Habitat Usage by Prairie Grouse on the Sheyenne National Grasslands[1]

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Abstract .--Prairie grouse habitat usage was observed for six years. Spring and summer habitat usage was primarily in the upland and midland grassland habitat types. Habitat usage shifted during the fall and winter to cropland and associated tree shelterbelts. The switchgrass plant community was the primary concealment cover for nesting and roosting. Cropland and associated tree shelterbelts was the primary habitat during winter.

Habitat management for Greater Prairie Chicken (Tympanuchus cupido pinnatus) and Sharp-tailed Grouse (Pedioecetes phasianellus) requires knowledge of the relative habitat usage by the grouse during different seasonal periods and major activities. The purpose of this study was to determine, in relative terms, which habitat types were being used by prairie chicken and sharp-tailed grouse during spring, summer, fall and winter and for spring courtship, nesting, brooding and day and night roosting.

STUDY AREA

The north unit of the Sheyenne National Grasslands is between 46°21' and 46°40' north latitude and 97°10' and 97°30' west longitude in Ransom and Richland counties of southeastern North Dakota. The boundaries include 67,320 acres of federal land and 63,240 acres of privately owned land. The federal land is administered by the United States Department of Agriculture, Forest Service and managed in cooperation with the Sheyenne Valley Grazing Association. The federal land is managed under the multiple-use concept. The primary uses are grazing by beef cattle, wildlife, and dispersed recreation. The private land is managed for grazing by beef cattle, hay production, and suitable areas are farmed for livestock feed or cash sale of harvested commodities.

The region has a continental climate with cold winters and hot summers. Data from the McLeod Weather Substation (U.S. Dept. Com. 1973) show that the long term mean annual temperature is 41.9°F. January is the coldest month with a mean temperature of 7.7°F. July and August are the warmest months with mean temperatures of 70.9°F and 69.9°F, respectively. The long term mean annual precipitation is 19.6 inches with 79% occurring during the growing season, April through September. The frost free period averages 130 days beginning in mid May. Soil thaw is usually completed in the spring by 1 May (Jensen 1972).

The Sheyenne National Grasslands is located on a geologic formation known as the Glacial Sheyenne Delta. The delta was formed near the end of the Wisconsin Glaciation where glacial meltwater of the glacial Sheyenne River emptied into Glacial Lake Agassiz and deposited sands, clays and gravels. A layer of nearly impervious lake sediments is below the delta formation. This layer is responsible for the relatively high water table of the area.

The vegetation on the Sheyenne National Grasslands consists of native forest, woodland and grassland communities and non-native (cropland) replacement communities with associated cultivated and introduced plant species. The native plant communities have quantitatively been described by Nelson 1964, Hanson 1976, and Manske 1980.

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METHODS

Field observations of prairie grouse habitat use were made from foot survey routes with trained bird dogs and listening and visual survey routes with a vehicle. This study of habitat usage by prairie grouse was conducted from March 1975 through February 1981. Foot survey routes were made by walking or riding on horse back along selected routes accompanied by a pointing dog. The length of each survey walked or ridden and the acreage covered by the dogs were recorded. Vehicle survey routes conducted similarly to standard spring census listening survey routes (Grange 1948 and Kirsch 1956) were made by driving a vehicle along all passable roads and trails and stopping at ¼, ½ or 1 mile intervals and scanning surrounding areas for grouse with the aid of binoculars and spotting scope. Concentrated efforts to locate nests, broods and day and night roosts were made at appropriate times. Cable-chain drag method as described by Higgins, Kirsch and Ball (1969) and Higgins et al. (1977) was also used to locate nest sites. Habitat use data were collected during the spring census. Distance from center of spring display grounds to livestock watering facilities was measured each year. The habitat use survey routes were conducted in all available habitat types during each seasonal period of each year. All time periods of the day were sampled except from 11:00 p.m. to 3:00 a.m. All prairie grouse observations were recorded in field notes by species and by sex, if it could be determined. Number and estimated age of chicks were recorded for each brood. The data included in each observation was: location (cadastral and/or allotment and pasture), land use, habitat type, dominant plant species, date, time of day, weather conditions, and behavioral activity of the bird. The habitat use data was separated into four seasonal periods, Spring (1 April - 15 June), Summer (16 June - 31 August), Fall (1 September - 15 November), and Winter (16 November - 31 March). Visual obstruction of vegetation was sampled by the height-density method developed by Robe1 et al. (1970a) and modified by Kirsch (1974). Visual obstruction measurements (VOM) were presented in decimeters. One decimeter equals 3.9 inches.

