QUANTITATIVE EVALUATION OF WINTER ROOSTING SITES OF THE RIO GRANDE TURKEY IN NORTHCENTRAL OKLAHOMA

By

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Bachelor of Science

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Ada, Oklahoma

1965

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
May, 1969

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ACKNOWLEDGEMENTS

I would like to thank the members of my committee, Dr. Robert I. Smith, Dr. Bryan P. Glass, and Mr. Ted Silker for their interest and assistance throughout the course of this research project. I am particularly thankful for the time and advice given to me by my major advisor, Dr. Robert I. Smith.

Thanks are given to the Oklahoma Cooperative Wildlife Research Unit which made funds and equipment available during the preliminary part of this study. I am also grateful to the many landowners and other interested individuals for their cooperation.

Finally, I appreciate the sacrifices made by my wife, Jean, and daughter, Carol, during the preparation of this thesis.

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CHAPTER I

INTRODUCTION

Roosting sites are a basic requirement in the management of wild turkeys and the quality of the roosting site is particularly important in the winter months when turkeys are subject to the most adverse environmental conditions. Winter roosting sites must provide concealment and shelter during this critical period of the year. Bottom-land forests which provide a source of food as well as concealment and shelter serve as good winter roosting sites for turkeys in northcentral Oklahoma.

This study was conducted to measure vegetation found within winter roosting sites of Rio Grande turkeys (Meleagris gallapavo intermedia Sennett) released east of their original range. Data were analyzed statistically to determine whether significant differences existed among winter roosting sites on different drainages. Information gained from this study should be useful in the selection of areas for future releases of winter-trapped turkeys in northcentral and eastern Oklahoma.

Most studies reported in the literature, which have been made on wild turkeys during the winter months, have been concerned with activities or movements and gave only qualitative descriptions of roosting sites (Glover, 1948; Lewis, 1963; Thomas et al, 1966; Logan, 1967; and Buikstra, 1968). One study by Hoffman (1968) did describe

quantitatively both winter and summer roosting sites of the Merriam's turkey in Colorado. Two studies, which dealt with evaluation of avian habitats were useful in outlining the methods used in this study. These were Emlen (1956) and Palmer (1963).

Releases of Rio Grande turkeys began experimentally in Payne County as early as 1959 to test establishment in an area more mesic than its original range. The relatively high annual rainfall and the change in habitat from the birds' original range in western Oklahoma and Texas were considered to be factors which might limit the establishment of the Rio Grande turkey in northcentral Oklahoma.

A single release made in 1959 apparently was not successful. Subsequent releases were made in 1963, 1964, 1965, and 1967, making a total of 13 releases in Payne, Pawnee, and Nobel counties. These releases have shown varying degrees of success. The study made by Buikstra (1968) shows that under the present conditions the Rio Grande turkey can survive and reproduce in Payne County.

Thomas et al (1966) reported that barring disturbance or habitat change Rio Grande turkeys in the Trans Pecos region of Texas will return to the same wintering range and roosting sites year after year. It has been noted by this writer that Rio Grande turkeys in northcentral Oklahoma do return to the same wintering range, although the same roosting site may not be used repeatedly.

In southern Texas several bottomland tree species serve not only as roosting trees, but provide a food source as well. These are live oak (Quercus virginiana), pecan (Carya illinoensis), cedar elm (Ulmus crassifolia), American elm (Ulmus americana), and sugar hackberry (Celtis laevigata) (Walker, 1951 and Glazener, 1963). In

northern and western Texas, northeastern New Mexico, and western Oklahoma, eastern cottonwood (Populus deltoides) increases as an important roost tree. Roosting sites consist of eastern cottonwood groves with both dead and live trees. In many localities cottonwood, which occurs entirely adjacent to streams, may be the only species available for roosting. In northcentral Oklahoma many other species are available for roost trees.

CHAPTER II

DESCRIPTION OF THE STUDY AREA

The area in which the releases of Rio Grande turkeys have been made and in which the search for winter roosts was conducted includes portions of Payne, Pawnee, and Noble counties. It is bounded on the south by the Cimarron River; on the west by the Indian Meridian; on the north by the line extending east along Highway 64 south of Morrison and Lela to a point on Highway 18 which is 3½ miles southeast of Pawnee; and on the east by Highway 18 south to Highway 51 then east to Payne county line and south to the Cimarron River (Fig. 1). It consists of approximately 378,880 acres with a range in elevation from 1150 feet above sea level at the twin mounds, 4 miles west of Yale, to 800 feet above sea level along the Cimarron River on the Payne - Creek County line.

The major creeks which drain the area are Wildhorse, Lost, Stillwater, Council, and Salt along with their tributaries which flow southeast to the Cimarron River. Long Branch, Oak, Lion, Panther, Pepper, and Camp creeks with their tributaries drain northeast into the Arkansas River.

The area may be divided into two physiographic regions: the Sandstone Hills region which occupies the eastern portion and the Redbed Plains region which forms the largest portion of the area (Bruner, 1931).

