

No. 25, (June 1941) 22nd
v. 21, no. 6

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KANSAS STATE TEACHERS COLLEGE OF EMPORIA BULLETIN • OF • INFORMATION

JUNE, 1941

EMPORIA, KANSAS

VOL. 21, No. 6

STUDIES IN EDUCATION NUMBER (Twenty-Second of the Series)



WILDLIFE CONSERVATION (Information Concerning and Helps for Teaching)

By LOREN W. MENTZER



Published monthly by Kansas State Teachers College of Emporia. Entered as second-class mail matter at the post office at Emporia, Kansas, under the act of August 24, 1912. Acceptance for mailing at special rate of postage provided for in section 1103, act of October 3, 1917.

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PRINTED BY KANSAS STATE PRINTING PLANT
W. C. AUSTIN, STATE PRINTER
TOPEKA 1941
18-9179

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EDITOR'S INTRODUCTION

In presenting to the citizens of Kansas a program for wildlife conservation with some suggestions for making this program applicable to the public schools, Loren Mentzer is doing a real service. Within the last ten years, possibly the last five, America has become conscious of its problem in conserving its valuable wildlife. The depletion of wildlife within a state is something like the advance of a malignant disease within an individual. One does not know that he is suffering until the disease is far advanced. America faces this problem in conservation. The buffalo, the antelope, the prairie chicken, the passenger pigeon, all are either totally destroyed or sadly depleted. Some fur-bearing animals have been for years on the protected list, all of which is evidence that Kansas is now fully cognizant of the real danger which it faces.

In the study which Mr. Mentzer presents in the following pages he offers not only much information concerning the status of wildlife in Kansas, but many valuable suggestions for a coöperative program to preserve that which now exists. That there is much need for teaching Kansas boys and girls the value of their heritage and ways and means of preserving it, goes without question. That such teaching is education in the finest sense of the word is equally unquestionable. "Act like a guest when you use the outdoors," the slogan of the School and Community Wildlife Lodge, is one which every citizen of Kansas, adult and youth, should make his own. Such a slogan can really become effective only when it is coupled with careful teaching in the schoolroom and in the home, as well as in clubs and camps and lodges wherever youth may congregate.

It is a pleasure to offer Mr. Mentzer's study to the schools of Kansas for use in their classroom programs.

EDWIN J. BROWN, *Editor.*



CANADIAN GEESE ON A STATE LAKE IN KANSAS

FOREWORD

"Accuse not nature, she hath done her part—
Do thou but thine!"
—Milton.

Americans cannot be proud of their stewardship of wildlife, for it has been one of careless, thoughtless destruction and extermination. Regrettable as it may be, accounts show that Kansas is no exception among the states.

Few United States histories fail to tell the story of how the American bison was recklessly slaughtered, and Kansas was one of the chief areas where this destruction took place.

Kansas is the geographical center of the United States, and because of its level plains it became one of the most inviting pathways to the West. From the time the fur traders blazed the first trails across it in the opening of the eighteenth century until the present time, men have found Kansas a favorite route to destinations both east and west.

From the very beginning, almost every group that has crossed the state has taken its toll of the wildlife that was once so abundant. The trails which were originally only the tracks of prairie wildlife broadened into the Oregon Trail and the Santa Fe Trail, which in its heyday covered an area of trampled earth a quarter of a mile wide in places. These trails are now only objects of history, as is almost all the wildlife which once furnished abundant food and clothing to the early travelers. The spot which was once known as "Hunter's Paradise" now stands as a pitiful example of what man's greed and thoughtlessness can do. The roaming fur traders, the frontiersmen, the passing travelers of covered-wagon days, and finally the settlers themselves have preyed upon the wildlife as though its resources were inexhaustible. Year after year the destruction continued at an alarming pace.

It was not until deplorable conditions had been reached that any consideration was given to the destructiveness. Only in recent years has wildlife come to claim even a part of its rightful place in conservation programs. Through an educational program of research and practical application lies the road for progress in building up in the American citizen's respect and responsibility for this part of their inheritance.

CHAPTER I

INTRODUCTION

PURPOSE OF THE STUDY

As Americans are awakening to their misuse of wildlife and are beginning to see the great need for conserving it, much study is being devoted to the subject. Many states have a definite program of conservation education in their public schools. These programs are usually sponsored by the state department of education, the state conservation department, or by combined efforts of the two. Although Kansas as yet does not have a definite program for teaching wildlife conservation in her schools, many closely related units and subjects are taught. Whether conservation should comprise a single subject or whether it should be integrated with subjects already taught is a matter of discussion, but most authorities seem to agree that it can be effectively taught through correlation.

This study is an effort to bring together useful materials which may be of value in teaching wildlife conservation in the secondary schools of Kansas. It is hoped that the material included here may be a help to both teachers and pupils.

PREVIOUS STUDIES

Although there have been no studies of this type made in Kansas, similar ones have been made elsewhere both by individuals and by organizations interested in wildlife problems.

Herbert Snapp¹ at Ohio State University wrote a master's thesis called *A Program of Education for Conservation*, in which he stressed the importance of building up correct ideas and attitudes. He gave a short history of the general conservation program, emphasizing the great changes of attitude in the past few decades. He then described and evaluated a program of teaching conservation in Ohio schools based upon his own experience as a teacher and as a lecturer. The study includes an interesting chapter concerning the background and enforcement of fish and game laws.

The combined efforts of the conservation commission and the state department of education of West Virginia resulted in two very useful bulletins called *Units in Conservation*.² One of these is for use in secondary schools and the other is for elementary school work. Teaching units for all grades are included. They were based upon recommendations submitted by various committees of teachers working over the state and also upon information obtained from wildlife, soil, and forestry experts in the state. For example, the units "Our Heritage of Beauty" prepared for the seventh and eighth grades are

1. Herbert L. Snapp, *A Program of Education for Conservation*, Master's thesis, Ohio State University, 1940, 97 pp.

2. Conservation Commission of West Virginia and the State Department of Education, *Units in Conservation*, Volumes I and II, Charleston, West Virginia: State Printer, April 1939, 128 pp.

planned for integration in art, mathematics, science, social studies, and English. The unit for grade ten, "Biological Bases of Conservation," is especially adapted to biology. Along with the suggested activities in the units in these bulletins is much useful material for teachers.

The United States Office of Education has published some good conservation studies to which reference will be made. As a background for valuable information dealing directly with wildlife conservation are the innumerable contributions on technical phases of management made by various state and federal agencies. A great number of these publications have been reviewed and many of them are listed in the bibliography.

THE PROBLEM

The scope of this problem and the method through which it is presented are as follows:

1. A review of the early status of wildlife in Kansas.
2. Early attitudes toward wildlife and the story of destruction.
3. The part played by man in upsetting the natural balance and the need for education in the matter.
4. General principles which apply to all wildlife management.
5. A review of the work of various Kansas agencies, especially the State Forestry, Fish and Game Commission.
6. Some suggested activities for teaching wildlife conservation in the secondary school program.

SOURCES OF DATA

Many sources for securing information for this study have been utilized. They are as follows:

1. Various state conservation department bulletins.
2. Bulletins published through the combined efforts of state conservation and education departments.
3. Bulletins published by state education departments.
4. Bulletins published by the United States Department of Interior, including the Federal Fish and Wildlife Service bulletins.
5. Bulletins published by the United States Department of Agriculture, including Forest Service and Soil Conservation bulletins.
6. Bulletins of the United States Office of Education.
7. Bulletins of extension divisions of several agricultural colleges.
8. Report of a special federal committee on the conservation of wildlife resources.
9. Books.
10. Periodicals.
11. Newspaper articles.
12. Interviews.
13. Moving pictures from the Soil Conservation Service and the Kansas Forestry, Fish and Game Commission.
14. Personal letters of inquiry to informed sources.
15. Visits and field trips.

DEFINITION OF TERMS

The following are definitions of technical or semi-technical terms used in this study:

1. *Wildlife*: birds, fishes, and other animals not domesticated by man.
2. *Ecological relationship*: relation of an organism to its environment.
3. *Natural balance* or *balanced conditions*: ecological relationships in which all species prosper enough to maintain their existence, while no one of them thrives so well that it seriously interferes with any of the others.
4. *Wildlife community*: a group of animals living in such a manner that they are much dependent upon each other and the plants in the area for their existence.
5. *Wildlife conservation*: wise use of wildlife resources.
6. *Predator*: an animal which preys upon other animals.
7. *Vermin*: all noxious animals which are difficult to control, especially birds and other animals that prey upon game.
8. *Closed season*: the time during which it is prohibited by law to hunt, shoot at, pursue, take, kill, injure, molest, destroy, or have in possession any game animal, fur-bearing animal, game bird, or game fish.
9. *Flyway*: route used by waterfowl in making migrations.
10. *Buffer food*: a species constituting food for predators and acting as a "buffer" to protect game from predators.
11. *Carrying capacity*: the maximum density of wildlife which a particular range is capable of carrying.
12. *Check out system*: measuring the number of hunters or their kill by checking them in and out at points of entry and exit.
13. *Refuge*: an area closed to hunting in order that its excess population may flow out and restock surrounding areas. Synonym—sanctuary.
14. *Management*: the art of producing sustained annual crops of wildlife for recreational use.
15. *Covert*: a geographic unit of wildlife cover.
16. *Covey*: a small flock of birds which "lie" flat to the ground.

CHAPTER II

EARLY CONDITIONS AND THE EFFECTS OF SETTLEMENT UPON WILDLIFE

EARLY DESCRIPTIONS OF NATURAL CONDITIONS

The Kansas that the Indian knew and lived in was an ideal spot for all types of prairie wildlife. Four hundred miles long and two hundred miles wide, it was a part of the Great Plains which stretched from the Mississippi river to the Rocky Mountains. These eighty thousand square miles of rolling prairie, broken by occasional bluffs and valleys and with enough rainfall to support a good growth of diverse vegetation, were inhabited by millions of wild creatures.

The first recorded reports of the land which is now Kansas were probably those given by Coronado and his men after they returned from their visit to the land of "Quivera" in 1541. Since these men were seeking gold, their accounts of natural features are brief and incomplete; but parts of them glowed with descriptions of the prairies, for example:³

"The earth is the best possible for all kinds of production for Spain; for while it is very strong and black, it is well watered by brooks, springs, and rivers. I found prunes, like those of Spain, some of which were black; also some excellent grapes and mulberries. I traversed mighty plains and shady heaths, smooth and wearisome, and bare of wood. All the way the plains are as full of crooked backed oxen as the mountain Serena in Spain is of sheep."

Of course, the crooked-backed oxen of which he spoke were the vast herds of bison which roamed over the prairie. In other places in his reports, he referred to the wild turkey as "cocks with great hanging chins." Again, he seemed quite impressed with the abundant growth of perennial grasses on the plains, probably the several species of grama, bluestem, bunch grass, and the short buffalo grass of the high plains region.⁴

During the period of about two hundred fifty years following Coronado's expedition, the area which is now Kansas was known only as the home and hunting ground of the Indian. About 1700, French fur traders began operating in the Kansas territory. From scattered sources it is known that the fur trade reached an enormous scale and was largely responsible for the inroads into the new country. The fur trappers were the first on almost every frontier.

"Beaver skins were the one ready product of the New World which the merchants of Europe were eager to purchase. As a consequence, competition in the trade for these skins was the source of strong and bitter antagonism between individuals and companies, and even caused jealous rivalries among the Dutch, English, and French colonies.

"Disputes over the right to trade in certain districts often led to bloodshed, and even to long wars, over the areas where powerful rival companies fought for the control of a new empire. This eager competition among daring ad-

3. Clara H. Hazelrigg, *A New History of Kansas*, Topeka, Kansas: Crane and Company, 1895, p. 11.

4. American Forestry Association, *American Forests*, Washington, D. C.: The Association, July, 1940, p. 298 ff.

venturers resulted in the constant extension of trading posts throughout the north and west, until the vanguard of civilization reached the far borders of the continent on the shores of the Arctic and Pacific oceans.⁵

In 1803, Lewis and Clark described a great number of animals, the majority of which were probably found in Kansas. Some of the forms of wildlife common in this area were the bison, pronghorn antelope, wild horse, elk, white-tailed deer, black-tailed deer, gray wolf, black wolf, coyote, panther, badger, hare, jack rabbit, prairie dog, black lynx, black bear, wild dog, two-striped skunk, raccoon, porcupine, ground squirrel, red fox, mouse, mole, turkey, bald eagle, magpie, raven, prairie chicken, and bobwhite quail.⁶ All these animals were taken in the territory of Kansas as late as 1859.⁷ Numerous song birds and migratory waterfowl could also be mentioned.

Pike, in his trip across Kansas in 1806, was amazed at the herds of bison and pronghorn antelope grazing together with the wild horses on the prairie. He was curiously interested in the innumerable prairie dogs living in "towns" sometimes covering two or three miles square. Once he poured a hundred forty gallons of water in a hole to drive out some of the occupants, but he did not succeed. A bit taken from his report says:⁸

"Of all the countries ever visited by the footsteps of civilized man, there never was one probably that produced game in greater abundance. We know that the manners and morals of the erratic nations are such as never to give them a numerous population; and I believe that there are buffalo, elk, and deer sufficient on the banks of the Arkansas alone, if used without waste, to feed all the savages in the United States territory for one century."

Various estimates of the number of bison present in the Great Plains Region have been made; according to the stories told of some of the immense herds, the figure of sixty million given by the American Bison Society does not seem unreasonable. Pronghorn antelope were reported to have equalled the number of bison in numbers.⁹

Long's expedition in 1819-'20 was the last of these three great explorations which did so much to acquaint the American public with the character of the Great Plains Region. Unfortunately the notes of Thomas Say, zoölogist with Long, were carried away by two members who deserted the party.¹⁰

With the opening of the Santa Fe Trail in 1820 came various other studies, all of which give descriptions similar to those of the early explorers except that most of them are more in detail. Among the more important of the surveys are the "railroad surveys" made in the middle of the nineteenth century.¹¹

5. Edward W. Nelson, *Wild Animals of North America*, Washington, D. C.: Press of Judd and Detweiler, Inc., 1918, p. 443 ff.

6. Nicholas Biddle, *History of the Expedition under the Command of Captain Lewis and Clark*, New York: A. S. Barnes and Company, 1904, p. 336 ff.

7. J. R. Mead, "Some Natural History Notes of 1859," *Transactions of Kansas Academy of Science*, Vol. XVI, Topeka, Kansas: State Printing Plant, June, 1899, p. 280 ff.

8. Mary Gay Humphreys, *The Boy's Story of Zebulon M. Pike*, New York: Charles Scribner's Sons, 1911, p. 208.

9. Edward W. Nelson, *op. cit.*, p. 452.

10. Walter Prescott Webb, *The Great Plains*, Boston, Massachusetts: Ginn and Company, 1931, p. 147.

11. Direction of Secretary of War, 1853-'55, *Explorations and Surveys for a Railroad Route from the Mississippi River to the Pacific Ocean*, 12 volumes, Washington, D. C.: Thomas H. Ford, Printer, 1860.

BALANCE IN NATURE

Nature, if left a free hand, has a peculiar way of grouping and providing for all of her wild creatures. Her plan includes plants as well as animals, since plants are the basis of animal food. In an exact balance of nature no one kind increases so rapidly that it becomes a hindrance to the other members of the group; yet, every group increases enough so that if any of the other groups are depending on it for existence, they will be provided for. Natural selection by the survival of the fittest holds each group in its rightful place. There are certain characteristics which prairie animals almost have to possess in order to survive. Some of these are fleet-footedness, protective coloring, and keen eyesight. A hiding place, usually a den, is essential for slow-moving animals.

Early records show that a nearly balanced condition must have existed in Kansas when white men first came to the state. The Indians had done little to upset this natural relationship. The following paragraphs represent an attempt to describe this balanced condition.

WILDLIFE COMMUNITIES IN KANSAS

From the general standponit of wildlife communities, Kansas may be divided almost equally into two regions—the True Prairie Region in approximately the eastern half of the state, and the Mixed Prairie Region in the western half.¹² All subdivisions in this discussion will, for the sake of clearness, be considered under one general heading, the typical grassland community of the High Plains. Because of migratory habits most of the species were common to both regions. The prairie, woodland, stream, and marsh communities were varied enough to merit separate discussions.

