DECIDUOUS FOREST MAN AND THE GRASSLAND FAUNA. II

By Professor V. E. SHELFORD
UNIVERSITY OF ILLINOIS

III. DESTRUCTION OF CARNIVORES

In the original state the coyote, badger, kit fox, black-footed ferret, weasels and bull snake, all of which can be allowed to operate on cattle ranges, kept the plant eaters in check. They were aided by the wolf and the rattlesnake which stockmen can not be expected to tolerate, but the smaller carnivores appear to increase following the withdrawal of the larger ones. The work of the carnivore group was of inestimable value to the species of the entire community before man interfered.

(1) *Prejudices.* Due to prejudices and carrying out of eastern and European practices, the enemies of rodents were sought out and killed by cattlemen and farmers and at the same time trapped for their skins. The results of these efforts were, however, much more far reaching in the grassland, due in a large degree to the easy visibility of their dens, trails, etc. This stands in sharp contrast to the difficulty in locating such animals in the forests where visibility is bad and hiding places numerous. Foxes had always been destroyed by agriculturalists in Europe and the eastern states and consequently, anything that looked like a fox, even a small one, was thought dangerous to livestock and poultry. Some of this killing has always been accidental. Poison was often used and in some cases the results were not intended by the settlers. Dr. C. D. Bunker (personal communications) of the University of Kansas Museum, states that the kit fox, which is beneficial to agriculture, was generally destroyed by poison put on buffalo carcasses by cattlemen to kill wolves, during the period of buffalo slaughter.

The badger and ferret were under suspicion, on the basis of European tradition, as raiders of the poultry yard. In his study of the mammals of Texas, Bailey[11] states that the cowboys had a "real grievance against the badgers," because horses step into their holes. But, prairie-dog holes are also dangerous, and badgers help to reduce the number of these pitfalls. The rapid increase of prairie dogs in certain parts of Texas is unquestionably due in great measure to the destruction of badgers.

(2) *Results of Carnivore Destruction.* The rodents of the grassland, particularly ground squirrels, prairie dogs, kangaroo rats and jack rabbits, for some time past, have constituted a problem in grazing areas as competitors of livestock (see Taylor and Loftfield[12]). Their increases on the plains, following settlement, are well described by Merriam[13] in the 1901 Yearbook:

> On many parts of the plains prairie dogs were more abundant in 1900 than formerly and their colonies have overspread extensive areas previously unoccupied. This is due to the aid of the settlers (1) by decreasing the animal's natural enemies, and (2) to a minor extent by increasing the food supply. The settler waged warfare against the coyotes, badgers, hawks, owls, snakes, and other predatory animals which previously held the prairie dogs in check. The prairie dogs had multiplied until they had become a pernicious enemy to agriculture. For example, one South Dakota settler stated that about 1885 his children noticed two or three burrows about a mile from his house, and in 1900 they had spread over and occupied a full quarter section (160 acres), having surrounded his house and taken possession of the land near it.

The damage done by prairie dogs results in the loss of grass eaten and buried under the mounds. Merriam cites many examples of losses. A cattle ranch had its carrying capacity cut from 1,000 cattle to 500 by an increase of prairie dogs which extended to cover 300 square miles. In the same area there was a decrease in population and the abandonment of a post office.

As the stockmen began to feel the losses resulting from their own depletion of the forage grasses, they first redoubled their efforts against carnivores. This involved the destruction of wolves, coyotes and other animals on the plains because of their alleged destruction of livestock and game. As the destruction of the enemies of rodents advanced, the increase in rodents called for their destruction and the use of poison for rodents. This was recommended by the Biological Survey in 1901.

About 1917 the Federal Government took it upon itself to assist in the control of predatory animals and rodents in the western area. The process of providing funds for the destruction of animals became a matter of politics and, as usual, political leaders secured votes in their promises of better conditions through mammal control with poison, which, no doubt, also greatly pleased manufacturing chemists and their salesmen. The U. S. Biological Survey, during this period of increasing control of mammals from 1916

[11] Vernon Bailey, "Biological Survey of Texas." N. A. Fauna, 25: 1–222, 1905.

[12] W. P. Taylor and J. V. G. Loftfield, "Damage to Range Grasses by the Zuni Prairie Dog," *U. S. Dept. Agr. Bull.* 1227, 15 pp., 1924.

