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MERRIAMS TURKEY ROOST CHARACTERISTICS AND SITE SELECTION SURVEY
MT. TRUMBULL - MT. LOGAN IN NORTHWESTERN ARIZONA

ARIZONA GAME AND FISH DEPARTMENT
REGION II, FLAGSTAFF, ARIZONA

AND

BUREAU OF LAND MANAGEMENT
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INTRODUCTION

In 1961 thirty-seven Merriam turkeys (Meleagris gallopavo merriami) were released in the Mt. Trumbull/Mt. Logan study area in an effort to expand the historical range of the wild turkey in Arizona (Hewitt 1967). Today, more than 20 years later, population estimates range from 150 to 350 turkeys (Pratt 1975-1980). The Mt. Trumbull turkey population has been successfully hunted since 1964 (Table 2).

In order to better understand this and similar isolated populations, a study was initiated as a cooperative effort between the Arizona Game and Fish Department and the Arizona Strip District of the Bureau of Land Management (BLM). The major objectives of this study were:

1. To locate and document roost site characteristics.
2. To determine locations of future water catchments that will best benefit turkeys and enhance the population allowing further utilization of the existing suitable turkey habitat.

DESCRIPTION OF STUDY AREA

LOCATION

The Mt. Trumbull/Mt. Logan study area (Figure 1) is a sky island located on the Uinkaret Plateau of the Arizona Strip. The study area boundaries were designed to encompass all stands and stringers of ponderosa pine, (Pinus ponderosa) where turkeys may be present (Figure 2). The area is bounded by Death Valley to the west, Hell's Hole and the Grand Canyon National Park to the south, and by Mt. Trumbull to the northeast. Due to time restraints, Mt. Trumbull itself was not included in the study area; however, figure 2 shows the boundary of ponderosa pine on Mt. Trumbull. ~?

TOPOGRAPHY

The study area was comprised of several rolling hills cut by deep ravines and canyons. Major topographical features of the surrounding area are Hell's Hole Canyon, Mount Logan, Mount Trumbull, and several perched lava flows. Elevations range from 6,350 feet at one of the lowest Mt. Logan seedings up to 7,866 feet at the summit of Mount Logan.

VEGETATION

Vegetation on the study area is classified as Montane Conifer Forest (Brown 1973). Ponderosa pine (Pinus ponderosa) comprises approximately 11,600 acres on the study area. Within the stands of ponderosa, Gambel oak (Quercus gambelii) and New Mexican locust (Robinia neomexicana) are common in dense thickets. Another major component of vegetation is the sagebrush (Artemisia tridentata) understory found in much of the area. Under a directive from the 1977 Mt. Trumbull Habitat Management Plan (HMP), approximately 600 acres were plowed and reseeded with "a mixture of grasses, forbes, and shrubs" for livestock and wildlife use. A majority of these seedings were at least moderately successful.

Along the study area boundaries a distinct transition zone from ponderosa to pinyon pine (Pinus edulis) and Utah juniper (Juniperus osteosperma) occurs.

CLIMATE

The climate of the Mt. Trumbull area is "characterized by two periods of precipitation - winter snow storms from October to February and summer thundershowers July to September. Total precipitation varies from 7" to 20" as elevation changes from 6,500 to 8,029 feet" (Wilhelm and Britt, 1977). Temperatures on the study area range from freezing to 90 plus degrees fahrenheit.