THE PRAIRIE WILDLIFE COMMUNITY

This community was characterized by the great herds of bison and antelope. The herds of bison were the largest during their migration, which took them several hundred miles south in the late autumn and back again in the early summer. The antelope sometimes sought shelter with the browsers, the elk and mule deer, in the cottonwood groves along the river bottoms. On the prairie these animals grazed on the buffalo grass and the bunch grama grass; both of these grasses had the desirable quality of curing on the ground in the fall and retaining their nutritive value all winter. Thus, they provided excellent food for the bison and antelope throughout the entire year.

Following the grazing animals were large packs of the lobo or gray wolf. These carnivores fed almost at will on the bison, although in winter much of their food consisted of ground squirrels and mice which were present in great numbers. A larger carnivore, the plains grizzly bear, also aided in cleaning up the buffalo carcasses.

The small rodents, jack rabbits, and prairie dogs were hunted and killed by the many coyotes on the plains. Rattlesnakes and burrowing owls were two other enemies of these small animals. They often lived in the same burrows with the prairie dogs and fed upon each others' young. The diet of the skunks,

12. Fredric E. Clement and Victor E. Shelford, "The North American Grassland: Stipa-Antilocapra Biotic Formation (Biome)," *Bio Ecology*, New York: John Wiley and Sons, Inc., 1939, chapter VIII, p. 260.

badgers, kit foxes, black foot ferrets, and weasels consisted mainly of flesh of other animals, various insects, and fruits of some prairie shrubs.

Prominent among the insectivorous and seed-eating birds of the community were the meadow lark, horned lark, Smith's longspur, western lark sparrow, lark bunting, and the chestnut collared longspur. Game birds, including the greater and lesser prairie chickens and the sharp-tailed grouse, also added to the abundance of bird life. Principal among the carnivorous birds were the marsh hawk, western red-tailed hawk, the prairie falcon, the bald eagle, and the raven. These were rodent eaters generally but sometimes preyed on smaller birds.

THE WOODLAND WILDLIFE COMMUNITY

East of the Flint Hills, the wooded hills and valleys supported a somewhat different animal community. Smaller fur bearers, such as the skunk, raccoon, opossum, wildcat, lynx, red fox, gray fox, weasels, and squirrels, made a good living on insects, small rodents, and fruits of the various shrubs and trees in these areas. Cottontail rabbits and woodchuck were numerous and the porcupine was found occasionally. Many of the animals regularly dwelling on the plains often migrated into the sheltered sections to browse or hunt. Dominant among the larger inhabitants of these communities were browsers such as the mule deer, white-tailed deer, and carnivores such as the black bear, panther, timber or gray wolf, and the coyote. The last named was attracted in from the prairie by the abundance of ground squirrels and the jumping mice.

The woods furnished nesting places for many birds, both migratory and resident. Typical among the insect eaters were a great number of song birds and woodpeckers. The crow often nested in the timber and sought food on the prairie. Sparrow hawks, Cooper's hawks, and the sharp-shinned hawks, as well as many species of the owls, were rodent eaters. The great horned owl and a few of the hawks depended upon the eggs and young of other birds for much of their diet. Game birds such as wild turkey, ruffed grouse, and bobwhite quail were also common.

STREAM AND WATER-EDGE COMMUNITIES

The entire area from which Kansas was formed lay in two great watersheds—that of the Missouri river and that of the Arkansas river. The fresh unpolluted streams were filled with deep lagoons. Some of these were the mouths of small creeks; others were previously river beds; and some were caused by the rush of flood water down a deep slough. Since unplowed sod covered the hillsides, the lagoons did not fill up with mud and trash but were alive with fish. The bottoms were covered with sandy places for fish to spawn; trees on the bank provided shade for the eggs; and there were plenty of open sand bars for the spawn that needed sunlight.¹³

In these fresh-water communities were many very small, even microscopic, plankton organisms such as algae and protozoans, rotifers, and small crustaceans. These, together with mussels, larva of insects, crayfishes and worms, made up much of the food for the fishes. Attached vegetation played only a minor part because it was present in such small amounts in the early streams. The fish consisted of both bottom-feeding and surface-feeding types. Suckers

13. Kansas Forestry, Fish and Game Commission, *Kansas Fish and Game, Being Biennial No. 6*, Topeka, Kansas: State Printing Plant, 1926, p. 13.

did much plowing of the bottoms for their food and ate much of the vegetation and decaying organisms on the bottoms of the streams. This aided greatly in keeping the earthen bottom which catfish desire. Other fishes such as bass and crappie were numerous in these communities. Both of these are carnivorous—the former eating much plankton; the latter preying upon minnows and the young of other fishes.¹⁴

Along the banks of the streams were great numbers of furbearers such as beaver, otter, mink, and muskrat. The beaver, engineer of the streams, got his food and also material for constructing dams and lodges from the trees on the banks. He sometimes cut down trees up to three feet in diameter. The mink and otter fed on snakes, muskrats, rabbits, mussels, frogs, and birds. The muskrat, being very prolific, was probably the most numerous. He ate mostly vegetation such as water plants and roots, but also consumed mussels, fish, and salamanders.

Certain shore and wading birds were common along the water's edge. Prominent were coots, rails, sandpipers, kildeers, and herons. They fed mainly upon water insects, though herons also ate frogs, fish, and snakes.

THE MARSH WILDLIFE COMMUNITY

Within the prairie regions of Kansas were several large marshes which supported communities quite different from those of the typical prairie elsewhere. Among the larger ones were the salt marshes in what is Cloud and Republic counties, and the Cheyenne Bottoms in Barton county. These areas were the resting places for millions of waterfowl as they journeyed over the great Central Flyway and many are said to have nested there. Typical of the shore birds were rails, least bitterns, coots, sandpipers, red-winged blackbird, bobolink, and herons. Insects and water plants provided food for the birds. The grassy outer edges of these swamps were favorite breeding places for frogs and muskrats.

ATTITUDES OF THE INDIANS

Although the Indian depended largely upon the creatures of the wild for his existence, he was a roving gardener and not an agriculturist; hence, he had slight occasion to interfere with the existing balances in the wildlife communities. He knew and loved nature probably better than any naturalist of today. He looked upon wild creatures as being gifted with mysterious and superstitious powers that in some way were capable of influencing the destinies of men. Superstition entered largely into the preparation for all hunting expeditions.¹⁵ He often worshipped certain species, one of his favorites being the beaver. He held him in high esteem because of his instinct and beautiful fur, and he never seemed to tire of repeating his praises both in story and in song. Another one of his favorites was the bison. Concerning him, he told how buffalo were kept on the prairies in such great numbers just for the red man. It was supposed that on the plains of Texas there was a huge cave, out of which some beneficent spirit sent the bison in large numbers every year as a prize for the redman. They were so convinced of this that, even when the bison were near extermination, they still clung to the legend that the great

14. Clements and Shelford, *op. cit.*, p. 297 ff.

15. George Wharton James, *What the White Race May Learn from the Indian*, Chicago, Illinois: Forbes and Company, 1908, p. 18.

spirit would not let them all be killed. Many old warriors of the different tribes told of some truthful relative who had witnessed the coming of the bison, and one old man told his white friends that he, personally, had seen them coming from the cave.¹⁶

The Indian knew if he was to have food and clothing the next year, he must leave an adequate breeding supply to produce the new crop. He passed no laws regulating hunting seasons, but frowned upon unnecessary killing of wild game. If the animals in an area became scarce, the tribe moved to a new hunting ground, while the old one was replenished.

ATTITUDES OF FUR TRADERS AND EARLY SETTLERS

It is hard to say just when the first trappers and fur traders came to Kansas, for they left few records. Although the French fur traders had traversed Kansas much earlier, competitive operations in the fur business can be said to have begun in the early part of the nineteenth century. Pioneers in this trade were principally the beaver trappers. The selling of furs offered large economic returns, and very soon the competitive spirit ran high in both trapping and buying from the trappers. Numerous trading posts were established, some of which figured prominently in the early economic history of the state. It is estimated that 10,000 furs of beaver, otter, and deer were shipped from Fort Kansas on the Missouri River in one year as early as the eighteenth century.¹⁷ In early eighteen hundreds, the business at one trading post amounted to \$300,000 annually. The white men often traded the Indian whisky, tobacco, and trinkets for the most valuable furs.¹⁸ The beaver skins were valued at \$4 each and were used as a medium of exchange in this early barter system.¹⁹

Although great inroads were made in the wildlife population, the truly systematic slaughter did not begin until about 1830. The large fur companies organized hunting and trapping expeditions; in order to take away the food supply of the hostile Indians and thus drive them further west, the government even took a hand in organizing expeditions to kill the wildlife. Once begun this destruction took on the aspects of an uncontrolled prairie fire; nothing could curb it. The thrill of the chase and the revenue derived from the sale of certain forms so completely dominated the interests that hunters had little concern for the future of the game and how valuable it might be to the future society of the land. They were drunk with freedom in this vast new empire.

It is said that the establishment of the transcontinental railroad in 1856 marked the beginning of the end of the wildlife in the prairie kingdom. Railroad crews were responsible for much of this slaughter. They consumed car-loads of bison and antelope. Sometimes when supply trains were captured by Indians, the workmen had to depend upon these animals entirely for food. It is said that the building of the transcontinental railroad would have been vir-

16. Elijah M. Haines, *The American Indian*, Chicago, Illinois: The Mas-Sin-Na-Gan Company, 1888, p. 452.

17. Edwin J. Brown and Marie Agnes Olson, *Our Kansas*, unpublished manuscript, Kansas State Teachers College, 1937, p. 13.

18. Noble L. Prentis, *A History of Kansas*, Topeka, Kan., Caroline Prentis, 1909, p. 64.

19. Nature Association, *Nature Magazine*, Washington, D. C.: The American Nature Association, November, 1933, p. 210 ff.

tually impossible at that time except for the abundance of the wildlife on the open prairies. These animals were killed not only for food and hides, but many of them were killed for the sheer pleasure of killing. Hundreds were shot from the windows of passing trains and left lying on the prairie to decay. Many a single hunter killed from fifteen hundred to two thousand bison in a single season. Thousands were killed for their tongues alone. This wastefulness finally reached a climax when the bison butcher, no longer content with skinning by hand, began to yank the hides off with horse power. It has been estimated that three to five bison were killed for every hide marketed. In 1873 four hundred thousand bison hides were shipped from Dodge City alone.²⁰ The shipments from other railroad centers that winter were estimated at three-quarters of a million. This wanton waste continued until about 1875 when the great herds were practically exterminated. With the passing of the hereditary monarch, the bison, went many other animals such as the pronghorn antelope, elk, gray wolf, beaver and many of the smaller forms.

The passing of the grazing animals left their former range with rank growths of grass which drew the cattle kings and their great herds. With the intense grazing by the millions of cattle which were not migratory like the bison, much prairie grass was destroyed. Overgrazing, combined with the killing of their enemies, allowed the prairie dogs and other rodents to increase rapidly. The balance was tilted and soon artificial methods had to be applied to take care of the rodent situation. The common method of poisoning was very hard on wildlife in general.

After the building of the transcontinental railroads, eastern cities with their large populations made increased demands upon the territory to furnish food. Ready markets encouraged farmers to increase production. They pushed farther and farther west, clearing woods and plowing sod. Many game animals were either exterminated or pushed ahead of civilization. But prairie chickens, quail, rabbits, raccoons, and opossum began to increase due to the more favorable conditions for food furnished by the farmer and to the decrease of their predators. Their glory, however, was not for long. The market hunter soon appeared exploiting prairie chicken, grouse, quail, wild turkey, ducks, geese, upland snipe, woodcock, and passenger pigeons. He pursued his game the year around, netting, trapping, and night hunting; sometimes he even went so far as to kill his prey with small cannon. In summer refrigeration was so poor that carloads of meat had to be thrown away. This terrific waste of game enriched no one. Competition was keen; business was poorly organized; the markets were usually glutted. In the early part of the nineteenth century, ruffed grouse sold for two cents, wild turkey for twenty-five, and it was hard to get a few cents apiece for quail. But the professional hunters ruined their own markets with their greedy killing. Birds soon became so scarce that hunters could no longer supply the demand. Prices soared; canvas-backed ducks brought five dollars, yellow legs and black-breasted plover three dollars, red-head ducks two dollars, scaup ducks fifty cents, and a dozen quail five dollars or more.²¹

By 1900 Kansas could no longer be called a game state.²² The market

20. Federal Writers' Project of the Work Projects Administration, *Kansas*, New York: The Viking Press, Sept. 1939, p. 179.

21. Innes G. Hartley, *The Importance of Bird Life*, New York: The Century Company, 1922, p. 226 ff.

22. Forestry, Fish and Game Commission, *Bulletin No. 4, Including Biennial Report of Fish and Game Warden*, Topeka, Kansas: State Printing Plant, 1912, p. 10 ff.

hunter deserved much but not all of the blame. Changing methods of farming also played their part. Replacement of rail and hedge fences with clean wire fence rows, burning of prairies and sloughs, cleaning of brush, and draining of swamps—all these destroyed natural habitats. Only rabbits and bobwhite were able to hold their own. The great flocks of ducks and geese that had formerly passed over the state diminished to comparatively small numbers. Prairie chickens found fewer and fewer meadows to nest in, and livestock tramping over the ground interfered with their hatching and growth.

The breaking of sod and destruction of habitats did not reach its peak until the World War, when practically every tillable acre in the state was used for agriculture, horticulture, or stock raising. Gushing rains carried mud and vegetation from the uncovered hillsides and bottoms and filled the deep lagoons in the streams with mud and trash. Spawning beds were reduced in number and size and few young fish hatched. The swollen streams carried away great numbers of the young of water animals.

At about this same time, industrial pollution of the streams was increasing. Many streams either carried lethal amounts of poisonous substances or were covered with a scum of oil. Streams especially affected have been the Neosho, Cottonwood, Walnut, Arkansas, and Verdigris rivers.

After a survey of this era of destruction, one wonders how there can be as much wildlife left in the state as there is. The regrettable fact is that many of the practices carried on under the name of expanding agriculture have not only destroyed wildlife habitats unnecessarily, but in the long run have proved to be exceedingly detrimental to agriculture itself. To see this, one only has to recall the rodent infestations already mentioned, view some abandoned eroded fields, or witness a western Kansas dust storm. Good judgment as to amount of grazing and breaking of sod would not only have saved tons of precious soil, but would in turn have saved cover and food for much of our now vanished wildlife.

Now with the increased number of hunters, modern methods of transportation, good roads, modern firearms and ammunition, and more leisure time, still more demands are being made upon the wildlife of the state. Although too late to save several species, foresighted individuals long ago began to see the real situation and gradually to create an enlightened public opinion. That their efforts have borne fruit is shown by various reports of those who are coöoperating in the work. It would be impossible here to give a complete picture of wildlife conditions in the state, but a brief discussion of a few prominent species follows.

PRESENT STATUS OF WILDLIFE

The bobwhite is the favorite and most abundant of all game birds and is still found in almost every county except that they are scarce in northwest counties. The present production of the state quail farms and the increased interest in the protection of this bird give assurance that it will be popular and abundant in the years to come. Its greatest need now is more adequate food and cover.

In the eyes of many sportsmen the first-place game bird is the prairie chicken. Reported almost extinct a few years ago, the greater prairie chicken after several years of closed season is making an excellent comeback, es-

picularly in eastern counties. As yet, artificial propagation has not proved satisfactory and much care will be needed to maintain their numbers. The lesser prairie chicken, formerly abundant in western Kansas, is now confined to comparatively small flocks in a few of the southwestern counties.

The ring-necked pheasant, another fine game bird now found in Kansas, was first introduced into the state about 1904. Only recently has production been stabilized so as to maintain the species for hunting. Hunting of ring-necked pheasants was allowed for three days in 1940 in twenty-one counties of northwest Kansas.²³

The chukar partridge was brought to the state from India. It has not done so well in the past, but recent reports have been encouraging. They do not seem to conflict with other game birds and their increase in numbers appears to be normal.²⁴ With increased production at the Meade County Game Farm, and with reasonable thoughtfulness of hunters, they may appear before long on the list of game birds that can be hunted.

