

ABSTRACT

Moisture levels and fire are generally credited with having kept woody vegetation from overwhelming prairie. That the American buffalo could have tipped the competitive balance one way or the other has been only scantily suggested by pioneers, and has since been largely discounted. However, it has been discounted mainly on the basis of the effects of cattle grazing and also on the basis of observations of buffalo in wildlife refuges of the far West. This discussion attempts to show the importance of buffalo and other large herbivores, particularly elk, in the establishment and maintenance of the historical prairie.

INTRODUCTION

Moisture levels and fire are considered the two factors governing the existence of prairie. Fire alone is generally credited with having kept woody vegetation from overwhelming the tallgrass prairie such as once existed in Illinois, Iowa, Missouri, and Wisconsin.

Though a few pioneer observers assigned a role to buffalo, elk, and deer in the establishment and maintenance of prairie, these scanty references have been discounted, evidently mainly on the basis of plentiful examples of negative or negligible effects of cattle on prairie. Assumptions have been that cattle would have about the same effects on vegetation as buffalo, and that the same parallel would apply to now numerous deer as opposed to the elk that once roamed prairies in large numbers.

That buffalo may have played any role, let alone a vital one, in the existence of prairie as we know it has also been discounted on the basis of observations of buffalo in western wildlife refuges. The present observations are an attempt to show the importance of buffalo in any full understanding of prairie.

OBSERVATIONS ON BUFFALO

Whatever effect buffalo may have had on the forest-prairie balance has been attributed to horning and rubbing trees and trampling vegetation, not to grazing (Roe 1972).

But I have found substantial evidence that: (1) buffalo have a much greater effect on woody vegetation than cattle; (2) that this adverse effect is likely to be considerably greater in the midwest than in the west and is also probably greater in the west than has been thought, and (3) in the midwest this effect is primarily due to grazing rather than rubbing and trampling. Therefore, buffalo may have tipped the competitive balance in favor of prairie over forest.

Buffalo and other large herbivores may have been a significant factor in the balance between forbs and the more dominant grasses of prairie, something fire is also thought to have been responsible for. This is because buffalo evidently make little use of forbs in their diet. In the pastures I have observed, they graze in the spring and summer almost exclusively on grass, including one pasture that was predominately forbs and alfalfa. Records of stomach contents of

buffalo at Yellowstone National Park indicate that forbs comprise only about 2 percent of their diet, about 90 percent of which was phlox and cinquefoil (Meagher 1973). Sedges and rushes comprised 61 percent and grasses 35 percent of their diet.

Buffalo also have considerably different effects on different species of trees, virtually ignoring some while literally ravaging others. In the midwest the two species they leave alone are oak and hickory, and it was oak-hickory groves that dotted the midwest prairie. Given a choice, they will select other species for horning and/or rubbing, and still others for eating the bark.

When it is considered that elk were as numerous, and probably more numerous than buffalo in the midwest, the possible effect of large native herbivores on forest-prairie ecology becomes even more impressive.

Of 11 midwest pastures with some woody vegetation that I compiled information on, all within 320 km (200 miles) east or west of the Mississippi River, buffalo had had a strongly adverse effect on the woody vegetation in four of them, a significant effect in two, and a very limited to negligible effect in five. Of the latter five, three were in the St. Louis area and one was on stripmined land. In all but one of the 11 pastures the buffalo were receiving a mineral protein supplement throughout the year and hay much of the year. In the one case buffalo were being given corn in the winter. Where buffalo have decimated trees in their pastures in the midwest, it has mainly been by eating the tree bark. A smaller proportion of trees is killed by horning and rubbing, but the ratio depends greatly on the species of trees.

In the west, however, the decimation of trees appears essentially limited to horning and rubbing, thus the adverse effect of buffalo on woody vegetation is not as extensive. Still, there appears to be some suppressive effect of buffalo on pines in the west not attributable either to grazing or to horning and rubbing. In one location it seemed to be almost chemical in nature. When buffalo have a choice, the species of trees they both horn and rub against are those with resinous sap, such as pine and cherry. The general belief is that their sap acts as an insect repellent. No significant use evidently is made of these species for eating. The horning and rubbing process eventually girdles the tree. Buffalo will continue to visit the same wound on a tree, and expand on it, as long as it continues to ooze sap.

Some species are used only for rubbing, which normally doesn't seem to break the bark. Still other species of trees are selected by buffalo for feeding on bark. Definite preferences exist in individual pastures, but because the species present differed so greatly from pasture to pasture, overall preferences were not ascertainable. Species from which buffalo were observed to have eaten bark are basswood, elm, maple, cottonwood, apple, white cedar, catalpa, and walnut.

When I observed them in a large pasture at Traverse City, Michigan, buffalo were essentially eating the bark of only one species, white cedar (*Thuja occidentalis*). However, the owner reported that in the

several years they had been in the pasture they had wiped out a "cedar swamp woods" growing within the pasture. A fence exclosed one portion of the woods. Inside the fence with the buffalo were only a few elderberry bushes and white cedar stumps. Immediately on the other side were thriving white cedar, willow, dogwood, elm, sumac, balsam fir, and elderberry. Cat-tails were also evident only outside the fence. There was no invasion of trees or shrubs in the pasture, though such invasion is common in northern Michigan. At the time of the observation in July 1975, there had been relatively little grazing of the grass in the low areas, and one swampy area was virtually untouched. Forbs were little used, if at all, and the owner said the buffalo made little use of alfalfa when he turned them out into a grass-alfalfa hay field.