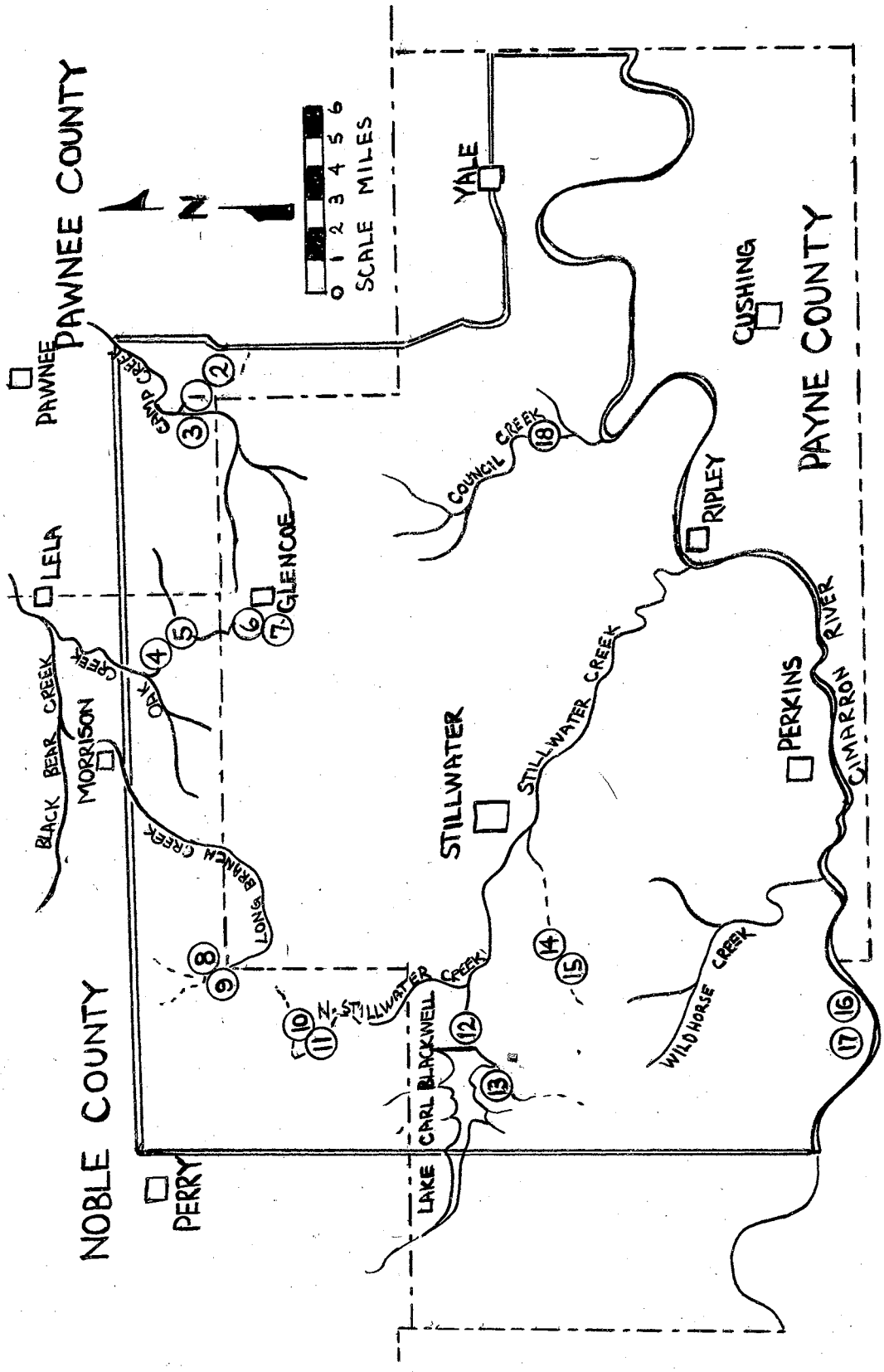

FIG.1 MAP OF STUDY AREA

The Pennsylvania shales of the Sandstone Hills region have weathered leaving the more resistant sandstone remaining as rough, low hills. Upland forests, predominatly scrubby post and blackjack oaks, cover much of the area, but grassy areas are also abundant.

The Redbed Plains region contains gently rolling plains composed of weathered red Permian clays and shales. The region is well suited for grasses which dominate the region. Upland forests are found on sandy soils.

Bottom-land forests of both the Redbed Plains and Sandstone Hills regions are found in narrow bands along the streams. These forests are dominated by American elm (Ulmus americana) with hackberry (Celtis spp.), green ash (Fraxinus pennsylvanica), and pecan (Carya illinoensis) being other important trees (Rice, 1965). Dominant trees of the upland forests are post oak (Quercus stellata) and blackjack oak (Quercus marilandica) with black oak (Quercus velutina) occurring in the eastern part of the study area (Rice and Penfound, 1959).

The principal agricultural crops of the area are wheat, prairie hay, and alfalfa hay. Other small grains such as barley, oats, and sorghum are of lesser importance. The wheat fields are used as pasture during the fall and winter months as ranching is the primary use of the land.

The winter weather is mild, the first killing frost generally occurs in October and the last killing frost in April. The turkey flocks begin to congregate on the wintering range near the time of the first killing frost and have usually completed the spring break-up by the last killing frost. Over a five-year winter period

from October 1963 to April 1968 the dates of the first killing frost came as early as October 9 and as late as November 29. The last killing frost for the same period occurred as early as March 14 and as late as April 21. The mean winter temperature for this same period was 46.5°F., the normal being 44.8°F. The lowest winter temperature recorded for this period was -4°F. Mean winter precipitation in the study area for the five year period was 7.61 inches compared to the normal winter precipitation of 10.14 inches. Most of the precipitation was rain, but occasionally it would snow. The occasional snowstorms were not usually heavy enough nor remained on the ground long enough to cover turkey food sources. The snowstorm on March 11 and 12, 1968 was the heaviest recorded since 1900; this snowstorm deposited 4 to 8 inches in the northwestern part of the study area and 12 to 16 inches along the northeastern edge, but remained on the ground for just a few days and caused no problems of winter food shortage.

CHAPTER III

METHODS AND PROCEDURES

Winter roosts were located by inquiring about the presence of wild turkeys around release sites. If the turkeys had been seen or there was the possibility that they might be in the area, permission was obtained to search for roosts on that land. A thorough search along the stream and adjacent areas for signs of turkeys or their roost involved much walking. Although searches were unsuccessful on several occasions the effort did eventually yield the desired results. Another method employed involved arriving before sunrise at an area where turkeys were suspected to be and listening for them before they departed from the roost.

A total of 18 winter roosts were located; these roosts were used by 10 different flocks. Location and sex and age composition was used to differentiate the flocks.

Vegetation within roosting sites was measured to determine basal area, height, frequency and density of tree species. A plot approximately 298 feet in width and 276 feet in length along the drainage on which the roost was located was sampled using the arms-length rectangle method, which is similar to a belt transect. Trees used for roosting were located near the middle of this plot. Sampling involved 10 arms-length rectangles of 6 feet by 145.2 feet spaced at intervals of 66 feet, 5 on each side of the drainage. These

rectangles each of 0.02 acre, extended at right angles from the drainage and were divided into proximal and distal halves of 0.01 acre for comparing vegetation nearest the drainage with that farther away (Fig. 2).

A plot of equal size 220 yards upstream and 220 yards downstream from the roosting site was sampled as a control for comparing vegetation of the same drainage. If an area to be used as a control was not timbered another area was used 110 yards further from the roosting site. Twenty control sites were sampled along with the 18 roosting sites making a total of 38 plots sampled.

Analysis of variance of vegetation within drainages and among roost sites and drainages was accomplished using the randomized complete-block design (Steel and Torrie, 1960). The randomized complete-block design was chosen in order to group for differences in vegetation near drainages and vegetation distal from the drainages. Treatments consisted of individual roosting sites or control areas.