Experiments are being carried on by the State Forestry, Fish and Game Commission to determine the desirability of trying to reintroduce the wild turkey into the state. A few have been placed in Elk and Barber counties, where they were known to thrive best in the late nineties. This is experimental and no further steps will be taken toward large-scale production until the results of this project are known.²⁵

The cottontail rabbit situation in Kansas is not at all encouraging at present. Since this game animal is not only a good source of food, but also has a value in the fur market, action should be taken to give it the protection other game animals have.²⁶ The jack rabbits seem to be holding their own over the state. Although they become destructive if allowed to become too numerous, they are of some value in the fur market because of hat makers who use fur felt. There can be little doubt that rabbits brought large sums to the farmers of southwestern Kansas in 1940.

An increase in migratory waterfowl has been shown in Kansas as well as other states along the Central Flyway in the last two or three years. However, field observers of the Biological Survey stationed along these flyways, say that the flights have had a decided lack of uniformity over the four major flyways, as indicated by the fall migrations. The Atlantic and Mississippi Flyways harbored most of the ducks and geese in 1940. The Central Flyway showed a large decrease in all species, but with the increased water areas of the lakes built in state parks and the restoration of some swamps, it may be expected to make a comeback if other favorable conditions prevail. Although Canadian geese were some greater in numbers in 1940, the mallard and the pintail duck seemed to make the greatest increase due to their extensive range. The number of waterfowl²⁷ on the continent was estimated at 65,000,000 in 1940.

23. Kansas Forestry, Fish and Game Commission, *Kansas Fish and Game*, Topeka, Kansas: State Printing Plant, November, 1940, p. 7.

24. Kansas Forestry, Fish and Game Commission, *Eighth Biennial Report*, Topeka, Kansas: State Printing Plant, June 30, 1940, p. 5.

25. *Ibid.*, p. 4.

26. *Ibid.*, p. 6.

27. Bureau of Biological Survey, *The Status of Migratory Game Birds—1939-'40*, Washington, D. C.: The Bureau, June, 1940, p. 3.

Although fur bearers are not nearly as plentiful as they used to be, they still represent a source of income for farm boys and a few professional trappers. The following table shows the number of furs purchased in Kansas during 1939 by three hundred three of the three hundred twenty fur buyers.²⁸

TABLE I
FURS PURCHASED IN 1939

Opossum	155,943
Badger	2,911
Wildcat	150
Fox	1,965
Civet cat	47,219
Coyote	14,022
Wolf	1,047
Weasel	170
Mink	2,271
Muskrat	119,918
Raccoon	8,374
Skunk	151,800
Rabbit	347,850

Beavers, having been under a closed season for a good many years, are making a fair increase. They have become numerous enough along some of the rivers in northern Kansas to merit transplanting and trapping. This has been done under the supervision of the Forestry, Fish and Game Commission. If managed correctly this wonderful fur bearer may again be a great source of income for the trappers in the state. In 1937, the number of beaver in the state was estimated at fifteen hundred and this has probably increased considerably.²⁹

Although still suffering from pollution and drought, the streams and lakes are now furnishing many good fish to the angler. Catfishes, bass, drum, crappie, sunfishes, suckers, and carp are the principal fish taken. The gar pike are also quite numerous, but are not desirable because of their predatory habits. Probably most of the streams and lakes are stocked to their carrying capacity. Because of the high rate of reproduction among fish, there is much greater danger of having a water area overstocked rather than understocked.

28. Kansas Forestry, Fish and Game Commission, *Eighth Biennial Report*, op. cit., p. 11.

29. Forestry, Fish and Game Commission, *7th Biennial Report*, Topeka, Kansas: State Printing Plant, 1939, p. 29.

CHAPTER III

GENERAL PRINCIPLES OF WILDLIFE MANAGEMENT

Certain general principles apply to all wildlife management, regardless of the area in which it is practiced. These fundamentals are of two common types, biological or natural, and man-made. Some of the natural laws have already been referred to in the foregoing chapter. They have always been and always are operating, while the man-made laws were put into effect only as they were conceived of as being necessary. They are not unchangeable and should be altered if conditions require it. It is a regrettable fact that the responsibility of the public in wildlife management has only recently been considered important.

A knowledge of the interrelationships of the animals in a wildlife community is essential for all successful management. Any program must recognize the reality and operation of the ecological communities and the effect of man's activities on them. It must then be realized that communities are not static, but may change with the seasons or even within a season.

The foremost problem in wildlife management in a given locality is to determine what is wrong with the environment and what is needed if the desired conditions are to be gained. No species can increase and survive beyond the carrying capacity of the range. If the carrying capacity of the range (whether land or water) remains unchanged a number of individuals equal to the yearly surplus must die during each twelve months. This is an inexorable law of nature which was in operation long before man appeared on the scene. Therefore, the only way to increase the number of survivors in an area is to increase the carrying capacity of their range. Stocking is necessary only if the desired species is absent or very scarce; it is useless waste unless there is a simultaneous and proportionate increase of food and cover. If the carrying capacity is increased, more individuals live through the year, and also more die because there is a larger surplus. With a game species this available surplus is what allows for the kill made by man; otherwise there is no biological justification for man's hunting or fishing.³⁰

In other words, this biological argument says the killing of game, fish and fur bearers by man is as legitimate as the killing of the same species by nature, provided always that the combined killing (by man and nature) does not reduce the breeding reserve below what is necessary to keep the range filled to its carrying capacity.

NATURAL FACTORS AFFECTING WILDLIFE POPULATIONS

The factors limiting the carrying capacity of the range may be classified into four general categories: (1) available food and water supply, (2) suitable cover and protection, (3) abundance and effectiveness of the predatory species, and (4) competition with other species, domestic stock, or disease.³¹

30. Rudolph Bennett, "Wildlife Conservation and Geography," *The Journal of Geography*, Vol. XXXIV, No. 6, Chicago, Illinois: A. J. Nystrom and Company, September, 1940, p. 221.

31. Ira N. Gabrielson, *Wildlife Conservation*, New York: The Macmillan Company, 1941, p. 112.

Although all of these factors are very much related from the standpoint of their effects upon wildlife, adequate food and cover are probably the most far reaching. An understanding of food control must begin with an appreciation of the diets of wildlife. Animals eat much greater variety of foods than humans do. For example, Stoddard found nearly a thousand kinds of food in the stomachs of 1659 Georgia bobwhite. Several hundred of these kinds occurred often enough to suggest that they were important.³² Control of food implies control of the kind, quantity, and quality of food needed by any given species at various ages and seasons in a given environment. To determine the amount of food available for a certain species in an area many things must be considered: (1) the number of animals living in the area, (2) the extent of their range, (3) the types of food eaten, (4) approximate quantity of the food that is present within their range, (5) other animals in the range that feed upon the same food, (6) nearness of the food supply to adequate cover and protection.

Population and range of most animals can be determined approximately by fairly easy means. Some of the ways are as follows: (1) observation of tracks in fresh snow, (2) observations of signs like droppings, dens, and nests, (3) observation of numbers feeding at established feeding stations over the area, (4) trapping of animals by noninjurious methods and then banding or tagging them so they may be identified when recaptured. Various types of traps have been described in government bulletins.³³

The types of food eaten by an animal should be determined through definite research concerning its feeding habits and not through just a casual observation now and then. Careful continuous observation will help, but the only sure way to tell what an animal eats is examination of stomach contents. In the case of certain birds such as owls this may be done by the examination of pellets which are regurgitated.

In determining the approximate amount of food available in the range it is necessary to study the amount and kinds of food available during the different seasons and also what other animals in the range depend on the same food. Seeds buried under snow or sleet are obviously not available except to a limited extent for species which scratch or burrow. An unhusked ear of corn is not available for a quail until he has learned by slow degrees to clip the husk away. The availability of food may depend upon its height above the ground.

Many say that cover is the most important factor in wildlife management, for without it wildlife cannot utilize the food and water supplies that may be present. Protection is necessary for game to have a place to feed, hide, rest, sleep, play, and raise young. It is because of the destruction of much of this cover that the annual crop of wildlife is greatly reduced. Cover may serve both as a source of protection and food, depending upon the type of plant growth and the feeding habits of the animal. A cornshock in the middle of an open field watched by a Cooper's hawk is not available to game in a near-by covert. A grapevine tangle for quail on a sunny bank with a south exposure and protection from wind, and with useful avenues of travel in the form of brushy fencerows leading out into the food types of cover may readily

32. Aldo Leopold, *Game Management*, New York: Charles Scribner's Sons, 1933, p. 254.

33. United States Department of Agriculture, *Propagation of Upland Game Birds*, Farmers' Bulletin—No. 1613, and *Propagation of Aquatic Game Birds*, Farmers' Bulletin—No. 1612, January, 1930.

become the home of a new covey of quail on the farm, when the same tangle situated in the middle of a bare field or on the north side of the same woodlot might have no value at all.³⁴ If they are on ground frequently mowed, burned, or covered with water, these nesting covers are more of a trap than a protection. A favorite nesting place for many upland birds seems to be in the outer four or five swaths of hay near the fence row. The hen uses the fence row as a street and enters the hayfield only far enough to hide the nest. Leaving the outer two or three swaths uncut or unmolested would protect most of the early spring nests. At the second cutting after the eggs have hatched, this marginal strip can be taken as usual and a new strip left for the succeeding year's nests on some other part of the field. A rotation of bait coverts is thus established without undue expense. These are especially valuable in winter when the snow is absent. The principle of rotation of margins can also be used in grainfields.

Another excellent technique of saving the nests of birds that nest in hay meadows is the use of a flushing bar. There are several different types of these bars, but one of the simplest and very effective ones is made of a piece of rolled steel eleven feet and four inches long by three-eighths of an inch wide. It extends from the outer end of the sickle-bar to the harness on the shoulder of the near horse in such a manner as to brush the tops of the hay, and thus flush any birds in time to allow the driver to stop the team and investigate. If there is a nest, an island of uncut hay may be left. This bar may be used on a tractor as well. Other types of bars are described and illustrated in various wildlife management bulletins.³⁵

In close relationship to the need of suitable cover for wildlife is their need for other forms of protection. Nature has equipped many of her creatures quite adequately with these devices. For example, the rabbit is a fast runner, the turtle has a thick shell, the porcupine has spines, the skunk has an odor, and the squirrel is a swift climber. Adults of certain large species have horns, antlers, or long sharp teeth. The newborn of animals have no scent until they are a few days old, and for this reason predators are not nearly as likely to find them when they are hidden away in the thick vegetation or in the earth by the mother. Some species, like the snowshoe rabbit and the weasel, change their color with the seasons so it blends with their surroundings. In general, nature has given her animals colors which tend to protect them during the seasons when they are exposed to the greatest dangers. Nature does not, however, protect her animals very well against modern firearms, traps, dogs, and other devices of man.³⁶

The abundance and effectiveness of predator species is probably the most discussed factor concerning wildlife management, and it is probably the one about which there are the most erroneous ideas. Many people condemn the whole group of animals just because there happens to be an occasional rascal in their ranks. Some sportsmen and farmers, once they see a hawk kill a game bird, a crow steal a quail egg, or a coyote destroy a deer or a turkey,

34. Aldo Leopold, *op. cit.*, p. 308.

35. United States Department of Agriculture, *Game Management on the Farm*, Farmers' Bulletin No. 1759, October, 1936, p. 12, and *Improving the Environment for Wildlife*, Farmers' Bulletin No. 1719, January 1934, p. 43, Washington, D. C.: Government Printing Office.

36. H. R. Kyle, G. H. Hieronymus, and A. G. Hall, *CCC Forestry*, Washington, D. C.: United States Government Office, 1937, p. 204 ff.

are prone to regard these predators as monsters that on every one of the three hundred sixty-five days a year are doing exactly what they have just seen. It may be true that sometimes animals like the mountain lion, wolf, coyote, bobcat, great horned owl, Cooper's hawk, sharp-shinned hawk, and the sparrow hawk may become very destructive and some measures must be taken to control them. It is important to understand that they should be controlled and not exterminated, for all animals of prey have a definite place in the balanced conditions of wildlife.

Many bitter experiences have occurred in areas where too many of the predators were killed. The pattern is about the same in all the cases. The first year after the predators have been killed, the game birds and animals increase as rapidly as the breeding supply permits. The second year the rats, mice, terrapins, snakes, and other vermin, unchecked by their natural enemies, descend in hordes and consume eggs, newly born young, and even older individuals.³⁷

Gabrielson, Chief of the Biological Survey, in his recent book on *Wildlife Conservation* says:

"In almost every case investigations have ranked predations as subordinate among suppressive agencies such as shortage of food, dearth of cover, incorrect relationship of food and cover, and disease. All of these are more potent factors in limiting desirable animals."

He adds that the number of game birds taken by predators seldom is great enough to have any lasting effect; however, man's hunting, combined with predation, may do considerable damage.³⁸

Among some of the worst predatory enemies of the wild birds and mammals are roving dogs and cats. It is hard to make these roving animals fit into the picture of natural balance. Especially is this true of cats that have once been domesticated, but have grown wild by living in the timber most of the time. They kill great numbers of young birds that are unable to fly and they also destroy a large number of eggs. They are probably accountable for more damage to the quail species than all the dogs, foxes, minks, and weasels combined.³⁹ In Missouri, it is estimated that these cats are responsible for the destruction of 12,000,000 birds a year.⁴⁰ In Kansas, good authorities have estimated that there is one wild domestic cat to every square mile of the state. It is hard to imagine the damage done to other wildlife by 80,000 of these carnivorous animals roaming over the state. It is true they eat some gophers, field mice, and other rodents; but their easiest prey and the bulk of their diet is the ground nesting birds.⁴¹

Another member of the wild community whose merit is often questioned is the crow. It is debated whether the small amount of insects and grubs taken in the spring make up for his destructive traits during other seasons of the year. His habits of feeding upon the eggs and young of small insectivorous birds and game birds are surely undesirable and he must be held in check if these are to exist. During the nesting seasons of 1934 and 1935, crows are said

37. Charles N. Elliot, *Conservation of American Resources*, Atlanta, Georgia: Turner E. Smith and Co., 1940, p. 519.

38. Ira N. Gabrielson, *op. cit.*, p. 199 ff.

39. Innes G. Hartley, *op. cit.*, p. 256.

40. Charles N. Elliot, *op. cit.*, p. 525 ff.

41. Kansas Forestry, Fish and Game Commission, *Outdoors with the Forestry, Fish and Game Commission*, Pratt, Kansas: The Commission, March, 1938, p. 2.

to have destroyed thirty-one percent of five hundred twelve waterfowl nests that were studied in the areas about Watertown Lake and Cooking Island in Canada.⁴² However, crows were concentrated here in especially large numbers.

Rodent control may well be discussed in connection with animals of prey, although it is usually made necessary through the combined effects of overgrazing and the destruction of the predators. Rodents such as the ground squirrels, prairie dogs, kangaroo rats, and jack rabbits have long constituted a problem on the grasslands. The chief means of control used to combat these animals have been poisoning and trapping. Some of these campaigns have been exceedingly expensive. Many times the poison has been improperly handled by amateurs and hundreds of song and game birds, fur-bearing animals, and even domestic animals have been the victims. Much research is being carried on to determine the fatal dose for animals and more desirable results are being obtained. Gas cartridges, ignited and thrown in the rodent burrows, have reached a promising state of development. New methods of trapping with detachable springs on regular steel traps are being used so that traps will not be sprung by animals of light weight.⁴³

The competition of one species of wildlife with another or with domestic stock is an important consideration. However, the factors involved here are so related to the problems connected with food, cover, and predation that many of them have already been discussed. Others will be discussed in the sections dealing with management of wildlife on the farm.

Disease as a limiting factor of wildlife populations is sometimes underestimated, for recent evidence shows that disease is an outstanding factor. Density limits of game populations are in many species set by disease. The long-prevailing under-evaluation of the disease factor may be definitely associated with limitations of the observational method in studying natural history. The diseased animals disappear or succumb quickly to natural enemies. It is only when the sick or dead animals become so numerous as to exceed the demands of their predators that they may be observed in the wild. Careful field observations combined with experimental laboratory techniques are essential in the study of the importance of diseases in wildlife populations.