At the National Laboratory at Batavia, Illinois, a herd that started with 15 buffalo had girdled in less than a year, about 80 percent of 600 trees in a 1 ha grove within a prairie-soil pasture of about 36 ha (90 acres). But they had left virtually untouched the oaks and hickories, save for a few saplings. The grove was predominately young elm with some basswood, box elder, hawthorne, white oak, and shagbark hickory, and, in a fence row, mulberry and black cherry. The oaks and hickories were mostly large old trees, and a number of these were scattered about the pasture outside the grove. It was the only midwest pasture observed that had prairie-derived soil. The buffalo had been extensively eating the bark of the elm and basswood, pulling strips of the bark loose from the trees up to heights of 4.9 m (16 ft). They had horned and rubbed the bark off many of the cherry trees. Although they were fenced out of the woods for much of their third year in the pasture, there was little resprouting from the roots of girdled trees. Almost all were completely dead within two years. The grove is rapidly becoming an oak-hickory grove. The buffalo were also using the mulberry, hawthorne, and to a lesser extent, the old oaks for rubbing. But they had not broken the bark on these trees by horning as they do trees with resinous sap. Later, when confined to a field with no other trees save a few old oaks, the buffalo did begin removing the bark from the roots at the bases of the old oaks.

A wide variety of forbs was thriving in the buffalo pasture, but in an adjoining cattle pasture, which did not have much more grazing pressure, all forbs except Canada thistle had been grazed down, even smartweed. Whereas the buffalo had concentrated their grazing in the better-drained portions of the pasture until the middle of summer, the cattle had done the opposite. In the buffalo pasture the grass immediately under the oaks and hickories had been left largely ungrazed through July 1974, and the pattern of ungrazed grass distinctly outlined the crowns of the trees. However, in August the buffalo showed a preference for this grass, and the outlines of the crowns became as distinctly etched by shorter grass as they had been by longer grass a month earlier.

At Custer State Park, South Dakota, where only a woven wire fence separated a buffalo grazing area from a cattle grazing area, and where the habitat was otherwise virtually identical on both sides of the fence, ponderosa pines were heavily invading the cattle pasture. But in the buffalo area, though there were plenty of seed sources, there was virtually no new invasion of pine, and the buffalo were gradually eliminating the old clusters of ponderosa pine through horning and rubbing. Leadplant was conspicuous on the buffalo side, but not evident on the cattle side.

At Custer Park the buffalo were observed to move rapidly through woodlands to get to open grazing areas on the other side, and otherwise stayed in the open almost continuously. Where they graze there is continual decimation of the ponderosa pine forests along their outer edges, and of course, of any trees within the open areas. However, areas of Custer Park where the buffalo do little or no grazing are rife with woody invasion.

In a survey of buffalo ranchers I conducted through Buffalo magazine, most said that buffalo browse on woody shrubs. Though I have not had much opportunity to observe before and after evidence of this, the buffalo pastures I have visited have been remarkably free of woody shrubs.

Two buffalo raisers noted that their animals have rubbed their heads and horns so vigorously against pine seedlings that they worked them out of the ground. This has also been observed in Yellowstone National Park, and it seems to be a behavior associated only with the pine family. Though they have rubbed to some degree on thorn trees in two midwestern pastures, an overall effect on thorny vegetation was not ascertainable. However, it is noted that, in an attempt to prevent buffalo from rubbing against and toppling the first telegraph poles across the Great Plains, spikes were inserted around the poles, "with the idea that they would wound the buffalo as they rubbed against the poles" (Dary 1974). It did not work. The buffalo sought out the spiked poles and even fought each other for the privilege of rubbing against them. The buffalo would scratch against a spike until it "broke or the pole came down."

A Canadian rancher informed me that his buffalo showed a taste preference for wild rose in his pasture, and I have seen where they have eaten the very prickly gooseberry.

Livestock raisers attribute the eating of bark by livestock to mineral deficiencies, but buffalo in the midwest, unlike cattle, are liable to keep on gnawing on trees even with a mineral food supplement. A difference in mineral content of soils is a possible reason for greater use of woody vegetation by buffalo in the midwest than in the west. Grasses growing in the leached deep loam soils of the midwest may not have the mineral content the animals need. The exception of the St. Louis pastures may be due to the limestone bedrock of much of that area. The strip-mined site, with soil heaved from deep down, may be more like western soils in mineral content. However, one buffalo raiser believes that bark provides roughage buffalo need. And there may be a significant difference in the roughage factor of western and midwestern range vegetation. Of interest is that buffalo in both the west and midwest have been observed licking bare soil.

A corollary to the effect of the American bison on woody vegetation is that the European bison, the wisent, is a browser, making extensive use of woody vegetation.

CONCLUSIONS

From the evidence on hand it seems quite reasonable that buffalo have heavy impacts on woody vegetation under some environmental conditions, and could possibly have played, along with elk and other large herbivores, a vital role in the existence of prairie, and in maintaining openings in woodlands. They also may have