Diameter-at-breast-height of trees was measured using a tree tape and height of trees was estimated using a clinometer. Stems of 3.0 inches or more in diameter at breast height were considered trees; those less than 3.0 inches but greater than 1.0 inch were considered saplings. Importance values were calculated for each tree species appearing in the transects taken at the roosting sites. These relative values are based on sums of three percentages: relative basal area, relative density, and relative frequency that rank the importance of each tree species sampled in the community (Curtis and McIntosh, 1951). Tree species with an importance value greater than 75 were considered to be dominant and tree species with an importance

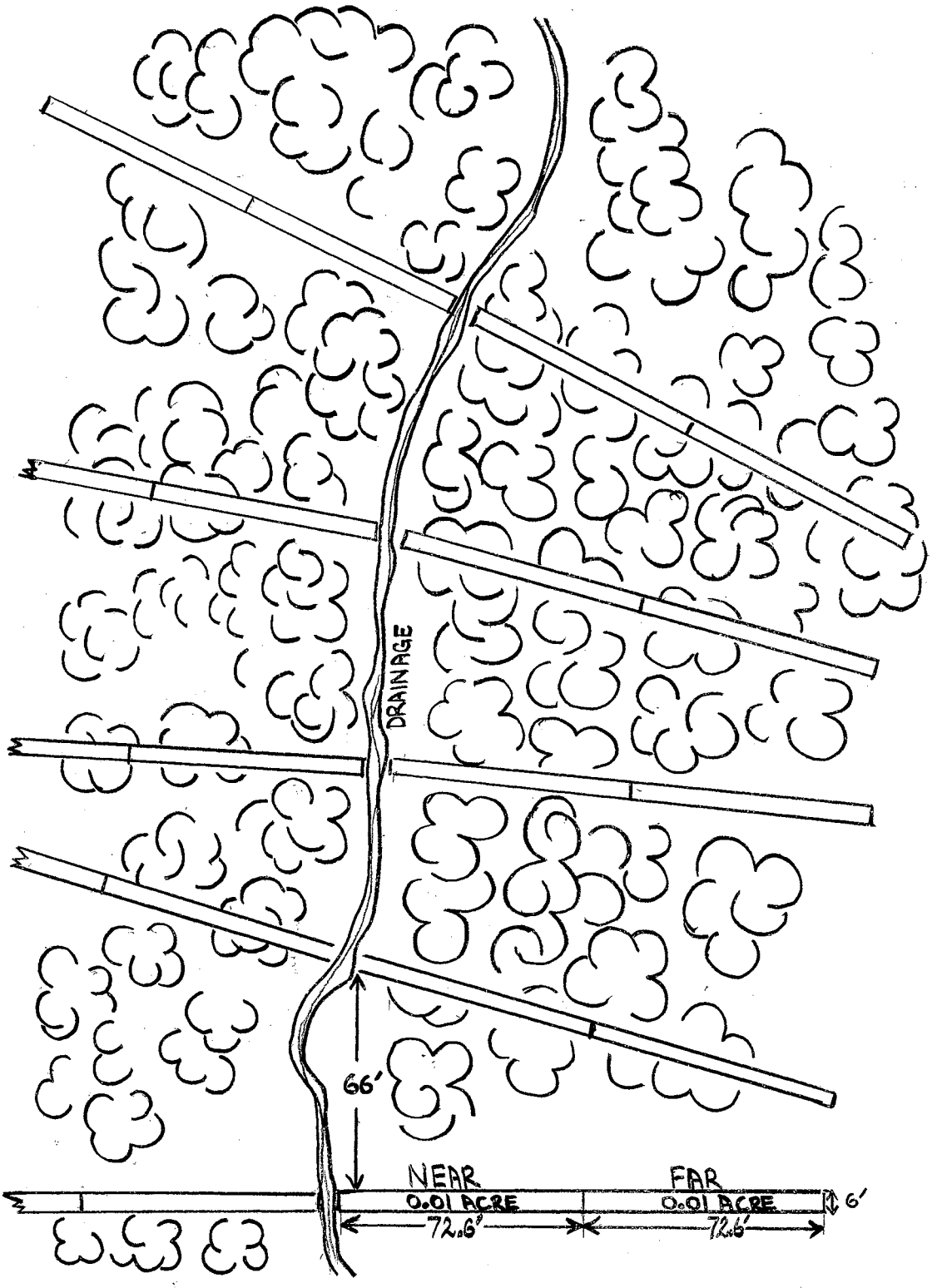

Figure 2. Placement of Arms-Length Rectangles Along Drainage

value between 40 and 75 were considered important. Seedlings and understory vegetation (less than 1.0 d.b.h.) along with saplings were sampled for frequency and density only.

Measurements were also made and recorded for each tree species used as a roosting tree. These were dbh, height of tree, distance to drainage, height of perches, diameter of perches, and azimuth of perches. Diameter-at-breast-height and distance to drainage were measured with a tree tape. Tree height and perch heights were measured with a clinometer. Perch sizes were estimated using 7 x 35 binoculars and azimuth of perches was determined with a compass.

Land-use surrounding roosts was also determined. An area of 4 square miles, one mile in the four cardinal directions from the roosting site, was analyzed to determine the number of acres in bottom-land timber, upland timber, crop-land, pasture, farmsteads, ponds, and other uses. Acreage determination was accomplished by studying aerial photographs prepared by the Soil Conservation Service with a polar planimeter. Visual inspection in the field determined any changes in land use since photographing. Soil types of the roosting site and adjacent areas were obtained from Soil Conservation Service soil maps. Field identification of soils at the roosting sites was by color and texture only.

CHAPTER IV

DESCRIPTION OF ROOSTING SITES

The following chapter describes the location of the individual roosting sites and the flocks of turkeys which used them. Composition of the vegetation within the sites, land-use and soil type surrounding each site are also discussed. Values computed from measurements of vegetation made within each site are given in Tables I and IV. Land-use surrounding each roosting site is tabulated in table VII.

Roosting Sites 1, 2, and 3

Roosts 1 and 2 were located in Pawnee County (Sec. 31, T. 21 N., R. 5 E.) on a tributary of Camp Creek. Site 3 was also located in Pawnee County (Sec. 36, T. 21 N., R. 4 E.) on a small tributary nearer the main branch of Camp Creek. All three sites were within $\frac{1}{2}$ mile of the Payne - Pawnee county line.

The soils of the roosting sites were mixed alluvial land of the bottom-land type. Adjacent land consisted of soils of the Darnell-Talihina-Stephenville association. Land-use in the area was primarily for grazing, but crops of wheat and sorghum were planted along the bottoms.

Site 1 was used regularly in 1967 from June until the last of November; it was used occasionally again in January and early February. Site 2 was used a short time in mid-January and Site 3

was used occasionally late in February. Turkeys which used these roosts presumedly came from a release of 4 hens and 1 tom in January 1967. On October 19, 1967, 6 hens and 4 toms were observed at roost 1, indicating an increase in number since release.