Upland game birds are subject to all diseases common to domestic fowl and several diseases of their own besides. Waterfowl are also subject to many diseases and great losses result from botulism, a food poisoning, caused by certain bacteria. This disease seems to be associated with alkaline lakes and marshes. Losses have been very heavy in the nesting grounds of South Dakota, Oregon, and California. Lead poisoning is responsible for much loss in waterfowl each year. This is caused by the birds picking up shot in the areas where much hunting takes place.⁴⁴ Cripples are among those most easily infected by disease because of their weakened condition and inability to obtain food. It is becoming increasingly evident that the ducks that starve are those badly injured or diseased. "The annual loss of crippled or unretrieved birds is

42. E. R. Kalmbach, United States Department of Agriculture, *Crow-Waterfowl Relationships, Based on Preliminary Studies on Canadian Breeding Grounds*, Washington, D. C.: Government Printing Office, June, 1937, p. 33.

43. Special Committee on the Conservation of Wildlife Resources, *The Status of Wildlife in United States*, Washington, D. C.: Government Printing Office, 1940, p. 112 ff.

44. United States Department of Agriculture, *Diseases of Upland Game Birds*, Farmers' Bulletin No. 1781, Washington, D. C.: Government Printing Office, August, 1937, p. 30 ff.

a very serious drain on our waterfowl."⁴⁵ Although to some extent unavoidable even by experts, a large percentage is the result of attempts to kill from too long a range.

Errington and Bennett (1933) made some studies on these losses in the marshes of northwest Iowa. Two of their cases studied are: Thirty-five average shooters shooting from blinds in marshes lost 41.5 percent of 212 ducks hit; twenty-six veteran shooters at vantage points lost 25.8 percent of 194 ducks that they hit.⁴⁶

Sometimes in wildlife management areas it may be considered desirable to introduce a new species. The United States has several of these, some of which, like the Hungarian partridge and ring-necked pheasant, have proved to be a real asset. Others like the English sparrow, the starling, the German carp, two species of rats, several of mice, and many insects, are great liabilities. Certainly no monument has been erected to the person who brought the German carp to our waters.

Many factors should be considered before a species is ever introduced or transplanted. Its entire life history should be well known, including its feeding habits, its rate of reproduction, the type of cover it demands, its enemies, and its ability to make adaptations.

THE FARMERS' PART IN MANAGEMENT

As progress is made in research concerning the needs of wildlife, conserving natural environment becomes more and more important. Indeed, a few states have even discontinued artificial propagation and are concentrating all their efforts on field management as the best method of restoring wildlife. Some states raise and release their birds only on state shooting grounds where adequate food and cover will be assured. However, farmers that have suitable conditions for game on their farms can still obtain game through most state departments. In Kansas, the Forestry, Fish and Game Commission coöperates in furnishing a farmer game stock if he can demonstrate suitable conditions on his farm.

Since all wildlife, whether propagated artificially or raised in the wild, is indirectly a product and part of the land, the production of wildlife is directly related to various agricultural practices. It is affected by the type of crops raised, the care of the wood lot or timber, the time and methods of cultivation and harvesting, the practices for control of soil erosion, and the like. As the care of the land is largely up to the farmer or landowner, he has an exceedingly important part to play in the restoration and management program. The government alone cannot manage wildlife; the farmer must carry out the fundamentals.

Some farmers have failed to see much, if any, cash value in many forms of wildlife; in fact, some species—including some game birds—have been looked upon as a liability rather than an asset. They have been the factor which served to attract hunters, some of whom have left gates open, destroyed fences, killed livestock, and even in some cases stolen produce from the farms. Some sportsmen have failed to realize the privilege they are being allowed when hunting on a farm. They do not realize that most farmers must devote

45. United States Department of Interior, Biological Survey, *The Status of Migratory Game Birds—1939-'40*, Washington, D. C.: Government Printing Office, June, 1940, p. 15.

46. Logan J. Bennett, *The Blue-Winged Teal*, Ames, Iowa: Collegiate Press, 1938, p. 117 ff.

their time and energy to making a living and that if the farmer cannot be shown some real benefit from the wildlife on his farm there is little incentive for him to exert much effort in protection of it.

Game birds are a reasonable asset on most farms if they are managed correctly, for with a reasonable amount of care and protection, they will usually multiply to the point where they will provide good shooting year after year. Most game birds are very prolific and their requirements for existence are not hard to provide.

The game crop, like any other crop, is subject to factors which will govern how much profit can be obtained from it. The following are some of the factors upon which a profitable game bird crop will depend:⁴⁷

1. Size of the farm: To yield a profit from shooting, the size of the farm or the group of farms should be at least one thousand acres.
2. Coöperation: Natural enemies must be controlled on adjoining farms. Neighbors can get together and prevent trespass, theft of farm products, injury of stock, and the like.
3. Organization: Organizations are in existence through which plans might be worked out for community control of game propagation.
4. Use now being made of land: A dairy farm or large area devoted to cotton, potatoes, or even wheat, where modern "clean farming" methods are employed, is unsuited to production of game farm crops.
5. Character of land: Good land for game should afford a natural home for the species to be propagated. The ideal farm is devoted to various small grains, vegetables, and other farm crops. The fields are small and separated by hedges or overgrown rail fences. A brook or running stream is of great value. Strips of briars, weeds, or grasses should be left uncut along fence rows and in the corners of fields.
6. Accessibility: Shooting areas located within easy traveling distance of town or city from which most of the customers come have advantage over isolated places.
7. Kinds of game birds: The best game bird depends to some extent upon the character of the land, and the species which are native to the section.
8. Boarding facilities for visiting sportsmen: As a general rule sportsmen prefer to board near where they shoot. They are not interested in fancy food or expensive quarters, but prefer a good bed and fresh, well-cooked food, such as any farm affords.
9. Amount of work: As with any farm crop the production of game birds in a wild state necessitates the investment of time and effort.
10. Laws: Both the farmer and the hunter must obey the local, state, and federal game laws.

If the farmer or landowner has a game crop on his farm, there are many ways in which he can derive profit from it. Some suggested ways are as follows.⁴⁸

1. Renting shooting rights on a per day, per season, or per bird basis.
2. Guiding sportsmen over his property.
3. Supplying dogs to sportsmen.

47. Charles N. Elliot, *op. cit.*, p. 106 ff.

48. Charles N. Elliot, *ibid.*, p. 107 ff.

4. Boarding dogs. (Charge is from \$15 to \$20 per month.)
5. Using his land for training bird dogs and running field trials.
6. Selling pelts of fur-bearing animals.
7. Selling farm products such as butter, eggs, etc., direct to sportsmen and arranging to ship them regularly to sportsmen and their friends.
8. Providing meals and lodging for visiting sportsmen.
9. Preventing crop losses. (The main diet of game birds consists of insects and weed seeds.)

Practices such as those mentioned above have been carried out in many places and the landowners now look upon their game crops as an asset. They have changed many of their old attitudes when they have come to an understanding of the economic value of these animals. The revenue from the supply of game, fur animals, or fish may even be relatively high in some cases, for a large proportion of the money the farmer receives from the sale of wheat, corn, pork, and other products must go to pay for the heavy cost of labor, seed, and fertilizer. The amount received from shooting privileges or fishing rights, or from the sale of furs, etc., is usually clear money and the landowner is out little money or labor.

In planning the best arrangement of food and cover for the animals he wishes to propagate, it is necessary for the farmer to understand the animal. The following items should be considered.⁴⁹ (1) What are the enemies that it fears? (2) Under what circumstances can these enemies be eluded? (3) What food is preferred, and how can it be reached in safety? (4) How much does lack of cover prevent game from moving about the farm? (5) Where can it nest so that eggs or young will be reasonably safe from enemies, from high water, and from trampling by stock or destruction by farm machinery?

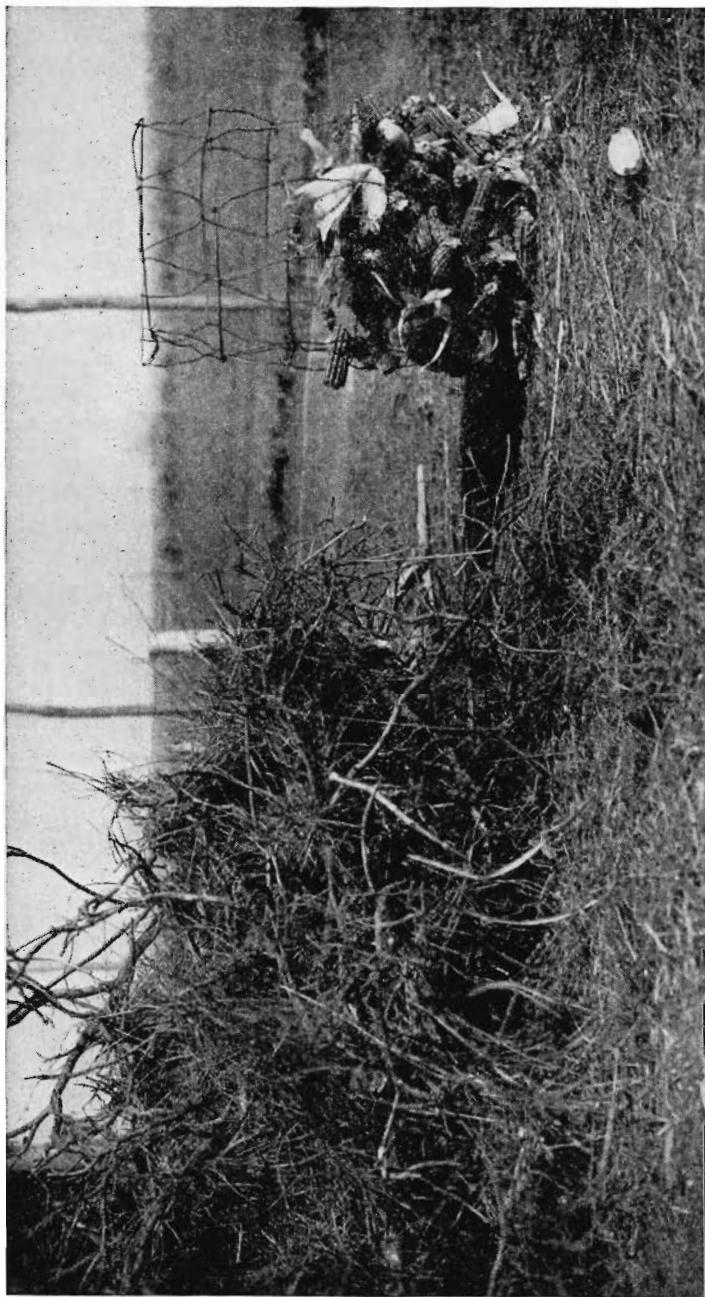
Cover may be of most any type so long as it affords protection from predatory enemies, climatic extremes, floods, droughts, snows, and severe storms. Low thick bushes, vines, or rapid growing perennial plants are the kinds most commonly available. Artificial shelters may also be provided if the natural shelters are not present. A sample type of an artificial shelter and a feeding station for upland game birds is shown in the picture which follows. In the planting or placing of these covers, careful attention should be given to the accessibility to water and to food if the cover does not serve as both.

Some shrubs which serve for food as well as shelter are the junipers, bayberries, spicebrush, sassafras, blackberries, dewberries, raspberries, roses, chokeberries, elderberries, hawthorns, sumac, dogwoods, huckleberries, blueberries, snowberries, wild grapes, blackhaws, and honeysuckles. These produce food for many forms of wildlife.

Trees like the hickories, walnut, butternut, birches, and oaks provide much food for squirrels. Maples, boxelders, tulip trees, and ashes have winged seeds that the birds, squirrels, and mice are fond of. Fruit-bearing trees such as the red cedar, hackberry, mulberry, hawthorns, flowering crab, wild cherry, wild plum, holly, and gum trees cater to a variety of wildlife.⁵⁰

49. United States Department of Agriculture, *Game Management on the Farm*, *op. cit.*, p. 9.

50. United States Department of Agriculture, *Improving the Farm Environment for Wildlife*, *op. cit.*, p. 38 ff.



A FEEDING STATION FOR UPLAND GAME BIRDS

THE SPORTSMEN'S CONTRIBUTION

The sportsmen have had a definite part in the restoration of wildlife. Usually they have a keen interest in the program once they realize that the destruction of wildlife will mean an end to their sport. Few of them know that the productive capacity of the range must be kept up and certain protection must be given the species or there will be none to pursue in the following season. It is essential that hunter and fisher have a true sportsmen's attitude, for without this all the work of the state game and conservation departments and other agencies as well as the work of the farmers will be of little avail. The day has gone when the man returning with the biggest bag of game or creel of fish is the best hunter or fisherman. This was true only when the hunters were few and the game was abundant. Today, with the great increase in the number of hunters, it is only through the sharing of the available stock that the sport can be continued. He who takes his bag limit today is but one step from being a violator. Pictures showing excessive numbers of game taken should not be advertised.

As many species of wildlife are indigenous to the farm, the farmer becomes its custodian and protector. During the recent years there has generally developed a friendly relationship between the farmer on whose land the game lives and breeds and the sportsmen who seek it there. Of late years, thousands of rod and gun clubs and other groups have coöperated in bringing about this better relationship. Many times this is done through the sportsmen's organizations or individual sportsmen aiding the farmer in his game management program by supplying cover plants or planting them themselves, or by winter feeding of bobwhite or other birds.

MAN-MADE LAWS AFFECTING WILDLIFE POPULATION

Man-made laws concerning the management of wildlife were on the statute books early in the history of the nation; but in the days of poor communication and transportation, it was especially hard to enforce them on the frontier. Also the need was not nearly so evident at that time with the abundance of wildlife.

The earliest game laws recorded like most of those today seemed to deal primarily with the killing of animals. The first of these was a law calling for a closed season on deer in Massachusetts in 1694. Following this in 1739, the first game wardens in America were appointed in that same state. Delaware began prohibiting Sunday shooting in 1750. By 1776 most of the colonies had a few game laws, and the same year the federal government passed a law calling for a closed season on deer in all colonies except Georgia. The first appearance of hunting licenses came when New York adopted them in 1864, and the first fixing of bag limits on any species of game was done in Iowa in 1878.

The famous White House Conference of the governors of the United States held in Washington in 1908 was probably one of the most important meetings ever held from the standpoint of conservation. This meeting undoubtedly did more to encourage the conservation movement in general than any previous event. All phases of the program were considered and soon new federal legislation resulted in most of the fields.

A far-reaching piece of legislation in the field of wildlife conservation was the Migratory Bird Law of 1913. This gave the federal government custody over the migratory birds and game which does not remain permanently within the boundaries of one state. The Department of Agriculture was empowered to prescribe regulations in regard to closed seasons in all of the different zones over which the birds travel. Boundaries of the zones were designated and Kansas lies in the intermediate zone. Following this law, in 1916, the United States and Canada ratified a treaty providing for the protection of all beneficial insect eating birds and agreed as to the restrictions on the hunting of all migratory birds. The law was put into effect in 1918. In 1936, the provisions were extended and a similar agreement was made between the United States and Mexico.⁵¹

Long periods of swamp drainage, severe droughts in the decade just preceding, and the heavy toll by hunters each year reduced the waterfowl population to such a low figure in 1934 that it was feared several species might soon become extinct. This led to the passage of the Migratory Bird Hunting Stamp Act in March, 1934. This act requires all hunters over sixteen years of age to buy a duck stamp costing one dollar before hunting waterfowl. The money is used by the Biological Survey to supplement other funds for the purchase and maintenance of waterfowl refuges throughout the country. These stamps now produce around a million dollars a year. The refuges purchased with the money raised from the sale of these stamps combined with the regularly appropriated funds now number fifty-nine. They are scattered throughout the whole United States, generally near the flyways. Almost two million acres have been set aside as resting places and havens of refuge for ducks, geese, and other migratory waterfowl while they are on their journeys from north to the south and back again.⁵² The completed program of refuge establishment calls for the restoration of 7,500,000 acres of marshland.⁵³

Probably the most beneficial measure since the passing of the Migratory Bird Law was the Pittman-Robertson Act of 1937, also known as the Federal Aid to Wildlife Restoration Act. Under this law from three to four million dollars is indirectly collected from the sportsmen through an excise tax on firearms and ammunitions every year. This money is apportioned to the states for selection, restoration, rehabilitation, and improvement of areas of land and water suitable for feeding, resting, and breeding places for wildlife. Some of the money also goes for research. The administration of the fund is under the direction of the Secretary of Agriculture, who may deduct eight percent of it for administration. The fund is apportioned one-half in the ratio that area of the state bears to the total area of all the states, and one-half in the ratio the number of hunting licenses in the state bear to the total number of licenses sold in the country. No state is to get less than \$15,000 annually, provided it contributes \$5,000 and further provided that no money collected in the state from hunting license fees shall be used for any purpose other than the administration of its fish and game department. The secretary of the United States Department of Agriculture must approve all projects before the money is allocated and the state must contribute at least twenty-

51. World Book Company, *The World Book Encyclopedia*, Vol. 2, Chicago, Illinois: W. F. Quarrie and Company, 1937, p. 766.

