage. The soils around Lake Claire and Lake Athabasca have been deposited out of the muddy waters flowing into these lakes.

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Along the channels connecting the Peace and Slave Rivers with Lakes Athabasca and Claire, spruce trees, probably no more than 150 years old are growing with their trunk buried in two to three feet of silt. This would indicate a present rate of deposition of about twenty inches every hundred years. The present river banks, in these locations are only ten feet above the high water level. Thus, it seems evident that most of the lowlands around Lake Athabasca and Lake Claire were part of Lake Athabasca as recently as 500 years ago.

B. Soils:

The soils of all the buffalo range are of glacial or lacustrine origin. Since the soils are frozen through much of the year very little bacterial decay occurs. The cold temperature of the soil causes a condition of physiological dryness and allows only fungal decay, resulting in an acid soil. The soil is very poor in humus and lacks available nitrogen. Such edaphic conditions are well suited to coniferous trees.

The soils of the Salt Plains are too salty for most plants. The soils of the Lake Claire meadows also possess a high content of salt, but not sufficient to

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prevent mesophytic vegetation becoming established.

C. Vegetation:

With the Exception of the Salt Plains and Lake Claire meadows, most of the park supports a forest of white spruce (Picea glauca), or successional stages leading to a white spruce forest. There are some areas on the Alberta Plateau which have very poor drainage and consequently support a black spruce (Picea mariana) bog. Along rivers and streams, varying amounts of willow (Salix spp.), balm (Populus balsamifera), aspen (P. tremuloides), and birch (Betula papifera) occur. In the southern portion of the park, along the Athabasca river, balsam fir (Abies lasiocarpa (?)) can be found. Jackpine (Pinus banksiana) covers extensive areas as the first stage of a pyrosere and also occurs on very dry sites such as morainic ridges and sand dunes. Large grass meadows occur only on the Salt Plains.

The distribution of vegetation on the salt plains is determined by the salinity and the moisture content of the soil. Raup (1935 p. 53) provides an excellent

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discussion of the Salt Plains to which I can add nothing.

The meadows on the north side of Lake Claire, in the vicinity of Sweetgrass camp are of three vegetation types. The wettest areas are vegetated by Glyceria and Carex tricocarpa. On more elevated ground, Scolochloe (Fluminea) festucacea replaces Glyceria. On the driest areas the vegetation is Calamagrostis canadensis which grows in a nearly pure stand. The ridges of the meadow have a Hordeum-Potentilla association. The driest ground in the area is covered with thickets of willow or forests of balm or spruce. A more detailed discussion of the vegetation is given in Raup (1935 pp. 67-74).

Raup (1935) after having made only brief studies of the grassland on the Alberta Plateau and providing us with an accurate description of the present state of the communities (pp. 41-53) is unable to determine their origin. He states (p. 60):

> "As there is no evidence of an earlier, forested condition, the grasslands or possible tundra forebears of them must have persisted as a type of vegetation from their inception. This eliminates fires and other secondary influences as causes for their existance, and pushes their history back to the origin and exposure of the soil itself."

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Moss (1955) and Thieret (1958) refer to Raup's explanation uncritically, and Raup repeats it in his 1946 paper (p. 69). I cannot agree with Raup. First, on all existing upland prairies I was able to find, evidence of previous forest fires were indicated. Secondly, a study of the successions which are now following recent fires in the area clearly indicate that the grass meadows originate from previously forested land. And thirdly, it is not logical to imagine grasslands which existed for thousands of years to suddenly be invaded by aspen and spruce since 1935, and now supporting forests.

In the following paragraphs I will attempt to show that the present distribution of the grasslands and forests are largely determined by their immediate past history, especially fires, and not by edaphic or climatic conditions, nor are they a successional stage from tundra vegetation.

The vegetation following a fire will be determined not only by the soil type, topography and climate, but also by the severity of the fire, the previous vegetation, the seeds and roots present in the ground and the seed

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which may be brought onto the burn by wind, water and animals.

Raup (1946: p. 47-48, 55) and Moss (1955: p. 524) discuss the forest succession following a forest fire. They omit to include a grass meadow stage in their analysis. Where a quick return to a forest type follows a fire, no grass meadow stage occurs. In the northern boreal forest, fires have often burned areas in such a way that tree species do not appear immediately afterwards. There are several areas in the park which were burned 20 or 30 years ago and still show no sign of regenerating a forest. In such areas grass species may become established so firmly that the aspen, pine or spruce cannot invade. Depending on the soil and drainage, three types of grass meadow association can be produced. Each of them will eventually develop into a forest, but for possibly a hundred years they will remain essentially a grass meadow.