Sampling of vegetation at Site 1 indicated only one tree species with a large enough importance value to be considered dominant; this species was American elm (Ulmus americana). Black walnut (Juglans nigra), black oak (Quercus velutina), and white hickory (Carya tomentosa) were numerous but had a lesser importance value. Black oak and white hickory were found more often in the distal transects than in the ones near the drainage. Saplings which occurred most frequently were American elm, white hickory, redbud (Cercis canadensis) and rough-leaf dogwood (Cornus drummondii). Understory vegetation was of medium density and consisted of buckbrush (Symphoricarpos orbiculatus), poison ivy (Rhus radicans), and rough-leaf dogwood. Smooth sumac (Rhus glabra) occurred frequently in the outer edges of the timber.

Trees used for roosting were an American elm, a burr oak (Quercus macrocarpa), and a sycamore (Platanus occidentalis); they were within 12 feet of the stream which was 5 feet wide and 8 inches deep at that point. These trees were within 700 feet of a well traveled road and a dwelling, but they were well concealed by dense vegetation along the stream.

Site 2 was located 3/4 mile upstream from Site 1 near one of the seeps which fed the stream. The width of the stream at this point was 3 feet and the depth 4 inches; a steep bank was on the east side. This roost was in what could be considered an upland forest. The

dominant trees were post oak (Quercus stellata) and burr oak, with American elm having a lesser importance value. Post oak, rough-leaf dogwood, and redbud saplings were numerous. The understory vegetation was of medium density with buckbrush, saw greenbrier (Smilax bonanox), and rough-leaf dogwood being the most frequently occurring species. An American elm and a burr oak were the roost trees; these trees were 40 yards west of a clearing made for a power line and were well protected from north winds by higher timbered slopes.

Roost 3 was on a rivulet 30 yards from the main branch of Camp Creek. The large American elm which was used as the roosting tree was well sheltered by the surrounding bottom-land forest. The dominant trees of this roost were American elm and burr oak; black oak and hackberry (Celtis spp.) were of lesser importance. Hackberry saplings were the most frequently occurring saplings and buckbrush the most common understory species. Density of the understory was medium.

During the months of December and January an estimated 78 acres of upland timber was cleared north and west of this roosting site to prepare for the construction of a proposed flood-detention structure on Camp Creek.

Roosting Sites 4 and 5

Roosts 4 and 5 were located in Noble County, 3½ miles southeast of Morrison (Sec. 26, T. 21 N., R. 3 E.). They were on a branch of Oak Creek which was 4 feet wide and 8 inches deep at the roosts; they were within 800 feet of a well-traveled road and 1200 feet from a dwelling.

These roosts were used by a flock of 26 turkeys from late September until early January. According to the landowner, this area had been used as a roosting site for the past two winters. On January 12, 1968 these roosts were visited and no recent signs of turkeys were found except for a quantity of breast and wing feathers near roost 4.

Soils of land surrounding the roosting sites were Darnell-Stephenville fine sandy loam and those of the bottom-land were Dale silt loam. Land surrounding the roosting sites was used for pasture, but small plots of wheat and sorghum were also found. Large blocks of upland timber accounted for approximately 1/5 of the area. Fifty-five acres of this upland timber south of these sites was killed by aerial spraying in the spring of 1967.

Site 4, which was used more often, was on the edge of a wheat field and was neither very well concealed from view nor sheltered from north winds. Roost 5 located 350 feet upstream from roost 4 was well concealed and sheltered by upper timbered slopes.

Although these roosts were very near each other, species composition within the plots sampled was not the same. In Site 4, sycamore and American elm were the dominant tree species; post oak, white hickory, and chinquapin oak (Quercus muhlenbergii) were dominant trees in Site 5. Saplings most frequently occurring in both roosts were redbuds. Understory vegetation was of medium density with buckbrush and saw greenbrier being the most numerous species. Trees which were used for roosting in both sites were sycamores. These trees were located either on the bank of a stream or at a distance not greater than 23 feet (Fig. 3).

Roosting Sites 6 and 7

Roost 6 was located in Payne County approximately 3/4 mile northwest of Glencoe (Sec. 1, T. 20 N., R. 3 E.). Site 7 was located in the next section south (Sec. 12, T. 20 N., R. 3 E.). These two sites were used by the largest known flock in the study area; this flock contained as many as 73 turkeys during the winter months. Roosting sites 6 and 7 were also used the previous year according to the landowners.

Turkeys began using roost 6 shortly before November 2, 1967. This was the date on which the roost was discovered and 46 turkeys were observed in an area 1/4 mile from this site. The site was located at the effluence of the Glencoe sewage system by a stream approximately 6 feet wide and 18 inches deep. American elm and hackberry were the dominant trees of roost 6 with soapberry (Sapindus drummondii) and eastern cottonwood (Populus deltoides) being of lesser importance. Hackberry and rough-leaf dogwood saplings were the most frequently-occurring saplings. The understory was of medium density, consisting of buckbrush, poison ivy, and rough-leaf dogwood.

Roosting trees were elm, hackberry, cottonwood, and soapberry. The roosting tree the greatest distance from the drainage was an elm which was 70 feet away.

Roost 6 was used regularly until the end of December when clearing operations began 150 yards north of this site (Fig. 4). Approximately 24 acres of bottom-land timber and shrubs were cleared for pasture, thus eliminating a resting and feeding area for this flock. The flock then began roosting $\frac{1}{2}$ mile south on the same creek.

Roost 7 was 463 feet from a well-traveled road, however, the roost trees were sheltered from view by other trees and due to the slope of the land were below the line of sight from the road.

This roosting site differed in species composition from roost 6. Elm and black willow (Salix nigra) were dominant tree species, green ash (Fraxinus pennsylvanica) and hackberry had a lesser importance value. Rough-leaf dogwood and hackberry were the most frequently occurring saplings and the understory vegetation which was of medium density was predominately buckbrush. Sand plum (Prunus angustifolia) and smooth sumac were found in the outer edges of the timber.

Trees used for roosting were elm and black willows. The black willows were within 26 feet of the stream while the elms were as far as 34 feet.

The soils of the roosting sites were loamy prairie soils of prairie drainageway. Soils of the Renfrow-Zaneis-Vernon association were found surrounding these roosts under the native grass pastures which dominated the area.

Roosting Sites 8 and 9

Roosts 8 and 9 were in Noble County $\frac{1}{2}$ mile north of the Payne County line (Sec. 31, T. 21 N., R. 2 E.) on an intermittent tributary of Long Branch Creek. These roosts were used by a small flock of 11 turkeys during the months of January and February. The distance to the nearest dwelling from these roosts was over 1/4 mile and the roost trees were well protected from winds and observation by dense vegetation.

Land surrounding these roosting sites was primarily used for pasture but a larger per cent of it was in cultivation compared to environments surrounding other sites. Soils of the drainages were Yahola and Port silty clay loams; away from the drainages, Chickasha loam was found.