52. Charles N. Elliot, *op. cit.*, p. 90 ff.

53. Ira N. Gabrielson, *op. cit.*, p. 148.

five percent of the total cost. After the project is completed, it is the property of the state and is to be maintained at state expense and under its law, with the general federal supervision.⁵⁴

Each of the forty-eight states has a conservation agency which is charged with the protection and restoration of wildlife. All game that is relatively nonmigratory is considered property of the state and the state makes all laws concerning its management. Most of the states have administrators who are alive to their opportunities, and more and more technically trained men are being employed by these agencies. Much has been done of recent years to stabilize administration and policies and to remove them from the hazards of frequent political turnover. "This is a happy contrast with the days when wildlife administration was made the political football of the state executives."⁵⁵

A great number of federal and state game protectors are at work throughout the nation. These men were formerly, and in some places yet today, looked upon as agents who interfere with sport. Many times, especially during the early history of the protective service, they were in danger of their lives as they went about their duties. Their task seemed to receive little sympathy, but in those first few years they accomplished remarkable results in bringing the nation's hunters to their senses before it was too late. The market hunters were their worst enemies, and they are still present to some extent, trapping and shooting waterfowl over baited areas along the flyways. This commercial racket, still in existence, wipes out a million birds a year, many of which are trapped and served to elite society.⁵⁶

All game laws should be based upon scientific investigation. With anything as fluctuating as animal population, there is a great need for laws with much flexibility. The responsibility should rest with state conservation departments instead of with legislatures. Before seasons are ever opened or changed there should be a thorough investigation of the surplus animals in the locality and of the natural conditions affecting the animals at the time or likely to affect them in the future. To do this, it is necessary to have the best available knowledge of life histories, food habits, etc. After these are known, field investigations made by experts, combined with observations and reports made by reliable persons living in the range of the animals, should determine the most desirable management methods. Techniques such as staggered seasons, cutting daily bag limits, checking total number of animals in possession, limiting shooting hours, or restricting the kill to males only, are some of the ways of dealing with toll taken by the hunters.

54. Special Committee on the Conservation of Wildlife Resources, *op. cit.*, p. 39.

55. *Ibid.*, p. 22.

56. Robert McCormick, "Foul Play, Bootlegging Birds, A Million-Dollar Racket," *Colliers*, Springfield, Ohio: Crowell-Collier Publishing Company, November 4, 1939, p. 28 ff.

CHAPTER IV

PRODUCTION AND MANAGEMENT IN KANSAS

Some phases of management of wildlife appeared comparatively early in the history of Kansas, but due to the few enforcing officers, sparse population, and poor methods of transportation it was hard to enforce even the regulations that did exist. In the session laws of 1868, there appeared provisions forbidding the taking of wild buck, doe or fawn, elk, woodchuck, wild turkey, prairie chicken, ruffed grouse, or snipe between March 1 and August 1. Quail or pheasant were not to be taken between March 1 and October 1.⁵⁷

FORESTRY, FISH AND GAME COMMISSION

The Forestry, Fish and Game Commission started in 1877 with the appointment of Hon. D. B. Long as Kansas Commissioner of Fish. He was appointed by Governor George T. Anthony. Long's idea about animal culture in streams was expressed very well when he wrote the following to the Governor: "There is no just reason why our numerous streams may not be as productive of wealth to our state, as the fertile valleys through which they flow." Long argued that streams must be kept free from impassable obstructions so the fish might obey nature's laws in their increase and multiplication.

Similarities existed in laws concerning the paying of the commissioner then and of the commissioners now. In 1877 the commissioner was paid a per day compensation for fifty days a year and ten cents a mile for each mile traveled. Now the commissioners are paid a per day wage for forty days each year.

Occurring about 1877 or a little later, the game wardens of the counties were appointed in each county on the petition of twenty-five taxpayers. Now these positions are filled by men whose appointments have been petitioned by the license holders of the counties.

Though some similarity exists between the laws of then and now, there seems to be little likeness in the size of the fish taken from our waters. Long reported to Governor Anthony that it was not unusual for catfish weighing from one hundred seventy to one hundred seventy-five pounds to be captured in the river near Lawrence, Kan. The commissioner also stated:

"Tradition is positive that fish weighing as much as two hundred fifty pounds were taken and finally safely deposited on the river bank, only after resorting to the use of steamboat tow lines and oxen."

He went on to say that channel cats weighing from one and one-half to fifteen pounds were used by the anglers of the day as bait for the larger fish.⁵⁸

Even though most of the fish caught in Kansas today are considerably smaller than those taken in Commissioner Long's day, there seem to be much more efficiency displayed in the use of tackle. This was well demonstrated

57. Forestry, Fish and Game Commission, *7th Biennial Report*, 1937-'38, *op. cit.*, p. 37.

58. Forestry, Fish and Game Commission, *Kansas Fish and Game*, Topeka, Kansas: State Printing Plant, October, 1939, p. 7 ff.

during the summer of 1940 when an angler using a six and one-half-ounce fly-rod successfully landed a forty-three-pound catfish from the Meade County Lake.

In 1939, the legislature made a number of revisions which affect the Forestry, Fish and Game Commission. This body now consists of six members, three from each major political party and selected from each of six districts of the state. These men are appointed by the governor according to their personal merit and efficiency. Before 1939, the governor had acted as chairman but now the Commission appoints one of its members as chairman. The terms are staggered so that experienced men are always on the board. The chief executive of the department is the director, appointed by the Commission. He is selected according to merit, and he serves according to the will of the commissioners. He has an indefinite term fixed by them. The other employees of the department are appointed by the director with the approval of the Commission according to their scores made on competitive examinations.⁵⁹

The goal of the Forestry, Fish and Game Commission is to improve conditions of wholesome out-door recreation in the state. This calls for close co-operation between the farmer and the sportsman. It was also the intent of the 1939 law that the department should be operated with the advice of these interested groups who have shown a special interest by buying licenses to hunt and fish, because the Kansas department is supported by the sale of licenses and quail stamps.

The development of a program with so broad a scope calls for much administration and supervision. For this purpose the 1939 law provided that the director of the department call county meetings of license holders and others interested in the work. These groups recommend persons for appointment as game protectors in their counties. They submit twice as many names as the number of game protectors to be appointed. Selections are made by the director of the department and local sportsmen are responsible to a certain extent for their actions. Approximately two thousand five hundred county game protectors have been appointed.⁶⁰ These men serve without pay. It has been desirable to make the county organizations permanent, and as a result there are one hundred five of these organizations or one in every county of the state. They meet from time to time to study and discuss restoration, protection, and development of fish and game within their county.

A force of twenty state game protectors is also working in the state. These men have many duties. They are charged not only with the responsibility of law enforcement, but also with the additional duties of fish planting, selection of areas where game birds may be released, patrolling of streams in search of illegal fishing devices, and keeping watch on industrial plants to see that they do not cause or permit pollution of streams.⁶¹ They also assist the county game protectors in their work.

The Commission has recently organized a Department of Public Information in order to inform sportsmen and citizens in general of their work. This department aids in publishing the monthly *Kansas Fish and Game*, in interpre-

59. Forestry, Fish and Game Commission, *Eighth Biennial Report*, June 30, 1940, *op. cit.*, p. 3 ff.

60. *Ibid.*, p. 10.

61. *Ibid.*, p. 9.

tation of game laws, in making public declarations of seasons and other matters of common interest. The publication now has a circulation of approximately three thousand copies a month; the number of requests for information each year runs well into the thousands. Technical bulletins or pamphlets are occasionally issued by the department. Every other year a biennial report summarizes the activities for the previous two years. Practically all of these publications are free for the asking and much valuable information may be obtained from them. The Department of Information also has a traveling representative who goes over the state showing motion pictures and giving talks on various phases of wildlife conservation. The pictures, in both sound and color, show many beautiful spots in Kansas as well as interesting features of the work of the Forestry, Fish and Game Commission. This service, being available without cost to various interested agencies such as schools, sportsmen's groups, civic organizations, and religious organizations, is much in demand.⁶²

The Forestry, Fish and Game Commission has carried on the production of game birds and animals for many years. This commendable work includes the maintenance of the State Fish Hatchery at Pratt, the location of department headquarters; an accessory fish hatchery at Meade County State Park; two modern quail farms, one at Calista and the other at Pittsburg; and the phasasant-chuker farm at Meade County Park. The Commission also has twenty-four state parks and game preserves to administer and supervise. The applications for fish for the numerous streams, lakes, and ponds, and the calls for game birds far exceeds the production at the farms and hatcheries.

PROPAGATION OF FISHES

The fish propagated at these hatcheries are mainly of the types which are native to Kansas waters. Principal among the species produced are channel cat, bass, blue gill, and crappie. Although experiments with other kinds are constantly in progress, these fish have been propagated most successfully. The hatchery at Pratt, with its one hundred four brood ponds, is one of the finest in the nation for its purpose, the propagation of channel cat. About a million fish are distributed annually from the Pratt hatchery.

PROPAGATION OF CHANNEL CATFISH

The culturing of the channel cat is an interesting story. For a long time it was thought these fish would not spawn in ponds. It is said that the owner of a private pond in Barber county first conceived the idea of getting them to spawn in dens, having found the eggs under a seat of a sunken boat in an artificial pond.

In the brood ponds at the Pratt hatchery, nail kegs or similar dens such as hollow tiles are placed in eighteen inches to two feet of water out ten to twenty feet from the edges of the ponds. In the Kansas latitude, spawning begins in June and sometimes continues until the first or second week in July, this depending largely upon the weather. During the spawning season, the kegs are visited several times a week or even every day. If eggs are found they are placed in an incubator where, if conditions are suitable, they hatch in about five or six days. The incubator consists of a trough equipped with

62. *Ibid.*, p. 6 ff.

swinging blades which agitate the water back and forth lengthwise of the trough. This takes the place of the motion caused by the tail of the male catfish in the natural habitat. Spawns about eight inches in diameter and including as many as twenty-five thousand eggs have been taken from ponds where the adults have not weighed over eight or nine pounds each. The eggs are held together by a substance resembling transparent jelly and the mass has a spongy appearance. Records of as high as ninety-nine percent hatch are not unusual at the Pratt hatchery.

Since the young fish are equipped with a small supply of yolk when hatched, they refuse food for about a week. The habit of gathering in schools shows up just as soon as the young fish emerge from the eggs. At this stage, they resemble grains of wheat with sprouts. They are kept in water between the temperatures of seventy and ninety degrees. Well water is not suitable, since it does not contain plankton, the floating masses of microscopic plant and animal life. Among the favorite foods of the young fish are daphni and butterfly larvae. One of the greatest difficulties is to maintain the organisms in sufficient numbers for the quarter of a million fish which are sometimes produced at a time. It is very dangerous to have the young fish suffering from an unbalanced diet, as it seems to result in nervous defects. The diseased individuals may be noted rushing about in circles and finally turning on their sides and dying in a few minutes. Sometimes these "crazy fish" may be restored to normal by placing them in still water. When those that die from these attacks are examined they show a blood clot between the gills and the heart. This would indicate that they suffer from congestion.

The channel cat at the Pratt hatchery are comparatively free from disease. One of the most dreaded parasites that fish culturists have to deal with is the protozoan, *Ichthyophthirius*, but because of the three stages in its life cycle—the free form, a cyst, and a helpless embryo which does not survive well in running water—it does not give much trouble in the agitated water where the young fish are kept. The current carries the embryo off as it settles to the bottom.

Most of the young channel cats are kept in ponds at the hatchery until they are about two years old. During this time they feed upon ground carp and buttermilk, and at the end of this time are from eight to twelve inches long.⁶³ Then they are placed in fish transport trucks and hauled to various parts of the state where suitable conditions prevail for stocking. The trucks hold up to fifty thousand fish and can carry them safely to all parts of the state in all kinds of climatic conditions. This is made possible by pumps which circulate the water through the tanks and keep it properly aerated. This is a great improvement over the old methods of transporting fish. Formerly, many of the fish died before they ever reached the spot where they were to be placed, or they had to be placed in the first stream the driver reached regardless of the conditions prevailing in the stream.

Now careful investigations are made of the stream or the lakes in which the fish are to be deposited. A survey is made to determine the probable success of the fish in adapting themselves biologically to the native species, the probable food supply, the age of the stream, and its water supply.

63. Forestry, Fish and Game Commission, "Channel Catfish Culture," *Kansas Fish and Game*, Pratt, Kansas: The Commission, July, 1940, p. 3 ff.

Fish production at the Pratt hatchery has been increased considerably during the last few years, partly by expansion and partly by some changes made in practices. For example, grass is left unmolested around the ponds the entire year. This allows more insect life to multiply in it and makes the conditions better for the fish life. Also, a plan of alternation is carried on by which part of the ponds are left dry during the winter months. This greatly reduces the number of lily bulbs which have been becoming too numerous and have a tendency to reduce soil acidity; this increases other desirable water plants.

Fish production at the Meade County State Park is very similar to that at the Pratt hatchery except that more emphasis is placed on production in the brood ponds and the work is on a much smaller scale than at Pratt. Fishes from the ponds are distributed largely to the state lakes and streams of southwestern Kansas. In general the same species are raised as are produced at Pratt.

PROPAGATION OF GAME BIRDS

Because of the great demand for quail, the Forestry, Fish and Game Commission has seen fit to expand their production in recent years. Revenue for this expansion was obtained from the quail stamp and the sale of more hunting licenses. The entire efforts of the farms at Calista and Pittsburg have now been turned to quail, leaving the production of pheasants and chukars to the newly established game farm at Meade County State Park. The output of the two quail farms for 1940 was approximately 20,000 bobwhite quail.⁶⁴

For the reason that artificial production of the bobwhite is probably the best understood of all artificial methods of producing game birds and because many of the techniques involved are the same or similar to those used in producing other upland game birds, the process will be described here in some detail. The production of game birds on the farms is not an easy matter, for each species requires some special kind of care and each must have a balanced ration which will insure egg production and fertility.

Quail are monogamous, that is one male mates with only one female; therefore, a single pair of birds is placed in each laying pen. The feeding of these birds during the laying season is carefully regulated. The first meal of the day, not later than six o'clock in the morning, consists of a mixture of egg-flake meal, meat scraps, alfalfa-leaf meal, oatmeal, soybean meal and adult mash which is in part subjected to a steaming process. Later in the day a ration of lettuce is given. A hopper of prepared scratch mash is kept in each pen at all times, and fresh clean water always is available. On a diet of this type, the birds produce large numbers of eggs. The record for one pair of birds during the 1939 season was 158 eggs. The laying season begins during the early part of April and continues until September.

During the laying season the eggs are gathered daily and placed in thermostatically controlled electric incubators. The incubators have a capacity of approximately 12,400 eggs. Twenty-three days are required for hatching.

As soon as the young birds are hatched, they are taken to the brooder houses which have a capacity of several hundred each. These houses are

64. Forestry, Fish and Game Commission, *Kansas Fish and Game*, Topeka, Kansas: State Printing Plant, August, 1940, p. 6.

equipped with thermostatically controlled hovers to provide artificial heat for the young birds during the first four weeks. During the first week, the temperature is maintained at ninety-five degrees, from which it is reduced at the rate of five degrees each week until the fifth week when artificial heat is no longer necessary. Sometimes it is necessary to clip the beaks of the young birds in the brooder houses to curb toe pecking and feather plucking habits which may develop. The birds are retained in the brooders for ten weeks, after which they are taken to the rearing house for a five-week period in the pens or until they are released in carefully selected areas.