The wet, poorly drained depressions will support a climax white spruce forest, but the stages leading to the climax after a fire are somewhat different than on better drained sites. While the area is forested,

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the water table is depressed, and the ground is relatively dry. After a fire, however, loss of water by transpiration is reduced, the water table rises, and the area becomes flooded. Under these conditions a Calamagrostis-Salix-moss association develops which is almost identical to the Calamagrostis-Salix association which has developed around Lake Athabasca and the river deltas and flood plains connected with it. What stages the wet meadow must go through in order for a spruce forest to re-establish could not be exactly determined, but the presence of a few spruce seedling in the meadow indicate a direct development to the climax spruce forest. The buffalo have no effect on these wet meadows since they will not eat the Calamagrostis grass.

On the moist, well drained sites, with a clayey soil, an Agropyron association may appear following a fire. In the area east of where the Pine Lake road crosses the Salt River, the Agropyron association is developing. A fire about 20 years ago removed nearly all the trees in a mature aspen stand. There is little evidence of aspen or pine regeneration. The primary

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species of the meadow are Agropyron spp., Rosa acicularis and Symphoricarpos occidentalis. There is a large number of secondary species most common of which are Poa, Stipa, Koeleria, Calamagrostis, Amelanchier, Ribes and many forbs. This area make excellent buffalo range and is used during the summer by small herds of bulls. Agropyron, Koeleria and Poa receive the most use. The adjacent salt meadow received very little use by the buffalo.

The third habitat type exists on the well drained sandy soil which is very common in the Alberta Plateau. There, Elymus innovatus is the most common grass. Agropyron, Schizachne and other grasses occur in lesser amounts. Since this habitat type is the most extensive of the dry meadows it must provide the bulk of the non-sedge part of the diet. Not only is Elymus the primary grass of the open meadow stage in the succession, but it persists as almost the only grass in the aspen and pine forest stages which follow.

Where pine forms the pioneer forest tree the abundance of grass depends on the density of the pine. In the very extensive open pine stands which must have been present fifty to seventy years ago, it would appear

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that the grass understory would have been composed largely of Schizachne purpurascens and Elymus innovatus and would have provided considerable forage. In the dense pine forest, very little grass is present. Schizachne and Elymus are almost the only grasses present in the Aspen-Pine forest which now occupy the former pine "savannah".

Figure 1. illustrates the present condition of the pine "savannah" habitat. It is obvious that the pine tree in the photograph attained its early growth without competition from other trees. Later the aspen entered the site, but in the case illustrated, did not occupy all the grass meadow. A second invasion of aspen began about ten years ago and will completely dominate the open grass meadow within a few years.

D. Summer food habits of Buffalo.

1. Alberta Plateau and Salt Plains:

The buffalo herds along the Slave River remain on the Salt Plains, their winter range, until about the first of June. They return to the winter range during the latter part of August. Thus, for only three months the buffalo live on the small meadows in the forests of

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the Alberta Plateay. As we have seen, most of these meadows are temporary, being successional stages leading to a climax white spruce forest.

It is not possible to make a detailed study of the food habits of the buffalo for several reasons. Much of their range is inaccessible. Only that part which is within a few miles of the roads could be studied. Lack of prior detailed knowledge of the movements of buffalo and the distribution of vegetation types caused much time to be lost in fruitless search. Inferrence of food habits by noting use of plants can be misleading, but it was the only method possible. Observations of feeding animals would have helped considerably, but most of the time all that could be seen of the buffalo was their southern exposure (as they galloped north through the forest.)

Most of the buffalo's food comes from wet sedge meadows. The large grass meadows described by Soper (1941) and Raup (1935) have been almost completely eliminated by aspen forest. However, the grass of these meadows has persisted in the developing forest, and still provides considerable forage. The primary forage species of these upland meadows being Elymus innovatus, Agropyron spp.,

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Schizachne and Poa. It was not possible to determine to what degree each of the various grasses were used. The condition of the range did not indicate over-use. Areas of buffalo concentration such as around the water hole two miles south of Junction Lake and fifteen miles north of Pine Lake (see Soper, 1941, p. 383; Fig. 12 and also Fig. 2 of this report) show a regression of the range to a weed stage. This condition has persisted without significant change since Soper made his study in 1933.

