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A STUDY OF THE LESSER PRAIRIE CHICKEN
IN KANSAS

AUGUST 1953.....JULY 1956

MARVIN D. SCHILLING

KANSAS
FORESTRY FISH AND GAME
COMMISSION

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44-263

Fig. a. Displaying cock on booming ground, Kearney Co. Kansas.

ORIGINAL WORK PLAN OF RESEARCH PROJECT

Subject: Determination of status of Lesser Prairie Chicken
in Southwestern Kansas.

I. Character of range and distribution.

A. Ancestral range, Kans. & U.S. before settlement.

B. Present range, Kans. & U.S.

Density.

1. High 3. Low

2. Medium 4. Unoccupied, suitable for
transplanted stock.

D. Soil types, climax vegetation and capability.

E. Mapping, pastureland and non-pastureland to
include peripheral areas in northern Okla.
and western Colo. (S.C.S. Salina, Garden
City, and Dodge City.)

F. Location of strutting grounds.

G. Determination of population trends.

1. Spring count on a sample of all known
strutting grounds.
2. Correlation with regular census, possible
intensive questionnaire of more landowners.

II. Trapping and transplanting.

A. Locating several concentrations of birds in sites
suitable for trapping.

B. Locating most suitable re-stocking areas (Comanche,
Barber, Kiowa, Ford (along Ark. River), Edwards,
Stafford (Rattlesnake River), Kingman (?), Pratt(?),
Harper (?), Hamilton.)

Following up releases to note increase or decrease
and cause.

III. Banding Studies.

A. Movements, seasonal etc.

B. Sex, age, weight, (Peterle, Mich. for scales
methods etc.)

Behavior on strutting grounds (bands for denoting
sex and age together with alum. bands numbered).

IV. Arranging to get nests in the wild for propagation
study (as use in determining proper method for incub. etc.)

V. Food study--from dead or killed birds (skeletal study
to differentiate lesser and greater prairie chicken--
Fish & Wildlife Service, Food Habits Study Lab., Denver,
Colo.)

A. Crop analysis, gizzard.

B. Field observations.

Young and old, separate, ageing young by weeks.

VI. General - habits and activities.

OUTLINE

- I. General Introduction
 - A. History & Early Distribution
 - B. Present Range
- II. Life History
 - A. Booming Ground Activity
 - General Methods
 - Studies 1954
 - Studies 1955
 - B. Nesting Activity
 - General Methods
 - Studies 1954
 - Studies 1955
 - C. Young
 - Introduction
 - Studies 1954
 - a. Food Habits
 - b. Brood Size
 - c. Plumage Development & Ageing
 - Studies 1955
 - a. Brood Size
 - Molt of the Adult
 - Introduction
 - a. Specimens Collected
 - E. Flocking
 - F. Movements
 - G. Habitat

Spring	Fall	Booming
Summer	Winter	Nesting

H. Water Requirements & Waterhole Use

III. Food Habits

A. Foods of the Adults

B. Food Habits of Young

IV. Predators & Other Hazards

A. Ground Squirrels

B. Badger

C. Coyote

D. Marsh Hawk

E. Other Hawks

F. Others

V. Trapping and Transplanting

A. Weights

B. Marking & Banding

C. Drugs

D. Traps Used & Experimented With

E. Release Nets

F. Releases

VI. Conclusions

VII. Summary

LESSER PRAIRIE CHICKEN IN KANSAS

GENERAL INTRODUCTION

This will be the last report I shall prepare, due to a reassignment of my duties. I have enjoyed the time spent on this project immensely and hope it may be reactivated at a later date by another worker since the project is far from complete. Much remains to be worked out before we will fully understand the lesser prairie chicken in Kansas. Should anyone have use of the work thus far done, the material will be on file at the headquarters of the Kansas Forestry, Fish and Game Commission near Pratt.

It is a well-known fact that prairie chicken populations fluctuate in numbers in more or less definite cycles. It was unfortunate that the peak of the present cycle was apparently reached in 1951 or 1952, as the birds had gone into a sharp decline when the project was enacted in August of 1953. I have been very much encouraged by the ability of the birds to hold their own during these first declining years. True, they were reduced substantially in 1953. However, even during the extreme drought and apparent bad weather conditions of 1954, they were able to hold their own, or even show a slight increase. As the project closes, we are just past the nesting season of 1955 and, although too few broods have been observed to draw any definite conclusions, the broods seen were encouragingly large. Barfing climate disasters, they may be able to show another increase this year. It now appears the birds might be able to survive the present low in much greater numbers

than the previous ones because their grassland habitat has not suffered undue destruction. The ranchers over most of the areas are practicing much improved grazing methods and are not allowing wholesale destruction of the vegetation. This may be the major reason the birds have been able to hold up their numbers, entering this cycle low, as well as they have.

HISTORY AND EARLY DISTRIBUTION

The lesser prairie chicken probably occurred throughout at least the southwestern one-fourth of Kansas before the state was settled. Much of this grassland area was destroyed by misuse or broken out for agricultural purposes. Early writers failed to recognize the greater and the lesser as two different species. Actually it was not until 1885 that the lesser prairie chicken was recognized as a distinct species. By the use of preserved specimens, conversation and correspondence with long-time residents of this area, we believe the original range of the lesser prairie chicken would, roughly, extend at least as far north as the Smoky Hill River and as far east as Harper and Kingman Counties. Game Protector, E. L. "Pat" Bryan, tells me that the lesser prairie chicken formerly nested in Trego, Ellis, and Graham Counties. Also, Game Protector, Joe Concannon, tells me that the "little" chicken once occurred abundantly as far north as Wallace, Logan, and Gove Counties. Probably the "lesser" at one time occurred this far north, although the "greater chicken" was also to be found there. A few colonies of the greater prairie chicken are

to be found in this area presently. On August 17, 1954, while working on the Annual Upland Game Bird Survey in Ness County, I talked to the owner of the Triple Bar Ranch 3 miles west and 2½ miles south of Beeler on the Ness-Lane County line. He told me of a group of prairie chickens that had moved into his pasture and established a booming ground that spring. This area is midway between our known greater and lesser colonies and would be interesting to know just which of the two species they were. Two return trips were made to the area. One that same fall, September, 1954, and one during the booming period in the spring of 1955. No birds could be located. It seems probable, though, that they were the greater prairie chicken as the habitat they occupied was much nearer the type preferred by that particular species.

Preston Osborn of Lakin tells me that we once had both kinds of chickens here in this southwest area. The "little" or lesser chicken was to be found in the rougher sagebrush, sandhill ~~area~~ and the "big eastern" chicken in the ^{wetter} swampy, tall grass areas. He says the swampy, pothole country just south of Friend, in Finney County was ~~one of~~ the last hold-outs of the "big" chicken in this area.

In conversation with Frank Shulman, long-time resident and hunter of Garden City, he tells me that they never did have many chickens in the flatlands. The large numbers, often spoken of, were found only in the rough, sandhill-sagebrush areas along the Arkansas and Cimarron Rivers and also in the rough, but not too sandy, sagebrush areas along the streams and rivers in the area further north.

In a very interesting conversation with Dr. Claude W. Hibbard, University of Michigan Palenothologist, who has done extensive work on the fossils of this southwestern Kansas area, he told me that following the upheaval of the land masses from the sea that now make up southwestern Kansas, the climate, as indicated by the fauna, was apparently warm and humid. The fossils that have been taken indicate cool, humid summers and warm, mild winters, very different from the climatic extremes we know today. Also, he estimates an annual rainfall of over forty inches, as compared to about sixteen to nineteen inches today. Also at one time the area was apparently covered ^{with} by a dense pine forest. The rainfall apparently gradually decreased over the ages and the pine forest was forced to give way to tall grasses. ^{Among the fauna of this period of tall grasses} Fossilized remnants of the greater prairie chicken have been found, but not of the lesser prairie chicken. In fact, Dr. Hibbard believes the lesser prairie chicken has come into the area only very recently, geologically speaking, as he and his co-workers have never taken it as a fossil of this area. He believes they probably came into this area as the rainfall continued to decrease to a point that the tall grasses no longer could survive and so were replaced by short grasses, and in the more sandy areas, sagebrush, apparent preferred habitat of the lesser prairie chicken. This undoubtedly is an overly simplified version of the complicated changes of the past ages, but it nevertheless helps to explain the reports by the old timers that the greater prairie chicken also once was here, and that the colonies they knew probably were remnant flocks that were

able to hang on in the last areas of the disappearing tall grasses.

From what little has been written about the prairie chickens of Kansas, we learn that they originally were not as abundant as many may suppose and were probably originally found only in moderate numbers. However, as the state was settled and small grain crops produced, thus furnishing the prairie chickens as increased and more dependable winter food supply, which might have been a critical need or even a limiting factor. Their numbers increased sharply to become abundant enough to be a nuisance and destructive to farm crops in some areas. We know from past accounts in the historical writings, that early market hunting, and later illegal hunting and illegal devices took great numbers of the prairie chicken. But no evidence can be found to indicate any great reduction in their numbers before the drought of the thirties (1930-1940). According to residents of the area, the birds were abundant up until about 1929 or 1930. During this drought period, which apparently almost eliminated the lesser prairie chicken in Kansas, there was little water, food, or cover available over most of their range. Wind erosion and dirt storms were almost unbearable, even for the humans and many people left the area. Prairie chickens were reported found dead in large numbers with their throat and nostrils clogged with dust. I have been able to find evidence that only a very few birds survived this decade. Game Protector, Eddie Gebhard, tells me that he knew of only two small flocks that survived. One on the AI Ranch in Meade County, and the

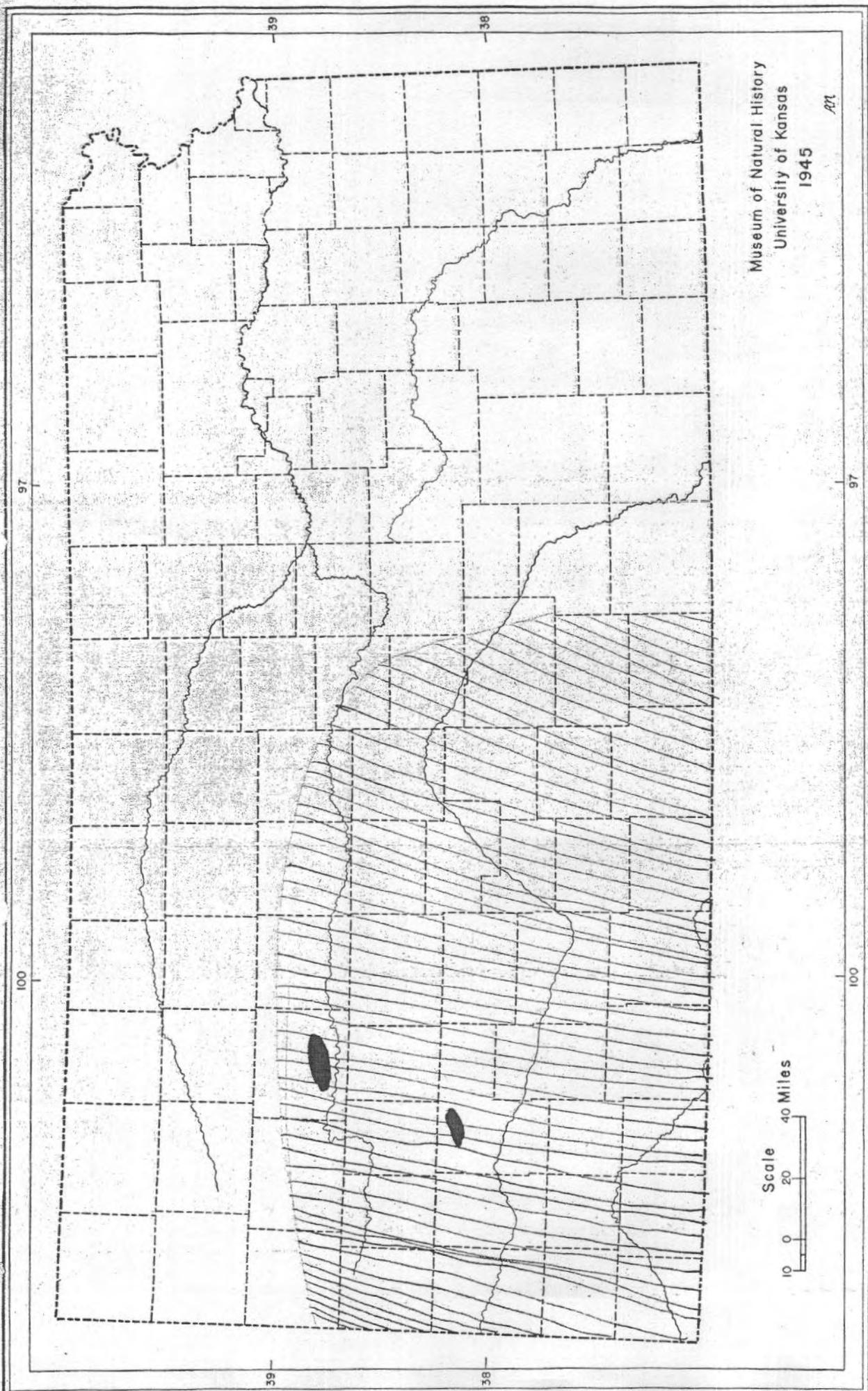


Fig. 1
 Approximate original range of the lesser prairie chicken in Kansas
 Areas in which the greater prairie chicken apparently still held on as recently as 50 years ago

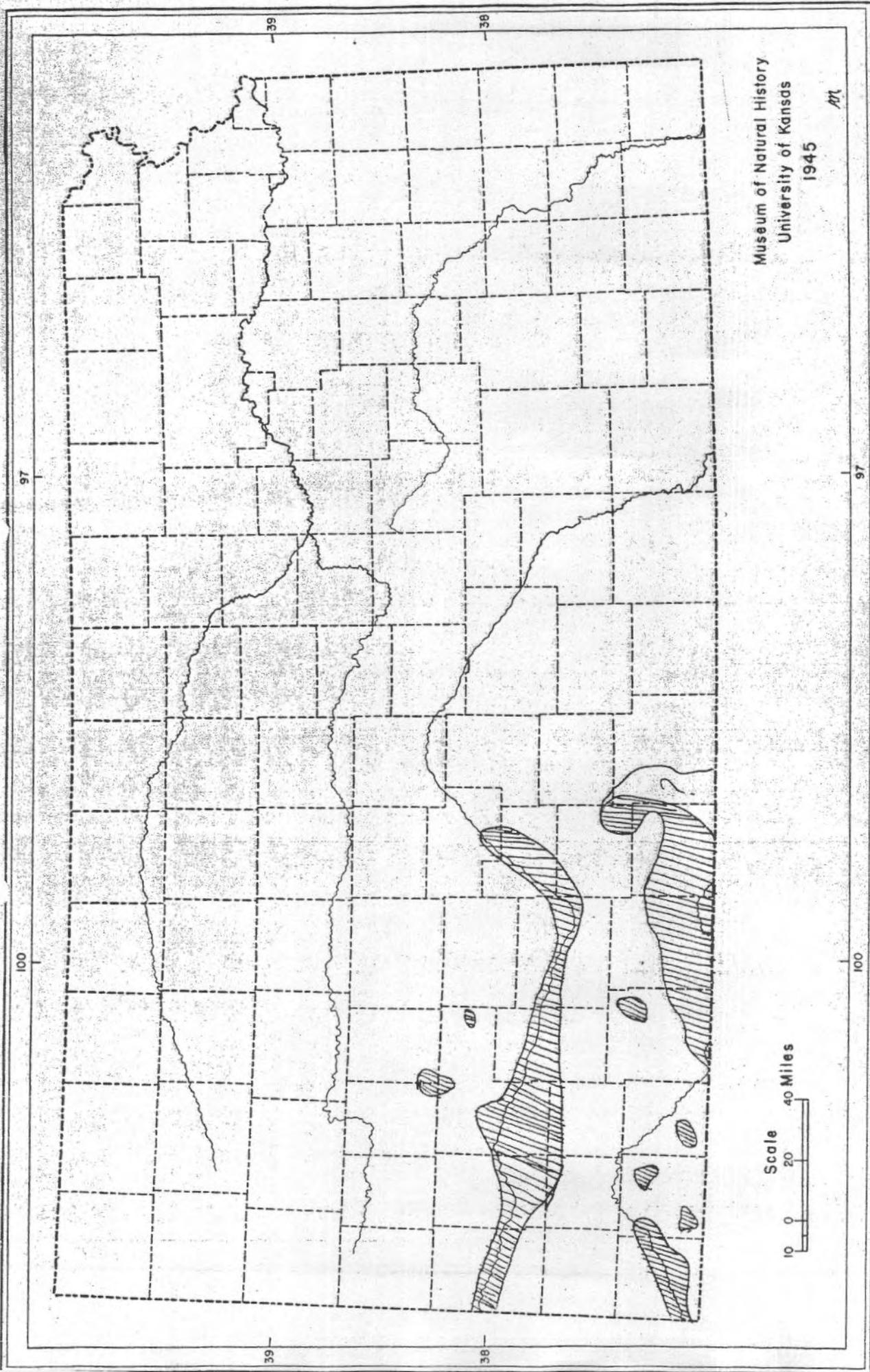


Fig. 2 Present nesting range of the lesser prairie chicken in Kansas

Fig. a. Typical booming ground, short grass cover in sage opening.
Fig. b. Displaying cocks on booming ground.

other on the Hitch Ranch in Seward County. Clarence Lenard, formerly of Pawnee County, tells me that the drought and dirt storms there were not as severe as they were further west and south, and that they had a flock of about forty birds live through about three miles east and one-half mile north of Garfield. Preston Osborn, of Lakin, says he believes some survived in Kearney County, but does not know exactly where.

PRESENT RANGE

Today we find the lesser prairie chicken again is to be found scattered through much of its assumed original range. Although little suitable habitat remains north of the Arkansas River, their nesting range is restricted largely to the grassland-sagebrush areas along, or near the Arkansas and Cimarron Rivers. They are seldom seen outside of this habitat in summer. During the winter they move considerable distances to feed in small grain fields and have been seen up to thirty or forty miles outside the sagebrush habitat during the feed-field feeding period. One was seen on the Milton Rusco farm west of Leoti, Wichita County, during the pheasant season of 1952. This is about 45 miles from any known inhabited nesting habitat.