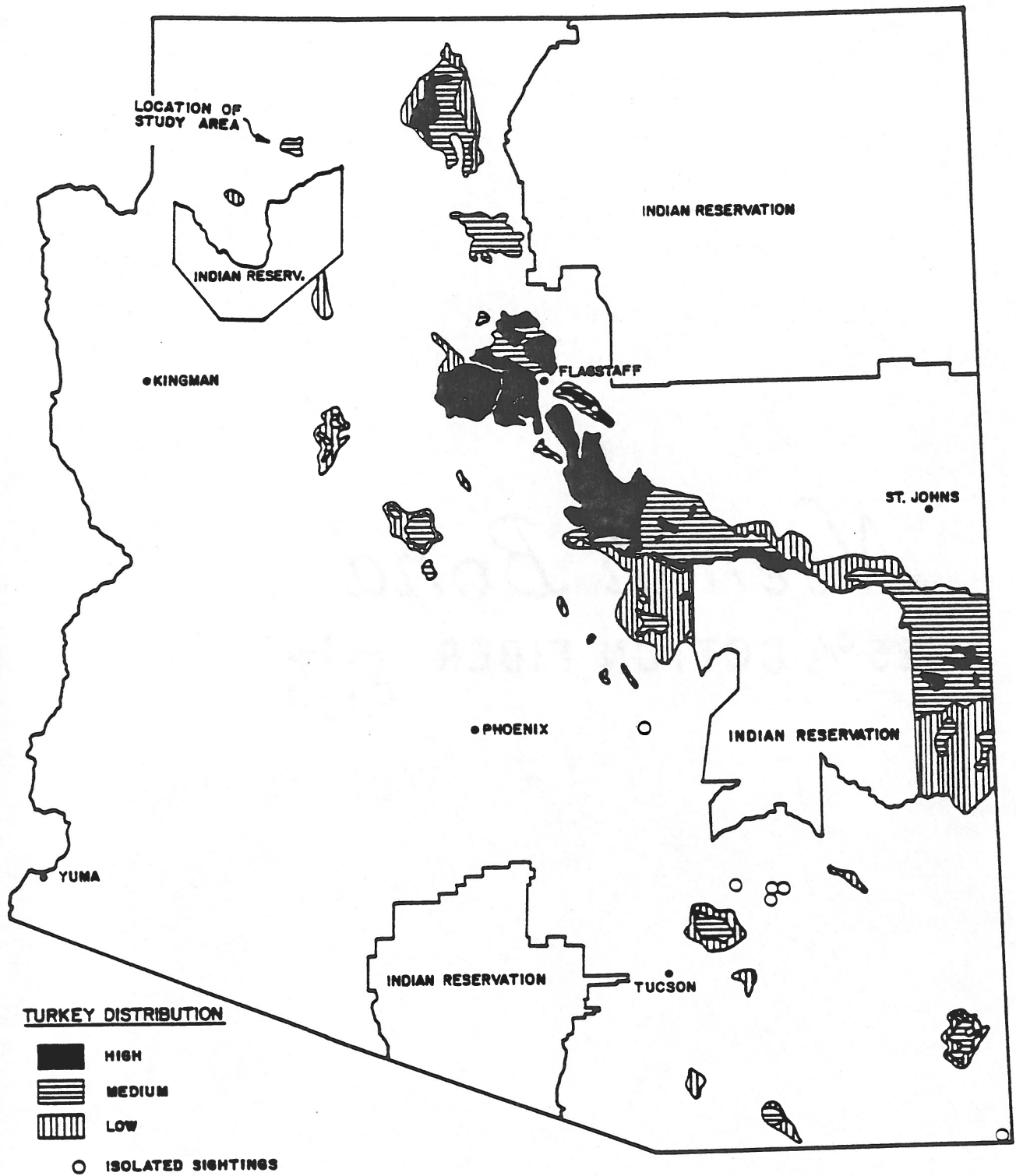
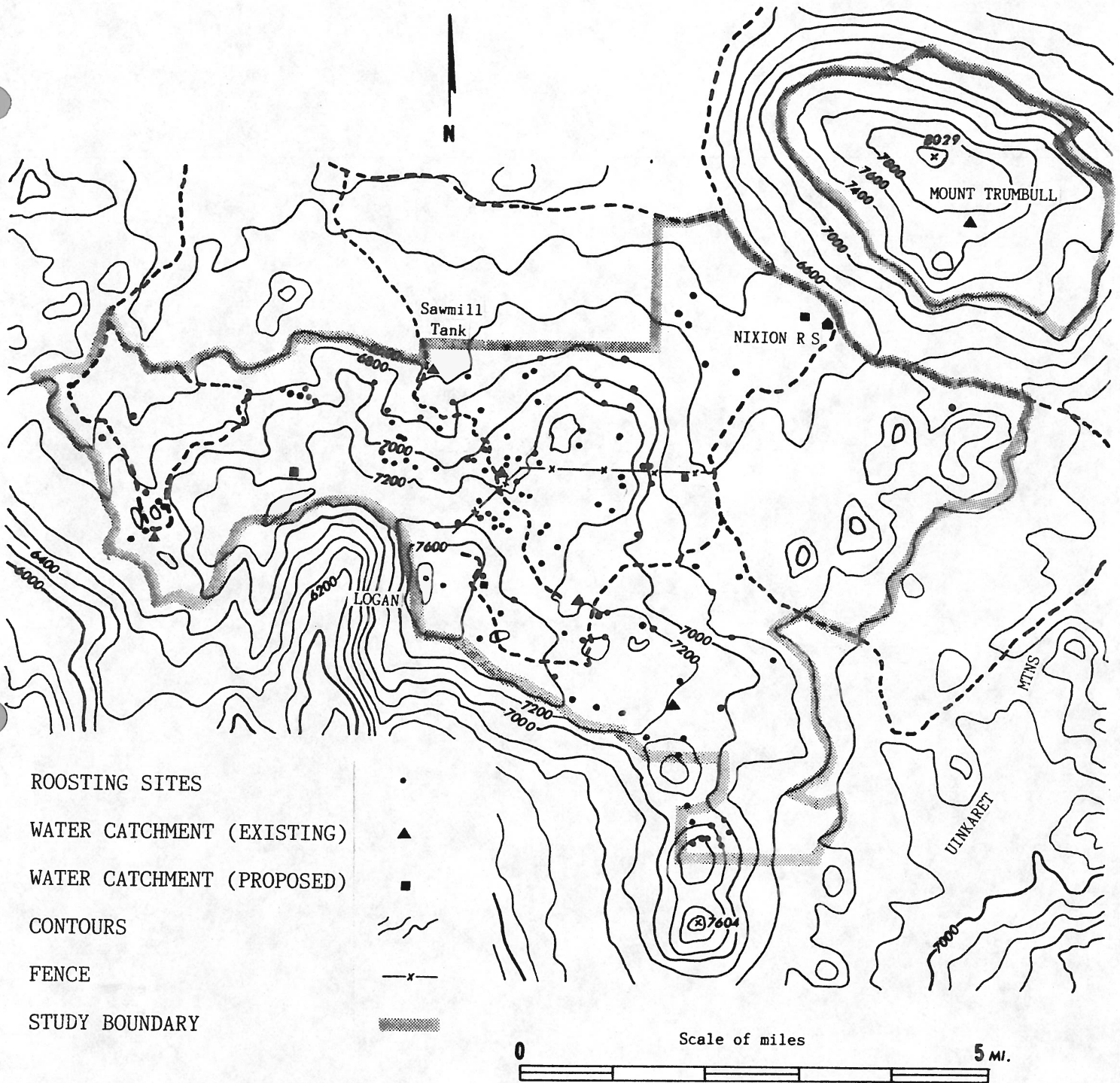


Fig. 1. Location of study area.



ROOST AND WATER DISTRIBUTION
FIGURE 2

WATER

Within the 18 square mile study area two earthen tanks and three developed wildlife water catchments supply the only dependable water sources. There are also two natural springs, but these sources are not dependable and no use by turkeys was noted.

MAJOR LAND USES

LAND OWNERSHIP

Approximately 93% (10,800 acres) of turkey habitat in the study area is public land. This land is administered under the Vermillion Resource Area of the Arizona Strip District of the BLM. The remaining 7% (800 acres) is state land.

Along the northern boundary are several sections of private land. The private land is composed of large sagebrush bordered meadows where turkeys were frequently observed.

TIMBER

*Need to get
data on harvest
during the 50's*

The history of timber cutting in the Mt. Trumbull area goes back to the 1870's when approximately one million board feet of milled timber was removed from the site to build the St. George Mormon Temple in St. George, Utah.

The Mt. Trumbull HMP discussed a proposed timber harvest on four sections of land within the study area. Later it was concluded that "the proposed timber harvest poses more of a threat to turkey habitat than a likely method to improve it" (Wilhelm and Britt 1977). The ultimate result being no major timber harvest in the area since the 1870's.

Current timber harvest is on a small scale and consists of cutting, junipers for posts and a free cut of ponderosa exists in the 240 acre - Logan burn area.

GRAZING

Current grazing in the Mt. Logan area consists of two allotments on a four year rest rotation schedule. In the first year, cattle are deferred until June, in the second and third year, deferment is until the seed heads ripen in late July or August. Grazing in the fourth year is deferred for that entire year (Sloan 1985).

RECREATION

Recreational uses in the Trumbull area are hunting, camping, hiking, and bird watching. Because the mule deer population is at a low level, the major big game animal sought is the wild turkey. Fall and spring turkey harvest results are summarized in Tables 2 and 3. Harvest interest is increasing in the transplanted Kaibab Squirrel since the opening of the season in 1983.