Although no noticeable difference in species composition could be observed between these two sites, sampling of the vegetation revealed a slight difference in the density of trees. Roosting site 8 had as its dominant species American elm and hackberry; site 9 which was 230 feet downstream had American elm as a dominant species with hackberry of lesser importance value. Redbud was an important tree in both roosts. These two roosts had a very dense growth of saplings and understory vegetation. Rough-leaf dogwood thickets contributed to this heavy density, but American elm and hackberry saplings were also numerous. Buckbrush and saw greenbrier were very dense as well.

Trees which were used for roosting were all large elms, within 8 feet of a dry stream bed. The largest of these trees was dead and a portion of it had blown down. An open pasture was within 60 yards of the roost trees.

Roosting Sites 10 and 11

These sites were also found in Noble County. They were 4 miles north of Lake Carl Blackwell (Sec. 15, T. 20 N., R. 1 E.) and were used by a flock which contained 43 turkeys in mid-November. These sites were located on an intermittent stream which is a branch of North Stillwater Creek. The area was sparsely populated and the

primary use of the land was for pasture. Large blocks of upland timber were scattered throughout the area and bottom-land timber occurred in narrow bands along the water courses (Fig. 5). Soils along these streams were Port and Yahola silt loam; adjacent land consisted of Darnell-Stephenville sand loams.

Roost 10 was used occasionally in mid-November, early January, and late February. According to local residents, this area had been used occasionally during the previous winter.

The vegetation was dominated by chinquapin oak with American elm, hackberry, and post oak being important trees. Saplings of greatest frequency were rough-leaf dogwood. Density of understory vegetation was light, consisting chiefly of buckbrush. Two large American elms within 6 feet of the creek bank were the roost trees.

The other roost found in this area was 450 feet downstream. It was located in mid-December and upon several successive visits no signs could be found indicating use during the other winter months.

Sampling of the vegetation in roost 11 did not find any species of trees with an importance value large enough to be considered dominant, but black walnut, red mulberry (Morus rubra), eastern cottonwood, post oak, burr oak, chinquapin oak, and American elm were all important trees. Saplings were primarily rough-leaf dogwood and the density of the understory was light, buckbrush being the major species. Roost trees were two elms and a black walnut, all located within 13 feet of the drainage.

This roosting site was open to the west with little protection from northwesterly winds, which might account for its limited use in winter.

Roosting Site 12

This site was 1/4 mile southeast of the Outdoor Hydraulic Laboratory in Payne County (Sec. 10, T. 19 N., R. 1 E.). It was used regularly by a flock of 21 turkeys from October until early January after which it was abandoned until late February.

The roost was located on Stillwater Creek which was 10 feet wide and 18 inches deep at that point. Soils along the drainage were deep alluvial soils of the Port series while soils surrounding the area were of the Renfrow-Zaneis-Vernon association. Some land immediately surrounding this roosting site was planted in wheat and alfalfa, but the major use of land in that area was for pasture.

Hackberry and American elm were the dominant trees of this roosting site with burr oak of lesser importance value. Saplings which were numerous were American elm and hackberry. Understory density was light with poison ivy, buckbrush, and saw greenbrier distributed throughout.

The roosting trees were 4 large American elms and a hackberry. One of the elms and the hackberry tree were near the stream; the three largest elms were further away, the most distant one being 117 feet from the bank.

Roosting Site 13

Another roost near Lake Carl Blackwell, number 13, was located near a stream 2 miles southwest of the Lake headquarters (Sec. 20, T. 19 N., R. 1 E.) and was used by a flock of 5 toms and 18 hens.

This roost was seen in use only once. Turkeys were observed in the area on December 11, 1967 and the roosting trees were located a

few days later, but no large accumulation of droppings was found underneath. The area along the drainage was searched for a roost several more times during the winter, but none was found. Turkeys did range through this area and a smaller flock had used a site 1/4 mile south of roost 13 as a roosting site for a few nights in September.

Most of the land surrounding the roosting site consisted of native grass pastures and broken areas of upland timber. Soils of the drainage were broken alluvial land; soils of the timbered uplands were of the Darnell-Stephenville association.

The understory vegetation of roost 13 was very dense and consisted mostly of saw greenbrier thickets near the drainage and smooth sumac in the outer edges of the timber. Saplings of the greatest density were rough-leaf dogwood with redbud also being numerous. American elm was the dominant tree near the drainage; black walnut, and redbud trees dominated the distal transects. Hackberry and post oak trees were important trees in this roosting site. Two mature elm trees on the banks of the stream were the ones used for roosting.

Roosting Sites 14 and 15

Roosting sites 14 and 15 were located in Payne County 1 1/4 mile southwest of the Stillwater Country Club (Sec. 30, T. 19 N., R. 2 E.). These roosts were along an intermittent tributary of Stillwater Creek and were over 1/4 mile from the nearest dwelling.

Land surrounding the roosting sites was mostly open pasture, but large blocks of upland timber were found to the south and west. Soils of the area were of the Renfrow-Zaneis-Vernon association, with

broken alluvial land along the streams.

Roosts 14 and 15 were used by 19 turkeys. Roost 14 was used in November and December and 15 was used in January, February, and early March. Although these sites were only approximately 1/4 mile apart, their species compositions differed. Site 14 had American elm as the dominant tree species, while in 15, hackberry and chinquapin oak were dominant. Boxelder (Acer negundo), pecan (Carya illinoensis), and eastern cottonwood were important trees in site 14; American elm was the only other tree species in site 15 with a large importance value. Common saplings in both roosts were hackberry and redbud, but American elm, pecan, and rough-leaf dogwood saplings were also numerous in roost 14. The density of the understory was medium in site 14 and heavy in site 15. The common species were buckbrush and saw greenbrier.

Roosting trees were 3 eastern cottonwoods and a pecan tree in roost 14. The cottonwoods were on the banks of the stream and the pecan tree was 32 feet from the drainage. In roost 15 American elms were used for roosting, the 3 trees used ranged in distance from 70 to 87 feet from the stream.

Roosting Sites 16 and 17

The turkeys which used roosting sites 16 and 17 were observed many times by the landowner from the time of their release in January, 1967 until November, 1967. Four hens and 1 tom were released and the flock increased in number to 7 hens and 6 toms the following summer. This flock roosted in several locations during the summer months, but by September they were using site 16 regularly. This

continued until the last of November when they abandoned it, except for occasional uses in January and March. They may have left because of some alleged poaching. The turkeys were observed afterward minus one of their number, but their other roosting site was not located until February.