L I F E H I S T O R Y

BOOMING GROUND ACTIVITY

A large number of booming grounds were observed during the course of this study. Those observed were located in a wide variety of varying terrain and vegetation. Some were

observed in sagebrush openings on the crest of the higher hills while others were observed down on the broad flats or even the lower spots in rough, knoll type, sandhill country. Some also were observed on hillsides. Most were in openings of the sagebrush cover, while a few were located in deserted fields that had gone back to grass, but ~~was~~ completely devoid of sagebrush. A few were also located in bare fields, which often were planted to maize in June or summer fallowed for wheat that fall. A few also were located in wheatfields that bordered the the grassland on the south edge of the sandhills, South of the Arkansas River. Their favorite booming ground appears to be in the sagebrush pastureland where there is an opening, or very thin growth of the sagebrush and the ground mostly sodded over by short grasses such as buffalo grass or blue gramma. A slight raise in the ground from the immediate surrounding terrain seems to be preferred even though it is often no more than a small knoll on a hillside or even in the low spots. Most of the grounds observed centered on such a small rise.

Dust affects the booming or dancing activity of the cocks quite noticeably, and the dancing areas located on bare ground often became less active as the constant vibration of their dancing feet churned the soil to a powder-fine dust. The stomping feet of a displaying cock causes this dust to boil up around the bird and undoubtedly causes considerable irritation to their throat and nostrils. Booming grounds on such locations were found to be much less stable from year to year than those on permanent grassland. Even the grounds located in the heaviest

and best sodded locations were also affected greatly by blowing dust on windy, dirty days that we have come to expect throughout western Kansas in the spring of the year. Dust blown in on these grounds during a windy, dirt blowing day ~~also~~ continues to hamper the dancing activity for several days following.

Hamerstrom (1939:108) came to the conclusion that display ground activity was determined by the upper and lower limits of a combination of light and temperature. This then explains why cocks often display during mild winter periods and in the fall as well as the spring breeding season. Earliest observed fall activity, during this study, was on August 31, 1954, when the seemingly dominant cock was collected from a group of nine cocks that were booming and displaying on a ground that had contained thirteen cocks during the previous breeding season, some three months earlier. It is interesting to note that this bird proved to be a young of the year and must not have been much, if any, over 14 weeks old. The juvenile molt of the remiges, except primaries 9 and 10 which are retained the first year, was complete.

The strutting behavior has been noted several times from various broods observed in the field. Jim Coats tells me that the young hatched in an incubator will show this strutting behavior when only a few days old. On August 6, 1954, Eddie Gebhard, Game Protector, and myself observed a brood of twelve young in Meade County. We estimated the young to be about 9 weeks old. Several of the young strutted and erected neck feathers but made no sound, as they crossed a bare trail between

the food patch and the grassland that they were returning to. The cock collected on August 31, 1955, must not have been over a month older than the brood of twelve. However, he boomed audibly and displayed aggressively on a previous established booming ground.

The sound uttered while displaying is very different for the two prairie chicken species. Old timers, on occasion, have referred to the greater prairie chicken as the "cooing or whooing" kind, and to the lesser prairie chicken as the "cackling" kind. Certainly "cooing or whooing" is very descriptive of the greater's call, although both species "cackle". The cackle, consisting essentially of the same series of notes, is on a noticeably different pitch. A very complete description of the greater prairie chicken on the booming ground is described by Schwartz (1944 and 1945).

It is difficult to describe the sound made by the lesser prairie chicken while booming. It seems to me to consist of a slurring blu-r-r-r-p--blu-r-r-rp----blur-r-rp, usually in a series of five or more such bursts. The bird often cackles after the blurping is completed and the air sacs are completely deflated.

This blurping sound carries very well and can be heard a considerable distance-up to at least two miles on quiet mornings.

While working with both species in the spring of 1955, we found the greater to be much more wary on the display grounds. While searching for booming grounds by automobile, we were unable to approach the grounds of the greater chicken much

closer than about a quarter of a mile. Invariably the birds flushed wild. In contrast to this we very often were able to ease the automobile virtually into the center of a group of displaying lesser chickens. They simply made room for the automobile and continued their displaying to within 12 to 15 feet of the car. We too could hear the call of the lesser chickens more distinctly and at greater distances. This we believe was due to the abrupt beginning and ending of the Blur-r-rp, as compared to the moan-like who-o-o of the greater prairie chicken.

COLOR OF THE AIR SACS

The air sacs of the lesser prairie chicken when inflated are a rather dull rubber red in color. They remind me very much of a child's red rubber ball. The air sacs of the greater chicken are considerably larger and a golden yellow in color. In fact, the color of the greater chickens air sacs are the same golden yellow color as the eyebrows of both species.

BOOMING GROUND STUDIES 1954

As the area in which the birds were to be found was extremely sandy and loose, making travel by car hazardous if not impossible during dry spells, the possibility of locating many grounds in a short time from the air was suggested and tried. Large scale county ownership maps were obtained and the trails, pipelines, windmills, gas wells, etc., were traced on them from the Soil Conservation Service's air photographs. This

TABLE # 2

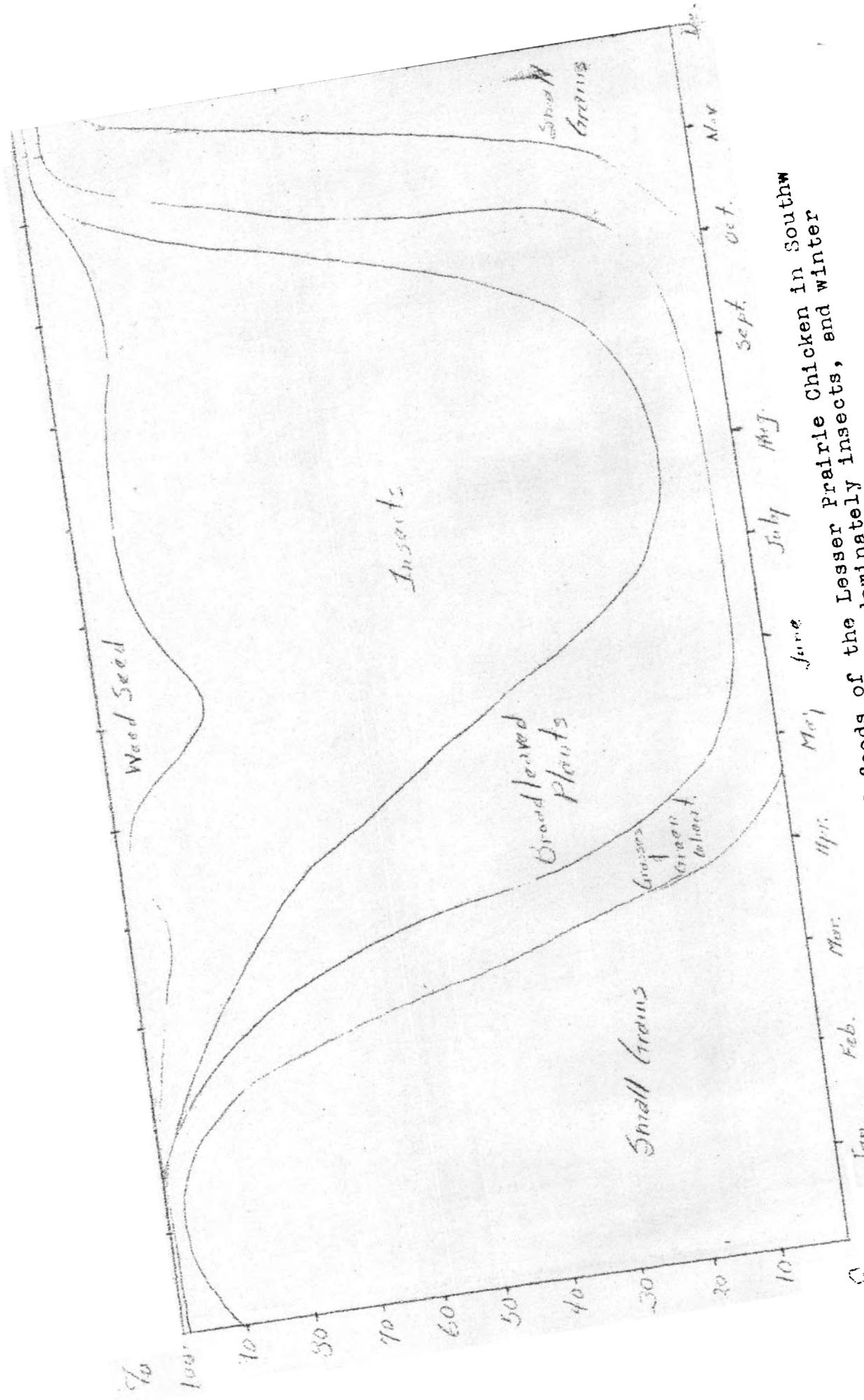
Percentage of animal matter, vegetable matter, and grit in the crop and gizzards of 14 prairie chickens (grit % is figured on basis of combined animal and vegetable matter) ADULT

SPECIMEN NUMBER	% Animal Matter	% Vegetable Matter	% Grit
3 Crop Only	100	Trace	Trace
11 Crop Only		100	Trace
12 Crop Only	100	Trace	Trace
13 Crop & Gizzard	48	52	6
14 Crop & Gizzard	Trace	100	12
15 Crop & Gizzard		100	Trace
16 Crop & Gizzard		100	1
17 Crop & Gizzard	34.6	65.4	3
18 Crop & Gizzard	Trace	100	7
19 Crop & Gizzard	Trace	100	24
20 Crop & Gizzard	44	56	3
21 Crop & Gizzard	69	31	
23 Crop & Gizzard	25.4	75.5	3
24 Crop & Gizzard	<u>69</u>	<u>31</u>	
AVERAGE	35%	65%	3%

TABLE: ² Food materials eaten, arranged in order of abundance, taken from crops and gizzards of adult lesser prairie chicken throughout the year.

FOOD MATERIAL	Parts Consumed	Volume C.C.	Percent Volume	No. of Birds Consuming	Percent Birds Consuming
1. Maize	Seed	46.9	19.78	6	43
2. Maize	Hulls	43.9	18.51	6	43
3. Short-horned Grasshoppers (Locustidae) (Acridiidae)	Nymphs & Adults	38.5	16.23	6	43
4. Beetles (Coleoptera)	Adults	16.6	7.00	8	57
5. Green Wheat	Veg.	15.6	6.58	1	7
5. Larvae (Lepidoptera)	Larvae	12.6	5.31	7	50
7. Ground Cherry (Solanaceae Physalis)	Veg. & Seed	11.1	4.68	5	36
8. Bugs (Hemiptera)	Nymphs & Adults	6.5	2.74	3	21
9. Indian Apple	Berry	6.5	2.74	2	14
0. Ragweed (Ambrosia Sp.)	Veg.	6.0	2.53	2	14
1. Rocky Mt. Beeplant (Capparidaceae Cleome)	Veg.	5.8	2.44	1	7
2 Yarrow (Compositae Achillea)	Veg.	4.1	1.72	3	21
3. Long-horned Grasshoppers, Mormon Cricket, & Cave Cricket (Tettigoniidae)	Adult	2.5	1.05	2	14
4. Bush Morning Glory	Buds	2.5	1.05	2	14
5. Grasses	Veg.	2.4	1.01	4	28
6. Sunflower (Compositae Helianthus)	Seed	1.6	.67	4	28
7. Russian Thistle (Chenopodiaceae Salsola)	Veg.	1.3	.54	1	7
8. Firebush (Chenopodiaceae Kochia)	Veg.	1.3	.54	1	7
9. Shepherds Purse (Brassicaceae Capsella)	Veg.	1.0	.42	1	7
0. Ragweed (Compositae Ambrosia Sp.)	Seed	.8	.33	5	36

1. Lamsquarter (Chenopodiaceae Chenopodium)	Veg.	.7	.29	1	7
2. Buckwheat (Polygonaceae Polygonum)	Seed	.3	.12	1	7
3. Bindweed (Convolvulaceae Convolvulus)	Seed	.2	.08	2	14
4. Cicada (Homoptera Cicadidae)	Adult	.2	.08	1	7
5. Grasses	Seed	.1	.04	3	21
6. Pigweed (Amaranthaceae Amaranthus)	Seed	Tr.		2	14
7. Nut Rush (Cyperaceae Cyperus)	Seed	Tr.		1	7
8. Broomweed (Compositae Amphiachyris)	Floret	Tr.		1	7
9. Saltbush (Chenopodiaceae Atriplex)	Veg.	Tr.		1	7
10. Dodder (Convolvulaceae Cuscuta)	Seed	Tr.		1	7
11. Sedge (Cyperaceae Carex)	Seed	Tr.		1	7
12. Bees & Wasps (Hymenoptera)	Parts	Tr.		2	14
13. Spiders (Arachnidae)	Parts & Seed	Tr.		1	7
14. Unidentified	Veg.	8.1	3.41		
15. Sagebrush (Artemisia Filibolia)	Veg.	Tr.		2	14



Seasonal variation of foods of the Lesser Prairie Chicken in Southwestern Kansas. Summer food is predominately insects, and winter food predominately small grains.

FIG. 6

2

Fig. a. Prairie Chicken tracks in snow, note broad toe marks.
Fig. b. Prairie Chicken diggings in snow for feed.

Examining ground study maps
of Linney Co. Kearney Co. & Meade Co.
not included in this copy

gave us landmarks so that we might keep our bearings while over the area. A small plane, two passenger Aer-Coop, was rented from the Garden City Airport. This plane was chosen because of its slow air speed. Our first attempt was made in the early morning of April 15, when we flew areas in Finney and Kearny Counties. No birds were located even though we passed over known booming grounds several times. We delayed further air census in hopes that the birds might show up better after the vegetation greened up. The areas were again flown on May 5, but still the chickens were extremely difficult to see from the plane. Only by circling dangerously low over a known booming ground were we able to see two birds standing motionless and blending in very well with their background, so the air census was discontinued. It is believed that the birds reacted to the plane much as they would to a hawk. They could see the plane much quicker than we could see them, and so cease their displaying and remain motionless until we were gone.

Following the trial of the air census, a search by car was undertaken in an effort to locate as many booming grounds as possible. The season was very dry and travel, by car, in the sandhills, was difficult or impossible in some areas. Nevertheless, 15 grounds were located in Finney County, 8 in Meade County, and one in Clark County. The number of cocks using these booming grounds varied from 23 to 1.

During the breeding season of 1954, the activity on the grounds seemed to build up to a high level through the months of April and May and began tapering off in early June. The spirited booming was still very high on June 1, but by June 7, the hours spent on the grounds by the cocks were much shorter,

lasting from daybreak until about a half-hour after sunrise. This compared to at least two hours after sunrise and all night on moonlit^{gh} nights earlier in the season. By June 12, only two cocks showed up at a booming ground that normally contained 12 or 13 birds. No booming was attempted and the two cocks simply loafed around the ground.

A definite peak of booming seemed never to form during the breeding season of 1954.

BOOMING GROUND STUDIES 1955

The air census was not again attempted, as it proved to be of no value in 1954. The ground census by car was intensified, as travel in the sandhills by car was possible due to favorable soil-moisture conditions. Thirteen booming grounds known from the year before in Finney County were again censused. These grounds had contained about 111 cocks in 1954. This total had risen to 130 in 1955. This shows an increase of 1.17% on these grounds. The booming ground having the most cocks observed was in Kearny County and had some 33 birds using it.

The cocks began to display in earnest about February 28, 1955, and were very active early in March. A wind and dirt storm on March 11 stopped all display activity for at least two days. A late season snowstorm and cold snap on March 26 stopped cocks from displaying for at least three days. Another wind and dirt storm stopped most of the activity for two day on April 23. Other than these temporary interruptions displaying morning and

evening was continuous and seemed to reach a peak about April 14. All booming grounds checks at this time showed hens to be present. Booming activity continued well past the cessation date of June 10 in 1954. This probably was due to a cool rainy period during the first two weeks of June. Territorial disputes and spirited booming was still taking place as late as June 18 in 1955.

N E S T I N G A C T I V I T Y

In the original plans we hoped to obtain eggs from nests in the wild for use in comparative studies with our game farm propagation experiments. Personal visits were made to many of the ranches in the grassland areas of Finney, Kearny, Meade, and Clark Counties. We asked them to report nests found by them during the nesting season. Reminder letters, with a report card enclosed, were sent to many of these ranchers during the early part of the nesting season. As much time as was available was spent searching more choice nesting habitat on foot. A jeep was made available, to which was rigged a flushing device, modified from that described by Lehmann (1946). This device consisted of two 18 foot cane poles suspended horizontally about three feet above the ground so as to carry over the sagebrush. The two 18 foot poles, plus the width of the jeep, made a flushing apparatus that covered roughly 42 feet. A central post tilted slightly forward was necessary to support these poles by wires. The poles were hinged at the point of attachment to the front fenders and the forward tilting central

Contact Letter of
Card not included in this
Copy

post allowed the poles to swing back and up, should the drags temporarily catch or the poles hit the sage. A short piece of chain (cross bars from tire chains) were attached to a length of wire about four feet long and attached at 14 inch intervals along the horizontal poles. These chain drags caught and wrapped around the sage badly and so were soon replaced by lath hinged to the horizontal poles at 14 inch intervals.

NESTING 1954

Nesting activity should begin between the middle of April and the first of May. A search for nests was begun on foot April 26, and many hours were spent from then until May 5, at which time the jeep flushing device was rigged out. This device was run over 1,500 to 2,000 acres from May 12 to June 10 without finding an active nest. One hen was flushed but no nest could be located. Egg shells that marked a nest destroyed by a predator, thought probably to be a ground squirrel from sign at the nest, was the only nest observed. A variety of other avian nests were found, including the morning dove, western meadowlark, Cassin's sparrow, grasshopper sparrow, lark bunting, ringnecked pheasant, and bob white quail. It seems impossible that so much area could be covered without finding a nest. It is believed that surely some nests had been passed over but the device failed to flush the hen. Probably a heavier drag that would forcibly move the vegetation will have to be used to locate nests in this heavy sagebrush cover.

On June 12, a hen, within 50 yards of the only hen flushed with census apparatus, was found with two young. The young was capable of only short flights. One was captured by running it down on foot. It made only two short flights, While I was busy chasing one, the other escaped in the sagebrush. The condition of the molt of the remiges showed the young to be 15-17 days old. (Age here is determined by a schedule worked out for the greater prairie chicken as none was available for the lesser.) (Baker. 1953) This would make the nest to have hatched about May 27. A hen was again seen in this immediate vicinity seven days later, but she had no young.