ROADS

Due to its remoteness, travel to Mt. Trumbull is minimal. Several roads do transverse the study area, but are seldom used. Use of the roads are expected to increase as the public becomes aware of the newly named Mt. Trumbull and Mt. Logan wilderness areas.

METHODS OF STUDY

MAPPING

Prior to the field work, topographical maps of the area were outlined with approximate boundaries of ponderosa pine type vegetation. The study area was then divided into 27 compartments. The compartment boundaries were designed to follow roads, ridges, or valleys to facilitate easy identification during field surveys. During the field work roost locations and numbers were recorded on the project maps according to compartment number.

FIELD SURVEYS

Field Surveys were conducted during the summer of 1985. Surveys were accomplished by spending one to two days in each compartment searching for roost sites, which Phillips (1982) describes as being "a clump of mature or over-mature ponderosa pine, any or all of which may be used by turkeys for roosting." When a roost site was found, its location was recorded on the map and the following measurements taken: slope, aspect, number of stems, basal area, roost area, amount of sign, and distance to water.

Slope was determined by ocular estimates and categorized into 5 degree intervals (0-5°, 5-10°, 10-15°, etc.). Aspect was found using a compass and recorded under the first eight compass divisions (N, NE, E, etc.). In determining number of stems within a roost site, all stems within the individual roost trees and those that were interlocking or provided thermal cover were included. Basal area was found using the 10 factor Ben Meadows basal area angle gauge. By rotating the gauge 360° around a single point and only tallying those trees that completely covered the 10 factor cut, basal area was found. Roosting area was determined by pacing the roosting site two directions perpendicular to each other. The relative use of a roost site was

determined by ocular estimate of sign and recorded as high, moderate, or low use. Distance to water was determined by measuring, to the nearest one-tenth mile, the distance from roosts recorded on the map to the nearest dependable water.

A planimeter was used to determine the acreage of ponderosa pine. The study area was found to contain 11,600 acres (18.2 sq. mi.) of ponderosa pine type vegetation.

FINDINGS

HISTORY OF POPULATION

Brood Surveys and Population Estimates

Following the 1961 transplant, summer turkey surveys were run yearly (except for 1982 and 1983). The results of these surveys are summarized in Table 1. The average poult/hen ratio since 1961 has been 4.5 with a range of 2.1 to 7.0. The poults, on average, consisted of over 64% of the observed birds.

Pratt (1975 thru 1980) estimated that the Mt. Trumbull population varied from 350 birds in 1976, 1977 and 1987, to 150-200 birds in 1979, and only 150 birds in 1980. This dramatic reduction in numbers, Pratt (1979) felt, was caused by the extreme winter of 1978-79. Current numbers of turkey have increased since 1980, and are thought to range from 200-250 birds.

Fall Harvest

Three years after introduction of the wild turkey on Mt. Trumbull it was felt a fall hunt would be acceptable. Hence, in 1964, eight fall turkeys were harvested for a hunter success of 72.7%. The remainder of the fall turkey harvest data is presented in Table 2.

Spring Harvest

1977 was the first year a spring turkey season was established in the area, with 13 permits given. Since 1977, 25 spring permits per year have been issued. Over the past seven years an average hunter density of .88 hunters per section has resulted, indicative of a high quality hunt in regards to number of hunters percent. A summary of spring harvest results is contained in Table 3.

Table 1
Summary of Summer Turkey Brood Survey Results
1963-1984

YEAR	TOMS	HENS	POULTS	UNCL.	TOTAL	POULTS/HENS	% YOUNG
1963	29	9	38	42	118	4.2	50.0
1964	7	6	25	0	38	4.2	65.8
1965	0	16	75	12	103	4.7	82.4
1966	10	13	39	0	62	3.0	62.9
1967	21	11	46	0	78	4.2	59.0
1968	31	11	54	0	96	4.9	56.3
1969	19	13	67	0	99	5.2	67.7
1970	11	3	18	0	32	6.0	56.3
1971	4	9	19	0	32	2.1	59.4
1972	7	10	45	19	81	4.5	72.6
1973	No Observations						
1974	No Observations						
1975	4	3	17	0	24	5.7	71.0
1976	18	6	25	0	49	4.2	51.0
1977	6	3	7	0	16	2.3	44.0
1978	0	6	30	0	36	5.0	83.0
1979	No Observations						
1980	2	9	24	0	35	2.7	69.0
1981	0	1	7	0	8	7.0	88.0
1982	No Survey						
1983	No Survey						
1984	9	1	7	43	60	7.0	41.0

TABLE 2
SUMMARY OF FALL TURKEY HARVEST ON MT. TRUMBULL
POPULATION, 1964-84

YEAR	HUNTERS AFIELD	HUNTER DAYS	TOTAL HARVEST	PERCENT SUCCESS	HUNTER DENSITY/(mi ²)
1964	11	22	8	72.7	.60
1965	13	22	0	.0	.71
1966	19	66	0	.0	1.0
1967	21	45	4	19.0	1.2
1968	100	355	26	26.0	5.5
1969	382	1367	24	6.3	21.0
1970	355	1357	11	3.2	19.5
1971	33	50	8	25.0	1.8
1972	26	87	0	.0	1.4
1973	35	64	10	28.6	1.9
1974	15	41	10	66.7	.82
1975	62	170	27	44.0	3.4
1976	32	92	0	.0	1.8
1977	28	87	8	29.0	1.5
1978	54	128	43	80.0	3.0
1979	37	103	12	32.0	2.0
1980	38	129	16	42.0	2.1
1981	41	100	12	29.0	2.3
1982	20	79	0	.0	1.1
1983	56	182	0	.0	3.1
1984	83	227	33	40.0	4.6

TABLE 3
SUMMARY OF SPRING TURKEY HARVEST ON MT. TRUMBULL
POPULATION, 1977-1984

YEAR	SPRING PERMITS	HUNTERS AFIELD	HUNTER DAYS	TOTAL HARVEST	PERCENT SUCCESS	HUNTER DENSITY/(mi ²)
1977	13	10	35	1	10.0	.5
1978	25	15	54	8	53.3	.82
1979	25	19	64	0	.0	1.0
1980	25	11	34	4	36.0	.6
1981	25	25	94	9	36.0	1.4
1982	25	19	73	9	47.0	1.0
1983	25	9	25	7	78.0	.5
1984	25	22	64	19	86.0	1.2

ROOST CHARACTERISTICS

ROOSTS PER SECTION

A total of 121 roosts were found on the 11,600 acre study area, 20 of which had a high level of use, 30 a moderate level, and 71 a low level (of the 71 low roosts 22 were single tree roosts). A summary of all roost characteristics, divided into use levels, is contained in Tables 4 thru 9. The resulting 6.6 roosts per section is considerably higher than the recommended minimum of 2 roosts/section on summer range and 4 roosts/section on winter range (Phillips 1980). Because the Mt. Trumbull turkey population is unable to move from a summer to a winter range, the entire area must be treated as winter range. Phillips (1982) found an average of 27.0 trees per roost site in the Bill Williams Mountain area, while the Mt. Trumbull area had an average of 5.6 trees per roost site. The results indicate that when large groups of roost trees are absent a greater number of roost sites are essential.