The grass species consistantly not utilized during the summer were Calamagrostis spp., Hordeum jubatum, Agrostis and most of the grasses on the saline meadows of the salt plains.

2. Lake One:

The large grass-sedge meadow which presently occupies the area designated as Lake One has a complicated history. The present "lake" exists as a small pothole a few yards wide. At one time the whole area of several square miles was flooded to a depth sufficient to warrant designation on maps as a premanent water body. At an earlier period it has been covered, at least in part, by a spruce (?) forest.

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The present flora of the meadow is predominantly Carex spp. Juncus, Hordeum and Agrostis are also common. An Agropyron association occupies the higher ground. On the better drained sites, aspen forms small groves (Fig. 3 and 4).

There was a herd of about 150 adult buffalo and 35 calves on the north end of the meadow when I was there on July 25. They were feeding mostly on the sedge. The preferred grasses and forbs in the Agropyron association had been heavily grazed and there was even some grazing evident in the Juncus-Hordeum-Agrostis association which is usually avoided.

A close view of the animals was obtained and they were all in a fat condition. However, the herd was predominantly cows, so the small number of calves present indicates a low reproductive rate.

The Calamagrostis-Salix areas north of Lake One showed no sign of buffalo and only very light usage by moose.

Spot checks on the group of lakes in the center of the Park, locally designated as Lakes Three, Four, etc., suggested to me a vegetation similar to that of Lake One.

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3. Lake Claire Meadows:

Carex spp. form the major portions of the buffalo's diet during the summer, and, apparently also during the winter. Although Calamagrostis meadows in the Lake Claire region are almost as extensive as the Carex associations almost no indication of use by buffalo was present. The other grasses in the region similarily received little use. The Hordeum-Potentilla association, being situated on the higher ground receives considerable mechanical damage as the higher ground was used by the buffalo as a wallowing area and as a "highway". Browsing on willow during the winter provides a significant amount of food. The habit of browsing is unique to the buffalo in this area.

Use of all sedge meadows was not equal. The meadows south of the corrals were heavily used, whereas those west of Sweetgrass Creek received very little use. The species of Carex appeared to be the same (Carex tricocarpa). No explanation for this behavioral difference could be found.

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E. Conclusions:

Knowledge of the origin of grasslands in Wood Buffalo Park is important in planning long-term management programs. Quite obviously, present forest management policies of total fire prevention is in conflict with maintaining buffalo summer range. The problem now facing administration is; should the Park be managed as buffalo range-or as a forest reserve. If it is to be managed as a buffalo range it must be decided when, where and how much burning is necessary or permissible.

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Figure 1: Typical summer buffalo range on the Alberta plateau. The amount of grassland in this habitat type has been severely reduced in recent years by invasion of aspen. The photograph illustrates four stages of the succession following a fire, viz: grass, pine-grass "savannah", aspen invasion (old), aspen invasion (recent).