Of the eight litters sent out to ranchers in outlying counties, with self-addressed report cards, only one was returned and he had no nests to report.

NESTING 1955

The search for nests, in the spring of 1955, was begun about April 18. Much time was spent from that time until about the first of June searching for nests afoot in Finney and Kearny Counties, usually with an old broom handle slapping sagebrush clumps, mostly along ridges and hilltops. The jeep used the previous year was not available and so no mechanical flushing devise could be experimented with.

On May 16, Eddie Gebhard, Game Protector, and the writer searched for nests, on foot, in Meade County, but none were

located. Mr. Gebhard later reported a nest to me that had been destroyed by a mowing machine in an alfalfa field on May 26. The eggs were not discovered until the field was raked the next day. Mr. Gebhard checked the nest. It contained seven eggs. All were fertile and estimated by him to have been incubated about one week. Assuming an incubation period of 23 days, the eggs would have hatched about June 11. The seven eggs suggest a below average sized clutch, (assuming again that the lesser prairie chicken lays about the same number of eggs as the greater prairie chicken, which was found to be 12 by Hamerstrom (Hamerstrom 1939:113). Also most of the first nesting attempts are believed to hatch by June 1. This nest then suggests a rather late nesting by that hen. Mr. Cole, the owner of the alfalfa field, told me that when this field was mowed on May 31, 1953, approximately twelve nests of the lesser prairie chicken, all very near hatching, were destroyed. All twelve hens refused to leave the nest and all were cut up and killed by the machine.

Another alfalfa field on the Del Randall farm in Clark County produced one lesser prairie chicken nest in the spring of 1953. The hen, however, escaped. Unfortunately, it was before this project was in force. These fields and other alfalfa fields in the vicinity of known booming grounds were watched, but no nests were found in alfalfa fields in the spring of 1954 and only the one mentioned here, found in 1955.

YOUNG

We had hoped to be able to locate nests in the wild, so we could mark and observe young of known age, from hatching date through the postnatal and postjuvenile molts. We planned to dye complete clutches shortly after hatching or while still in the eggs. From this we could recognize individual broods when again encountered in the field. Failure to locate the nests also seriously hampered studies of the young.

Young were collected whenever possible in the field to study their plumage development. Crops and gizzard contents were analyzed to learn their food habits.

FOODS TAKEN BY YOUNG

Young were considered all birds that by the condition of the molt of the remiges showed them not to have completed the postjuvenile molt. This molt is considered complete at about 13-14 weeks of age.

As can be seen in Table ~~I~~⁴, the eight young examined fed almost entirely on insects. Only .3 of one percent was vegetable material. Almost 75% of the insects taken were nymphs of the sub-family of the slant-faced grasshoppers. These grasshoppers are apparently less active and easier for the young to catch. Beetles made up about 20% of the food. Thus we see grasshoppers and beetles made up 94% of all their food. The other 6% was made up of a large variety of insects and spiders. Only two contained enough vegetable material to measure.

TABLE: 5 Food materials eaten arranged in order of abundance taken from crops and gizzards of young, to 14 weeks of age, lesser prairie chicken during June, July, and August of 1954 and June of 1955.

FOOD MATERIAL	Parts Consumed	Volume C.C.	Percent Volume	Birds No.	Consuming %
1. Short-horned Grasshoppers (Locustidae)	Nymphs & Adults	19.7	74.82	6	75
2. Beetles (Coleoptera)	Adults	5.1	19.31	6	75
3. Spiders (Arachnidae)	Adults	.7	2.65	3	37
4. Larvae (Lepidoptera)	Larvae	.4	1.51	2	25
5. Grasses	Veg.	.1	.37	6	75
6. Sagebrush (<i>Artemisia filifolia</i>)	Veg.	.1	.37	3	37
7. Lacewings (Neuroptera Chrysopidae)	Adults	.1	.37	2	25
8. Long-horned Grasshoppers (Tettigonidae)	Adults	.1	.37	1	12
9. Praying Mantis (Mantidae)	Adults	.1	.37	1	12
10. Leafhopper (Homoptera Cicadellidae)	Adults	Tr.		2	25
11. Nut Rush (<i>Lithospernum Cyperus</i>)	Adults	Tr.		2	25
12. Sunflower (Compositae <i>Helianthus</i>)	Seed	Tr.		1	12
13. Ant-Moundbuilding	Adults	Tr.		1	12

TABLE ~~II~~ ⁴

Percentage of animal matter, vegetable matter, and grit in the crop and gizzards of 8 prairie chickens under 14 weeks of age (Grit percentage is figured on basis of combined animal and vegetable matter.)

SPECIMEN NUMBER	% Animal Matter	% Vegetable Matter	% Grit
1 Crop Only	100		
22 Crop Only	100	Trace	Trace
6 Crop Only	100	Trace	Trace
7 Crop Only	100	Trace	
8 Crop Only	96	4	Trace
9 Crop Only		Trace	
10 Crop Only	98.5	1.5	Trace
22 Crop & Gizzard	<u>100</u>	<u>Trace</u>	<u>13</u>
AVERAGE	99.7%	.3%	2%

B R O O D S I Z E

SPRING 1954

Finding broods in this dense sagebrush habitat also was found to be very difficult, particularly while the young are under two weeks of age. As the young grow older, they are progressively easier to locate and observe. About the time the young reach the age of four to five weeks, they often begin to frequent waterholes, particularly windmill-tank overflows. This seems to happen during extreme dry spells or when little or no morning dew is present.

The hatch in 1954 was very poor. Most of the hens observed had no young whatsoever. On July 15, while in Clark County, eight hens were recorded. Only one of the eight had young, and she had only one. Seven other adults were flushed during the course of the day, whose sex was not determined as they were not seen on the ground. Some probably were females without young.

A number of hens without young were seen on the Finney County study area but only seven were seen with young. The first was seen on June 12, with a brood of two. Others were July 17, six; July 18, two; July 19, one; July 31, seven; August 3, one; and August 18, one. This gives an average of only 2.85 young per brood in these seven broods. Probably hens without broods were less secretive and more often seen. *But* if the average brood size would have been divided among all hens seen, this would have been considerably less than one young per female.

Four other broods were seen outside the Finney County study area, the brood in Clark County of one young, mentioned earlier, and three in Meade County, all on August 6, when broods of twelve, two and one were seen. Apparently Meade County birds hatched considerably better than the other counties. This was attributed to the more favorable weather conditions during the nesting season in most of that county.

The average number of young in all observed broods in 1954 was 3.27 young per female.

SPRING 1955

The first young were seen on June 22, when a brood of ten were observed about four o'clock in the evening on the Finney County study area. Little time was spent searching for young after this date, as the project was soon to be discontinued and so most of my time was devoted to tabulating and evaluating previous work. The only other brood observed was in Meade County on June 27, when a hen with two young were observed. Meade County was the area of best production in 1955. ^{However in 1956} A-severe drought and hot weather dominated the area early in the spring, followed by severe thunderstorm activity, with hail, this apparently was very destructive to the young ^{there} ~~in that area.~~

Although little time was spent in search of broods in 1955, ranchers were called on and questioned as the material was being worked up. Lee Green, rancher, managing much of the

Finney County study area, told me he saw several large broods and more broods than were seen the year before (1954). O.C. Hicks, rancher, also from Finney County, told me he saw considerably more young this year than last.

PLUMAGE DEVELOPMENT OF YOUNG

The method of aging young by the condition of the molt has been worked out for many species of game birds. The method followed here is from that described by Baker (Baker 1953) and is based on his finding of the aging of pen raised Greater Prairie Chickens. I am assuming that the molt of the two are identical, although we do not know that they are. No material is available to me describing the molt of the young of the lesser prairie chicken.

The molt of the prairie chicken is as precise and orderly as in other birds. Feathers always molt in about the same order and the rate of growth is about the same. The sequence of the molt of young lesser prairie chickens appears practically identical to that of the young ring-necked pheasants (Mac Mullan 1954:47). The same sequence is followed and the same primaries are dropped and replaced within the same age variance. The major difference in the molt of the two is probably that the prairie chickens retain postjuvenile primaries 9 and 10 through the first winter, while pheasants molt and replace all remiges the first summer. Since even the lesser prairie chicken and the pheasant follow very closely the same molt condition, it seems probable that the molt of the two closely related prairie

Fig. a. Young prairie chicken 15 to 17 days old.

Fig. b. Young prairie chicken 51 to 53 days old.

Table 1.

DATE OF COLLECTION OF YOUNG.	AGE WHEN COLLECTED By molt condition	APPROXIMATE DATE OF HATCHING
6-12-'54	15-17 Days	May 28
7-15-'54	47-49 Days	May 29
7-17-'54	51-53 Days	June 1
7-18-'54	56 Days	May 25
7-31-'54	68-71 Days	May 23
8-10-'54	81-82 Days	May 21
8-18-'54	84 Days	May 26
8-22-'55	23-25 Days	May 28

Average hatching date May 26

chickens would be practically the same if not identical.

Following this method of aging table / shows the average hatching date of eight collected young to be May 26. The earliest date of hatching shown is May 21 and the latest is June 1. The sample here is small and with the exception of one bird, all were collected in 1954. This then probably does not show a normal hatching curve. Severe drought conditions existed on the study area during late spring of 1954, probably accounting for the lack of young from late nesting or renesting attempts. Apparently there was little or no survival from these nestings.

THE MOLT OF THE ADULT

Breeding and display activity of the male ceases about June 10 or usually during the second week in June. Males collected during the last week of booming activity show they had already begun a molt of the remiges. Primaries 1 and 2 usually were replaced and growing. See Bird No. 21.

A single hen, Bird No. 3, thought to be a cock when collected on July 7, 1954, shows a fully developed brood patch. No progressive molt had begun in the remiges or body feathers, indicating hens probably do not molt until after nesting and rearing of the young.

A hen which apparently was unsuccessful in her nesting attempt, No. 12, shows a molt condition very similar to that of a cock taken two and a half weeks earlier. This would seem to indicate that the hens that are unsuccessful in their nesting attempts go into a molt as the nest is abandoned or

destroyed ~~when~~^{if} the season has advanced past^{possible} renesting attempts. Whereas those that succeed in raising a brood may not molt until the brood is nearly mature. Thus we probably have a wide time variance in the molt of the hens. Some that had their nest destroyed too late for renesting might have a molt condition corresponding closely to that of cocks. Hens that lost their nest later would molt later and those that raised broods would molt still later.

The Pinnae are molted as the body molt, which starts on the wings and spreads quickly over the body, reaches the cervical region. The tail, head, and feet, caudal, capital, and pedal tracts, are the last to molt.

The retrices, being in the caudal tract, molt late or last along with the capital, and pedal tracts. Apparently a few of the more central retrices remain, Bird No's. 11 and 12, as the rest are dropped about the same time. The retrices of the males usually become badly worn. Often enough of the tip is worn away to completely lose the white band around the tip of the tail. This white band measures approximately 3 m.m. wide when the feathers are new. The primaries referred to herein are numbered proximal to distal in accordance with that procedure followed by Baker. Primaries 9 and 10 were judged juvenile or adult following the system used by Ammann (Ammann1944).
No. 3 FEMALE Taken July 7, 1954, all feather tracts complete, no molt has yet begun. Primaries 9 and 10 are juvenile, indicating the bird to be a little over one year old.

No 11 MALE Taken August 31, 1954, Primaries 8, 9, and 10 have been molted and show growing feathers; their respective lengths are 136, 70, 4 m.m. Since No's. 9 and 10 are molted, the bird must be over 1 year old. The retrices are badly worn, showing only a white tinge at the tips. Only 13 are present with the outermost ones being missing. No new replacements are in evidence for the missing feathers. The pinnae have been molted and are 19 m.m. long.

No. 12 FEMALE Taken September 17, 1954. Primaries 8, 9, and 10 have been molted and show growing feathers. Their respective lengths are 144, 95, 61 m.m. Since No.'s 9 and 10 are molting, the bird is over a year old. The retrices show only five of the more central, three right and two left, feathers remaining. The new feathers, still sheathed, are fairly uniform in length, being between 10 and 15 m.m. long, indicating they were all dropped about the same time.

No. 13 MALE Taken October 20, 1954. The molt of the remiges is complete and feathers fully grown. Primaries 9 and 10 are adult feathers. The retrices also have all been replaced and fully grown. White band around end of tail is 3 m.m. wide. Pinnae molted and growing 30 m.m. long.

No. 14 MALE Taken January 11, 1955. All molts complete. Primaries 9 and 10 are adult pinnae 64 m.m. long.

No 21 MALE Taken June 9, 1955. Primaries 1 and 2 have been molted and replaced. Feathers still growing and

are 27 and 5 m.m. in length. The other primaries are badly worn and some have broken tips. The retrices are also badly worn, having the white band completely worn away. None have been molted. The pinnae have not molted and are 62 m.m. long.

No 23 MALE June 27, 1955. Primaries 4 and 5 have been molted and replaced. Feathers still growing and are 112 and 52 m.m. in length. Primaries 9 and 10 are juvenile. Bird about one year old. Other primaries are badly worn and broken. Retrices badly worn. White band at tip of tail completely worn away. None have been molted. The pinnae have been molted and are very short, 10 m.m. long.

No 24 MALE July 15, 1955. Primaries 4, 5, and 6 have been molted and replaced. Feathers still growing and are 101, 71, and 13 m.m. in length. Primaries 9 and 10 are juvenile indicating bird to be one year old. Other primaries badly worn and broken. Retrices badly worn. White band at tip of tail completely worn away. None have been molted. The pinnae have been molted and are 15 m.m. long.

FLOCKING

The females are very adept at concealing the young, particularly during the first few weeks after hatching. Although the jeep with the flushing device was operated May 24, 25, 27, and June 1, 3, and 11, the first young were not found until June 12, 1954. One was collected and proved to be 15-17 days old, according to the condition of the molt of the remiges. Young collected later revealed that some had hatched as early as May 21. Thus it seems that this flushing device is not satisfactory for this dense sagebrush cover for locating broods or nest. In fact, all broods were found on foot or by observing windmill waterholes. It was found that young under 3-4 weeks of age were extremely hard to locate in this cover type. As the young advanced in age, they became increasingly less difficult to locate. On a few occasions, young of different size, presumably of different age, were seen together in the same broods. This probably indicates an intermixing of broods in the fields as they meet and separate or adoption of strays.

By mid-August the majority of the young are near maturity. The flocking tendency becomes much more evident after about the first of October. Later in the winter, snow and cold seems to cause flocks to group together into still larger flocks. The prairie chickens are often found in small flocks of 10-15 birds during the fall and early winter. These small flocks sometimes, but certainly not always, are made up of birds of the same sex. This tendency has been reported from

an analysis of a hunting seasons kill in New Mexico (Levon Lee 1949:475-77) when they found the birds to be often in age groups as well as sex groups. However, this age grouping tendency could not be checked during this study.

It seems probable, from field observation, that the size of the winter flocks depends much on the local weather conditions. During a mild winter with little snow, such as the winter of 1954-'55, the flocks remain small all winter, mostly under 50 birds. This ^{at} year compared to the cold, snowy winter of 1951-'52 before this project was enacted was quite a change. We observed flocks on a number of occasions, in January and February of 1952, that were estimated to number up to 500 birds. The largest flock observed was one that fed regularly in a small maize field of about 80 acres in Kearny County, southeast of Lakin. A peak of at least 500 birds was reached in January and February, 1952. Even though most of the birds congregate into flocks, one frequently finds singles or small groups during all seasons of the year.

MOVEMENTS

Exact movements of birds in this area are not yet fully understood. Over-all, seasonal changes are very evident. However, the grassland in which the birds are to be found in Finney County is all in one block, or strip, running parallel to the Arkansas River and consists of about 161,000 acres. This strip varies in width from about five to twenty-five miles.

The birds are rarely seen outside of this sagebrush-

grassland area between the first of May and the first of October (summer). In fact, it seems they leave the grass only in search of food during the months when the insects and green vegetation are nearly absent in the sandhills. As the fall weather, frost, and winter approach, the birds drift to the edges of the sandhills and begin feeding regularly, morning and evening, in the adjoining feed fields. ~~Some~~ ^{Most} flocks return to the grass and sagebrush to roost at night and also to loaf through the day. If suitable roosting cover, often sparse weed cover, is to be found in the fields, the birds may spend the night roosting in the feed fields if sufficient cover is available. The normal pattern most often followed was for the birds to return to the outer edges of the sagebrush through the middle of the day, except when there was a snow cover. Then the birds remained in the fields and fed most of the day.

During the ~~the~~ winter months, when the birds are feeding outside of the grassland area, they are seldom found back in the interior of the grassland. Instead, they remain in the outer $1\frac{1}{2}$ to 2 miles edge of the grass and sagebrush. As spring approaches, or a warm period occurs, the males return to the booming grounds, still flying out morning and evening to feed in the fields.

H A B I T A T

SPRING AND SUMMER COVER PREFERENCE

About the middle of March, or probably as sufficient insects are available to provide a food supply, the adult

birds gradually stop their morning and evening safarias into the feed fields and remain full time in the interior of the sagebrush-grassland area. The cocks become increasingly more active on the booming grounds. Early in the season, they tend to spend the night roosting near the protection of sagebrush clumps around the edge of the grounds, or under sparse weed growth as close as possible to the ground. As the tempo of the booming and dancing increases, they often spend the night on the booming ground proper. This can be plainly seen by their stools. Probably each cock stays in his particular territory all night long. During the day both sexes feed at random through the sagebrush, grass and weed patches, usually avoiding the denser sagebrush and feeding around the edges and more open spots. The hens apparently roost at random in sparse sagebrush or short weed cover.

As the young hatch, the hen is able to keep them very well concealed in the denser sagebrush. As the young grow older, they become less difficult to locate. They seem to feed more in the low open weedy depressions that usually are devoid of sagebrush. The weeds^{in these depressions} also probably harbour a more abundant insect food supply as well as the broad-leafed plants that are often browsed for green vegetation.

During the heat of mid-summer, the birds loaf in the shade during the mid-day, feeding in the cool of the morning and evening.

As the cocks leave the booming grounds, they go into a heavy molt and are very difficult to locate, apparently retiring

to the protection of the heavier sagebrush cover.