ASPECT

With regard to aspect Mt. Trumbull is typical of most areas. Boeker and Scott (1969) found that turkeys tended to use east and northeast exposures more readily. A preference for north to east exposures was indicated in the Williams area (Phillips 1982). Within the Trumbull study area the majority of roosts were found to face north and northeast exposures (Table 10).

SLOPE

Although Boeker and Scott (1969) felt slope had little effect on roost site selection in the White Mountains, the Mt. Trumbull area indicated otherwise. The range of slopes chosen for roost sites varied from 0° to 45°, but a preference for steeper slopes (20°) was found among high use roost sites. The moderate and low use roosts had a much lower slope preference (11.0 and 10.5 respectively). By examining the project maps*, high use roost sites are evident on the north/northeast side of most steep slopes present on the study area.

* Project maps are available at the Arizona Game and Fish Department, Region II (Flagstaff) office, and at the BLM - Arizona Strip District, Vermillion Resource Area office in St. George, Utah.

NUMBER OF STEMS AND BASAL AREA

A preference for higher number of stems and greater basal area was also found to correspond to the hierarchy of use in the different roost sites (Table 10). In both cases, number of stems and basal area decreased as roost site classification went from high, to moderate, to low without singles, to low with singles, and finally to single tree roosts. ?

AVERAGE DIAMETER AT BREAST HEIGHT

A negative relationship was found with regard to average DBH. Single tree roosts had the highest average DBH at 39.2 inches, while high use sites had the lowest DBH at 27.3 inches. This relationship most likely exists due to the increased competition from more stems in the high use roosts and the low competition in single tree roosts. The average DBH for all roost sites was found to be 29.9 inches. This is considerably higher than the 22-24 inch DBH found on the Coconino National Forest (Pinkerton 1985) and the 25.4 inch DBH reported in the White Mountains of Arizona (Boeker and Scott 1969). This result is undoubtedly due to the lack of timber harvest in the area.

DISTANCE TO WATER

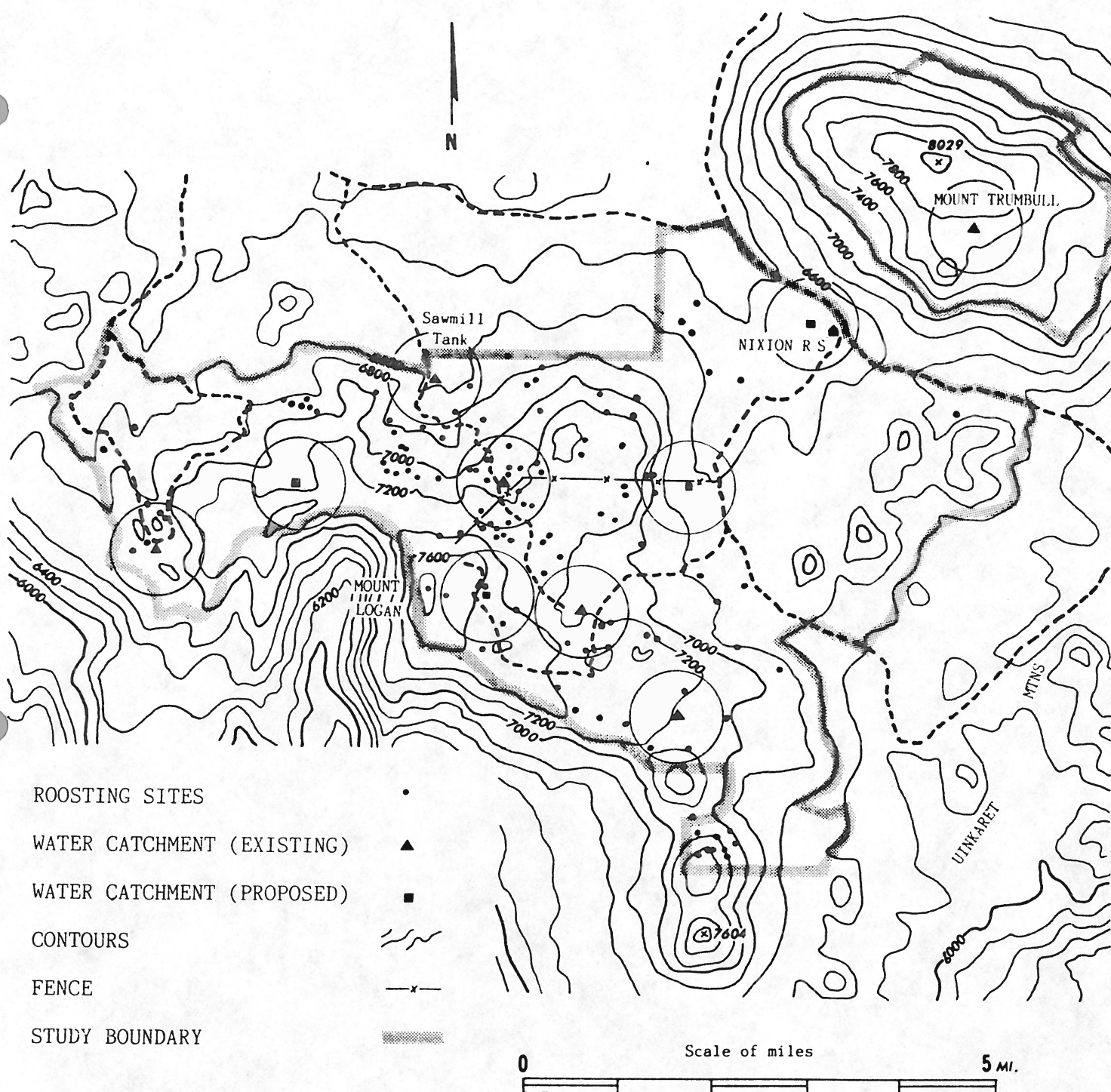
Phillips (1980) stated that turkeys "prefer roosts located within 1/2 mile of water". Boeker and Scott (1969) also found that the majority of roost sites were within .5 miles of permanent water. In the Trumbull area roost locations were found to be, on average, within .8 miles of a permanent water source (Figure 3). This is due to the lack of dependable water in the area (there is an average of one water per 3.64 sections on the study area). It is also likely that roost location is more likely tied to slope than to water, of which the latter is found in relatively flat areas.