[13] C. H. Merriam, "Prairie Dogs of the Great Plains," Yearbook, U. S. Dept. Agr., 1901: 257–270, 1901.

to 1931, probably had ten to twenty destroyers to every scientific investigator.

During the early part of the poison period, apparently there was no thought of any values for the so-called noxious animals or of other methods being practicable.[14]

IV. The Effect of Overgrazing on the Grassland Animals

Recent investigations have brought out some wholly unexpected effects of overgrazing. Several animals despised by livestock growers and accused of causing depletion of grasses have been found to be innocent to considerable degree. Increases of their populations have been found to be the effects of overgrazing rather than the causes of grass depletion.[15]

Under conditions of the close cropping of grasses in eastern pastures, the grasshoppers and other insects get more of the available forage than the cattle pasturing on the area.[16] It is also the general conclusion of the students of grasshopper "outbreaks" on the western plains that they have their origin in over-grazed areas due to the changes brought about by the lessened cover and the growth of such broad-leafed herbs as are commonly called weeds. Overgrazing definitely favors broad-leafed herbs and thus some species of grasshoppers also. Many of these feed on broad-leafed herbs rather than grasses and should be called weed hoppers.

Vorhies and Taylor[17] state that increases of white-throated wood rats in some ranges are an effect rather than a cause of overgrazing. The rat appears to be an "animal weed" in the same way the grasshoppers are. Its principal foods are cactus and mesquite, which increase with overgrazing. Wood rats are caused to increase, and by disseminating cactus, etc., they tend to accentuate the overgrazed condition.

In the southwest, jack rabbits are favored by overgrazing, which provides more shrubs and broad-leafed herbs. Hence again their increase is in part an effect of overgrazing, and they too are comparable to weeds.[18]

V. Modern Ideas

Three ideas have come forward recently as a result of serious researches. Though doubtless they are far from new they are still farther from the field of practical application by agriculturalists, range supervision and game managers. They may be stated as follows:

(1) Biological control, *e.g.*, certain of the carnivores may be used to control rodent populations.

(2) Burrowing animals are beneficial to the soil in the grassland areas.

(3) Predators in the long run are beneficial to game species. They may be discussed in the order above.

(1) *Biological Control.* The discussion by Merriam indicates that the reverse of biological control is a fact: "The prairie dog and ground squirrels have several mortal enemies which, when not interfered with by man, usually serve to hold their numbers in check." The most important of these as listed by Merriam were the coyote, kit fox, badger, black-footed ferret, bull snake and rattlesnake.

The writer, after extended inquiries among plains biologists and an examination of the literature on the subject and an inspection of large areas of the great plains, came to the conclusion that the predators necessary for a study of the possibilities of biological control of mammals did exist on the plains at one time. A goodly number of species not incompatible with agriculture were once available in abundance and still exist in reduced numbers. The conclusion was that there had never been well-planned attempts to try out biological control of rodents on grazing lands. Several of the predators have been absent. Cases which the Biological Survey has cited as examples of the failure of predator control of rodents have been inadequate to prove anything of value as they were more or less incidental to the regular control operations. Accordingly biological control of mammalian populations has not been tried. It should, however, be the regular practice on grazing lands in arid areas because of the benefits of the burrowing animals to soils.

(2) *Benefits to Soil.* Vorhies[17] has written regarding the benefits of rodents to the soil. He states that in areas in which burrowing rodents are important in the loosening up and aeration of the soil—as in the earthwormless, arid Southwest—the little animals deserve to have the possible benefits they confer on the soil carefully balanced against the possible ill effects on erosion or as competitors of livestock. "It may be fairly questioned whether rodents, by and large, are important in causing erosion directly."[18]

(3) *Benefits by Predators.* Murie[19] concludes his study of the coyote in Yellowstone Park with the following paragraph: "In the present study every effort

[14] S. F. Olson, *Scientific Monthly*, 46: 323–336, 1938.

[15] C. T. Vorhies and W. P. Taylor, "The Life History of the Kangaroo Rat," *Professional Paper; U. S. Dept. of Agr. Bull.*, 1091: 1–40, 1922.

[16] G. N. Wolcott, "Animal Census of Two Pastures and a Meadow in Northern New York," *Ecol. Mon.*, 7: 1–90, 1937.

[17] C. T. Vorhies and W. P. Taylor, "Life, Biology and Ecology of the Jack Rabbits," *Univ. of Ariz. Agr. Expt. Sta. Tech. Bull.*, 49: 472–587, 1933.