FALL AND WINTER COVER PREFERENCES

After frost and as the insect food supply decreases and later disappears, the birds gradually begin to group up and move out from the interior of the sandhills to the edge of the grass sagebrush area. They usually loaf through the day in the sparse sagebrush cover, sometimes also roosting there, or roosting in the feed fields if a sparse weed cover is available. During cold weather they often move into areas of larger weed or heavier sagebrush cover for roosting protection. The denseness of the cover seems to never even approach the dense cover often used by pheasants during cold, snowy spells. Prairie chickens always seem to prefer sparse cover at least in this area.

WATER REQUIREMENTS AND WATERHOLE USE

Trapping was found to be most successful at waterholes. Certain flocks at times frequented waterholes with great regularity. However, we have come to believe that water is not a necessity of the birds, but rather a luxury. Of the flocks kept under daily surveillance, many more seemed not to water than those that did. Probably the only time water is actually a necessity is during the hatching season, particularly the latter part of it. Then, it seems, the newly hatched young must have water. This probably is usually obtained in the form of morning dew. However, some years we have dry periods of no dew. This being the case during the latter part of the hatching season of 1954 and is believed the reason no

late broods were found that season.

We found that when we had a situation where a windmill waterhole was in or very near a feed field that prairie chickens were feeding in, they sometimes formed a habit of watering each time they fed, often walking to the water. Such a situation is not common in this area as the wells are, for the most part, back in the pasture away from the fields. Most of the flocks that were closely checked never or seldom were seen watering. For example one flock of 25-35 birds were observed twice daily for continuous periods of up to a week long, from January 10 through March 4, 1955. This particular flock was roosting along the north edge of the Finney County study area. They crossed the Arkansas River to feed twice daily in a maize field. The river is broad at this point, at least a quarter mile wide. It carried little water during this period and many standing pools were scattered across its broad bed. Although this situation would seem very inviting to chickens, should they want or need water, they were never seen to alight or water in the river bed. This was the only water available to this flock since all the stock-water wells had been shut off and the tanks drained for the winter. Other flocks were followed periodically during the study. Most flocks, as the one that fed on the Potter farm southeast of Garden City, had no water available anywhere in its normal daily feeding range and must not have had need for water.

We did find, however, that as the nesting season approached, the hens seemed to frequent waterholes more often or at least in larger numbers than the cocks. Late winter or spring

trapping netted a larger percent of hens than did mid-winter trapping.

FOOD HABITS

FOODS OF THE ADULT

The adult lesser prairie chicken probably includes a greater percent of insects in its summer diet than any other of our upland game birds. As is shown in figure 6, the foods taken by the lesser prairie chicken in this area are essentially insects in summer and small agricultural grains in winter. Broad-leaved plants, weeds, and grasses (mostly green wheat) are taken as vegetation.

Grasshoppers make up the largest portion of the animal diet, with beetles, caterpillars, and bugs following in that order. Bees, ants, spiders, cicadas, and a few other insects were taken on occasions. See table 3.

Maize and other small agricultural grains are the most abundant vegetable foods. Green wheat, ground cherry, other forbes, and sagebrush make up the bulk of the rest. See table 2.

PREDATORS AND OTHER HAZARDS

Too many people are prone, even today, to place too much blame for game losses on predators, even though many studies have definitely shown predators to be a much less limiting factor than was supposed years ago.

During the short course of this study, none of the furbearers were found to be an important predator on prairie chickens of any age.

Figs. a & b. Desert ground squirrel, probably most serious predator due to relative abundance, preys on nests and young.

Predator species which are most abundant in the area and because of their presence probably prey upon the birds on occasion, are ground squirrels, badgers, coyotes, marshhawks, other hawks, and the great horned owl.

GROUND SQUIRRELS--Ground squirrels of two species, striped ground squirrel and desert ground squirrel, are abundant throughout most of the lesser prairie chicken range. Because of its comparative abundance the desert ground squirrel is probably the most serious predator to nests in the area. The remains of that nest located in 1954 was probably destroyed by one of these ground squirrels.

BADGER--Badgers are fairly common throughout the range of the lesser prairie chicken. They probably destroy nests when found, although no evidence was found during the course of this study to indicate badgers affected numbers of prairie chickens severely.

COYOTE--Two ^{consecutive} winters preceding this study, the coyote had been poisoned with 1080 poison by the Fish and Wildlife Services Predator Control program in Finney County. Finney County was where the bulk of the study was made, consequently the coyote population was very low. However, the population had increased considerably by the second year of the study. Only one instance was found where it was believed a coyote had fed on prairie chicken. This was near a windmill waterhole during July, 1955. A fence nearby may have been the cause of the death and the coyote merely fed on the dead bird. Tracks in the mud certainly indicated that a coyote had fed on this

bird, but showed no evidence of a scuffle.

MARSH HAWK--The marsh hawk is a fairly common summer resident in the area and an abundant winter resident. Marsh hawks were easily the most common hawk seen around and over the chickens. They could be seen hunting over fields harboring feeding prairie chickens most of the time. The birds often were flushed by these hawks and undoubtedly were harassed often by them. It was a common sight to watch a hunting marsh hawk as he passed near a flock of feeding birds, bank and swoop low over the birds, causing them to flush and move to another sector of the field. Following is an account from my field notes.

February 26, 1955 8:30 A. M. to 11:45 A. M.

Cloudy with snow showers, 32° wind E, NW, 20-25 MPH.
Potter farm, maize field. Observing feeding activity of prairie chickens. Birds seem to be badly scattered throughout the field of 160 or more acres. Most flocks range from one to nine in number, totaling about 50-60 chickens feeding in the field. Four marsh hawks and one bald eagle hunting field and harassing the chickens. The chickens sometimes are flushed as often as four-minute intervals and seldom were unmolested for more than ten minutes. When molested, they simply flush and fly a short distance alighting still in the field and continuing to feed. No actual attempt by a hawk to catch a bird was seen. They seemed content

only to swoop low over the feeding flock causing them to flush just for pure devilment.

OTHER HAWKS--Prairie chicken seem to react in much the same manner to all hawks regardless of the species. Any hawk flying overhead, or even an airplane, causes the birds to cease movement until the danger is past. The large wintering populations of the Buteos "House Hawks", particularly the American and Ferruginous rough legs, were never seen to harass the birds.

The hawks as a whole, including the marsh hawk, undoubtedly are much more beneficial than detrimental to the prairie chickens, due to their tendency to feed on rodents such as ground squirrels, rats, mice, snakes, etc., that are harmful to the nests and young of all upland game birds.

GREAT-HORNED OWL--Since there is very little timber in the sandhill area, the great-horned owl probably affects the prairie chickens very little, if any, during the summer. However, during the winter, as the birds feed and roost sometimes very near the Arkansas River, which has many great-horned owls along its course, it is probable that a few are killed by them, although no actual predation by them was noted.

OTHERS--Other wildlife that at times might prey on the prairie chickens, but which are believed to cause very little harm, would include rats, snakes, skunks, stray cats, and stray dogs. The latter two probably might cause the most damage and may ^{at times} warrant control.

TRAPPING AND TRANSPLANTING

WEIGHTS

During trapping operations in February, March, and April of 1954, and April, 1955, thirty-five adult trapped birds were weighed at time of capture. Fourteen were females and twenty-one were males. Average weight of the males was approximately 1 pound 12 ounces and 1 pound 8 ounces for the females.

Yeatter (Yeatter 1943:393) reports average weights of the greater prairie chicken from Illinois in January as 2 pounds 4.7 ounces for males and 1 pound, 12.5 ounces for females.

Baker (Baker 1953:42) in his study of the Kansas Greater Prairie Chickens, gives their average weights as males, 951 grams (about 1 pound 14 ounces), females, 807 grams (about 1 pound 10 ounces).

This gives a difference of about 8 ounces between the greater of the Illinois study and the lesser of this study, and only about 2 ounces between the greater of Baker's Kansas study and the lessers of this study.

MARKING AND BANDING

A prerequisite to a study such as this is to be able to recognize individual birds when again encountered afield or in traps. Although most birds that were trapped on the W. Faye Stone farm in Finney County were banded, all banded birds were kept in captivity at our game farm for propagation studies. Some of the excess cocks were later released in Kiowa and Kingman Counties.

After this project was begun in 1953, all birds caught were banded in such a manner that cocks could be recognized

DATES ON WHICH INDIVIDUAL PHASES OF PROJECT
WERE STUDIED AND TIME SPENT IN EACH AREA

Beginning, August 19, 1953

670 days (556 working days)

Ending, June 30, 1955

1. HISTORY - Literature-

Kansas State College 10-7, 10-8, Kansas University 10-9,
Hays State College 9-30, Scott Co. 3-11, Logan Co. 3-11,
Hays 5-1, plus many unrecorded visits with old timers in
Finney Co., Kearny Co., Clark Co., Meade Co., Seward Co.,
Morton Co., Stanton Co., Grant Co., Ford Co., Gray Co.,
Pawnee Co., Edwards Co., Kiowa Co., Barber Co., Comanche
Co., and others, Colorado A. & M. College 2-19, Haskell
Co. 2-23, Scott Co. 3-22, Gray Co. 6-14

TOTAL 10 days

2. DISTRIBUTION-

Barber Co. 9-15, Clark 9-10, 9-15, 10-31, Finney Co. 9-25,
10-5, 10-19, 10-20, 10-28, 10-29, Ford 12-16, 5-14, Grant
11-23, Haskell 9-2, 9-4, 10-5, 11-23, Hamilton 12-22, 3-2,
Kearny 8-19, 8-31, 9-5, 9-6, 9-19, 9-24, 9-26, 10-2, 10-17,
10-30, 11-18, 11-19, Kiowa 7-14, Lane 10-28, Scott 9-11,
9-16, 9-29, Morton 1-6, 8-19, after initial distribution
check, bird distribution was included under feeding and
movements and not separately as locations.

Greater Prairie Chicken Chas Co. 10-6, 10-10

TOTAL 40 days

3. HABITAT & VEGETATION-

Hays State College 9-30, 5-1

TOTAL 2 days

4. MAPPING PERIPHERAL AREAS-

Oklahoma 5-17, 5-18, Colorado by correspondence with Don
Nolting, Bird Biologist, Colorado Game & Fish

TOTAL 2 days

5. LOCATE RELEASE SITES-

Finney Co. 11-2, 3-20, 4-10, Hodgeman Co. 7-23, Correspondence
from ranchers in Comanche Co., Rice Co., Scott Co., Wallace
Co., Stanton Co., and others wanting chickens released on
their ranches.

TOTAL 4 days

Fig. a. Captured male prairie chicken taken in Ligon type trap.
Fig. b. Captured male showing individual plastic strip marking.

from hens, even during the molt period. This was done by banding the cocks on the right leg and the hens on the left leg. This was not a satisfactory method of marking as it was difficult to see the bands at distances one must normally observe birds afield. Also this does not individually mark birds and one cannot know which bird is being observed without again being able to trap the banded bird. Re-trapping is quite often impossible.

Three birds trapped on April 6 and 7, 1954, in Clark County, were sprayed with dye. An immature female was dyed yellow, weighed, banded, and released. A mature female was dyed red, weighed, banded, and released, and an immature male was dyed green weighed, banded, and released. Only little time was spent in this area following this marking and none of the three birds were again observed. This dye method has been used successfully by other workers. However, since the birds of this project were trapped only during the winter and spring months, a short time before the birds annual molt in June and July, this marking lasted only a short time.

We planned to mark all trapped birds during the winter of 1954-55 with neck tabs of a type described by Richard Taber (Taber 1949:). This type marker had been used successfully on quail, pheasants, chucker, partridge, and band-tailed pigeons by the California Department of Game and Fish. However, the winter of 1954-55 proved to be a very mild one and no large concentrations were located. No flocks were found that followed a waterhole use pattern. Only six birds were caught by a variety of traps. One was marked by

this method. Others were kept for breeding purposes. The marked bird, a male, was taken in a tip top trap in a maize field just north of the Finney County study area on February 22, 1955. It was never seen again, and must not have danced on a ground in the study area or one of the many that were observed in the surrounding area.

D R U G S

Avertin, a brand name of the drug tribromoethanol, which is a white crystalline powder can be obtained dissolved in a solution of amylene hydrate and is soluble in water at 104° F. (40° C.) up to about 3.5 per cent. This narcosis-producing drug was experimented^{with} with the idea that we might be able to entice feeding flocks of birds to take treated grains, thus allowing capture in large numbers as the drug might temporarily immobilize the birds. We first tried treating shelled corn and placing the treated grain in the booming grounds shortly ahead of the arrival of the displaying cocks in the morning and later tried also in the evenings. The cocks refused to eat. Several reasons may have been the cause of the birds refusal to eat. After the amylene hydrate and water have evaporated, a white coating of avertin is left on the kernels, discoloring them. Amylene hydrate also has a distinct odor that may have been repulsive to the birds.

These first experiments with avertin and water-soaked shelled corn placed on the booming grounds were carried on in northeastern Kansas on booming grounds of the greater prairie chicken with the assistance of Game Management Supervisor,

Max Stone, who had previously worked out dosage of avertin necessary to narcotize domestic chickens, and project supervisor, Jim Coats. Upon returning to southwestern Kansas, I tried baits treated in the same manner with this drug on booming grounds of the lesser prairie chickens, first using shelled corn and in addition, maize treated in the same manner. When this failed, several grasshoppers were captured and a dosage injected into the hopper by means of a hypodermic needle. Unfortunately, this injection stopped muscular activity of the hopper and the chickens apparently refused to feed on these seemingly lifeless hoppers that were placed at several points within a booming ground.

In checking work done by Howard M. Wight, Missouri, he found that avertin decomposed upon exposure to $5\frac{1}{2}$ hours of sunlight, breaking down into hydrobromic acid and dibromoacetaldehyde, both strongly irritant. This may explain somewhat the cause of the birds refusing to eat the grain as it probably should be applied to the grain only very shortly before placing it on the grounds. Too, the birds at this time of year are on a diet consisting largely of insects. Probably the best season to use such treated grain would be during the winter months when the birds are feeding in small grain fields. The drug would remain potent longer, due to cooler temperatures, and also the birds would be feeding almost wholly on small grains. Possible pre-baiting an area with untreated grain would be very helpful, if not necessary.

Even though no success was attained by the use of this narcosis-producing drug, we believe that under some circum-

stances, it could be very effective. We simply have not experimented with it enough to work out proper techniques.

TRAPS USED AND EXPERIMENTED WITH

During the winter months of 1952, before inception of this study, Mr. Coats was in need of adult birds for use in his propagation studies. He contacted Mr. J. Stockley Ligon, formerly of the U. S. Fish and Wildlife Service, and had him come to Kansas to demonstrate trapping techniques and equipment that he had developed and used successfully on the lesser prairie chickens in other areas. These demonstrations took place in the area that I then worked as a District Game Management Supervisor and so I was present during this demonstration.

After Mr. Ligon had gone, Mr. Coats and I were able to trap 68 birds with this trap at a waterhole on the W. Faye Stone farm during February of 1953. Fifty-six of these birds were cocks, while only 12 of them were hens. This shows a disproportionate sex ratio of 100:21, and the ratio of old to young of trapped birds as 100:126. Such a small sample and short trapping period probably does not show these true ratios.

As I was subsequently assigned to this study, this pre-association with techniques of trapping proved very useful. The trap that had been designed and used by Mr. Ligon was retained for use and another made with modifications suggested by him. This was the most successful trap-type used during the course of this study.

Although we were very successful with this trap during

PLATE 7

Fig. a. Wing funnel net trap designed by J. Stokely Ligon

Fig. a. Ligon traps set at waterhole on Gabbert ranch
Fig. b. Ligon trap with trapped birds

the short period of trapping during the winter of 1952-53, we found it to be ^{useful} ~~successful~~ only at waterholes that were regularly visited by prairie chickens. Only one such waterhole was located during the winter of 1952-53, and all birds trapped were taken at that location. After the study was begun in the fall of 1953, there had been a substantial reduction in the over-all numbers of the chickens and none were feeding or watering on the Stone farm where trapping had been successful the year before. A number of flocks were located in Finney and Kearny Counties and their feeding pattern checked closely to determine if any might be watering. Much time was spent in search of prairie chicken flocks using a waterhole, but none could be found in Kearny or Finney County. It was believed that the series of weekly, or less, snow showers afforded the birds adequate moisture. On February 2, 1954, Mr. Coats and I visited chicken areas in Clark County and located a small flock of about 35 birds using a waterhold on the Gabbert Ranch. Later this flock increased to nearly twice that number.

Mr. Krier, operator of the Gabbert Ranch, gave us permission to trap ~~some~~ birds. Between February 2 and April 7 35 birds were caught. Twenty-two were males and 15 were females. Sex ration, 100 males per 68 females (100:68). Ratio of old to young was found to be 100 old per 65 young (100:65).