A map of the habitat associations was constructed using a combined mapping technique to include the vegetation, soil and topographic characteristics. A general vegetation map was constructed by visual interpretation of homogeneous reflectance from two sets of Landsat-2 images taken on 6 May 1976 and 22 August 1976 and one set of Skylab photographs taken 12 June 1973. A general soil map was constructed from the General Soils Maps of Ransom and Richland Counties (1963) using homogeneous regions of similar soil textural class and general topographic relief. Soil characteristics for the soil series were taken from Thompson and Joos (1975). A general topographic map was constructed from the nine U.S. Geological Survey Topographic Quadrangle Maps (1960) of the area by combining homogeneous physiographic regions. These three general maps, vegetation, soil and topography, were field checked and combined to form one Habitat Association Map.

All vegetation within the boundary of the Sheyenne National Grasslands north unit were classified into eleven habitat types according to vegetative composition, soil characteristics and topography. These habitat types were grouped into four habitat associations. Plant species composition, soil and topographic characteristics were quantitatively described by Manske (1980) and Manske and Barker (1981) for each habitat type and habitat association. Acreages of each habitat type and habitat association were determined by electronic planimeter (3 replications) and dot grid (2 replications) on aerial photographs taken in 1970 (Manske and Barker, 1981).

Prairie grouse habitat use index as developed by Robe1 et al. (1970b) (% of bird locations/% of study area) was used to indicate relative habitat use by prairie grouse. A habitat use index value greater than 1.0 indicated that prairie grouse selection for that habitat was greater than expected if the grouse exhibited no preference. A value less than 1.0 indicated habitat use at a level less than expected. A value of zero indicated avoidance of that habitat type.