After the birds come from the incubator and desire food, they are placed on a diet of grilled egg yolk, mixed with mash. A little later, they are fed chopped lettuce and mash mixed moist. Meals are given four times a day placed on paper napkins and paper plates. These sanitary methods are necessary in order to insure the maximum production both from the laying birds and from the standpoint of the number of young birds raised to maturity.

Quail are susceptible to almost every disease of poultry and a few diseases of their own. For this reason the brooder houses, laying pens, and rearing pens are thoroughly cleansed once each week or as often as the weather conditions make it necessary. The buildings and structures are thoroughly scrubbed and disinfected. All equipment and utensils used in handling the birds is burned out and sterilized by the use of a fire gun which burns kerosene.

At the close of the laying season, the birds are separated according to sex and twelve birds placed in a winter pen. Here they are protected from disagreeable weather conditions and from predators. They are kept in these pens until spring, when they begin to show signs of restlessness and fighting moods. This being a sign of the laying season approaching, they are again paired and placed in the laying pens for another season.⁶⁵

Experimental work with various other game birds such as the wild turkey, prairie chickens and several species of quail besides the bobwhite is carried on at the quail farms, but as yet no effort has been made to propagate them in large numbers. Efforts to propagate the greater prairie chicken artificially have not resulted in enough success to merit large scale expenditures for this work. Concentration on field management seems at present to be the most satisfactory method of increasing their number.

Production at the state game farm at Meade County State Park is concentrated on the raising of the ring-necked pheasant and chukar partridge. Since these species seem to be best adapted to the conditions in the western part of the state, the location of the farm here makes a convenient point from which the birds may be distributed. This new farm has a potential output of 20,000 pheasants and 4,000 chukars per year.

The production of pheasants and chukars differs in some respects from the production of quails. The pheasants are polygamous in their mating habits. In the natural state the chukar is usually monogamous, but he may be polygamous under artificial propagation. The pheasants are placed four hens and one cock to each laying pen directly on the ground. The pens (12' × 12' × 6') are moved at varying intervals determined by vegetation and weather conditions. The chukar may lay up to 125 eggs a season.

65. *Ibid.*, p. 6 ff.

The incubators are basically the same as those used at the quail hatcheries. About twenty-four days are required for the pheasant eggs to hatch. The newly hatched chicks are placed in battery brooders for the first week, then moved to the brooding houses for the remainder of the five-week period. These brooders differ from the colony type used for quail in that they have no sun porches, and each house contains twenty ($10' \times 10'$) compartments with an electric hover in each. After the brooding period, the pheasants are placed in a two-acre hardening pen where they are kept until liberated at approximately nine weeks of age. This pen is enclosed with a nine-foot vermin-proof fence, but is not covered. Here the birds find life in general similar to that in the wild. Birds raised thus are far superior to those reared in small pens.⁶⁶

STATE PARKS AND REFUGES

Under a system started in 1926, the Forestry, Fish and Game Commission supervises the twenty-four state parks and game refuges. The twenty state parks have a total area of around 15,000 acres, including 4,000 acres of water. They offer facilities for fishing, picnicking, boating, swimming, and camping. Records showed that 402,116 persons entered ten of these parks in 1940.⁶⁷

During the last two years, the Commission has obtained federal aid for several projects submitted in accordance with the Pittman-Robertson Act. These include the acquisition of five hundred acres of additional land for the Finney County Game Preserve, fencing the Lyon County State Park, and the distribution of pheasants from the Meade County Game Farm. Several new projects have been submitted to the federal government as a part of the Commission's 1941 program.⁶⁸

On the state game farms and in the state parks and game preserves, the Forestry, Fish and Game Commission is continually carrying on experiments to try out different practices in game management. For example, it has been debated whether quail and pheasants will live in harmony in the same area. A great number of both of these species live in the wild together year after year in the Meade County Park; both apparently find food and reproduce successfully.⁶⁹

A pending project of interest is the proposed Cheyenne Bottoms in Barton County. This would be set aside, reflooded and improved for a resting and nesting area for migratory waterfowl. The appropriation of \$250,000 from the federal treasury has not been made, however, so the area has not been restored.⁷⁰ This would probably be a successful refuge, for ducks like to nest in the vicinity. It is estimated that 10,000 waterfowl, including pintails, blue-winged teal, shovelers, gadwalls, and widgeons, were reared in the near-by Stafford county marshes in 1938.⁷¹

66. L. W. Sutherland, Superintendent of State Game Farm, Meade, Kansas: *Personal Letter*, February 24, 1941.

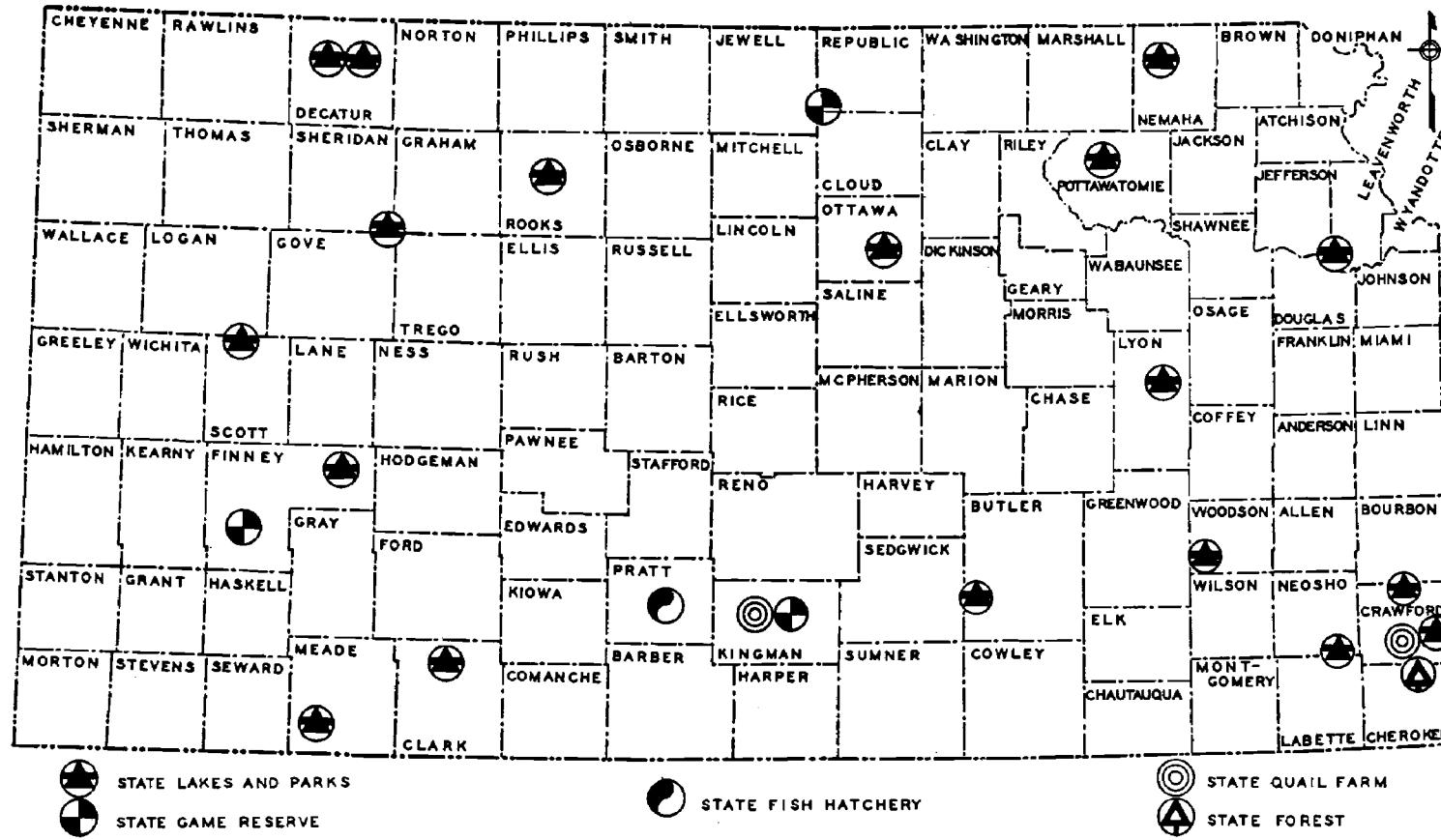
67. Forestry, Fish and Game Commission, *Eighth Biennial Report*, op. cit., p. 19.

69. Forestry, Fish and Game Commission, *Eighth Biennial Report*, op. cit., p. 13.

70. Helen DeVault, Publicity Director for the Forestry, Fish and Game Commission, *Interview*, March, 1941.

71. Special Committee on the Conservation of Wildlife Resources, *The Status of Wildlife in the United States*, op. cit., p. 43.

72. Forestry, Fish and Game Commission, *7th Biennial Report*, op. cit., p. 22.



STATE PARKS AND GAME REFUGES IN KANSAS

TABLE II
STATE PARK DATA⁶⁸

STATE PARK.	Location.	Date established.	Park area.	Lake area.
Butler County.....	Augusta.....	1931	568	232
Clark County.....	Kingsdown.....	1934	1,243	337
Crawford County No. 1.....	Pittsburg.....	1926	418	60
Crawford County No. 2.....	Farlington.....	1935	455	150
Decatur County No. 1.....	Oberlin.....	1932	92	40
Decatur County No. 2.....	Oberlin.....		481	161
Finney County.....	Kalvesta.....	1933	760	325
Kingman County (Annex).....	Kingman.....	1930	1,562	80
Leavenworth County.....	Tonganoxie.....	1928	506	200
Lyon County.....	Reading.....	1930	581	162
Meade County.....	Meade.....	1926	1,240	100
Nemaha County.....	Seneca.....	1934	705	356
Neosho County.....	Parsons.....	1926	216	92
Ottawa County.....	Bennington.....	1926	711	137
Pottawatomie County.....	Westmoreland.....	1932	100	23
Republic County.....	Jamestown.....	1930	1,064	765
Rooks County.....	Stockton.....	1934	333	67
Scott County.....	Scott City.....	1926	1,280	115
Sheridan County.....	Quinter.....	1934	436	123
Woodson County.....	Toronto.....	1933	445	180

68. Forestry, Fish and Game Commission, *Activities of the Kansas Forestry, Fish and Game Commission*, Topeka, Kan.: State Printing Plant, 1940, p. 4 (four-page folder).

OTHER CONSERVATION AGENCIES IN KANSAS

Many other agencies interested in wildlife conservation in the state are doing constructive work. Prominent among these are Soil Conservation Service, Forest Service, CCC Camps, 4-H Clubs, Kansas Academy of Science, Boy and Girl Scouts, nature societies, sportsmen's clubs, and garden clubs.

The Soil Conservation Service has a slogan which says, "Save the wildlife with the soil." The program of soil conservation and wildlife conservation are inseparable, for vegetation that holds soil also may provide cover and food for wildlife. The efforts of the Soil Conservation Service in Kansas the last few years have resulted in the restoration of many acres of land which was once overgrazed and eroded. Much of this land has been restored into fields with luxuriant vegetation which provides much needed homes for many forms of wildlife. This is done by carefully selecting plants that furnish food and cover for wildlife as well as hold the soil in the gullies, on the terraces, washing hillsides, and stream edges.

The Forest Service, in accordance with the Prairie States Forestry Project, is aiding greatly in the program of restoration of food and cover for wildlife through the planting of approximately 2,500 miles of shelterbelts. This is especially true west of the Flint Hills, where trees such as mulberries, hackberries, cedars, pines, elms, and cottonwoods are popular for these plantings. These provide much of the necessary food and cover. The table which follows, based upon 119 replies of farmers to questionnaires sent out by the Forest Service, illustrates some of the influence of the shelter belts on wildlife populations.

Through the CCC camps, available manpower came at a critical time in the development of both state and national wildlife policies. Without this aid, it would have been impossible for Kansas to have developed as fine a system of

state parks—at least, for a good many years. Dams, roads, trails, shelter houses, and numerous other improvements have been constructed. Vegetation which serves both as food and cover has been started in many park and

TABLE III
WILDLIFE IN KANSAS SHELTERBELTS⁷³

Game birds:	
Quail	2,627
Pheasants	681
Prairie chickens	14
Other game birds.....	2,520
Total	5,842
Total game bird nests.....	497
Total insect eating birds.....	40,921
Total insect eating birds' nests.....	3,456
Fur bearing animals:	
Opossums	177
Skunks	695
Badgers	138
Raccoons	2
Weasels (predators)	19
Coyotes	159
Total	1,290
Total number of fur bearers' dens.....	198

refuge areas. Besides the great improvements in physical conditions for wildlife; probably of equal or even greater value is the wider dissemination of practical wildlife knowledge to the numerous young men who are in the camps.⁷⁴

The Kansas Academy of Science is also making worthy contributions to the wildlife restoration program. Since 1931, a special committee on conservation and ecology has been investigating areas in the state which because of scenic beauty, geological interest, and ecological reasons should be preserved for posterity. Principal among the areas surveyed are Rock City in Ottawa county, Monument Rock and Castle Rock in Gove county, and the reclaimed strip pits in the Pittsburg mining area.⁷⁵ Besides the work of this committee, numerous technical phases of wildlife management are investigated each year and reported upon by members of the Academy. These reports are published in the annual publication, *Transactions of the Kansas Academy of Science*.

The 4-H Clubs have interested themselves in wildlife conservation in the state. Their work includes a program of setting aside thousands of acres as game refuges, planting cover, making game surveys, identification of animals, studying feeding habits, leaving patches of feed, and propagation and pro-

73. T. Russell Reitz, Kansas Director of the Prairie States Forestry Project, Manhattan, Kansas, *Personal Letter*, March 10, 1941. (Replies of 119 farmers to questionnaires for the year 1940.)

74. United States Department of Agriculture, Bureau of Biological Survey, *The CCC and Wildlife*, Washington, D. C.: Government Printing Office, 1938, p. 16.

75. Walter H. Shoewe, "Conservation of Our Natural Areas," *Transactions of the Kansas Academy of Science*, Vol. 42, Topeka, Kansas: State Printing Plant, 1939, p. 59 ff.

tention of game.⁷⁶ Each fall a 4-H Club Conservation Encampment is held at Hutchinson. Members who have done outstanding work in their own clubs are brought together for a five-day meeting. Here they discuss various subjects, including wildlife conservation, forestry, soil conservation, entomology, landscaping, rural engineering, nature art craft, photography, outdoor cookery, and many others.⁷⁷

The Boy and Girl Scouts regularly do some notable work in wildlife conservation. Merit badges in conservation may be earned by learning such essentials as the principal natural resources of the locality, principal game animals and the seasons during which they are protected, and the habits of these animals; by taking of at least two photographs of some phase of conservation; and by presenting evidence of having helped directly in some practice such as checking soil erosion, stocking a stream with fish, planting wild rice or other waterfowl food plants, feeding of birds in the winter, or stopping stream pollution.⁷⁸ The Scouts also aid much in the protection of wild flowers and the song and insectivorous birds. Protection of these birds is of tremendous value. The American Wildlife Institute estimated that insect eating birds are worth \$350,000,000 a year to the farmers of America.⁷⁹

Some sportsmen's organizations are doing some fine work in raising and releasing game animals and helping to protect wildlife in general. For example, "coon" hunters' associations have been organized at various places over the state. These have as their purpose the promotion of sound attitudes toward the care and management of the raccoon. This includes the protection of den trees from burning and cutting, increasing the raccoon population through releasing bred females, and the setting aside of refuge areas. Funds for carrying on this work are often raised through the holding of a "coon" dog field trial. Because of limited resources and funds, the Forestry, Fish and Game Commission has not propagated many of these fur bearing animals, but they are willing to do all they can to help restock areas closed for a period of time.⁸⁰

Individuals over the state are carrying out interesting and important work in management and gathering of important information concerning wildlife. A few examples are the work of various game breeders who are propagating quail, pheasants, and fur bearers, and also the work of several individuals in the banding of birds. A federal banding station is operated by Frank Robl, near Ellinwood, Kan.