RECOMMENDATIONS - CONCLUSIONS

ROOSTS

At present, BLM timber management in the Mt. Trumbull area is not permitting timber harvest that would affect roost sites. If such a harvest was to occur, roost sites should be retained at the present level of 6.6 roosts per section to insure adequate roosting habitat.

In some areas the minimum requirement of 4 roosts/section may not be adequate. If the number of stems per roost is low, as in the Mt. Trumbull case, consideration should be to retain a greater number of smaller roost sites.



RELATIVE NUMBER OF ROOSTS .5 MILE FROM WATER.

FIGURE 3

WATER

The Mt. Trumbull HMP stated as objective B-2, "to maximize turkey populations through protection and improvement of existing turkey habitat." This habitat improvement could best be met thru the construction of new water catchments in the area. Phillips (1982) recommended that one dependable water source be present per section of turkey habitat. The Trumbull distribution of one water per 3.64 sections falls far short of this recommendation.

Shaw and Smith (1977) found that water distribution strongly influenced turkey distribution on the Moqui study area. On the Coconino and Sitgreaves National Forests, Reeves (1951) felt that:

"The construction of catchment basins to bring about better distribution of water throughout the range and to provide for the utilization by turkey areas which occasionally dry up during late summer is also considered to be an aid toward future increased turkey populations."

In order to enable the Mt. Trumbull turkey population to utilize all available habitat, construction of four new water catchments is recommended (Figure 3). By construction of these catchments the percentage of roosts within .5 miles from water will increase from 40% to 46% and for those within 1.0 mile the percentage will increase from 76% to 93%.

FURTHER STUDY

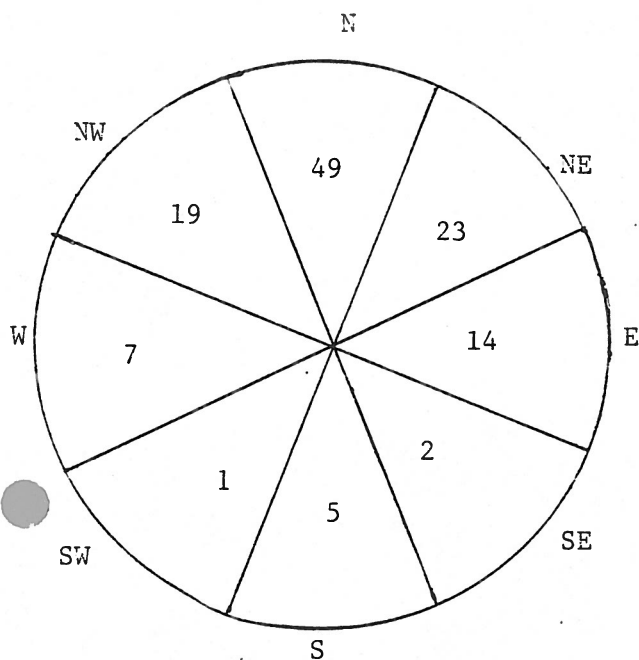
As discussed earlier Mt. Trumbull proper was not included in the study area. This area contains a virgin stand of ponderosa pine and other characteristics that make it an ideal area for future study.

REFERENCES

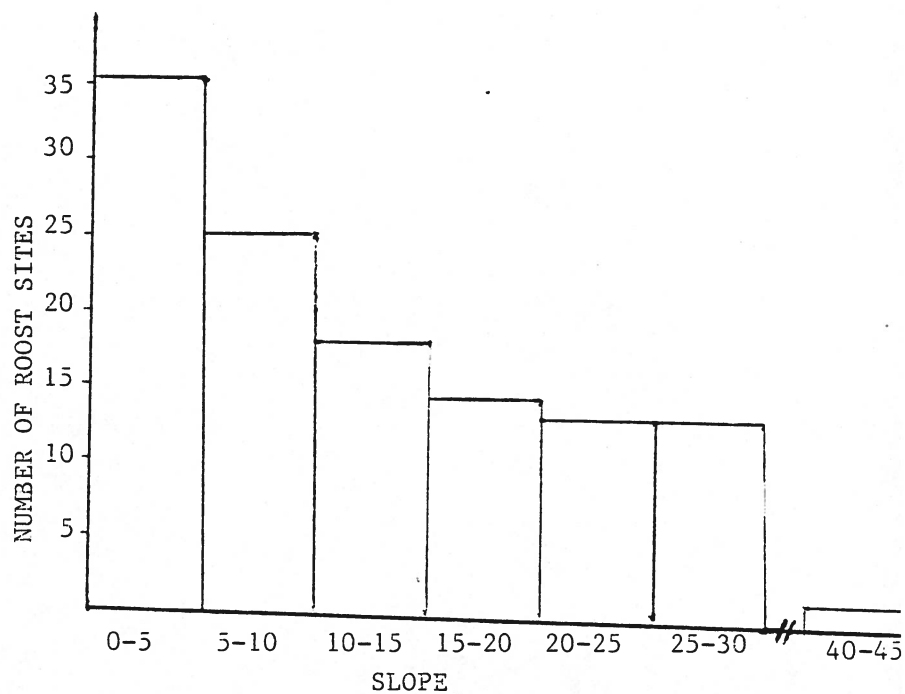
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CHARACTERISTICS OF ALL ROOST SITES

ASPECT



SLOPE

NUMBER OF STEMS

MEAN: 5.6
 ST. DEVIATION: 5.2
 RANGE: 1 to 43

BASAL AREA

MEAN: 81.4
 ST. DEVIATION: 30.2
 RANGE: 20 to 200

AVERAGE DBH (in.)