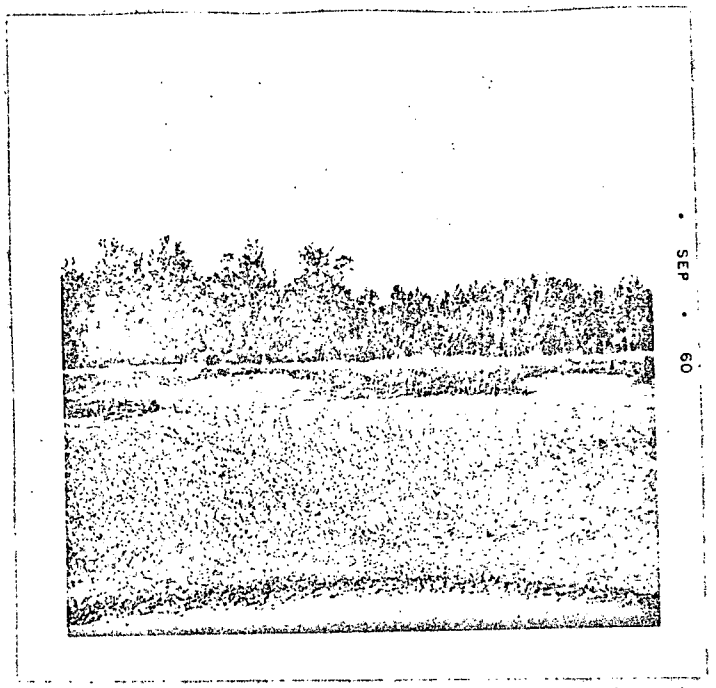

Figure 2: Buffalo waterhole in forested region two miles south of Junction Lake and 15 miles north of Pine Lake. The vegetation of the meadow is in a grass-weed stage.

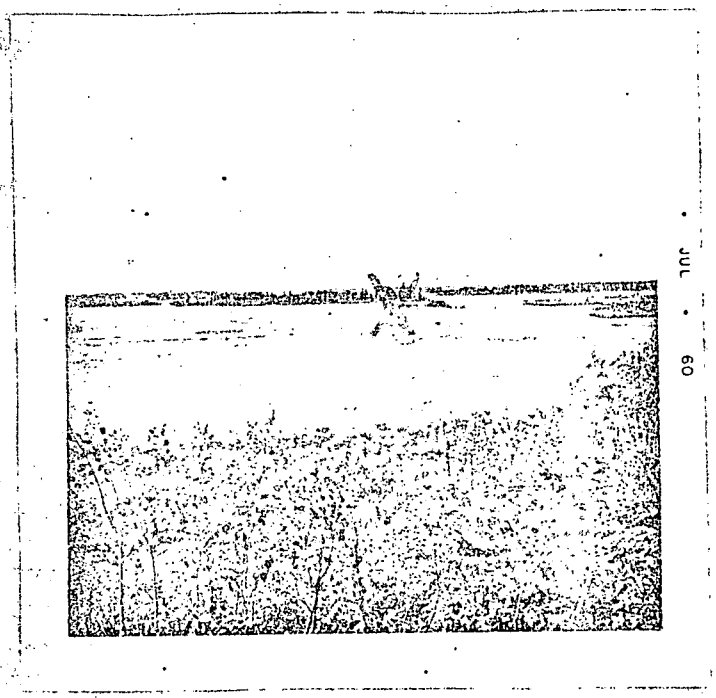

Figure 3: Lake One meadow as viewed from the hill on the east side of the lake. "X" marks the location of the poplar "bluff" shown in Figure 4.

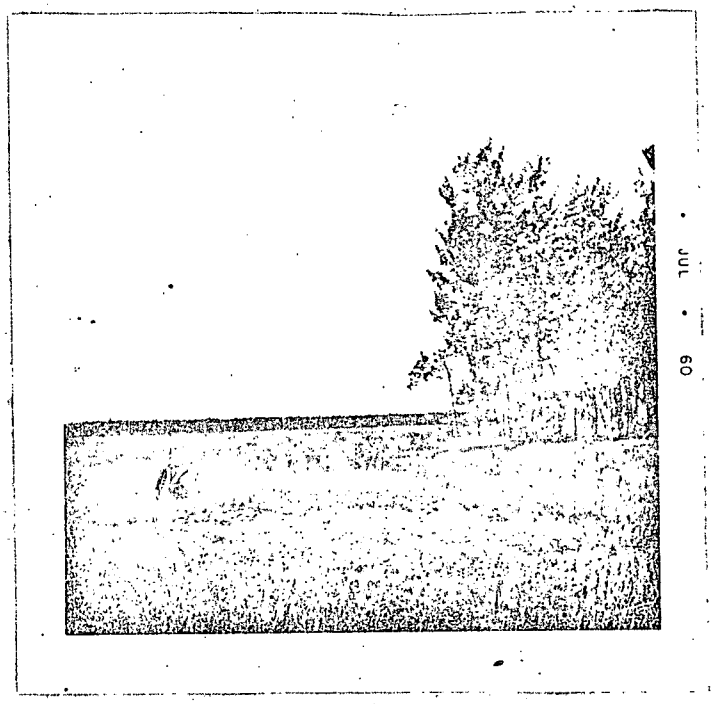

Figure 4: Grass meadow by poplar "bluff" is heavily used by buffalo. Most of the grass in the foreground is Agropyron sp.

Holsworth, W. N.
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