Some interesting facts regarding the travels of birds have been revealed by these banding operations. One bird, banded and released by Mr. Robl, was captured seventy-two days later by another bird banding station near Nome, Alaska. On another occasion, Mr. Robl recaptured two birds he had banded eleven months earlier. This would indicate these two birds had traveled in a pair past the hunter's fire. Sixteen ducks banded by Mr. Robl on March 4, 1925, reveal interesting information concerning the directions

76. Ruth Lohmann, Bureau of Biological Survey, Miscellaneous Publication No. 291, *Teaching Conservation of Wildlife Through 4-H Clubs*, Washington, D. C.: Government Printing Office, February, 1938, p. 6 ff.

77. Forestry, Fish and Game Commission, *7th Biennial Report*, op. cit., p. 16 ff.

78. Boy Scouts of America, *Conservation*, New York: Boy Scouts of America, 1930, p. 1.

79. Forestry, Fish and Game Commission, *Kansas Fish and Game*, Pratt, Kansas: The Commission, October, 1938, p. 4.

80. Forestry, Fish and Game Commission, *7th Biennial Report*, op. cit., p. 29.

traveled by waterfowl. About half of these birds were taken by hunters. Two were taken by Eskimos in the Northwest Territory; one in Alaska; one at Lamar, Tex.; one on Buck Creek, Calif.; one at Varden, Miss.; one at Willow City, N. D.; and another at North Bottle Creek, Saskatchewan, Canada.⁸¹

MANAGEMENT THAT MIGHT BE EMPHASIZED MORE IN KANSAS

There are many swamp areas in the state that could be made more productive through some planting of suitable vegetation and restocking with muskrats. The requirements for these animals are comparatively simple. Water plants are necessary for their food and housing facilities. These may be almost any kind of marsh vegetation, but the favorite plants are the bullrushes, flags, three-square grass, willow sprouts, cattails, wild lilies, wild rice, and water potatoes. Crayfish and clams are also good to have in the marsh. These plants and animals should be introduced before the muskrats are allowed to feed in the vicinity.⁸² The animals develop quickly; those born in spring and summer are ready for market the next spring. With proper food and favorable conditions, a female will produce from two to three litters in a season, and the young number from two to ten in each litter. One male will suffice for three females. An acre of good improved marsh may provide for from fifty to seventy-five adults and their young each year. Any amount from five acres up will make a good muskrat farm.⁸³ Other animals that may be introduced and raised in connection with muskrats are beaver, goldfish, and a few ducks or geese. If there are trees in the area, a few raccoon may be introduced.⁸⁴

More sportsmen seem to be taking to angling every year in Kansas, as well as in the nation as a whole. Kansas, with her 250,000 acres of water area, or potential water area, has great possibilities of reaping a good harvest from fish from the waters, but they are not producing as they might if conditions for fish were improved. In the more hilly parts of the Flint Hills and Blackjack regions there are many timbered, rock ribbed creeks and rivers that could be greatly improved by a series of low-water dams. The water level in these areas has been so greatly reduced through a long period of plowing, overgrazing, and drainage methods of our highway systems that these streams often cease to flow in late spring. When winter comes many of the low shallow pools—if they are not dry—freeze solid, and fish suffer greatly. A series of dams in these regions would help to store the water which is plentiful during the spring months, recharge the land surrounding the streams, and revive the water supply from springs. This would benefit agriculture and stock raising as well.

Fish shelters for spawning beds and resting places would be beneficial in some of these water areas. These pools of water do not have to be deep. A depth of four to eight feet, with abundant growth of water plants along the shore and algae and moss in the deep water, will result in adequate fish food in most cases.

81. Forestry, Fish and Game Commission, *Kansas Fish and Game*, Topeka, Kansas: State Printing Plant, September, 1940, p. 5.

82. E. J. Dailey, *Practical Muskrat Raising*, Columbus, Ohio: A. R. Harding, 1927, p. 69 ff.

83. *Ibid.*, p. 16.

84. *Ibid.*, p. 88 ff.



A LOW-WATER DAM

Food shortage is probably one of the commonest and most serious of the factors limiting fish production in natural waters. Experiments show that an acre of pond water well stocked with water plants will supply up to thirty-two hundred pounds of fish food annually, while the acre without water growth of any kind would supply only about three hundred pounds. A pair of spawning sized channel catfish placed in an acre pond that has no other fish will produce from ten to fifteen thousand young the first year. These will reproduce the next year.⁸⁵ It can readily be seen how quickly a pond may be overstocked unless an abundant supply of food is available. More ponds and lakes suffer from overstocking than from understocking. The result is that the fish become badly undersized and cannibalistic. Several methods may be used to improve the natural food available. (1) Artificial fertilizers such as phosphorus and nitrogen compounds may need to be added to encourage plant growth. (2) Areas where food is most abundantly produced may be increased by flooding lowlands about the lake. (3) Increasing the production of forage minnows and other food organisms is particularly conducive to rapid growth of the larger fish.⁸⁶

There is a great need for more feed and nesting cover management in the eastern part of Kansas for the upland game birds. This along with woody escape cover is needed in the central part of the state, and all kinds are needed in western Kansas. Small patches of feed left standing on some farms would make them very productive of upland birds such as quail and prairie chicken.⁸⁷ Many of the principles concerning types of cover and location that were given in the preceding chapter will apply to the Kansas cover situation.

85. Forestry, Fish and Game Commission, *7th Biennial Report, op. cit.*, p. 13.

86. Dan J. Ramey, Superintendent of State Quail Farm, Calista, Kansas, *Personal Letter*, February 20, 1941.

87. Carl L. Hubbs and R. W. Eschmeyer, *The Improvement of Lakes for Fishing*, Ann Arbor, Michigan: University of Michigan, 1937, p. 118 ff.

CHAPTER V

SUGGESTIONS FOR TEACHING

WILDLIFE CONSERVATION IN KANSAS SECONDARY SCHOOLS

Conservationists in Kansas as well as in the entire nation see the need of educating the people in the motives and goals of what they are doing, and have published much material in all phases of conservation education. Wildlife conservation, although lagging at first, is gradually beginning to receive a place in the program of education. Much of the available material has been distributed to interested workers, but because the wildlife situation is like a chronic disease and seemingly presents no emergency, the public as a whole has been slow to act. Conservation sharply affects no individual in particular, but rather is the problem of all present and future citizens. This chapter is an effort to present suggestions to aid the coworker of the conservationist—the public school teacher.

The teacher's problem is two-fold. First, he must become familiar with the work of conservation, and second, he must work out a plan of correlating the work with the material taught in the various subjects.

With the abundance of available literature and also the courses in conservation which are being offered in the colleges training teachers, the first problem is relatively simple. Once the teacher has begun reading or studying concerning this program, he will find the material interesting and at times fascinating; for there is no subject more challenging and alive than wildlife conservation. With the aid of a pen and a few post cards, the teacher can soon obtain a valuable library of bulletins and other studies. Most of the bulletins listed in the bibliography are free, and this is only a sample of the available material which may be obtained from various agencies, both state and federal. The Kansas Forestry, Fish and Game Commission will put the name of any interested teacher on their mailing list to receive the monthly publication, *Kansas Fish and Game*, and will also coöperate by sending other current material. The service of their traveling publicity director is also available for the schools of the state. Many of the books named in the bibliography may be secured for a period of time from the extension division of most any large library.

The problem of correlation is by no means as simple as the first, but most teachers with the use of some intelligent planning can find ways to correlate conservation with other subjects taught.

SUGGESTED ACTIVITIES

I. Experiences in general science and conservation of wildlife.

- A. *Survey of a wildlife community.* Study the animal and plant life as seen in a meadow, marsh, stream, or woods. Try to see how dependent they are upon each other. Study carefully the animals' food habits; do the same plants serve both for food and cover? Do droughts, floods, and fires destroy the nests and the adults? Where do the animals hide, rest, feed, and raise their young? How effective

are the predators? Are they feeding upon desirable animals, either young or old? How effective is disease among the animals and are sick animals ever found? Is there enough food and cover for all animals present? Find out from reading or inquiring from old settlers what wild creatures have become extinct or very rare in the locality.

- B. *Field and laboratory methods of study.* Visit the area being studied as frequently as possible. Keep good records, based on careful observation for a long period of time. Erect an observation blind if it is necessary. Take pictures of animals in their natural surroundings in the area. Study various pictures of animals in the laboratory so they may be easily recognized in the field. Study charts showing food habits. If necessary collect a few animals in order to study their stomach contents or parasites and disease affecting them. It may be necessary to send some of these animals to the State Agricultural College or to the Biological Survey for examination. Study the life histories of the animals.
- C. *Restoring wildlife in the area.* Find out what types of animals are the best adapted and most desirable for the area. What types of plants could be planted or what other improvements could be made for game that might be restocked or introduced? Other improvements might include the building of artificial shelters and feeding stations, construction of low water dams, promoting concern for wildlife before crops are harvested or fields plowed or burned, reporting the pollution of a stream and doing what one can to stop it, or reporting game violators and studying why wildlife needs protection.

II. Experiences in social studies and conservation of wildlife.

- A. *Fish and game laws.* Trapping, fishing, and hunting are each activities for both recreation and profit in Kansas. There are many regulatory laws in the state which are broken by people who feel that this is not a serious offense. Have an up-to-date knowledge of the hunting, fishing, and trapping laws of your locality and of the state as a whole. Also become familiar with federal laws affecting the migratory birds. Build up reasons why these laws are necessary for the good of all, and create a conscience about breaking them. Discuss the limited effect of these laws upon the whole problem of wildlife conservation, and the necessity of coupling wise field management with them. Discuss how the observance of laws has resulted in increased wildlife populations in various places.
- B. *Aids for wildlife.* The building of feeding stations, shelters, bird houses, and the like can be made a very valuable conservation project. Knowledge of the most advantageous types of these can grow out of a study of the particular animal's characteristics, and its enemies. The necessity of providing food for the animal the whole year around should be stressed. This may be studied in connection with the study of the need of food, clothing, and shelter of the people all over the world during the entire year. Rural students with the coöperation of their parents may do much toward providing food and cover for wildlife; city students may feed the small animals that live in the near-by parks.
- C. *Benefits other than sport derived from animals.* The discomforts we experience from insects can be made real to all. Investigate the work of the birds in combating these pests. Study what animals mean from the aesthetic standpoint. Compare the difference between an area in the winter when most of the animals are either gone or hibernating with the same area in the summer when there is an abundance of

wildlife. Study the economic value of earthworms as soil builders; the work of beavers in flood control and fish conservation. These are examples of aids that wildlife contributes to man.

- D. *Wildlife refuge.* Visit some wildlife refuge. Observe carefully the different types of animals found in the area. Learn something of how they are managed. Consider how each little project contributed to the larger program.
- E. *Upsetting the natural balance.* Try to grasp the way in which nature's ways have been changed through the draining of swamps, plowing of land, overgrazing, cutting of timber, and excessive hunting and trapping. Try to see that a program of restoration involves the study of what is wrong with the environment and what should be done. Study ways of getting better coöperation between city and rural people in the problem of wildlife management.

III. Experiences in mathematics and conservation of wildlife.

- A. *Economic values of wildlife.* Learn the current processes of distributing fish to the markets. Study the prices of fish and their value for family use in the diet. Investigate the income derived from visiting sportsmen who have come to hunt or fish in the community. Make a collection of fur samples with the pelt prices for each. Compare these pelt prices with the price of a coat made of the same fur. This will induce finding out how many pelts were required to make the coat, the waste in using skins, and the labor required in the process of manufacturing the garment. Learn about trade names in the fur industry.
- B. *Operating a fur farm.* Find out the amount of money invested, the risks taken, and the prices of furs. Study the possibilities of raising wild game as one of the farmers' activities for profit. Which is really worth more—a clean farm or one which is so managed as to provide generously for wildlife? Why? Where can one obtain the right kinds of trees and shrubs to plant to provide for food and shelter for wildlife? How much do these plants cost?

A SAMPLE UNIT

BIOLOGICAL BASES OF WILDLIFE CONSERVATION

- I. General objective:
To show from study of biology that wise conservation is founded upon biological concepts.
- II. Specific aims:
 1. To show the biological reason for wildlife regulations.
 2. To teach methods whereby conservation must be carried on in agreement with the fundamental principle of interdependence of living things.
- III. Approach:
On the basis of subject matter in biology text, ask questions such as these: Why would life on earth probably perish if—
 1. All green plants were destroyed.
 2. All nitrogen-fixing bacteria were destroyed.
 3. All bacteria of decay were destroyed.
 4. All enemies of particular organisms were destroyed.
 5. All animals disappeared.Would life on earth perish if all organisms were to stop dying? Is there a sound biological reason for hunting and fishing?

IV. Outline of study:**A. Wildlife:**

1. Of prairie and woodland:
 - (a) Mammals—fur bearers, game, rodents.
 - (b) Birds—song and insectivorous, game, scavengers, predatory.
 - (c) Reptiles—lizards, turtles, snakes.
 - (d) Other forms—worms, insects.
2. Of stream and water-edge:
 - (a) Fish—predatory, rough, game.
 - (b) Mollusks—snails, mussels.
 - (c) Crustaceans—crayfish and associated forms.
 - (d) Lower forms—invertebrates and microscopic organisms.
3. Of marsh:
 - (a) Amphibians—frogs, salamanders, newts.
 - (b) Reptiles—snakes, turtles.
 - (c) Birds—dabbling, diving, wading.
 - (d) Mammals—mostly fur bearers.

B. Extinct or near extinct species in Kansas. Examples:

Passenger pigeon, bison, deer, elk, antelope, cougar, and bear.

C. Agencies helping to bring about unbalancing of nature:

1. Natural occurrences:
 - (a) Disease. Examples: Rabbit fever in rabbits and lead poisoning and botulism in ducks.
 - (b) Loss of range and lack of food for wildlife.
 - (c) Predatory invasions.
 - (d) Climatic variations. Examples: severe winter or drought.
2. Man influenced factors:
 - (a) Uncontrolled hunting and fishing.
 - (b) Fluctuations of fur markets and prices.
 - (c) Woodland fires and grass fires.
 - (d) Introduction of new species. Examples: English sparrow, starling, and German carp.
 - (e) Extermination of predatory or game species.
 - (f) Stream pollution.
 - (g) Industrial and agricultural encroachments.
 - (h) Concentration of human population.
 - (i) Unsound woodland practices.
 - (j) Soil erosion.
 - (k) Introduction of unnatural predators by man (cat and dog).

D. Factors helping to restore and maintain a balance in nature:

1. Natural:
 - (a) Plant succession. Bare ground, lichens, mosses, shallow weeds, larger weeds, trees using much sunlight, forest trees, underbrush, and shrubs.
 - (b) Resistance of species to harmful influences, such as overcrowding, overshooting, and disease.
 - (c) Wilderness areas, or remoteness of habitat from roads, agriculture, and other encroachments of man.
 - (d) Adaptability of species to environment.
2. Man-influenced factors:
 - (a) Conservation laws.
 - (1) Bag and creel limits.
 - (2) Open and closed seasons.
 - (3) Penalties for violations, i. e., law enforcement.
 - (b) Conservation practices.
 - (1) Game and fish management.
 - (a) Refuges and state parks.
 - (b) Environmental improvement.
 - (c) Spawning grounds and feeder streams.
 - (2) Good sportsmanship.

- (3) Restocking and propagation.
- (4) Recognition of native biotics, or specific environment.
Example: Salt marshes in Stafford county.
- (5) Wise land use:
 - (a) Utilization on basis of suitability as determined by relief, contour, climate, and soil.
 - (b) Scientific cropping.
 - (c) Use of fertilizers.
 - (d) Prevention of erosion.
- (6) Shelter belts.
- (7) Control of predatory species. Examples: cats, crows, and Cooper's hawks.

E. Agencies helping to maintain a balance in nature:

1. Forestry, Fish and Game Commission.
2. U. S. Forest Service, U. S. Department of Interior, Soil Conservation Service.
3. CCC.
4. Nature societies.
5. Sportsmen's clubs.
6. Garden clubs.
7. 4-H clubs.
8. Boy Scouts and Girl Scouts.
9. Wildlife leagues.