Comparing these ratios of trapped birds for the two seasons, this shows the sex ratios to be: 1952-53, 100:21 in Finney County and 1953-54, 100:68 in Clark County. The old-young age ratios would be: 1952-53, 100:126 in Finney County

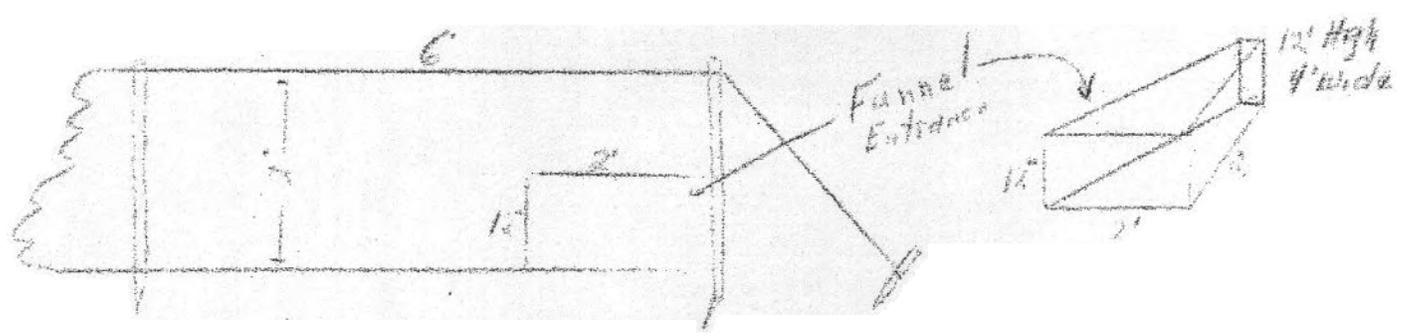
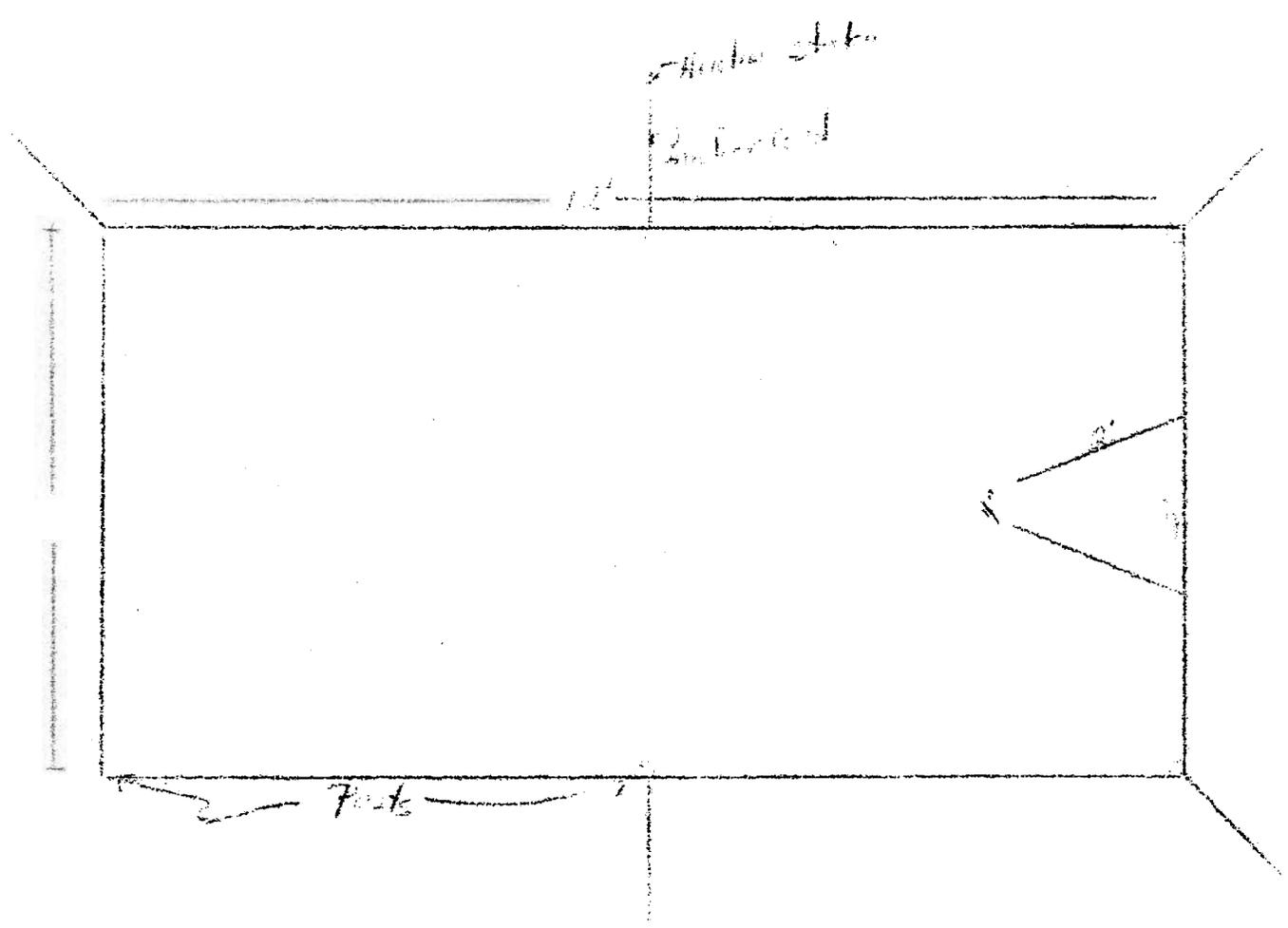


Fig. 1 Instrument Type Wire Fall Trap

Fig. a. Ligon trap showing trapped birds.

Fig. b. Ligon trap, removing birds with dip net.

and 1953-54, 100:65 in Clark County.

Admittedly, there are many factors to vary these figures. The samples were ~~relatively~~ small and in widely separated areas. The sex ratio appears to be the less accurate of the two. The old-young ratios probably are a truer reflection of the success of the hatch the previous season, in that particular area.

O T H E R T R A P S

As the winter of 1953-54 progressed, it soon became evident that other traps designed for use other than at waterholes use would have to be devised if any chickens were to be trapped. Baiting areas in an effort to eventually bait the birds into traps was tried without success, as there was an abundance of waste grain in the many fields surrounding the area.

P E R M A N E N T W I R E F U N N E L F I E L D T R A P

Two permanent funnel-type wire traps with netting tops were erected in a maize field on the Potter farm southeast of Garden City. The area was baited previous to trap erection. These traps were left out several weeks without success. Clean thrashed maize was used as bait; however, field observations indicated that the birds might prefer unthrashed grain still in the head. The birds often pull off chunks of the head containing a number of kernels and swallow the chunk in a browsing manner. This may be preferred by them rather than picking up one kernel at a time of thrashed grain.

D R O P - N E T T Y P E

This net was attached to a frame and suspended by means of a heavy cord to four posts so as to form an overhead net

(Green Steel Market Trap)

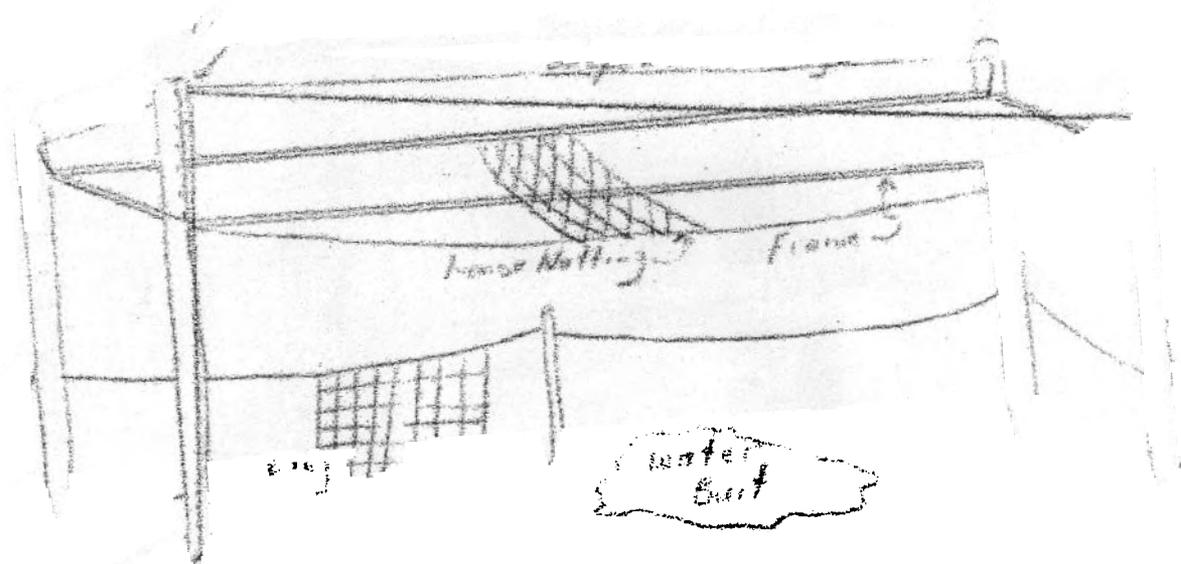


Fig. 8 Drop Structure Trap

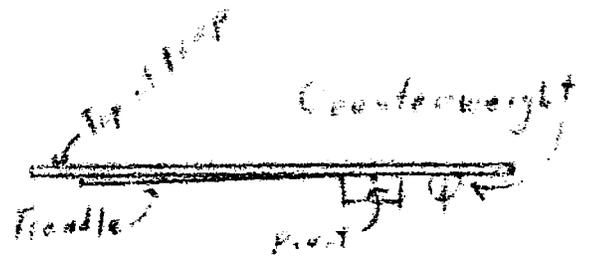
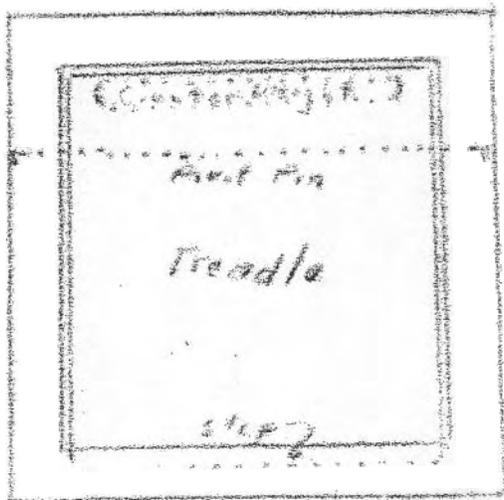
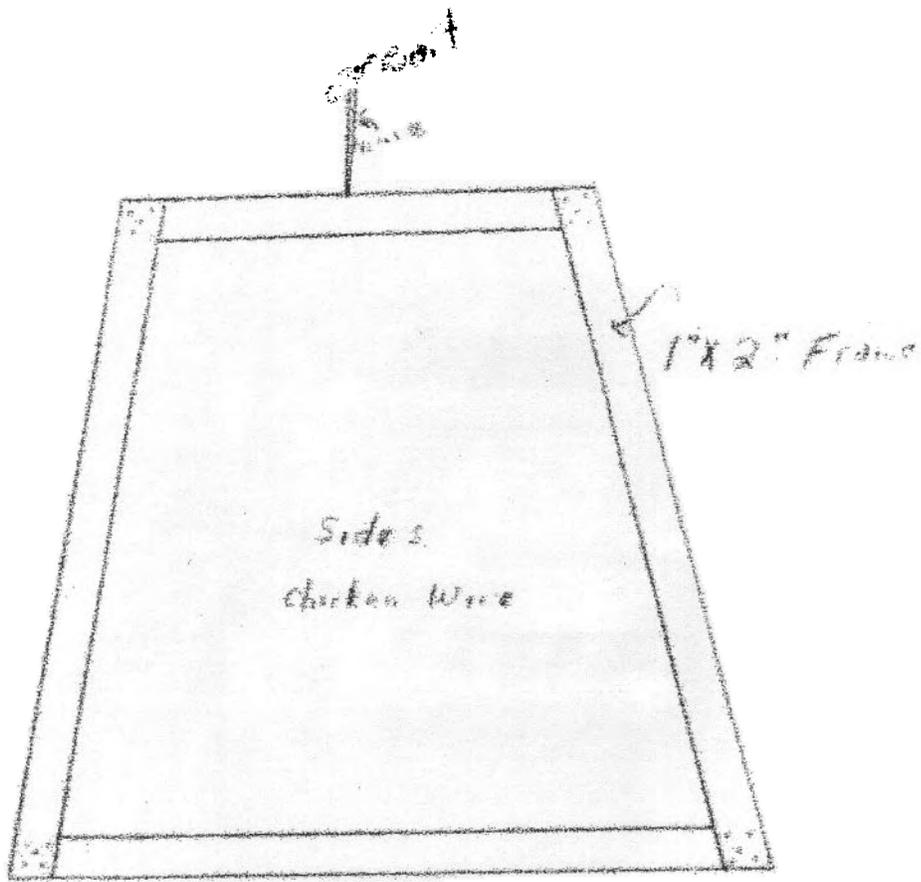


Fig. 9. Tip Top Trap

that could be dropped as birds were lured under it. This was suspended about $3\frac{1}{2}$ feet above the ground and experimented with at waterholes. Pools of water were used to entice the birds under the net. The birds were suspicious of anything over their heads and so only two birds, of the many that came near, actually walked under the net. The first bird escaped after the net had fallen over it. The netting on this first model was stretched tight, thus allowing the bird to worm its way out from under the net before we could reach it. A revision of design was made, giving a loose, baggy netting cover. Only one bird walked under this net and was caught. However, since most birds would not tolerate the overhead structure, it was not considered worthy of further experiment.

TIP TOP TRAPS

Four tip top traps had been constructed for Mr. Coats and tried by him previous to this study. He had used them near Sitka in Clark County on the Bill Dome farm. Although he was able to trap a few birds, the process was slow and drawn out, thus not too desirable. These traps were given to me and used in feed fields near Garden City on the Vaughn and Bill Rapp farms during the late winter of 1954-55. One bird was caught at each location. Both were males, and the bird from the Rapp farm had a deformed, hooked bill and was very poor. It died two days later during a cold rain. This type of trap probably would be much more successful during spells of cold, snowy weather. Such a condition did not exist in 1954-55 except for very short periods.

SPRING NET TRAP

This trap is constructed by welding the ends of two half-ovals to a pair of covered spring screen-door hinges. The trap is covered with loose netting while the ovals are laid out flat. This then was set by staking one oval to the ground and folding the other oval back on it, thus cocking the springs. A self trip was made from mouse traps so that a head of maize could be attached by a length of string to the trip of the mouse trap. When a feeding bird moved the head, the trap was set off, catching the bird in the bag of the netting. This trap was developed too late in the study to test its diversity of use. It may be very useful, particularly for booming ground trapping. It seems also to have promise of success when used in feed fields. In such a situation, a number of the traps probably would have to be used. Two cocks were captured on the booming ground during its short period of use.

RELEASE NETS

A release net was constructed, plate 10, to allow a gentle, quiet release so as not to scare or frighten the birds away from the desired release sit. This net was made from the same material, two and a quarter inch netting, that the waterhole trap was constructed from. The net was six feet wide, twelve feet long, and eighteen inches high. A release gate was made to completely close one end of the net, (6' x 18"). This gate was constructed so that the gate might be fastened down by means of a slip loop that could be pulled loose from a remote position, usually out of sight of the birds. This gate was suspended on two covered spring screen-door hinges. When

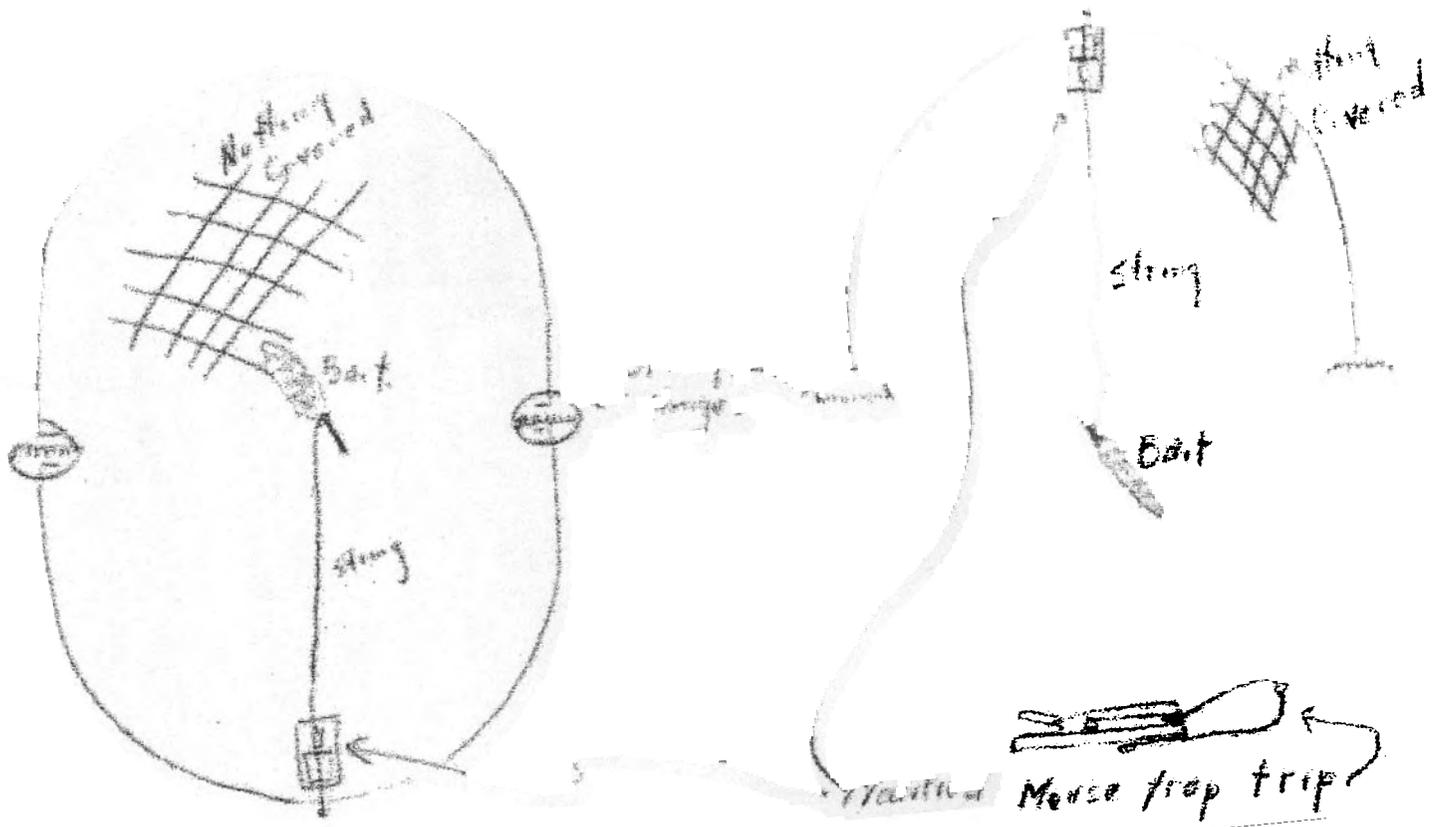


Fig. 10 Spring Hinge Ground Net Trap.

PLATE 10

Fig. a. Release net, showing gate closed with slip knot string.
Fig. b. Release net, showing gate open, note spring hinges.

released it swings up slowly, opening a complete end of the enclosure, allowing the birds to move out as a group. This was very successful and all released birds walked off at ease. None seemed frightened or flushed.

RELEASES

Three releases were made, one each in Kiowa, Kingman and Finney Counties.