Roost 17 was located in Payne County 3 miles east of Coyle (Sec. 15, T. 17 N., R. 1 E.) and roost 16 was 1 mile further east (Sec. 14, T. 17 N., R. 1 E.). Neither of these roosts was located on a drainage, but both were between stabilized sand dunes north and adjacent to the Cimarron River. The species composition on sites 16 and 17 was more like that of an upland forest. Post oak and eastern redcedar (Juniperus virginiana) were the dominant species in site 16 with American elm having a lesser importance value. In roost 17 all three species were codominant. Saplings consisted chiefly of eastern redcedar and rough-leaf dogwood at both roosts. Understory vegetation was light with saw greenbrier and rough-leaf dogwood being the most frequently occurring species. Roost trees were all mature elms with spreading horizontal branches (Fig. 6).

Small plots of land along the Cimarron were in cultivation, but the main use of the land was for grazing. Soils of the area were deep sandy soils of the flood plains composed of soils of the Yahola-Port-Rienach association.

Roosting Site 18

Roost 18, located 2½ miles east of Ingalls on Council Creek (Sec. 26, T. 19 N., R. 4 E.), was used occasionally during January and February by a flock consisting of 4 toms and 8 hens. Access to another roosting site, 3/4 mile downstream from 18 was denied by the landowner.

Dominant tree species at site 18 were American elm and black oak; eastern cottonwood and box elder were of lesser importance value. Saplings which frequently occurred were hackberry and box elder. Understory vegetation was of medium density with buckbrush and poison ivy being the most common species. A large burr oak located 34 feet from the creek was used for roosting.

Soils along Council Creek were soils of the Yahola-Port-Reinach association. Land immediately surrounding this roost had been cultivated, but most of the land was used for pasture.

Figure 3. Roosting trees of Site 4.

Figure 4. Clearing of land north of Site 6.

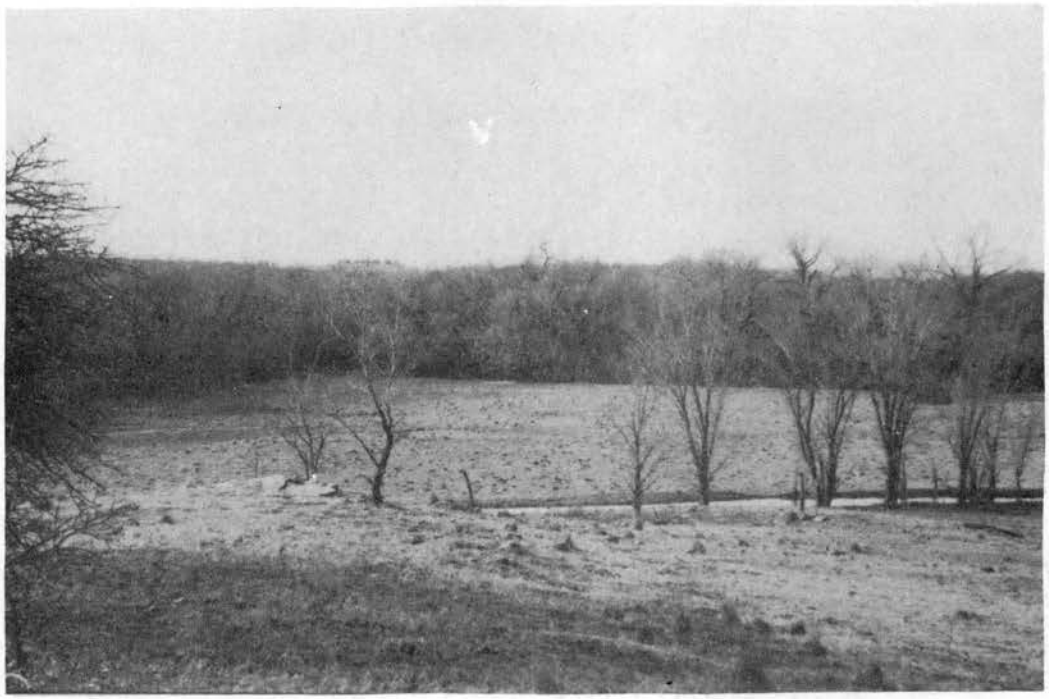

Figure 5. Habitat of Sites 10 and 11.

Figure 6. Roosting trees of Site 17.

CHAPTER V

DISCUSSION OF TESTS AND MEASUREMENTS

Analysis of the Vegetation

Data computed from measurements made in the roosting sites are presented in Table I. These data were analyzed statistically to ascertain whether or not any significant differences in basal area, height, and density of vegetation existed among roosting sites. Statistical tests were also made to determine if there were significant differences in vegetation among drainage areas in which roosts were located. Data from roosting sites plus data computed from measurements made in control areas were used in these tests. The F values obtained for testing the hypothesis of no differences in vegetation among roosting sites are given in Table II. Those obtained for testing the hypothesis of no differences among drainage areas are given in Table III.

The variation among blocks (vegetation near the drainage and vegetation far from the drainage) was also tested. Expected differences did exist in basal area, height and density of trees. The values for these measurements were larger in the transects near the drainage, except in roosting sites 8, 12, and 14. There was no significant difference in the density of saplings and understory vegetation among the blocks.

TABLE II

F VALUES OBTAINED IN TESTING FOR DIFFERENCES IN VEGETATION AMONG ROOSTING SITES

Category	F Value	Remarks
Basal Area	.81	No significant difference in basal area of trees among roosting sites
Height	1.11	No significant difference in mean tree height among roosting sites
Tree Density	1.65	No significant difference in tree density among roosting sites
Sapling Density	6.51	Significant difference in sapling density among roosting sites
Understory Density	4.01	Significant difference in stem density among roosting sites

The F value for 17 and 17 degrees of freedom at the 10 per cent level is 1.93.

TABLE III

F VALUES OBTAINED IN TESTING FOR DIFFERENCES IN VEGETATION AMONG DRAINAGES

Category	F Value	Remarks
Basal Area	3.56	Significant difference in basal area among drainages
Height	5.19	Significant difference in mean tree height among drainages
Tree Density	.78	No significant difference in tree density among drainages
Sapling Density	15.41	Significant difference in sapling density among drainages
Understory Density	12.03	Significant difference in stem density among drainages

The F value for 9 and 9 degrees of freedom at the 10 per cent level is 2.44.

Data from roosting sites and control areas were also analyzed to determine whether significant differences existed in vegetation within a drainage area. With few exceptions, differences in vegetation within drainages were not significant. Significant differences existed in the tree height within the drainage area where roosts 14 and 15 were located and tree density of Stillwater Creek drainage which contained roost 12. The Camp Creek drainage had a significant difference in sapling density. In the area north of the Cimarron River where roosts 16 and 17 were located a significant difference existed in both sapling density and understory density.

Importance values based on the sum of the three percentages: relative basal area, relative density, and relative frequency were calculated for each tree species appearing in the transects taken at the roosting sites (Table IV). Dominant tree species were those with an importance value greater than 75 and those with an importance value between 40 and 75 were considered important.