V. Activities and problems:

- A. Make a chart showing ten valuable wildlife species of Kansas with the food they must find, the enemies they must escape, and the rate and time of reproduction. Then show how man upsets these activities of wildlife by—
 1. Hunting and fishing out of season, or during breeding and spawning seasons.
 2. Cleaning off forest floors too much.
 3. Burning off areas of farms and woodlots.
 4. Keeping fences around farms too clean of bushes and brush.
 5. Exterminating entirely one species—either predatory or game.
 6. Pollution of streams.
- B. Make a list of conservation lessons learned from the above.
- C. Describe as many state parks and refuge areas as possible. If possible, visit some of them.
- D. Set up reasons why:
 1. It is probably never justifiable to entirely exterminate one species.
 - (a) The passenger pigeon has been exterminated.
 - (b) Beaver were practically extinct.
 - (c) Cougar and buffalo disappeared.
 2. Large areas producing a single crop lead to serious epidemics.
 3. Forests and plant life conserve the soil and prevent floods.
 4. Prevention of stream pollution is part of conservation.
 5. Over-cultivation leads to soil depletion.
- E. From our state bounty laws determine the animals and birds that are considered harmful. Study their habits and speculate on what might happen if they were exterminated; what measure of control should be maintained?
- F. Show how the Kansas game and fish regulations are based on biological laws. Justify the recent extension of some of our closed seasons for hunting and fishing. Show how these laws will ultimately make better fishing and hunting. (Latest editions of fish and game laws may be obtained from the County Clerk's office.)
- G. Show how the desire of consumers for furs in summer as well as in winter creates a conservation problem.
- H. Account for the fact that:
 1. Color of soil determines the richness. Why do your flower boxes have better blooms when rich wood soil is used in them?

2. Some young trees in the forest must die.
 3. We have epidemics of crows, dandelions, and grasshoppers.
 4. Insect pests threaten our welfare.
 5. Proper hunting and fishing help a conservation program and make more fish and game.
- I. Discuss the methods of taking a wildlife census.
- J. One of the fundamental bases of a good conservation program is to maintain a balance of nature. In the activities suggested above, it is hoped students understood this concept. In order to check on this understanding, have students make lists of all the ways man upsets the balance of nature.
- K. Have students plan a program for the year for helping to maintain a balance. All kinds of worth-while activities will be suggested and reports can be made to the class on the success of such projects.

SCHOOL AND COMMUNITY WILDLIFE LODGE

"Act like a guest when you use the outdoors."

FOREWORD

The teacher should attempt to arouse interest in wildlife and in conservation practices by assembly talks, distribution of literature, lantern slides and motion pictures.

It is always better to have suggestions to form an organization come from the pupils themselves. An organization or activity coming from the teacher, already worked out and in a manner forced on the children, rarely succeeds.

When sufficient interest has been aroused and desirability of an organization is recognized by the pupils, the teacher should proceed to guide the formation of the club.

I. General objectives:

1. To offer to the students of the school and the adults of the community an opportunity to participate more actively in the conservation movement in Kansas.
2. To form an organization which can create public interest in the protection and restoration of wildlife in the community and secure concerted action in the execution of a definite conservation program.

II. Specific aims:

1. To encourage pupils to carry on practical projects in conservation in the community.
2. To teach parliamentary practice and procedure.
3. To protect and care for wildlife for use and enjoyment.
4. To create understanding of game laws and regulations and encourage observance of the same.
5. To promote better and fuller consideration of landowner's interests and property in use of wildlife.

III. Approach:

SUGGESTED CONSTITUTION

Article I—Name

SECTION 1. The name of this organization shall be the.....Wildlife Lodge ofHigh School.

Article II—Membership

SECTION 1. All 7- 8- 9- 10- 11- 12-grade pupils who demonstrate an active interest in wildlife are eligible to become members of this organization. Specific eligibility rules may be drawn by each lodge.

Sec. 2. Parents and adults of the community may become members in an honorary capacity.

Sec. 3. Fees and dues—to be decided by local lodge.

Article III—Officers

SECTION 1. The officers of this organization shall be (1) Conservation Chief, (2) Junior Protector, (3) Keeper of the Records, (4) Custodian of the Wealth, (5) Counselor (must be a teacher), (6) Senior Advisor (member adult sportsmen club, game protector, or other adult active in conservation).

Sec. 2. Duties of the officers shall be in keeping with accepted parliamentary procedure and designed to forward the work of the lodge.

Article IV—Election of officers

SECTION 1. Officers shall be elected at the second meeting in September and shall serve for a period of one year or until the installation of their successors.

Article V—Time and Place of Meeting

(To be decided by the Lodge)

Article VI—Purposes

1. To learn to know and recognize the wildlife in the community.
2. To make a study of habits of birds, animals, and fish in order better to know conservation principles.
3. To learn methods of protection and management of wildlife.
4. To institute approved practices in the community for protection and management of wildlife.
5. To discourage practices that tend toward destruction of wildlife and forests.
6. To coöperate in worth-while conservation projects of the local sportsmen's club.
7. To lend aid to the Conservation Commission of Kansas in the execution of its program.
8. To enlist help of all hunters and fishermen in wildlife conservation.
9. To become familiar with state game, fish and forestry laws.
10. To foster understanding and coöperation between the hunter and the landowners.

Article VII—Committees

The following standing committees shall be appointed by the Conservation Chief for a period of one year; additional committees may be named as the need arises:

1. Publications (it shall be the duties of this committee to secure books, folders, and pamphlets for the use of the lodge).
2. Finance (carry on activities to raise funds needed to carry out program of the lodge).
3. Publicity.
4. Birds.
5. Game animals and game management.
6. Fish and fish management.
7. Nongame animals and fish.
8. Protective devices.
9. Propagation and restocking.
10. Winter care of wildlife.
11. Farm coöperation.

Article VIII—Quorum

(To be decided by the local lodge)

Article IX—Method of Amending

This constitution may be amended by a two-thirds vote of members who are present.

IV. List of activities and projects:

1. Construct a workable and inexpensive "flushing bar." Contact farmers in the community explaining and demonstrating the use of this bar in mowing. Keep records of such uses and ascertain results. Survey fields for nests before the crops are harvested.
2. Build various types of bird houses and place them in suitable and desirable places.
3. Build and place feeding boxes and tables for the birds.
4. Build breeding pen for quail.
5. Encourage propagation of quail.
6. Carry on wildlife feeding campaigns during emergency periods in winter.
7. Plant trees and shrubs for bird protection and for game food and shelter.
8. Contact the farmers of the community and secure permission to plant seed to provide food for birds and wild animals.
9. Make a list of the predatory animals and birds of the community and work on a plan to control them without resorting to extermination.
10. Visit forest nurseries and game preserves.

11. Build up a Conservation and Wildlife Library for use of the entire school in teaching conservation.
12. With coöperation of the game protector, who is a representative of the Forestry, Fish and Game Commission, plan and carry out a restocking program for fish and game animals in the community.
13. Make a natural resource survey of the county.
14. Read stories of animals of the great outdoors.
15. Make an estimate of the number of rabbits in your community. Are more needed? If so, plan with your game protector for restocking.
16. Keep a record of the kind and number of wild animals you see killed on the highways.
17. Make an estimate of the number of quail. Plan a restoration program.
18. Make a wall chart as you begin to collect materials that can be related in this way.
19. Make suggested year program for lodge.
20. Plan September organization meeting of lodge.
21. Make an estimate of the number of squirrels. Plan a restoration program.
22. Write a letter to a local sportsmen's club asking them to send a speaker to one of your meetings.
23. Make an annual report of activities.

SUGGESTED PLEDGE FOR MEMBERS

I, _____, member of the _____ Wildlife Lodge of _____ High School, pledge myself to learn what is meant by conservation and why conservation laws are necessary; to help conserve wildlife of all kinds; to remember that wildlife belongs to everyone and act accordingly.

MEMBERSHIP REQUIREMENTS

It has been suggested that some lodges may desire to establish requirements for admission to membership. To attain neophyte status, it is suggested that a candidate first acquire 500 points from among these suggested activities, working in coöperation with a committee member or the entire lodge. This ranking would entitle a student to participation in full club activities without a vote and without eligibility to office or committee membership. Pledge badge or other insignia may be worn. Upon completion of additional activities totaling 500, a neophyte is eligible to initiation and full membership.

Suggested schedule for points and activities for neophyte ranking:

1. Identify 15 Kansas birds—resident, migrant, or game—100.
2. Identify 10 Kansas mammals; list habits, uses, and the regulations on each—100.
3. Identify 15 Kansas trees and name uses to wildlife, scenic resources, or timber—100.
4. Identify 10 fishes; habits, uses, and regulations on each—100.
5. Take part in a field trip with teacher or organization leader for wildlife study. Each trip—50.
6. Write 500-word history of conservation in own community—300.
7. Service feeding shelter for wildlife (in emergency periods only) per shelter, per day—25.
8. Identify 10 Kansas vines and shrubs and name their uses to wildlife—100.
9. Know open seasons, bag limits, creel limits, length limits on game and fish—250.
10. Each Boy Scout merit badge on conservation—100.
11. Each Girl Scout proficiency badge on conservation—100.

The club may give extra points for identifying additional birds, mammals, fish, trees, flowers, or shrubs. The lodge can select the manner of demonstrating candidate's right to points through tests, supervision, etc.

A suggested group of requirements for full membership are given as follows:

1. Participation in Wildlife Restoration Week—50.
2. Make a talk before a class or group on "Why Conservation Laws," or "What is Conservation?"—150.
3. Plant trees on reforestation project, trees, shrubs, and vines for wildlife refuge or farm management project. First 100 trees, or vines and shrubs—200.
4. Make conservation posters. Each poster displayed—50.
5. Supply 25 pieces for wildlife conservation museum, including game bird food samples, shells, colored pictures of native species, and wood samples—200.
6. Participate in planting or school ground beautification activity—50.
7. Plant small area with corn, millet, soybean, perennial lespedeza, wheat, sunflower to be left standing. For each rod—300.
8. Assistance in school bird haven—50.
9. Establish wildlife haven of one-half to one acre; haven must be planted with trees and shrubs, fenced from grazing, and protected from fire—2,500.
10. Build emergency feeding shelter of approved type—300.
11. Provide bird houses. Each occupied by nesting bird—100.
12. Rescue game birds by marking nests with stakes during harvest or when grass is cut. For each nest—100.
13. Participation in construction and demonstration of flushing bar to farmer—100.
14. Explore a brook for half a mile and write notes on observations of water, its channel, speed of flow, fish and plant life, insects and vegetation on bank, etc.—400.
15. Start library of not less than 25 books or state and federal pamphlets on wildlife conservation, forestry, and farm game management—250.
16. Make survey of farm, including map showing creeks, ponds, timber, fields, den trees, nesting sites, etc.—500.
17. Coöperation with game or fish technician on wildlife management surveys and similar projects—300.
18. Participation in rabbit, quail, squirrel, or other wildlife surveys—50.
19. Participation in approved predator control program—50.
20. Participation in game restocking program in coöperation with game protector—200.
21. Supplying of conservation news items to newspapers; for each printed item—100.
22. Installation of den trees, corn shock for wildlife use, or brush pile for wildlife shelter. Each unit—200.
23. Coöperation in giving information or otherwise assisting in bringing observance of conservation laws—1,000.
24. Aiding a farmer in improving his wildlife habitats—1,000.
25. Completion of allotted period of work on community or school forest. Each period—100.

Lodge may set up additional suggested activities and points or modify these points toward awards and membership. The award of Distinguished Service in Conservation is usually given for 10,000 points earned by outstanding service in the lodge.*

OBSERVING SPECIAL OCCASIONS

National Wildlife Restoration Week offers a fine opportunity for emphasizing conservation of wildlife. The third week in March has been set aside by proclamation of the President of the United States as the week during which this is to be observed. During this time, especially, a national effort is made to focus the attention of the American people upon the importance of wildlife as a national resource, aesthetically and economically. Special meetings of both state and national organizations are held. Also the National

* The unit, "Biological Bases of Conservation," and plans for a "School and Community Wildlife Lodge," have both been abridged and revised for Kansas from *Units in Conservation for West Virginia Public Schools*, Vol. II, Grades 7 to 12, *op. cit.*, pp. 87-45 and pp. 109-115.

Wildlife Federation distributes a sheet of one hundred colored stamps of wildlife designs and key stamps. These may be purchased for classrooms, scrapbooks, bulletin boards, or other uses. Funds derived from the stamp sale are used for conservation and educational programs.

Arbor Day and Bird Day both offer excellent opportunities for programs demonstrating different phases of wildlife conservation. Arbor Day in Kansas is named by proclamation either in March or April.⁸⁸ Bird Day is sometimes celebrated in connection with Arbor Day, but usually it is observed on Audubon's birthday, May 4. Special programs may be given about wildlife and the ways of protecting it. Such activities as planting trees and shrubs which will provide food and cover for wildlife are good projects.

A HUNTING CODE

Be a Good Sport

1. Respect the rights of your hunting companions and landowners.
2. Do not hunt on the property of others without asking permission. Be courteous even if your request is refused.
3. Poor sportsmanship of someone else is no excuse for you.

Be a Conservationist

1. Do not kill beneficial birds just for sport.
2. Remember that you will want to hunt again next year and so must help to conserve the supply.
3. Don't use every moving creature as a target.

Be Humane

1. Humaneness is the cardinal rule of all sportsmen.
2. Shoot to kill. There is no sport in crippling game that will run away and die.
3. Put a stop to useless pain.

Obey the Law

1. Laws are for your protection and benefit.
2. Most laws are within reason and have been made for a useful purpose.
3. When you hunt without a license, you are shirking your responsibility as well as taking a risk.

Suggestions

1. Your game protector is your friend and a gentleman. Get acquainted with him.
2. Remember that if you do not play safe today, you may have no opportunity to do so tomorrow.

THE TEN COMMANDMENTS OF SAFETY

1. Treat every gun with the respect due a loaded gun. This is the cardinal rule of gun safety.
2. Carry only empty guns, taken down or with the action open, into your automobile, camp, and home.
3. Always be sure that the barrel and action are clear of obstructions.
4. Always carry your gun so that you can control the direction of the muzzle even if you stumble.
5. Be sure of your target before you pull the trigger.
6. Never point a gun at anything you do not want to shoot.
7. Never leave your gun unattended unless you unload it first.
8. Never climb a tree or a fence with a loaded gun.
9. Never shoot at a flat, hard surface or the surface of water.
10. Do not mix gunpowder and alcohol.

Make your motto: "Safety First—Always!"

88. Ray D. Hodgell, Kansas Department of Public Instruction, *Manual of Patriotic Instruction*, Topeka, Kansas: State Printing Plant, 1935, p. 177.

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**AGREEMENT
FOR WILDLIFE SAFETY ZONES ***

County _____ Date _____

We (I), the undersigned, hereby agree to have _____ acres on our (my) farm located in _____ county, _____ township, set aside and closed as a safety zone for wildlife for a period of _____ years, beginning on the above-mentioned date. It is understood that there will be no hunting permitted on or within the safety zone at any time, during the period of this agreement, except for predator control when authorized by the conservation agent, and that any wild bird or animal escaping into the safety zone shall not be pursued, killed, taken or driven therefrom, under terms of this agreement, and that so to do will be considered a violation of the trespass law of the Fish and Game Code of the state. The location of the safety shall be approved by the landowner or the tenant.

The landowner or tenant agrees not to destroy food or cover within the safety zones, and not to permit the safety zone to be grazed by livestock of any kind without the consent of the Conservation Department. The Division of Conservation agrees to post the safety zones and to protect and maintain it for the above-stated period, and purposes.

The purpose of the safety zone is to prevent overshooting, to save seed stock in cover, to bring about an increase in game and wildlife and to improve hunting conditions in general. A safety zone on any farm will mean better hunting for everyone who obtains permission to hunt, for guest hunters and for the farmer and his family.

It is understood that the undersigned landowners and tenants enter into this agreement for the above-named purposes and that no rental or fee is to be paid by the Division of Conservation unless otherwise agreed upon.

Number of acres in farm _____. Acres in the zone _____.

(Signed) _____, Landowner,

(Signed) _____, Tenant.

(Signed) _____,

Agent of Division of Conservation.

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