RELEASE NO. 1--This release in Kiowa County was made by Jim Coats, March 17, 1953. Due to other scattered flocks in this area, determination of success or failure of birds to remain in that area is not possible. No birds have been observed close enough to reveal leg bands. The release consisted of eight cocks trapping during February, 1953, on the Stone farm in Finney County.

RELEASE NO. 2--Release made in Kingman County on September 28, 1953, by Jim Coats and myself. This release consisted of surplus cocks retained from 1953 trapping on the Stone farm in Finney County. They may have been seen once after release. The birds failed to stay in area of release. Release consisted of ten cocks.

RELEASE NO. 3--Released in Finney County. First birds were released by me on March 25, 1954, supplemented with more birds on April 2 with Jim Coats. Total birds in this release was thirteen, nine cocks and four hens. The release was made just before the nesting season and was successful in that the cocks established a booming ground in the vicinity of release and the hens nested. By the fall of 1954, Mr. Raymond Erkie, owner of release site

land reported a flock of 30-35 birds. Possible this
release will be successful in establishing a new breeding
colony.

CONCLUSIONS

1. Improved grazing practices of the rancher within the range of the lesser prairie chicken have apparently allowed them to survive the present severe drought of the past three years in larger numbers than would have been possible a very few years ago.
2. Air census of lesser prairie chickens on the booming grounds is not successful in this area.
3. Lesser Prairie chickens feed primarily on insects in summer and agricultural grains in winter.
4. Adult lesser prairie chickens probably feed more on insects when they are available than any of our other upland game birds.
5. Lesser prairie chickens apparently do not need water to exist after reaching an age of about three weeks.
6. Booming grounds were found to be located in a variety of locations, habitats and elevations. A small rise or knoll was usually the center of use on the grounds. No particular character could be singled out to predict where the grounds might be located in any new locality.
7. The booming sound of the lesser prairie chicken could be heard at considerably greater distances than the sound made by the greater prairie chicken.
8. Booming grounds do not continue to grow and harbour more cocks in a growing population, instead it seems they can harbour only a given number after which time smaller supplementary booming grounds spring up in surrounding areas.

9. It appears that old established booming grounds will remain about the same in a declining population, with small supplementary booming grounds disappearing, or consolidating with the major grounds first.
10. Nests are extremely difficult to locate in the dense sagebrush cover.
11. The hens are very adept at concealing their young until they are about three weeks old.
12. Hatching begins in late May, and due to the short breeding season, lasts only about six weeks.
13. Young have completed their post-juvenile and juvenile molts at the age of about 14 weeks.
14. Flocking, as to age and sex, varies from year to year and from area to area.
15. Winter flocks on occasion reached as many as 500 birds. They normally ranged under 75, however.
16. Birds were found widely distributed throughout large blocks of pastureland during the summer months. They seemed only to leave during the months that the insect food supply was insufficient for their needs as food. During this season they move to the edge of the pasture area and feed in small grain fields, returning to the grassland to loaf and roost.
17. Only one adult bird was found that was believed to have been killed by a predator, probably a coyote. Ground squirrel predation on nests is believed the most serious type of predation.

18. Only two types of traps were found to be successful to a point as to be worthy of use, one the waterhole net trap designed by Mr. J. Stokley Ligon, with a modified entrance, and a hoop, spring ground net trap designed by the writer.
19. Avertin, a narcosis-producing drug, was tried without success. However, its possibilities were not exhausted and it may be simply a matter of technique.

SUMMARY

1. The original range of the lesser prairie chicken probably covered most of the southwest one-third of Kansas. As the land was settled and small scale farming began, they apparently increased their numbers. However, this agricultural expansion was rapid and soon reached a point of detriment to the chicken population causing the numbers to drop off far below their original numbers.
2. Present range of the lesser prairie chicken is only a very small percent of the original area. The two major areas remaining are the sandhill and rough pasture areas along the Arkansas and Cimmaron Rivers.
3. Paleontologists find fossil remnants of the greater prairie chicken in this area but not the lesser prairie chicken, indicating that the greater was to be found here years ago, whereas the lesser is apparently a more recent replacement.
4. The drought of the 1930's almost exterminated the entire lesser prairie chicken population of Kansas. Since that time they have made an impressive comeback.
5. Spirited booming ground activity and display usually began in the last two weeks of February and continued through June 10-15.
6. Booming grounds were located in a wide variety of locations of varying terrain and vegetation, even if it was located in a valley or on a sidehill. A small raise or knoll was usually the center of a display ground.
7. Booming ground activity was greatly slowed down and even stopped for periods of up to three days following blowing dirt storms that occur in the area most spring seasons.

8. The "Blurping" sound made by the booming lesser prairie chickens could be heard much greater distances than the "Whocing" made by the greater prairie chicken.
9. Booming ground census from the air proved unsuccessful on two attempts, one on April, 1954, and one on May 5, 1954.
10. Numbers of cocks on the booming grounds varied from 1 to 33.
11. Although many areas were searched for nest by several methods, no nests were located due to the excellent nests concealing habitat and the hens unwillingness to leave the nest.
12. First broods were located early in June. Collected young showed them to begin hatching the last week of May.
13. Locating broods under 3 weeks of age in this area of dense sagebrush cover was found to be very difficult.
14. Young often frequent waterholes in later summer during drought periods, if they are handy.
15. The molt was found to be similar to the molt of the greater prairie chicken completing the post juvenile and juvenile molts when approximately 14 weeks of age.
16. Some indication was found to indicate flocking of sex and age groups in the fall and early winter although this appeared not to always occur each year or alike in all areas.
17. It seemed probable that the size of the wintering flocks may depend somewhat on weather conditions particularly low temperature and snowfall.
18. Largest winter flock seen in this area was approximately 600 birds. Flock size normally ranged under 75 birds.
19. The birds are rarely seen outside of the grassland area from the first of May until the first of October. They seem to leave the grassland only during the winter months in search of food

20. On cold, snowy winter days the birds often remained to feed most of the day in the fields. They prefer to roost in grass cover.
21. The birds are seldom found back in the interior of the grassland area during the months they are feeding on a grain diet, but as an insect diet makes itself available in the spring they change to feed largely on insects and seldom leave the area.
22. Drinking water appeared to be a luxury and not a necessity.
23. The food of the adult consists largely of insects in the summer and small grain in winter. They probably include a greater percent of insects in their diet when available than any other of our upland game birds.
24. Predators and hawks were not believed to cause unnecessary damage. Ground squirrel predation on nests was believed to be the most serious threat.
25. Trapping was most successful at waterholes in late winter.
26. Avertin, a narcosis-producing drug, was experimented with on small grains and grasshoppers. Little success was achieved. However, we believe this has good possibilities and needs further experimentation.
27. Many types of traps were experimented with. The waterhole net trap designed by J. Stokley Ligon proved the most successful. A self-tripping ground net trap probably has good possibilities for booming ground trapping.

Bird Number 1 Age 2-3 weeks Date June 12-54
12-11 days

Where Collected: T 24 R 33 S 26

Buffalo Pasture

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
		X	X	X	X	X	X					X	X	X	X	X	X				Growing Feather X
15	20	25	30	35	40	40	40	0	0	40	50	55	55	55	45	40	35	0	0		Measurements in MM

Bird Number 2 Age 7 wks Date July 15-54
41-47 days

Where Collected: T 35 R 22 S 12

Clark Co. Kans.

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
X	X	X					X	X	X	X	X	X	X				X	X	X		Growing feather X
15	22	24	25	27	28	28	34	44	23	24	25	26	27	30	29	28	39	44	24		

Bird Number 3 Age Adult ♀ Date July 7, 54

Where Collected: T 24 R 33 S 35

Buffalo Pasture

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing feather X
10	11	12	13	14	14	14	13	11		11	11	11	13	13	14	14	14	13	11		Adult ♀ Not Molting - Breed Patch well developed

Bird Number 6 Age 7-8 weeks Date July 17, '54
51-53 days

Where Collected: T 24 R 33 S 33

Lee Greenland Brood of Six

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing Feather X
X	X	X						X	X	X	X	X						X	X		
78	68	42	0	2	1	1	10	57	7	78	68	42	0	88	99	116	70	57	36		Measurements in M.M.

Bird Number 7 Age 8 weeks Date July 18, '54
56 days

Where Collected: T 24 R 33 S 34

Lee Greenland Brood of Two

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing feather X
	X	X						X	X	X	X							X	X		
97	101	92	72	45	101	111	126	72	42	94	102	96	71	28	40	107	92	69			Measurements in M.M.

Bird Number 8 Age 9-10 weeks Date July 31, '54
68-71 days

Where Collected: T 25 R 33 S 4

Lee Greenland Brood of Seven

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing feather
				X	X			X	X					X	X			X	X		
94	100	106	115	95	42	112	126	122	97	94	100	106	115	92	42	112	7	126	100		Measurements in M.M.

Measurements in M.M.

umber

Aug. 10, '54

Measurements in M.M.

Bird Number 12

Age Adult ♀

Date Sept. 17 '54

Where Collected: T 24 R 34 S 24

Arch Wagner Land (So. of Holcomb) Coll. by Jim Coats

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing Feather
								XXX										XXX			
96	99	102	104	100	100	104	104	99	99	97	99	102	102	112	108	106	104	95	91		

Bird Number 13

Age Adult ♂

Date Oct. 20 '54

Where Collected: T 24 R 34 S 35

Brown Land (So. of Holcomb) Group of 17 banded

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing feather
101	104	109	117	120	127	132	134	126	112	107	105	108	112	107	107	107	104	104	111		

Bird Number 14

Age Adult ♂

Date Jan. 11 '55

Where Collected: T 24 R 33 S 14

On Vaughn Land (So. of Buffalo Pasture)

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing feather
112	110	112	118	124	125	127	125	124	115	107	108	106	113	117	117	111	113	115	116		

Bird Number 15 Age Adult ♀ (old) Date Feb 10-55

Where Collected: T 26 R 33 S 17

Eggs Stone Farm (Maize Field)

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing Feather
																					Life Mount not Measured

Bird Number 16 Age young of year ♂ Date Feb 25-55

Where Collected: T 26 R 33 S 17

Eggs Stone Farm (Maize Field) 10:00 AM

Pinnae 65 mm

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing feather
99	103	109	117	Broken	123	128	134	140	151	95	101	110	116	122	133	139	156	177	122		

Bird Number 17 Age Adult ♂ (old) Date Mar 11-55

Where Collected: T 25 R 32 S 16

Hicks Ranch - Booming Cuck

Pinnae 64 mm

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing feather
99	101	108	120	145	153	158	157	146	157	96	102	107	120	146	155	156	157	144	106		

Bird Number 18 Age Adult 1954 Date Mar. 16-55

Where Collected: T 25 R 32 S 25
Pete Smith Farm wheat & Maize Field 9:45 A.M.

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		Growing Feather
91	98	104	112	131	150	157	157	146	119	79	100	106	114	130	146	155	151	141	119		

Nos 19 & 20 are Life Mounts.

Bird Number 21 Age Adult ♂ Date June 9-55

Where Collected: T 25 R 33 S 4
Lee Greene Ranch (Booming Gr. No. 14) Primaries badly worn

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		Growing feather X
XX										XX											
54	11	115	126	128	146	151	125	128	118	27	5	114	114	131	153	146	113	130	119		

Tip broken Tip broken

Bird Number 22 Age 3-4 wks. Date June 22-55

Where Collected: T 24 R 33 S 21
Lee Greene Ranch (Brood of 10)

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		Growing feather X
X			XXXXX											XXXXXX							
15	6	6	6	6	6	41	31	0	44	6	6	6	6	6	6	42	42	30	0		

Bird Number 23 Age Adult ♂ Date June 27-55
 young of 1954

Where Collected: T 33 R 28 S 36
 Near Aaron Haruh Farms

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
			XX										XX								Growing Feather X
100	105	110	105	110	115	110	115	110	115	102	107	112	117	112	117	112	117	112	117		

tips broken

Bird Number 24 Age Adult ♂ Date July 15-55
 young of 1954

Where Collected: T 25 R 34 S 9
 P. A. Brown Land

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
			XXX										XXX								Growing feather X
96	100	107	105	110	115	110	115	110	115	97	101	108	113	108	113	108	113	108	113		

very badly stained

Bird Number _____ Age _____ Date _____

Where Collected: T _____ R _____ S _____

Left Wing Primaries										Right Wing Primaries										Wt.	Remarks
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		
																					Growing feather

JANUARY (1 Bird)

No. 14

Jan. 11, 1955 Lesser Prairie Chicken Adult Male No. 14

Kansas, Finney Co. Vaughn Feed Field 6:30 P.M. M. D. Schwilling

Gizz. 9.8cc. Crop Emptycc. Anim. -% Veg. 100% Grit 1.4cc. 12%

Crop-Empty

Gizzard-Grit	1.4 cc.	12%
Sorghum (Hulls)	1.8 cc.	18%
Unknown (Seed & Vegetable) Seed resinous, Hulled Lots of Woolly Material	8.0 cc.	82%
2 Straw Paspalum Stramineum (Seeds)		Tr.
Sunflower Helianthus (Hulls) (Seeds)		Tr.
1 Lepidoptera (Larvae Small)		Tr.
	<hr/>	<hr/>
	9.8	100%

FEBRUARY (2 Birds)

No. 15

Feb. 10, 1955 Lesser Prairie Chicken Adult Female No. 15

State, Kansas, Finney Co. Faye Stone Farm Maize Field 11:00 A.M.

Collector: M. D. Schwilling w/Jim Coats

Gizz. 18.6cc. Crop 3.1cc. Animal ___% Veg. 100% Grit ___cc. Tr.%

Crop---

105 Sorghum (Seeds) (white)	3.0cc.	97%
5 Sorghum (Seeds) (red)	.1cc.	3%
Sorghum (Hulls)		Tr.
Grit		Tr.
	<hr/>	<hr/>
	3.1	100%

Gizzard--

Sorghum (Hulls)	15.7cc.	84%
67 Ragweed (<i>Ambrosia coronopifolia</i>) (Seeds)	.6cc.	4%
83 Sorghum (Seeds) (White)	1.9cc.	10%
15 Sorghum (Seeds) (Red)	.4cc.	2%
Grit	<u> </u>	<u>Tr.</u>
	18.6cc.	100%

Feb. 25, 1955 Lesser Prairie Chicken Adult Male No. 16
 State, Kansas, Finney Co., Faye Stone Farm Maize Field 10:00 A.M.
 Collector: H.D. Schwilling

Gizz. 23.7cc. Crop 1.9cc. Anim. % Veg. 100% Grit 0.2cc. .01%

Crop--

41 Sorghum (Seeds)	1.9cc.	100%
Many seeds still in hull and in clusters (red maize)	<u> </u>	<u> </u>
	1.9cc.	100%

Gizzard--

Grit	0.2cc.	1%
77 Sorghum Seeds (Some still in hull, red maize)	3.3cc.	14%
Sorghum (Hulls and parts of head)	20.1cc.	85%
3 Ragweed Seeds	<u>0.1cc.</u>	<u>1%</u>
	23.5cc.	100%

March 16, 1955 Lesser Prairie Chicken Adult Female Egg Prod. Not Showing
 No. 18

State, Kansas, Co., Finney, Pete Smith Farm 9:45 A.M.

Collector: W.D. Schwilling

Gizz. 18.8cc. Crop 19.1cc. Anim. Tr.% Veg. 100% Grit 2.5cc. 7%

Crop--

Green Wheat (veg.)	4.5cc.	23%
292 Sorghum (Seeds) Red Milo	9.2cc.	48%
1 Pigweed (Seed)		Tr.
Ragweed vegetable-2pts.	5.3cc.	29%
Russian Thistle vegetable-1 pt.		
Fire Bush (Cocha) veg.-1 pt.		
1 Larvae (Lepidoptera)		<u>Tr.</u>
	<u>19.1cc.</u>	<u>100%</u>

Gizzard--

Grit	2.5cc.	13%
176 Sorghum (Seeds) Red Maize	4.7cc.	29%
1 Black Beetle (Coleoptera chrysomelidae)		Tr.
Green Wheat (Veg.)	11.1cc.	68%
Ragweed (Sprouts) (Veg.)	.3cc.	2%
6 Ragweed (Seeds)	.1cc.	1%
2 Grass (Seeds) Side Oats, gramma		Tr.
2 Bindweed Seed	<u>.2cc.</u>	<u>1.5%</u>
	18.8	100%
Less grit	<u>2.5</u>	
	16.3cc.	

MARCH (2 Birds)

March 12, 1955 Lesser Prairie Chicken Adult Male (Booming) No. 17

State, Kansas, Co., Finney Caldwell Hicks (Booming) Ranch Evening

Collector: M.D. Schwilling

Gizz. 11.5cc. Crop 24.6cc. Anim. 24.6% Veg. 65.4% Grit 4.3cc. 3%

Crop--

	406 Sorghum (Seeds) Red Maize	15.2cc.	62%
	Sorghum (Hulls)	Tr.	Tr.
	5 Pigweed (Seeds)		Tr.
	Lambsquarter (Tiny Sprouts; vegetable)	.7cc.	3%
A	20 Grasshoppers (Nymphs) Locustinae Acrididae	8.3cc.	33.6%
	1 Night Shade (1. berry) Ground cherry	0.1cc.	.4%
A	1 Larvae Lepidoptera		Tr.
A	1 Mormon Cricket	0.3cc.	1%
	1 (Seed)		Tr.
A	1 Flower bug Anthocoridae		

Gizzard--		24.6cc.	100%
	Grit	4.3cc.	3%
	139 Sorghum (Seeds) Red Maize	5.2cc.	45%
	2 Ragweed (Seeds)		Tr.
	2 Nut rush (Seeds)		Tr.
	1 Bindweed (Seed)		Tr.
A	Flower Bug (Parts) Anthocoridae		Tr.
	Ragweed (Sprouts-young plants)		Tr.
	Sorghum Hulls	6.3cc.	55%
	8 Pigweed (Seeds)		Tr.
		15.3cc.	100%
	Less grit.	<u>4.3cc.</u>	
		11.5cc.	