Importance values of tree species in control sites were also calculated and the number of times a species appeared as a dominant or important tree in the control sites was compared to the number of times it appeared as a dominant or important tree species in the roosting sites (Table V). The number of roosting sites in which the species was used as a roosting tree was also compared. It was noted that American elm appeared as a dominant species more often in roosting sites than in control areas. The same is true of sycamore and burr oak; eastern cottonwood appeared more often as an important tree in roosting sites. These tree species were all used as roosting trees with American elm being used more often.

TABLE IV

IMPORTANCE VALUE OF TREE SPECIES OCCURRING
IN ROOSTING SITES

Tree Species	Roost Number 1		2		3		4		5		6	
	Near	Far	Near	Far	Near	Far	Near	Far	Near	Far	Near	Far
Acer negundo					13.6		12.6					
Bumelia lanuginosa		12.2	9.6	13.5		24.5			17.2		9.5	15.5
Carya illinoensis		12.2										
Carya tomentosa	36.7	68.6					16.2	44.9	85.5	35.8		
Celtis spp.					48.9	34.2			27.2		104.2*	99.9
Cercis canadensis		12.2	19.9	12.5	9.8	11.2	24.3	25.5		11.5		
Cornus drummondii												
Diospyros virginiana												
Fraxinus pennsylvanica					9.8							
Gleditsia triacanthos											9.7	
Gymnocladus dioicus												
Juglans nigra	61.3											
Juniperus virginiana						11.2			12.8			
Maclura pomifera												
Morus rubra	17.1				15.6	15.3						15.5
Platanus occidentalis							98.5*		25.5*			
Populus deltoides											34.3*	
Prunus mexicana	8.9	12.2										
Quercus macrocarpa	8.9*	35.6	81.1*		76.7	92.3			23.1	56.5		
Quercus marilandica			10.2	12.5				13.5				
Quercus muhlenbergii		46.3	28.9				47.5	63.3	72.1	79.5		
Quercus stellata	10.0	31.2	82.0	261.5		38.3	55.6	72.7	29.8	103.9		
Quercus velutina	39.1	69.6			46.6	38.3						
Salix nigra												
Sapindus drummondii						12.4					56.1*	29.7
Ulmus americana	118.0*		68.1*		78.2*	22.4	52.3	80.1	15.7		86.2*	139.1

*Species used for roosting

TABLE IV (Continued)

Tree Species	Roost Number 7 Near	7 Far	8 Near	8 Far	9 Near	9 Far	10 Near	10 Far	11 Near	11 Far	12 Near	12 Far
Acer negundo							13.0		10.16			39.4
Bumelia lanuginosa					18.5	20.7		13.4				14.3
Carya illinoensis			18.6	10.5								
Carya tomentosa						13.2						
Celtis spp.	27.7	62.7	86.1	60.1	66.9	61.2	28.4	66.8	39.2	29.9	126.8*	98.3
Cercis canadensis			28.0	44.4	36.0	33.8			20.1	30.2		
Cornus drummondii												
Diospyros virginiana		17.0										
Fraxinus pennsylvanica	55.5	57.0									31.4	
Gleditsia triacanthos	16.9											
Gymnocladus dioicus												
Juglans nigra			24.6		11.5		11.5		49.9*	25.01	21.8	
Juniperus virginiana						13.2						
Maclura pomifera	16.4	20.7			23.2							
Morus rubra	9.8	18.7	18.6			16.9	10.5		39.7	45.8		14.3
Platanus occidentalis												
Populus deltoides									43.78			
Prunus mexicana								28.6				
Quercus macrocarpa							10.9			64.5	70.8	33.2
Quercus marilandica				22.9		46.5						
Quercus muhlenbergii							157.2	63.7	40.0	12.2		
Quercus stellata							19.4	60.8	10.9	51.4		
Quercus velutina												
Salix nigra	83.9*		20.6									
Sapindus drummondii								11.5	20.1		9.5	
Ulmus americana	89.7*	116.9	103.4*	162.1	143.9*	94.6	50.8*	55.3	26.2*	41.1	39.8*	100.5*

*Species used for roosting

TABLE V

THE NUMBER OF TIMES A TREE SPECIES WAS DOMINANT OR IMPORTANT IN ALL ROOSTING AND CONTROL SITES COMPARED TO THE NUMBER OF TIMES USED AS A ROOSTING TREE

Tree Species	Roosting Sites (18)		Control Sites (20)		No. Times Used for Roosting
	Dominant	Important	Dominant	Important	
Acer negundo		3	1	1	
Bumelia lanuginosa		2		2	
Carya illinoensis	1			1	1
Carya tomentosa	1	2	1	2	
Celtis spp.	4	5	7	4	2
Cercis canadensis	1	1			
Fraxinus pennsylvanica		1	3		
Juglans nigra	1	2		1	1
Juniperus virginiana	2		2		
Morus rubra		2		1	
Platanus occidentalis	1			2	3
Populus deltoides		3		1	2
Quercus macrocarpa	2	3	1		2
Quercus marilandica				1	
Quercus muhlenbergii	3	4	3	2	
Quercus stellata	4	4	7	3	
Quercus velutina	1	2	2		
Salix nigra	1				1
Sapindus drummondii		1		2	1
Ulmus americana	12	5	9	8	14

Measurements of Roosting Trees

Measurements made and recorded for each tree species used as a roosting tree included dbh, height of tree, distance to drainage, height of perches, diameter of perches, and azimuth of perches. These measurements are listed in Table VI.

Roosting trees were not necessarily located on the drainage, but were usually within the area included in the near transect. They were usually mature trees with spreading horizontal branches. Exceptions to this were trees used by the large flock near Glencoe; smaller trees were used by turkeys in this flock after the larger trees has been filled. The largest number of turkeys observed using a roosting tree was 24 turkeys in an elm tree within roosting site 6. Mean perch height was 36 feet and the average perch diameter was $1\frac{1}{2}$ to 2 inches, this size branch was probably chosen because it was comfortable and would support the weight of the turkey. Most perch limbs extended in an east or west direction, thus allowing the turkey to face into northerly winds. Birds were observed on the perches when the wind was from the north and when it was from the south; most of them faced the wind.

Analysis of Land-Use

Land-use surrounding roosting sites is given in Table VII. Analysis of variance was made to ascertain whether differences existed among areas with respect to the number of acres in each of the following divisions: bottom-land timber, upland timber, cropland, and pasture.