[18] C. T. Vorhies, (a) "Wildlife Aspects of Range Rehabilitation." *Hoofs and Horns*, N. 5, No. 8: 6–7; N. 5, No. 9: 10–11, 1936. (b) "Control Projects Provide Easy but Dubious Way to Spend Money." *Nat. Magazine*, 28: 363–365, 1936.

[19] A. Murie, "Ecology of the Coyote in the Yellowstone Fauna of the National Parks of the United States." *Bull.*, 4: 1–206, 1940.

has been made to study the coyote in the interactions with all elements of the fauna and its relation to human interests. In consideration of these findings and the absence of facts to show that the coyote is an undesirable element of the wildlife in Yellowstone, it is concluded that artificial control is not advisable under present conditions." The paper in general refutes most of the charges against this animal. Again Olson has defended the presence of the large wolf in the Superior National Forest on the ground that it is really a benefit to the game. All in all the idea is growing that decisions as to the treatment of species suspected or believed to be detrimental to man's interests should await precise data based on special researches.

VI. Conditions Necessary for Needed Scientific Research

To test the value of the kit fox in the control of rodents and the several other modern ideas that have been advanced calls for a large tract of land (approximately 1,000,000 acres). It can be poor land suitable for grazing only. The fauna would have to be largely restored, and the species reduced in numbers allowed to rebuild to original status by protection, in order to bring back an approach to the original balance. The plants would also have to be allowed to recover from overgrazing or plowing. The processes involved in the recovery of the biotic community are much in need of investigation, and thus the time devoted to restoration is as profitable as any other from the research standpoint. The great plains have come to constitute one of the great national economic problems of the United States. The variable rainfall, unscientific exploitation, chiefly with the plow, and the loss of the soil, the reduction of animals beneficial to soils, call for serious longtime research work which can be combined with a National Monument which will preserve the original fauna in a natural state for posterity while retaining historic conditions of the covered wagon days.

At a recent Wildlife Conference[20] in Chicago, the Secretary of Agriculture stated that the United States is at the turning point. We either start saving and restoring our soil and biological resources or go down to economic destruction. (He no doubt had in mind the fate of certain Mediterranean countries.) In the same session a prominent official of the Department of the Interior stated that a sound national policy requires that more land come under public ownership in the national interest, even though it conflicts with some local interests. Public ownership of grassland is necessary for a long time continuous study of grassland problems. Work in this relatively untouched field is an essential part of any national conservation program.

OBITUARY

ROY E. DICKERSON

February ended the careers of a number of prominent geologists. Not the least was Roy E. Dickerson, who died of a coronary thrombosis at the American Institute of Mining and Metallurgical Engineers annual meeting in February. Funeral services were conducted in Arlington, Virginia, and the ashes will be interred in California.

The son of Merritt Michael and Martha Gilmore Dickerson, he was born at Monticello, Ill., on August 8, 1877. His entire university career was at the University of California, where he received the degree of B.S. in 1900, of M.S. in 1910 and a Ph.D. in 1914. His education, however, never ceased and he was as ardent a student on the morning of February 24 as he had been in university days.

Mr. Dickerson taught in California high schools and completed his graduate work while at Polytechnic in San Francisco. In addition, beginning as part-time curator in 1907 he became curator of paleontology at the California Academy of Science. During the summer, he taught at the University of California and acted as paleontologist for the Standard Oil Company of California.

In 1918, he joined the Standard as a full-time employee and became geological superintendent in the Orient. He served the Atlantic Refining Company in Middle and South America from 1926 to 1935, when he was promoted to chief geologist (foreign). In 1942, he became chief of the Technical Section of the Petroleum Division of the Foreign Economic Administration.

During nearly four decades of travel, he was accompanied by his wife, the former Delle Howard, of Cloverdale, Calif., whom he married on July 14, 1904.

Mr. Dickerson's most important publications were in paleontology, physiography and stratigraphy. While a graduate student, he completed a series on the Tertiary of the Pacific Coast. In later years, he devoted attention to the physiographic development of the East Indian and Philippine Islands, particularly as evidenced by the distribution of life. In spite of executive responsibilities of the last decade, he continued study and writing, leaving several unpublished manuscripts.

[20] Widely quoted by the press and to be published in the Transactions of the Ninth North American Wild Life Conference.