APRIL (1 Bird)

April 30, 1955 Lesser Prairie Chicken Adul Male Killed in trap No. 19
(Booming)

State, Kansas, Co., Kearny, Campbell Ranch Morning

Collector: M. D. Schilling Testis

Gizz. 4.1cc. Crop .6cc. Anim. Tr.% Veg. 100% Grit 1.0cc. 24% of Gizzard

Crop--

	Grit	Tr.%
	Yarrow (Veg.) Compositae- Achillea	.6cc. 100%
A	False Wireworm Beetle (Parts) Coleoptera-Tenebrionidae- Elodes	Tr.%
2	Grass (Seeds) Side Oats Gramma	Tr.%
		<hr/>
		.6cc. 100%

Gizzard--

	Grit	1.0cc. 24%
	Grass (Veg.) 1 Pt. Yarrow (Veg.) 1 Pt. Compositae-Achillea	3.0cc. 97%
	1 Maize (Seed & Hull)	.1cc. 3%
A	False Wireworm Beetle (Parts)--Coleoptera- Tenebrionidae-Elodes	Tr.
		<hr/>
		4.1cc. 100%
	Less Grit	<u>1.0</u>
		3.1cc.

MAY (1 Bird)

May 27, 1955 Lesser Prairie Chicken Adult Male (Singing) No. 20

State, Kansas, Co., Finney Brown Ranch So. Holcomb Morning

Collector: M. D. Schwilling

Gizz. 8.8cc. Crop Occ. Anim. 44% Veg. 56% Grit .3cc. 3%

Crop-- Empty

Gizzard--

	Grit	0.3cc.	3%
A	Mormon Cricket (Parts) Tettigoniidae-Udeop sylla	2.2cc.	26%
	Ragweed (Veg.) Ambrosia Coronopi folia	3.1cc.	36%
	Shepherd's Furse (Veg.) Brassicaceae-Capsella	1.0cc.	12%
	Grass (Veg.)	.7cc.	8%
A	Leaf Beetle (Parts) Coleoptera-Chrysomelidae		Tr.
A	Blister Beetle Coleoptera-Meloidae-Epicauta		Tr.
A	False Wireworm Beetle (Parts) Coleoptera-Tenebrionidae-Elodes	.4cc.	5%
	1 ? (Seed)		Tr.
A	Insect Heads (Parts)	<u>1.1cc.</u>	<u>13%</u>
		8.8cc.	100%
	Less Grit	<u>.3</u>	
		8.5cc.	

JUNE (4 Birds)

June 12, 1954 Lesser Prairie Chicken Young 14-17 days No. 1
State, Kansas, Co., Finney Kansas Fish & Game Buffalo Preserve
6:00 A. M.

Collector: M. D. Schwilling w/Gordon Penny

Gizz. - cc. Crop Tr. cc. Anim. 100% Veg. 0% Grit 0 cc. - %

Crop--

1 Ant, Moundbuilding (*Pogonomyrmex occidentalis*)

Tr.

100 %

June 9, 1955 Lesser Prairie Chicken Adult Male (Booming) No. 21
State, Kansas, Co., Finney Lee Greene Ranch 8:30 A. M.

Collector: M.D. Schwilling

Gizz. 14.7 cc. Crop 16.3 cc. Anim. 69% Veg. 31% Grit - cc. - %

Crop--

A	3 Larvae (Lepidoptera)	.1cc.	0.7 %
A	56 Grasshoppers	7.5cc.	46 %
A	<u>33</u> Grasshoppers (Slant Faced)	4.6cc.	<u>28</u> %
	Ground Cherry (Nightshade) (Veg.)	.6cc.	3.5 %
	Grass (Veg.)	.1cc.	.7 %
	Sagebrush (Veg.) <i>Artemisia filifolia</i>		Tr.
	Yarrow (3 seed pods & veg.)	.2cc.	1 %
18	Bush Morning Glory (Buds) Convolvaceae-Ipomoea Leaves (Veg.)	1.4cc.	9 %
	Rocky Mt. Beeplant Cappdridaceae-Cleome	1.8cc.	11.1 %
		<u>16.3cc.</u>	<u>100</u> %

Gizzard--

	Yarrow (3 Seeds & Leaves)	1.3cc.	9 %
	Corn Grass (Veg.)		Tr.
A	1 Larvae (Lepidoptera)	.1cc.	.5%
	Ground Cherry (Nightshade) (Veg.)	.1cc.	.5%
A	Leaf Beetle (Parts) Coleoptera-Chrysomelidae		Tr.
A	63 Insect Heads ?	4.1cc.	28 %
A	Grasshopper Parts	5.1cc.	25 %
	Rocky Mt. Beeplant Leaves (Veg.) Capparidaceae-Cleome	4.0cc.	27 %
		<hr/>	
		14.7cc.	100 %

June 22, 1955 Lesser Prairie Chicken Young (Brood) No. 22

State, Kansas, Co., Finney Lee Greene Ranch P. M.

Collector: M. D. Schwilling

Gizz. 1.3cc. Crop .3cc. Anim. 100% Veg. Tr. Grit .2cc. 13% of Gizz.

Crop--

	Grit		Tr.
	1 False Wireworm Beetle Coleoptera Tenebrionidae- Elodes	0.3cc.	100 %
	Grasshopper (Parts)	<hr/>	<hr/> Tr.
		.3cc.	100 %

Gizzard--

	Grit	0.2cc.	13 %
	Blister Beetle (Parts) 4 Pts. Coleoptera-Meloidae	1.3cc.	100 %
	Leaf Beetle (Parts) 1 Pt. Coleoptera-Chrysomelidae		
	Grass (Veg.)	<hr/>	<hr/> Tr.
		1.5cc.	100 %
	Less Grit	<hr/>	
		.2	
		<hr/>	
		1.3cc.	

June 27, 1955 Lesser Prairie Chicken Adult Male (Feeding) No. 23

State, Kansas, Co., Meade near Aaron Unruh Farm 10:00 A. M.

Gizz. 2.9cc. Crop 2.9cc. Anim. 24.5% Veg. 75.5% Grit. .3cc. 3% of Gizz.

Crop--

A	3 Slant Faced Grasshoppers	.8cc.	27	%
	4 Ground Cherry (Nightshade) Pods & Berries	2.0cc.	70	%
	1 ? (Seed Pod)	<u>.1cc.</u>	<u>3</u>	<u>%</u>
		2.9cc.	100	%

Gizzard--

	Grit	.3cc.	3	%
A	Leaf Beetle (Parts) Coleoptera-Chrysomelidae		Tr.	
A	False Wireworm Beetle (Parts) Coleoptera-Tenebrionidae		Tr.	
A	Slant Faced Grasshoppers	1.4cc.	17	%
	1 Buffalo Grass (Seed)	.1cc.	1.5	%
A	1 Larvae (Lepidoptera)	.1cc.	1.5	%
A	1 Cicade (Small Green) Homoptera-Cicadidae-Melampsalta	.2cc.	3	%
	Ground Cherry (Berries & Pods) (Parts)	3.3cc.	39	%
19	Bush Morning Glory (Buds) Convolvulaceae-Ipomoea	1.0cc.	12	%
	Indian Apple (Parts)	2.5cc.	30	%
	Broomweed (Floret) Gutierrezia		Tr.	
		<u>8.9cc.</u>	<u>100</u>	<u>%</u>
	Less Grit	<u>.3</u>		
		8.6cc.		

JULY (6 Birds)

July 7, 1954 Lesser Prairie Chicken Adult Female No. 3
State, Kansas Co., Finney Kansas Fish & Game Buffalo Preserve
6:00 P. M.

Collector: M. D. Schwilling

Gizz. - cc. Crop 3.6cc. Anim. 100% Veg. Tr.% Grit - cc. Tr.%

Crop--

	Grit		Tr.
6 Grasshoppers Slant Faced Acrididae-Subfamily Tryxaline	1.6cc.	44	%
56 Webworm Larvae Lepidoptera- Loxostage similalis	2.0cc.	56	%
Sagebrush Artemisia filifolia			Tr.
	<u>3.6cc.</u>	<u>100</u>	<u>%</u>

July 15, 1954 Lesser Prairie Chicken Young 6-7 weeks No. 2
State, Kansas Co., Clark Nickelson Ranch 1:00 P. M.

Collector: M. D. Schwilling

Gizz. - cc. Crop 2.4cc. Anim. 100% Veg. Tr.% Grit - cc. Tr.%

Crop--

10 Grasshoppers, Slant Faced Sub-family Tryxaline- Acrididae	2.0cc.	84	%
1 Leaf beetle - Chrysomellid	.1cc.	4	%
1 Praying Mantis Mantidae	.1cc.	4	%
4 Spiders Arachnidae	.2cc.	8	%
3 Small Grass Stems			Tr.
Grit			Tr.
	<u>2.4cc.</u>	<u>100</u>	<u>%</u>

July 17, 1954 Lesser Prairie Chicken Young 7 weeks No. 6

State, Kansas Co., Finney Lee Greene Land 6:30 A. M.

Collector: D. Schwilling

Gizz. - cc. Crop 1.6cc. Anim. 100% Veg. Tr.% Grit - cc. Tr.%

Crop--

	Grit	Tr.
5 Grasshoppers, Slant Faced Sub-family Tryxaline- Acrididae	.7cc.	44 %
5 Strawberry Root Beetles Chrysomelidae-Pariacanella	.3cc.	20 %
1 Colc. Potato Beetle Chrysomelidae-Leptinotarsa decamlineato	.2cc.	12 %
1 Mormon Cricket Orthoptera-Tettigonidae	.1cc.	6 %
1 Click Beetle (Eliteridae)		Tr.
2 Webworms (Larvae) Lepidoptera-Pyralididae	.1cc.	6 %
1 Black (Chrysomalidae)	.1cc.	6 %
3 Lacewings Neuroptera-Chrysopidae	.1cc.	6 %
Sagebrush (Veg.) Artemisia Filifolia		Tr.
1 Leafhopper Homoptera-cicadellidae		Tr.
1 Nut Rush (seed) Lithospernum-Cyperus esculentus		Tr.
	<hr/>	<hr/>
	1.6cc.	100%

July 18, 1954 Lesser Prairie Chicken Young 8 weeks No. 7

State, Kansas Co., Finney Lee Greene Land Brood of two 3:00 P. M.

Collector: Schwilling

Gizz. - cc. Crop. 11.4cc. Anim. 100% Veg. Tr.% Grit - cc. - %

Grasshoppers Acrididae	10.0cc.	88 %
Grasshoppers Slant Faced Sub-family Tryxaline- Acrididae	.9cc.	8 %
4 Leaf Beetles Chrysomellidae	.3cc.	3 %
1 Click Beetle Eliteridae		Tr.
2 Metallic Wood Borer Euprestidae-Agrilus	.2cc.	1 %
1 Leaf Beetle Chrysomellidae		Tr.
1 Spider Arachnidae		Tr.
Grass Leaves		Tr.
	<u>11.4cc.</u>	<u>100 %</u>

July 31, 1954 Lesser Prairie Chicken Young 10-11 weeks No. 8
 State, Kansas Co., Finney Lee Greene Land Brood of seven 7:00 A. M.
 Collector: M. D. Schwilling

Gizz. - cc. Crop 2.7cc. Anim 96% Veg. 4% Grit - cc. Tr.

Crop--

Grit		Tr.
4 Grasshoppers Acrididae	2.0cc.	74 %
1 Grasshopper Slant Faced Sub-family Tryxaline- Acrididae	.1cc.	4 %
Sagebrush (Veg.) Artemisia filifolia	.1cc.	4 %
Grass (Veg.)		Tr.
7 Leaf Beetles (Black) Chrysomelidae	.5cc.	18 %
1 Strawberry Root Beetle		Tr.
4 Nut Rush (Seeds) Lithospernum-Cyperus esculentus		Tr.

July 15, 1955 Lesser Prairie Chicken Adult Male (Booming) No. 24
 State, Kansas Co., Finney P. A. Brown Ranch A. B.
 Collector: M. D. Schwilling

Gizz. 16.5cc. Crop 19.5cc. Anim. 69% Veg. 31% Grit - cc. - %

Crop--

A	1 Larvae (Tomato Hornworm) Lepidoptera-Sphingidae- Phlegethontius	4.3cc.	22. %
A	1 Larvae (Lepidoptera)	.1cc.	.5 %
A	2 Grasshoppers Slant Faced	.6cc.	3. %
A	4 Grasshoppers	2.1cc.	11. %
A	56 Small June Bug Beetle Coleoptera-Scarabaeidae	4.4cc.	22.5 %
A	33 Leaf Beetles Coleoptera-Chrysomelidae	2.1cc.	11. %
A	11 Colo. Potato Beetles Coleoptera-Chrysomelidae	2.4cc.	13. %
A	14 Stink Bugs Hemiptera-Pentatomidae	1.7cc.	9. %
A	10 Harlequan Bugs & Larvae Hemiptera-Pentatomidae	.5cc.	2. %
A	1 Lady Bug Beetle Coleoptera-Coccinellidae		Tr.
	2 Ground Cherry (Pod & Fruit)	1.1cc.	5. %
	Yarrow (Veg.)	.1cc.	.5 %
	Grass (Veg.)	<u>.1cc.</u>	<u>.5 %</u>
		19.5cc.	100 %

Gizzard--

A	3 Colo. Potato Beetles Coleoptera-Chrysomelidae	.4cc.	2.5 %
A	1 False Wireworm Beetle Coleoptera-Tenebrionidae-Elodes	.1cc.	.7 %
A	6 Harlequan Bugs & Larvae Hemiptera-Pentatomidae	.4cc.	2.5 %
A	15 Leaf Beetles Coleoptera-Chrysomelidae	1.1cc.	7.0 %

A	6 Small June Bug Beetles Coleoptera-Scarabaeidae	.4cc.	2.5 %
A	9 Stink Bugs Hemiptera-Pentatomidae	.9cc.	5 %
A	Grasshopper (Parts)	3.9cc.	23.6 %
	Indian Apple ? (Parts)	4.0cc.	24. %
	Ground Cherry (Pod & Fruit)	\$.2cc.	31.5 %
	2 Bush Morning Glory (Buds) Convolvulaceae-Ipomona	.1cc.	.7 %
		<hr/>	<hr/>
		16.5cc.	100

AUGUST (3 Birds)

August 10, 1954 Lesser Prairie Chicken Young 11-12 weeks No. 9
 State, Kansas Co., Finney Lee Greene Land Collector: M. D. Schwilling
 Gizz. cc. Crop cc. Anim. % Veg. 100% Grit cc. Tr. %
 Crop--

1 Grass (Veg.)	<hr/>	<u>Tr.</u>
	0 cc.	-- %

August 18, 1954 Lesser Prairie Chicken Young 12 weeks No. 10
 State, Kansas Co., Finney Lee Greene Land Collector: M. D. Schwilling
 Gizz. cc. Crop 6.7cc. Anim. 98.5% Veg. 1.5% Grit cc. Tr. %
 Crop--

Grit		<u>Tr.</u>
8 Grasshoppers (Acrididae)	4.0cc.	61 %
1 Sun Spider (Solpugida)	.5cc.	7 %
2 Leafhoppers (Homoptera-Cicadellidae)		<u>Tr.</u>
22 Leaf Beetles (Black) Chrysomelidae	1.7cc.	<u>25</u>
2 Strawberry Root Beetle Chrysomelidae	.1cc.	1.5 %
1 Webworm (Moth) Lepidoptera-Pyralididae		<u>Tr.</u>

OCTOBER (1 Bird)

October 20, 1954 Lesser Prairie Chicken Adult Male (Booming) No. 13

State, Kansas Co., Finney (Brown Land) So. of Holcomb 6:00 A.M.

Collector: M.D. Schwilling

Gizz. 6.2cc. Crop .1cc. Anim. 48% Veg. 52% Grit .4cc. 6%

Crop--

Yarrow (Leaf) .1cc. 100 %
Achillea

Gizzard--

Grit .4cc. 6 %

1 Sedge (Seed) Carex Tr.

31 Ragweed (Seed) 1 Part

12 Nightshade (Seed) White
1 Part Solanum dulcamara

22 Nightshade (Seed) Whorls .4cc. 7 %
1 Part Solanum

20 Buckwheat 3 Parts
Polygonum

A Grasshopper (Parts) 2.2cc. 39 %
Acrididae

FINE VEGETABLE & ANIMAL PARTS: = 3.2cc. 54 %

Sunflower 48 Parts
Helianthus

Sorghum (Hulls) 2 Parts

Ragweed (Seed) 15 Parts
Ambrosia

Yarrow 10 Parts
Achillea

Nightshade 3 Parts
Solanum

Cave Cricket 2 Parts
Tettigonidae

Acrididae
Grasshopper 10 Parts

1 Lacewing Neuroptera-Chrysopidae		Tr.
Grass (Corn Grass) (Veg.)	.1cc.	1.5 %
Sagebrush (Veg.) Artemesia filifolia		Tr.
1 Sunflower (Seed) Helianthus		Tr.
2 Larvae (Lepidoptera)	<u>.3cc.</u>	<u>4 %</u>
	6.7cc.	100 %

August 31, 1954 Lesser Prairie Chicken Adult Male No. 11
State, Kansas Co., Finney State Buffalo Game Preserve A. M.

Collector: M.D. Schwilling

Gizz. - cc. Crop - cc. Anim. - % Veg. 100 % Grit - cc. Tr. %

Crop--

Grit		Tr.
Atriplex ? (Leaves)		Tr.
Dodder (Seed)	<u> </u>	<u>Tr.</u>
	<u>--cc.</u>	100 %

SEPTEMBER (1 Bird)

September 17, 1954 Lesser Prairie Chicken Adult Female No. 12
State, Kansas Co., Finney (Arch Ladner Land) Road So. of Holcomb
6:30 P.M.

Collector: Jim Coats for M. D. Schwilling

Gizz. - cc. Crop 4.9cc. Anim. 100 % Veg. Tr. % Grit - cc. Tr. %

Crop--

Grit		Tr.
13 Larvae (Lepidoptera Sp.)	4.8cc.	98 %
1 Darkling Beetle Tenebrionidae	.1cc.	2 %
2 Sunflower (Seeds) Helianthus		Tr.
	<u>4.9cc.</u>	<u>100 %</u>

Grasshopper 2 Parts
Sub-family Tryxaline-
Acrididae

Bee 1 Part
Hymenoptera

Buckwheat 5 Parts
Polyganum

Spider 1 Part
Arachnidae

Leaf Beetle 1 Part
Chrysomelidae

6.2cc.

100 %

Table 6.