TABLE VI

MEASUREMENTS OF ROOSTING TREES

Tree Species	No.	Percent	D.B.H. (Inches) Mean	D.B.H. (Inches) Range	Height (Feet) Mean	Height (Feet) Range	Distance to Drainage (Feet) Mean	Distance to Drainage (Feet) Range
Carya illinoensis	1	2	27.0	-	49	-	32	-
Celtis occidentalis	3	5	15.9	9.4-20.5	44	41-51	51	21-66
Juglans nigra	1	2	19.1	-	40	-	13	-
Platanus occidentalis	6	10	23.2	11.2-35.2	50	45-57	6	1-23
Populus deltoides	5	9	30.6	21.3-40.0	55	52-61	2	1-3
Quercus macrocarpa	3	5	20.6	15.6-28.3	46	44-48	22	8-34
Salix nigra	8	14	11.9	8.1-17.0	41	36-43	11	1-26
Sapindus drummondii	3	5	11.2	8.9-15.5	42	41-43	42	24-52
Ulmus americana	28	48	26.4	9.0 45.4	42	32-55	34	1-117
Total	58							

	Perch Height (Feet) Mean	Perch Height (Feet) Range	Perch Diameter (Inches)	Perch Azimuth (Relative Percentage) N-S	E-W	NE-SW	NW-SE
Carya illinoensis	41	40-42	2.0	1			
Celtis occidentalis	35	31-41	1.5		2		
Juglans nigra	32	30-34	1.5	1			
Platanus occidentalis	39	36-44	2.0		11	2	2
Populus deltoides	43	41-45	1.5		2	6	
Quercus macrocarpa	34	32-36	2.0		4		
Salix nigra	31	26-35	1.5	1	9	2	
Sapindus drummondii	39	38-41	1.0	1	1	1	2
Ulmus americana	33	27-47	1.5	8	35	4	4
Total				12	65	15	8

TABLE VII

LAND-USE SURROUNDING ROOSTING SITES

Roosting Site Number(s)	Number of Acres Out of 4 Square Miles (2560 Acres)						
	Bottom-land Forest	Upland Forest	Cropland	Pasture	Ponds	Farmsteads	Other
1, 2, & 3	201	188	210	1927	8	26	
4 & 5	149	559	228	1603	12	9	
6 & 7	118	88	169	2029	19	19	118
8 & 9	132	84	362	1931	16	21	14
10 & 11	110	336	100	1963	12	9	30
12	156	252	248	1280	3	27	594
13	186	435	25	1816	4	7	87
14 & 15	119	557	29	1737	21	22	75
16 & 17	109	186	230	1896	6	15	118
18	149	90	214	2078	10	19	
Mean	143	278	182	1826	11	17	103
%	5.6	10.8	7.1	71.3	.4	.7	4.1

Significant differences existed among areas surrounding roosting sites only in acres of upland timber and acres of cropland. No significant differences were found in bottom-land timber or pasture.

Korschgen (1967) and Walker (1951) found that because of habitat preference, agricultural crops comprise a small percentage of the wild turkey diet. The turkey is not found in open agricultural lands with high human populations, but tolerates an interspersion of cultivated crops and forests. This study found that turkeys were located in areas where a smaller percent of the land was used for crops compared to land-use on a county-wide basis (Table VIII).

TABLE VIII

LAND-USE OF THE COUNTIES IN THE STUDY AREA

Land-Use	Payne County		Pawnee County		Noble County	
	No. Acres	Percentage	No. Acres	Percentage	No. Acres	Percentage
Timber	57,497	16.3	48,209	13.8	22,521	4.9
Cropland	67,110	19.0	85,399	24.5	217,653	46.8
Range	217,940	61.8	207,728	59.6	222,411	47.8
Ponds	4,320	1.2	3,339	1.0	1,580	.3
Farmsteads	5,812	1.7	3,668	1.1	958	.2
Total	352,679	100	348,343	100	465,123	100

Source: County conservation needs committee for each county in 1958. Land-use for 1958 and projected land-use for 1975 was given. Values in Table VIII were determined by adding to the 1958 land-use, 58% of the difference between 1958 and 1975 acreage.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Quantitative evaluation of 18 winter roosting sites of the Rio Grande turkey and 20 control sites on 10 different drainages in northcentral Oklahoma was made in the winter of 1967 and 1968. The evaluation of vegetation in the winter roosting sites revealed no significant differences in the basal area, height and density of trees, among roosts, but differences did exist in the density of saplings and understory vegetation among roosts. Analysis of the vegetation among the different drainages indicated significant differences in basal area, height of trees, sapling density, and understory density. No significant differences existed in tree density.

Importance values for tree species within roosts and control sites were calculated and it was found that American elm, hackberry, post oak, eastern redcedar, and chinquapin oak were the dominant trees of the drainages sampled. American elm outnumbered the others in frequency of dominance by a ratio of 3:1, and was the most frequently used roosting tree as well. Other roosting trees which were used to a lesser extent, were sycamore, eastern cottonwood, and burr oak. These trees along with American elm had a greater importance value in roosting sites than in control sites. Measurements were made on trees used for roosting and with few exceptions, these

trees were mature with a greater dbh and height than surrounding trees. They were located near the drainage in an area which afforded concealment and shelter. Branches used for perches were horizontal, 1½ to 2 inches in diameter, at an average height of 36 feet and extended predominately in an east or west direction.

Land-use surrounding roosting sites was analyzed, and it was found that land was predominately in grasses with acreages in upland forest, cropland, and bottom-land forests in descending order. Significant differences existed in number of acres in upland forests and cropland among areas surrounding roosting sites. A large number of acres in cropland did not appear necessary for wild turkeys, as indicated by the larger percentage of cropland acreage on a county-wide basis than the percentage of cropland surrounding sites. Percentages of other land-use were essentially the same as that of the county.

It was concluded from this study that all roosting sites measured were similar with respect to basal area, tree height, and tree density. Areas which were selected as a roosting site had a number of trees which were taller and had a larger dbh than trees in other areas.

Mature American elms were the most frequently used roosting trees, probably because of their form, which had spreading horizontal branches suitable for roosting and because they were the most abundant large tree. Other species of large trees such as sycamore, eastern cottonwood, burr oak, and hackberry with similar forms were used to a lesser extent.

Land surrounding roosting sites was predominately open pasture, with smaller amounts in upland timber, cropland and bottom-land forests. Turkeys used bottom-land forests for most of the day, feeding in or near the edge and roosting there at night. Bottom-land forests which provided a good source of food, concealment, and shelter were selected over the more open forests. Plots of cropland or naturally occurring clearings were used by turkeys early in the morning as an area for landing and preening after they departed from the roost.

The clearing of bottom-land and upland timber in the study area has caused turkeys to abandon roosting sites. Clearing of timber destroys good roosting sites, and limits the food supply in that area. The effect of land clearing upon the number of suitable roosting sites and the survival to turkeys should be investigated in the future.

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