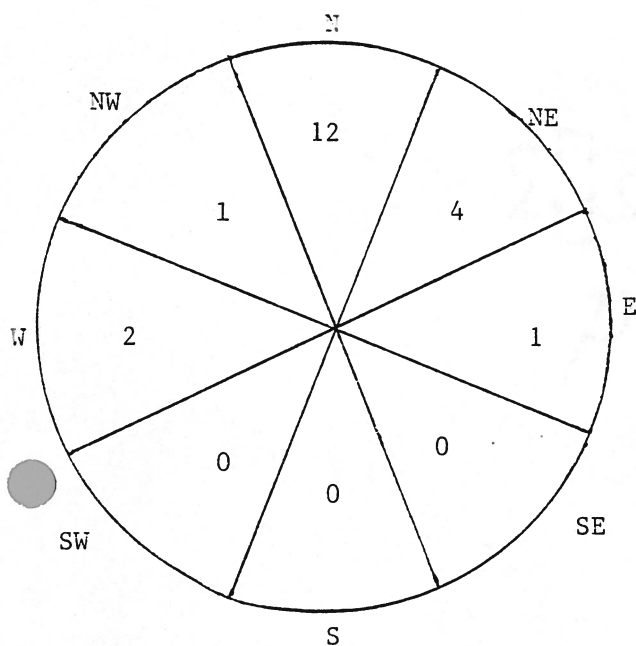
MEAN: 29.9
 ST. DEVIATION: 7.2
 RANGE: 17.8 to 53

DISTANCE TO WATER (mi.)

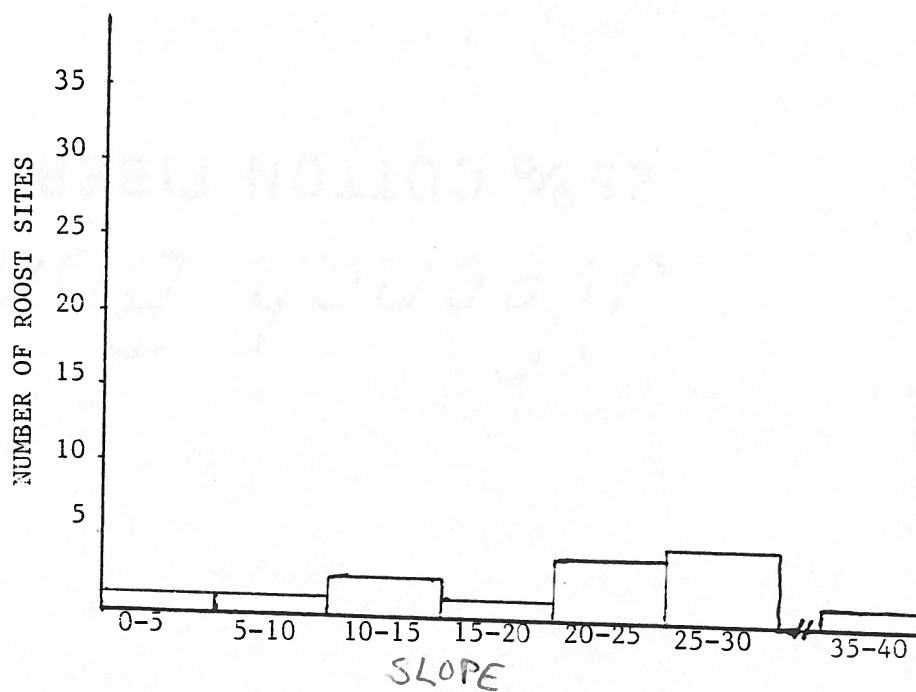
MEAN: .78
 ST. DEVIATION: .48
 RANGE: .1 to 3.4

TABLE 5
HIGH USE ROOSTS

ASPECT



SLOPE

NUMBER OF STEMS

MEAN: 10.6
ST.DEVIATION: 9.2
RANGE: 3 to 43

BASAL AREA

MEAN: 109.5
ST. DEVIATION: 39.9
RANGE: 50 to 200

AVERAGE DBH

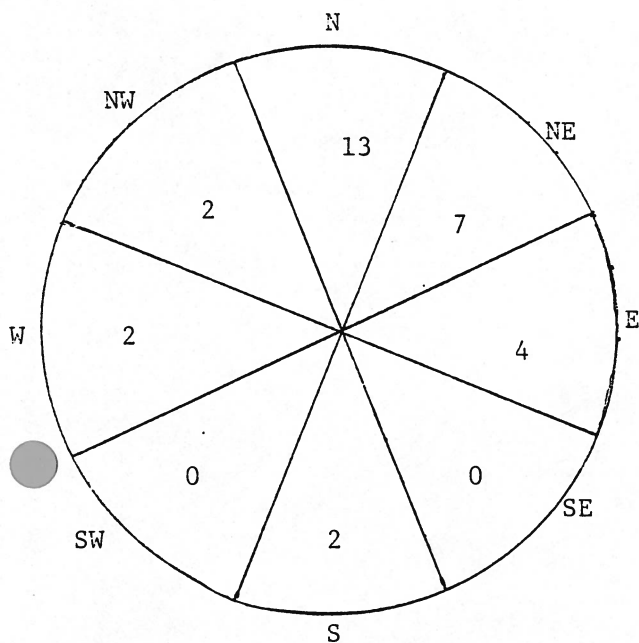
MEAN: 27.2
ST.DEVIATION: 4.5
RANGE: 18.82 to 37.66

DISTANCE TO WATER

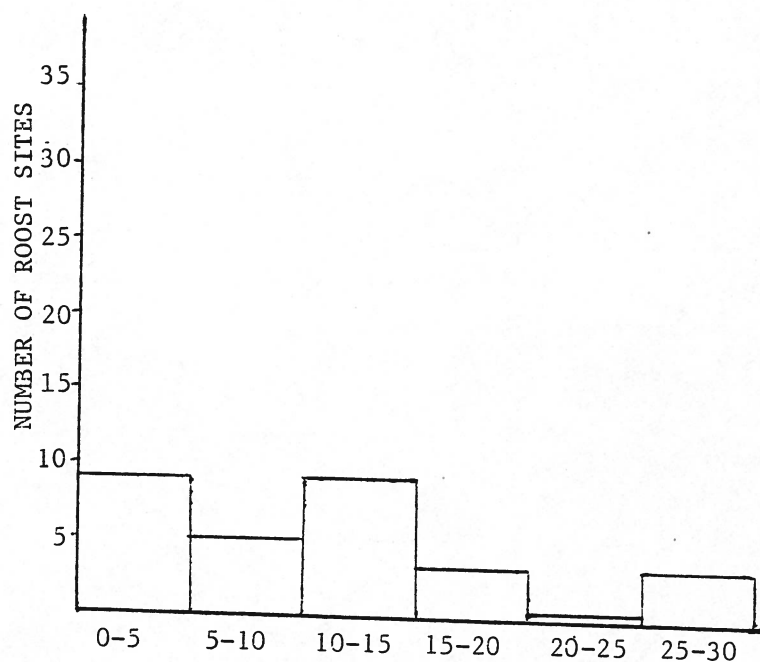
MEAN: .85
ST. DEVIATION: .43
RANGE: .4 to 2.0