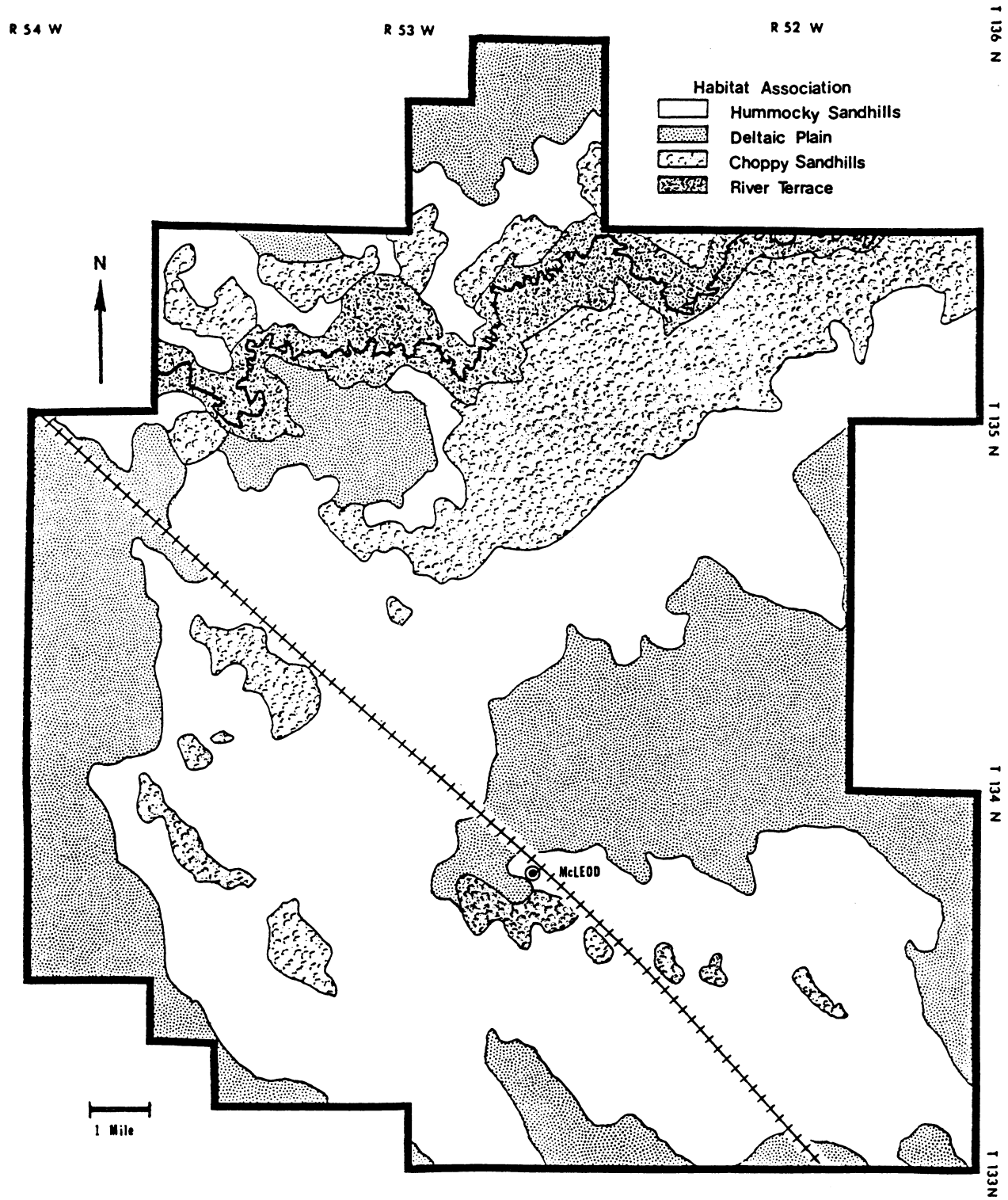
RESULTS AND DISCUSSION

Habitat Associations and Habitat Types

The vegetation on the Sheyenne National Grasslands was divided into eleven habitat types on the basis of similar plant species composition, soil type and topography. Eight habitat types consisted of native vegetation and three of replacement (cropland) vegetation. The habitat types of closely related characteristics and distribution were grouped into four habitat associations (fig. 1).

The Hummocky Sandhills Habitat Association consists of 65,494 acres 50.16% of the Sheyenne National Grasslands. The topography is gently rolling and undulating hummocks (small hills) with relief usually 5 to 10 feet and slope 5 to 10%. The soils are primarily loamy fine sand with low available soil water. This habitat association is divided into four habitat types. The Upland Grassland Habitat Type exists on the summit and shoulder slopes of each hummock. The combined area is 34,389 acres (26.34%). The soils are loamy fine sand which are low in available soil water. The vegetation is the Bouteloua gracilis - Stipa comata - Carex heliophila mixed grass prairie community. The Midland Grassland Habitat Type exists on the back and foot slopes of each hummock with a combined

FIGURE 1. HABITAT ASSOCIATIONS ON THE SHEYENNE NATIONAL GRASSLANDS



area of 16,558 acres (12.68%). The soils are loamy fine sand with low to moderate available soil water. The vegetation is the Andropogon gerardi - Andropogon scoparius - Panicum virgatum tall grass prairie community. The Lowland Grassland Habitat Type exists on the foot and toe slopes and has an area of 12,737 acres (9.76%). The soils are fine sandy loam with moderate to low available soil moisture but with high soil moisture because of a high water table. The vegetation is the Carex lanuginosa - Calamagrostis inexpansa - Juneus balticus sedge meadow community. The Cropland Habitat Type exists on areas with generally low relief with characteristics of the midland habitat type. The combined area is small with 1,810 acres (1.39%). The soils are primarily loamy fine sand with low to moderate available soil water. The vegetation is primarily Zea mays and Medicago sativa. Associated with the cultivated land is 37 acres (0.03%) of planted tree shelterbelts.

The Deltaic Plain Habitat Association consists of 38,761 acres, 29.69% of the Sheyenne National Grasslands. The topography is nearly level with relief usually 1 to 2 feet and small areas of relief of 1 to 5 feet and slopes mostly less than 2%. The soils are primarily loam with high to moderate available soil moisture. The entire association has a high water table. This habitat association is divided into three habitat types. The Midland Grassland Habitat Type exists on areas that are slightly elevated with a total area of 14,476 acres (11.09%). The soils are loam to fine sandy loam and are high to moderate in available soil moisture. The vegetation is the Andropogon gerardi - Andropogon scoparius - Sorghastrum nutans tall grass prairie community. A very small area of less than 15 acres (0.01%) of Bouteloua gracilis - Stipa comata mixed grass prairie community exists within this midland habitat type on areas of slightly higher relief. The Lowland Habitat Type is located in the slight depressions in the landscape. The combined area is 5,387 acres (4.13%). The soils are loam with moderate to low available soil moisture. The vegetation is the Carex lanuginosa - Calamagrostis inexpansa - Carex spp. sedge meadow community. The Cropland Habitat Type is a large portion of this association because of the nearly level topography and good fertile soil. The combined area is 18,898 acres (14.47%). The soils are loam to fine sandy loam with high to low available soil moisture. The vegetation is primarily Zea mays, Medicago sativa and Helianthus annuus. Associated with the cultivated land is 402 acres (3.08%) of planted tree shelterbelts.

The Choppy Sandhills Habitat Association consists of 19,170 acres, 14.68% of the Sheyenne National Grasslands. The topography is very rough and choppy with relief usually 5 to 50 feet and slopes 10 to 20%. The soils are fine sand with very low available soil moisture. This habitat association is divided into two habitat types. The Upland Woodland Habitat Type exists on the slopes and depressions of the choppy topography and has a combined area of 12,269 acres (9.40%). The soil is fine sand with low available soil moisture. The vegetation is the Quercus macrocarpa - Populus tremuloides - Fraxinus pennsylvanica woodland community with a thin understory of grass, forbs and shrubs. The tree population varies from dense groves to scattered individual trees. The Open Grassland Habitat Type exists between the areas of dense groves and has a combined area of 6,901 acres (5.29%). The topography is rough and highly variable. The soil is fine sand with very low available soil moisture. The vegetation is the Bouteloua gracilis - Carex heliophila - Sporobolus cryptandrus mixed grass prairie community.