VEGETATION OF AREA

Taken From Plots in Clark Co. Ks.
By Fort Hays Kansas State College
(Botany Department)

Dr. F. W. Albertson
Compiled June 7, 1954

GRASSES

1. <i>Agropyron smithii</i>	Western wheatgrass
2. <i>Andropogon gerardi</i>	Big bluestem
3. <i>Andropogon saccharoides</i>	Silver beardgrass
4. <i>Andropogon scoparius</i>	Little bluestem
5. <i>Aristida longiseta</i>	Red triple-awn
6. <i>Aristida purpurea</i>	Purple triple-awn
7. <i>Bouteloua curtipendula</i>	Side oats grama
8. <i>Bouteloua gracilis</i>	Blue grama
9. <i>Bouteloua hirsuta</i>	Hairy grama
10. <i>Buchloe dactyloides</i>	Buffalo grass
11. <i>Chloris verticillata</i>	Windmill grass
12. <i>Elymus canadensis</i>	Canada wild rye
13. <i>Elymus virginicus</i>	Virginia wild rye
14. <i>Eragrostis cilianensis</i>	Ill scented love grass
15. <i>Eragrostis pectinacea</i>	Carolina lovegrass
16. <i>Eragrostis purshii</i>	Purshis love grass
17. <i>Eragrostis trichodes</i>	Sand love grass
18. <i>Festuca octoflora</i>	Six weeks fescue
19. <i>Hordeum jubatum</i>	Squirrel tail
20. <i>Hordeum pusillum</i>	Little barley
21. <i>Muhlenbergia cuspidata</i>	Plains muhly
22. <i>Muhlenbergia mexicana</i>	Mexican muhly
23. <i>Muhlenbergia racemosa</i>	Marsh muhly
24. <i>Muhlenbergia torreyi</i>	Ring muhly
25. <i>Munroa squarrosa</i>	False Buffalo grass
26. <i>Panicum capillare</i>	Old witch grass
27. <i>Panicum obtusum</i>	Vine mesquite
28. <i>Panicum virgatum</i>	Switch grass
29. <i>Schedonnardus paniculatus</i>	Texas crabgrass
30. <i>Sitanion hystrix</i>	Squirrel tail
31. <i>Sorghum halepense</i>	Johnson grass
32. <i>Sorghastrum nutans</i>	Indian grass
33. <i>Sporobolus asper</i>	Tall dropseed
34. <i>Sporobolus cryptandrus</i>	Sand dropseed
35. <i>Sporobolus pilosus</i>	Hairy dropseed
36. <i>Sporobolus neglectus</i>	Poverty grass
37. <i>Sporobolus texanus</i>	Texas dropseed

55. <i>Hedeoma hispida</i>	Rough falsepennyroyal
56. <i>Helianthus annuus</i>	Common sunflower
57. <i>Helianthus maximiliani</i>	Maximilian sunflower
58. <i>Helianthus petiolaris</i>	Prairie sunflower
59. <i>Helianthus rigidus</i>	Stiff sunflower
60. <i>Heterotheca subaxillaris</i>	Heterotheca
61. <i>Hoffmannseggia jamesii</i>	Little leaf rushpea
62. <i>Houstonia angustifolia</i>	Narrow leafed houstonia
63. <i>Hymenoxys odorata</i>	
64. <i>Hymenopappus corymbosus</i>	Hymenopappus
65. <i>Ipomea leptophylla</i>	Bush morning glory
66. <i>Iva xanthifolia</i>	Marsh elder
67. <i>Kuhnia glutinosa</i>	False Boneset
68. <i>Lactuca ludoviciana</i>	Wild lettuce
69. <i>Lappula echinata</i>	European stickweed
70. <i>Leptilon canadensis</i>	Mare's tail
71. <i>Lepidium densiflorum</i>	Pepper grass
72. <i>Leucelene ericoides</i>	Heath aster
73. <i>Liatris punctata</i>	Blazing star
74. <i>Linum compactum</i>	Golden flax
75. <i>Linum rigidum</i>	Stiffstem flax
76. <i>Linum sulcatum</i>	Grooved flax
77. <i>Lithospermum linearifolium</i>	Narrow leafed puccoon
78. <i>Malvastrum coccineum</i>	Salmon colored mallow
79. <i>Melampodium leucanthum</i>	Plains blackfoot
80. <i>Mentzelia decapetala</i>	Tenpetal Mentzelia
81. <i>Mentzelia stricta</i>	Chalk lily
82. <i>Meriolix serrulata</i>	Serrate leafed evening primrose
83. <i>Mimosa illinoense</i>	Illinois bundleflower
84. <i>Morongia uncinata</i>	Catclaw sensitive brier
85. <i>Neomamillaria vivipara</i>	Pinceeshion cadus
86. <i>Opuntia macrorrhiza</i>	Rickly pear
87. <i>Oxalis stricta</i>	Sheep sorrel
88. <i>Oxytropis lambertii</i>	Lambert loco
89. <i>Paronychia jamesii</i>	James nailwort
90. <i>Parosela aurea</i>	Silktop dalea
91. <i>Parosela enneandra</i>	Slender Parosela
92. <i>Pentstemon albidus</i>	White Penstemon
93. <i>Peop foetidissimus</i>	Wild gourd
94. <i>Persicaria lapathifolium</i>	Gulthood ladysthumb
95. <i>Persicaria pennsylvanica</i>	Spotted ladysthumb
96. <i>Petalostemon candidus</i>	White prairie clover
97. <i>Petalostemon purpureus</i>	Purple prairie clover
98. <i>Plantago pushii</i>	Woolly Indianwheat
99. <i>Plantago rhodosperma</i>	Redseed plantain
100. <i>Plantago spinulosa</i>	Spiny plantain
101. <i>Polygala alba</i>	White milkwort
102. <i>Polygala verticillata</i>	Whorled milkwort
103. <i>Polygonum ramosissimum</i>	Bushy knotweed
104. <i>Portulaca oleracea</i>	Common purslane
105. <i>Prionopsis ciliata</i>	Prionopsis
106. <i>Prunus angustifolia</i>	Wild plum
107. <i>Psoralea argophylla</i>	Silverleaf scurfpea
108. <i>Psoralea cuspidata</i>	Railbread scurfpea
109. <i>Psoralea tenuiflora</i>	Slimflower scurfpea or wild alfalf

FORBS

1. <i>Acerates viridiflora</i>	Green acerates--Green milkweed
2. <i>Allinola linearis</i>	Linear-leaved four o'clock
3. <i>Allium nuttallii</i>	Wild onion
4. <i>Amaranthus blitoides</i>	Prostrate amaranth
5. <i>Amaranthus graecizans</i>	Tumbleweed amarath
6. <i>Amaranthus hybridus</i>	Slim amaranth
7. <i>Amaranthus retroflexus</i>	Red root amaranth
8. <i>Amphiachyris dracunculoides</i>	Tarragon snakeweed
9. <i>Ambrosia elatior</i>	Common ragweed--Hogweed
19. <i>Ambrosia psilostachya</i>	Western ragweed
11. <i>Antennaria campestris</i>	Pussytoes
12. <i>Argemone intermedia</i>	Prichee poppy
13. <i>Artemisia dracunculoides</i>	False Tarragon sagebrush
14. <i>Artemisia filifolia</i>	Sand sagebrush
15. <i>Artemisia gnaphalodes</i>	Cudweed sagebrush
16. <i>Artemisia kansana</i>	Darruth sagebrush
17. <i>Asclepiodora decumbens</i>	Spider antelopehorn
18. <i>Asclepias pumila</i>	Plains milkweed
19. <i>Aster fendleri</i>	Fendler's aster
20. <i>Aster multiflorus</i>	Many flowered aster
21. <i>Aster oblongifolius</i>	Aromatic aster
22. <i>Astragalus lotiflorus</i>	Low milk vetch
23. <i>Astragalus missouriensis</i>	Missouri loco
24. <i>Astragalus mollissimus</i>	Woolly loco
25. <i>Astragalus pectinatus</i>	Narrow leaf loco
26. <i>Astragalus racemosus</i>	Racemose milk vetch
27. <i>Astragalus shortianus</i>	Short milk vetch
28. <i>Callirrhoe involucreta</i>	Purple poppymallow
29. <i>Castilleja citrina</i>	
30. <i>Chamaesaracha conioides</i>	Hairy chamaesaracha
31. <i>Chamaesyce geyeri</i>	Geyer euphorbia
32. <i>Cheirinia aspera</i>	Western wall flower
33. <i>Chenopodium album</i>	Lambsquarter's goosefoot
34. <i>Chenopodium hybridum</i>	Maple leaf goosefoot
35. <i>Chenopodium leptophyllum</i>	Slimleaf goosefoot
36. <i>Chrysopsis villosa</i>	Hairy goldaster
37. <i>Cirsium ochrocentrum</i>	Yellow spined thistle
38. <i>Cirsium undulatum</i>	Wavy leafed thistle
39. <i>Cleome serrulata</i>	Colorado bee plant
40. <i>Croton texensis</i>	Texas croton
41. <i>Cryptantha crassasepala</i>	Thick-sepaled cryptanthe
42. <i>Echinacea angustifolia</i>	Snakeroot
43. <i>Englemannia pinnatifida</i>	Engelmann daisy
44. <i>Erigeron pumilus</i>	Low fleabone
45. <i>Erigeron ramosus</i>	Daisy fleabone
46. <i>Euphorbia marginata</i>	Snow-on-the-mountain
47. <i>Evolvulus pilosus</i>	Evolvulus
48. <i>Gaillardia pulchella</i>	Gaillardia
49. <i>Galpinsia lavendulaefolia</i>	Lavenderleaf evening primrose
50. <i>Gaura biennis</i>	Biennial gaura
51. <i>Gaura coccinea</i>	Scarlet gaura
52. <i>Gaura parviflora</i>	Velvet leafed evening primrose
53. <i>Grindelia squarrosa</i>	Curlycup gumweed
54. <i>Gutierrezia sarothrae</i>	Broom snake weed

110. <i>Ratibida columnaris</i>	Upright prairie coneflower
111. <i>Ratibida tagetis</i>	Prairie coneflower
112. <i>Salsola pestifer</i>	Tumbling Russian thistle
113. <i>Salvia pitcheri</i>	Pitchers sage
114. <i>Sideranthus spinulosa</i>	Spring sideranthus
115. <i>Solanum nigrum</i>	Black nightshade
116. <i>Solanum torreyi</i>	Torrey nightshade
117. <i>Solidago glaberrima</i>	Smooth goldenrod
118. <i>Solidago mollis</i>	Missouri goldenrod
119. <i>Solidago rigida</i>	Stiff goldenrod
120. <i>Sophora saricea</i>	Silky sophora
121. <i>Specularia perfoliata</i>	Clasping venu looking glass
122. <i>Stenosiphon linifolium</i>	Narrow leaf stenosisphon
123. <i>Strophostyles leiosperma</i>	Wild beam
124. <i>Tetrameuris acaulis</i>	Stemless tetrameuris
125. <i>Teucrium canadense</i>	American germander
126. <i>Thelesperma</i>	Greenthread
127. <i>Tragapogon pratensis</i>	Meadow salsify
128. <i>Verbena bipinnatifida</i>	Dakota verbena
129. <i>Verbena bractlosa</i>	Bigbract verbena
130. <i>Verbena hastata</i>	Blue verbena
131. <i>Verbena stricta</i>	Wooly verbena
132. <i>Vernonia baldwinii</i>	Baldwin ironweed
133. <i>Xanthium commune</i>	Oriental cocklebur
134. <i>Yucca glauca</i>	Soapweed

6. RELEASES-

Kingman Co. 9-28 (10 cocks), Finney Co. 3-25, 4-2
(9 cocks, 4 hens)

TOTAL 3 days

7. AIR CENSUS-

Finney Co. 4-15, 5-5, Kearney Co. 4-15, 5-5

TOTAL 2 days

8. BOOMING ACTIVITY-

Finney Co. 3-14, 3-27, 4-13, 4-25, 4-26, 4-28, 5-3, 5-4,
5-7, 5-10, 5-11, 5-15, 5-17, 5-24, 5-30, 5-31, 6-1, 6-4,
6-7, 6-12, 6-14, (Fall 8, 10, 8-23, 8-24, 8-27, 8-30, 8-31,
9-16, 10-20, 10-25) 2-28, 3-11, 3-14, 3-19, 3-26,
3-28, 3-29, 4-1, 4-4, 4-18, 4-22, 4-23, 4-24, 5-11, 5-12,
5-21, 5-27, Clark Co. 3-8, 3-22, 4-1, 4-6, 4-7, 7-20,
Hamilton Co. 4-11, Kearney Co. 3-23, 3-26, 4-4, 4-23, 5-8,
5-22, 3-4, 3-23, 3-20, 4-11, 4-20, Meade Co. 5-20, 5-21,
4-20, Morton Co. 6-12

Greater Prairie Chicken - Chase Co. 4-29, 5-3, Coffey Co.
5-4, 5-5, Geary Co. 4-27, 4-28, 5-6, Pottawatomie Co. 4-25,
4-26, 5-6

TOTAL 80 days

9. SNOW EFFECT ON BOOMING-

Finney Co. 3-26, 3-28. Stopped activity three days.

TOTAL 2 days

10. DIRT EFFECT ON BOOMING-

Meade Co. 3-19, Stopped all activity (killed pheasants)
Finney Co. 3-11, 4-23, 4-24. Stopped activity for two
days.

TOTAL 4 days

11. NESTING-

Finney Co. 5-4, 5-7, 5-12, 5-13, 5-15, 5-24, 5-25, 5-27,
5-30, 6-1, 6-3, 6-11, 6-12, 6-15, 6-21, 6-25, 4-18, 5-11,
5-27, 5-28, 6-9, 6-10, 6-13, Kearney Co. 5-22, 6-2, 6-13,
6-18, 6-20, 6-22, 6-26, 4-14, 6-8, Meade Co. 5-16, 6-27,

TOTAL 34 days

12. YOUNG-() DENOTES YOUNG & NUMBER IN BROOD.

Clark Co. 6-16, 6-17, 7-15 (1), Comanche Co. 6-17, 7-14,
7-15, Finney Co. 6-11, 6-12, (2), 4-14, 6-15, 6-18, 6-21,
6-25, 6-28, 6-29, 7-1, 7-2, 7-7, 7-8, 7-11, 7-17 (6),
7-18 (2), 7-19 (1), 7-22, 7-24, 7-28, 7-31 (7), 8-2, 8-3
(1), 8-4, 8-8, 8-9, 8-18 (1), 9-14, 9-15, 5-21, 5-22, 5-27,
5-28, 6-9, 6-10, 6-13, 6-22 (10), Kearney Co. 6-13, 6-20,
6-22, 6-26, 7-11, 8-21, 6-8, Meade Co. 7-20, 7-21, 8-6
(12) (2) (1), 5-16, 6-27 (3), Morton Co. 8-10.

Greater Prairie Chicken, Chase Co. 8-14 (9) (5)

TOTAL 58 days

13. FEEDING

EMENTS-

30.

Hamil

Has

-8.

9-17
, 11

Morto

Meade
Co.

Greater Prairie Chicken Chase Co. 11-27, 11-28, 11-29,
11-30, 12-1, 12-2, 12-3.

TOTAL 208 days

14. FOOD HABITS-

Denver Colorado (Fish & Wildlife Service, Food Habits Lab.)
2-17, 2-18, 2-19, Garden City Experiment Station 4-13.

TOTAL 4 days

15. TRAPPING-

Clark Co. 2-2 (0), 2-4 (0), 2-8 (0), 2-9 (5), 2-12 (2),
2-13 (1), 2-23 (0), 2-24 (1), 3-4 (10), 3-8 (0), 3-3 (1),
3-22 (7), 4-1 (6), 4-6 (1), 4-7 (2), Finney Co. (Potter
farm) 1-16 (0), 1-18 (0), 1-19 (0), 1-20 (0), 1-21 (0),
1-22 (0), 1-23 (0), 1-24 (0), 1-25 (0), 1-27 (0), 1-29 (0),
1-30 (0), 1-31 (0), 2-3 (0), (Vaughn Lanol) Tip Tops.
2-5, 2-6, 2-7, 2-8, 2-9, 2-10, 2-11, 2-12, 2-13, 2-14,
2-15, 2-16, 2-17, 2-18, 2-19, 2-20, 2-21, 2-22 (1), 2-23,
2-24, 2-25, 2-26, 2-27, 2-28, 3-1, 3-2, 3-3, 3-4, 3-5,
3-6, 3-7, 3-8, 3-9, 3-10, 3-11, 3-12, 3-13, 3-14, 3-15,
3-16, 3-17, 3-18, 3-19, 3-20, 3-21, 3-22, 3-23, 3-24, 3-25,
3-26, 3-27, 3-28, 3-29 (1), 3-30, 3-31, 4-1, 4-2, 4-3, 4-4,
4-5, 4-6, (2), 4-7, 4-8, 4-9, 4-10, 4-11, 4-12, 4-13, 4-14,
(1), 4-15, 5-30.

TOTAL 99 days

16. BIRDS CAUGHT-

Clark Co. (Ligon type trap) trap put out 15 times, birds caught on 10 attempts, total of 33 birds, (drop type net) tried 4 times, only one bird caught, not too effective
Finney Co. permanent feed field traps (2) put out on Potter farm, left out and baited for 18 days, birds too suspicious, none caught. Finney Co. (Vaughn Land) Tip Top trap (4) 70 days, 1 bird caught--(Bill Rapp land) tip top traps (2) 44 days, 1 bird caught--Faye Stone farm (Ligon type trap) set 4 times, birds caught on one attempt 2 birds, Pet Smith farm (Ligon type trap) set 2 times, no birds caught--ground net trap booming grounds, set 6 times, none caught.
Kearny Co. ground net traps, booming grounds, Campbell land, set on two occasions, two birds caught.

17. SHINING TECHNIQUES-

Finney Co. Potter farm. 1-30 (0)

TOTAL 1 night

18. AVERTIN DRUG TRIED-

Finney Co. 5-10, 5-12, in Grasshoppers
Kearny Co. 4-30 on Grain.

Greater Prairie Chickens

Chase Co. 5-3, 5-4, 4-20, Grain
Coffey Co. 5-4, 5-5 Grain
Geary Co. 4-28, 5-5, 5-6 Grain
Pottawatomie Co. 4-26, 4-27 Grain

TOTAL 13 days

19. BIRDS MARKED-

Finney Co. (Vaughn Land) 2-22 one cock

TOTAL DAYS ON VARIOUS PROJECT PHASES 567

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