TABLE 6
MODERATE USE ROOSTS

ASPECT



SLOPE

NUMBER OF STEMS

MEAN: 6.4
ST. DEVIATION: 3.6
RANGE: 2 to 15

BASAL AREA

MEAN: 88.3
ST. DEVIATION: 26.0
RANGE: 20 to 140

AVERAGE DBH

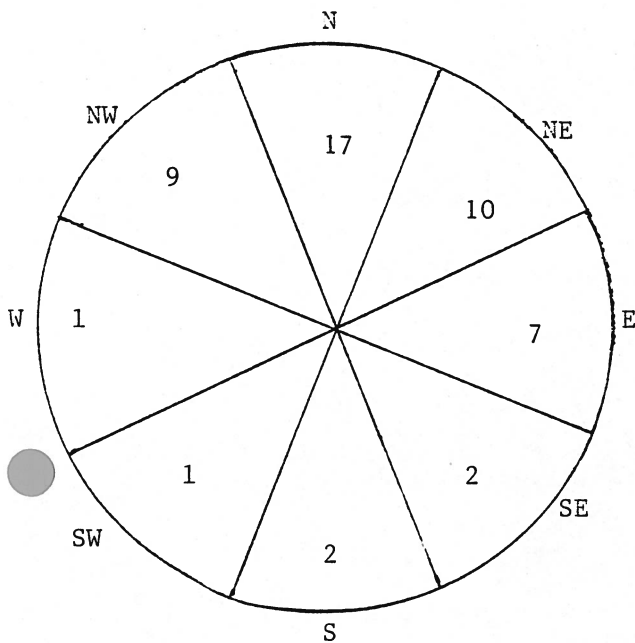
MEAN: 27.4
ST. DEVIATION: 6.3
RANGE: 18.36 to 41.75

DISTANCE TO WATER

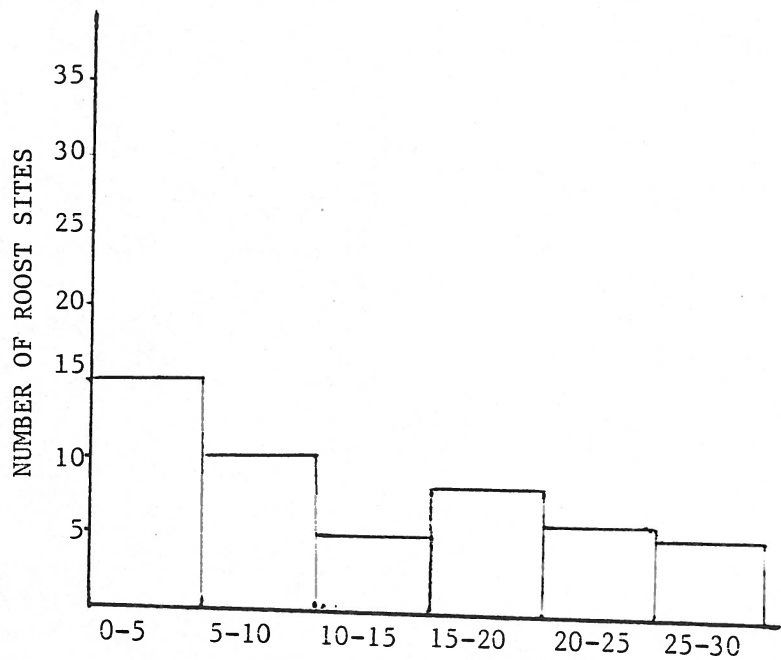
MEAN: .76
ST. DEVIATION: .32
RANGE: .2 to 1.3

LOW USE ROOSTS
EXCLUDING SINGLES

ASPECT



SLOPE

NUMBER OF STEMS

MEAN: 5.1
ST. DEVIATION: 2.6
RANGE: 2 to 15

BASAL AREA

MEAN: 73.7
ST. DEVIATION: 22.3
RANGE: 30 to 140

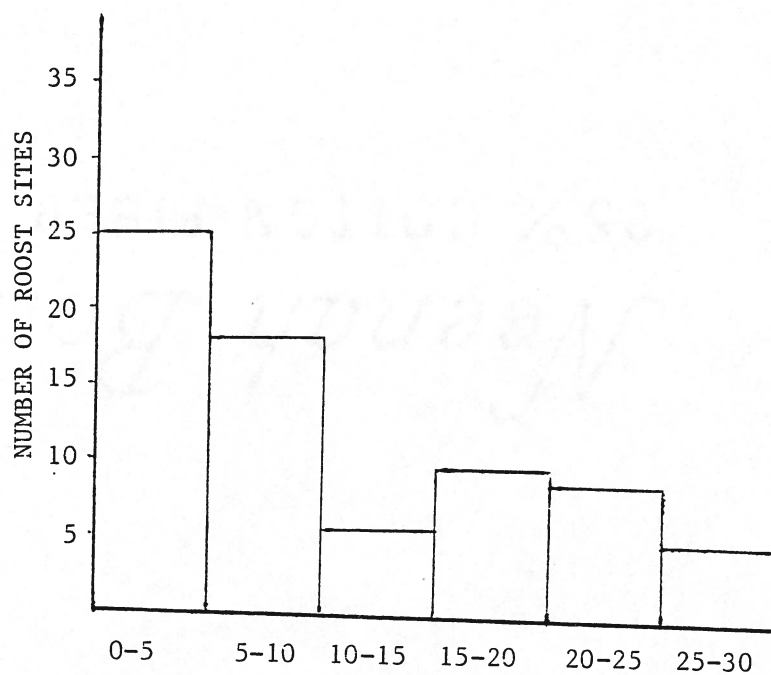
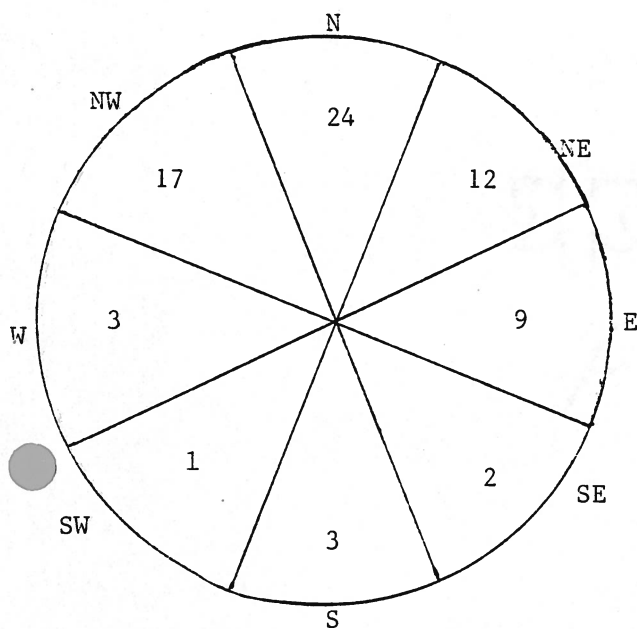
AVERAGE DBH

MEAN: 28.4
ST. DEVIATION: 5.5
RANGE: 17.8 to 39.5

DISTANCE TO WATER

MEAN: .84
ST. DEVIATION: .63
RANGE .1 to 3.4

TABLE 8
LOW USE ROOSTS
INCLUDING SINGLES



NUMBER OF STEMS

MEAN: 3.9
ST. DEVIATION: 2.9
RANGE: 1 to 15

AVERAGE DBH

MEAN: 31.8
ST. DEVIATION: 7.7
RANGE: 17.8 to 53

BASAL AREA

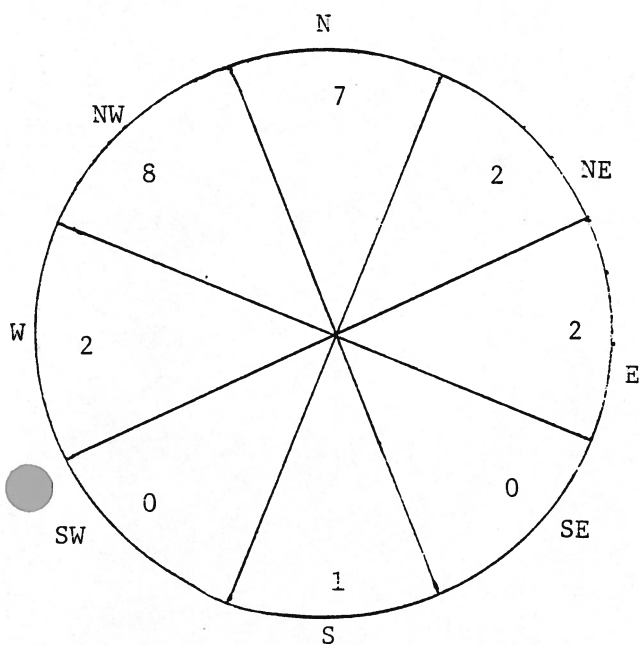
MEAN: 70.7
ST. DEVIATION: 22.0
RANGE: 30 to 140

DISTANCE TO WATER

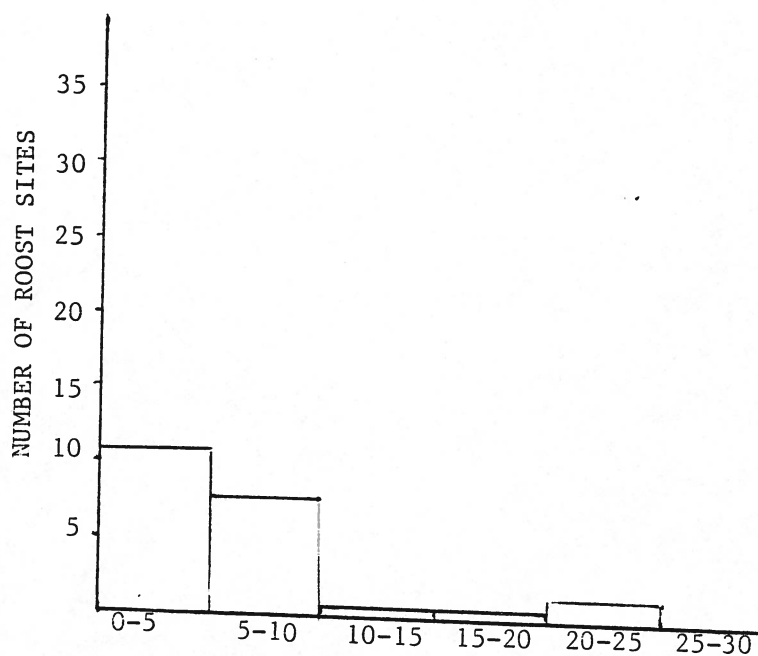
MEAN: .77
ST. DEVIATION: .56
RANGE: .1 to 3.4

TABLE 9
SINGLE ROOST TREE SITES

ASPECT



SLOPE

NUMBER OF STEMS

1 Per Site

AVERAGE DBH

MEAN: 39.2
ST. DEVIATION: 5.5
RANGE: 28 to 53

BASAL AREA

MEAN: 64.1
ST. DEVIATION: 20.2
RANGE: 30 to 100

DISTANCE TO WATER (mi.)

MEAN: .6
ST. DEVIATION: .3
RANGE: .1 to 1.3

TABLE 10
SUMMARY OF ALL ROOST CHARACTERISTIC DATA

	Average Slope (°)	Aspect (% N&NE)	Number of Stems	Basal Area	Average DBH (in.)	Average Distance to Water (mi.)
All Roosts (121)	12.3 + 9.4	59.5	5.6 + 5.2	81.4 + 30.2	29.9 + 7.2	.78 + .48
High Use Roosts (20)	20.3 +11.3	80.0	10.6 + 9.2	109.5 + 39.9	27.3 + 4.5	.85 + .43
Moderate Use Roosts (30)	11.0 + 7.9	60.0	6.4 + 3.6	88.3 + 26.0	27.4 + 6.3	.76 + .32
Low Use Roosts (Exc. Singles) (49)	12.0 + 8.7	55.1	5.1 + 2.6	73.7 + 22.3	28.4 + 5.5	.84 + .63
Low Use Roosts (Inc. Singles) (71)	10.5 + 8.3	50.7	3.9 + 2.9	70.7 + 22.0	31.8 + 7.7	.77 + .56
Single Tree Roosts (22)	7.0 + 6.3	40.9	1	64.1 + 20.2	39.2 + 6.6	.6 + .3