The River Terrace Habitat Association exists along the Sheyenne River and its spring fed tributaries. It consists of 7,135 acres, 5.46% of the Sheyenne National Grasslands. The topography is very level on the various alluvial terraces with a slope of 0.3%. The river channel has steep banks. The edge of the river valley has a very steep escarpment of 25 to 30 feet with a slope greater than 20% The soils are silt loam with high available soil moisture. This association is divided into two habitat types. The Riparian Forest Habitat Type exists throughout the river terrace and river valley escarpment except for oxbow areas and areas cleared for farming. The area is 5,710 acres (4.37%). The soils are silt loam to silty clay with high available soil moisture. The vegetation is the Tilia americana - Ulmus americana - Fraximus Pennsylvania forest community. Very small areas of sedge-cattail-willow wetland communities exist in the oxbows and along the river channel. The Cropland Habitat Type exists in areas that have been cleared of forest vegetation. The combined area is 1,425 acres (1.09%). The soils are silt loam with high available soil moisture. The vegetation is primarily Zea mays, Helianthus annuus and Medicago sativa.

Transportation Routes with associated right of ways have been constructed across the Sheyenne National Grasslands. Three categories of transportation routes were separated. The Railroad Transportation Route has 17.5 miles of track with 106 acres of right of way which is 0.08% of the Sheyenne National Grasslands. The Gravel Road Transportation Routes have 112 miles of road with 679 acres of right of way (0.52%). The Asphalt Road Transportation Route has 13 miles of road with 79 acres of right of way (0.06%).

Habitat Association Use

Prairie grouse habitat use for the four seasonal periods was primarily in two Habitat Associations, the Hummocky Sandhills and the Deltaic Plain (table 1). No prairie grouse habitat use was observed in the River Terrace

Table 1. --Habitat use index for prairie grouse during four seasonal periods of the habitat associations on the Sheyenne National Grasslands (SNG).

Habitat Association	% of SNG	Spring 1 Apr - 15 Jun			Summer 16 Jun - 31 Aug		Fall 1 Sep - 15 Nov		Winter 16 Nov - 31 Mar	
		Prairie Chicken	Sharp-tailed Grouse	Hybrid	Prairie Chicken	Sharp-tailed Grouse	Prairie Chicken	Sharp-tailed Grouse	Prairie Chicken	Sharp-tailed Grouse
Hummocky Sandhills	50.17	1.89	1.98	1.99	1.78	1.79	0.73	1.62	0.36	0.34
Deltaic Plain	29.70	0.17	0.0	0.0	0.35	0.08	1.81	0.53	2.58	2.16
Choppy Sandhills	14.69	0.0	0.06	0.0	0.0	0.53	0.0	0.06	0.0	0.39
River Terrace	5.46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation Routes	0.66	0.0	0.0	0.0	0.0	0.0	14.57	2.89	8.00	19.55
(N) =		3642	958	117	638	350	780	210	3524	1248

Table 2. --Habitat use index for prairie grouse during four seasonal periods of the habitat types on the Sheyenne National Grasslands (SNG).

Habitat Association Habitat Type	% of SNG	Spring 1 Apr - 15 Jun			Summer 16 Jun - 31 Aug		Fall 1 Sep - 15 Nov		Winter 16 Nov - 31 Mar	
		Prairie Chicken	Sharp-tailed Grouse	Hybrid	Prairie Chicken	Sharp-tailed Grouse	Prairie Chicken	Sharp-tailed Grouse	Prairie Chicken	Sharp-tailed Grouse
Hummocky Sandhills										
Upland Grasslands	26.34	1.64	2.48	1.95	1.18	1.36	0.55	0.76	0.14	0.31
Midland Grasslands	12.68	3.38	2.33	3.77	3.34	2.57	0.42	4.62	0.34	0.03
Lowland Grasslands	9.76	0.76	0.34	0.09	1.27	1.96	0.17	0.20	0.01	0.08
Cropland	1.36	0.97	0.61	0.0	2.65	1.89	11.12	0.70	6.11	5.07
Shelterbelts	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.81	32.05
Deltaic Plain										
Upland Grasslands	0.01	5.49	0.0	0.0	0.0	0.0	1897.44	190.48	295.12	0.0
Midland Grasslands	11.09	0.40	0.0	0.0	0.34	0.03	0.94	0.09	0.99	0.42
Lowland Grasslands	4.13	0.14	0.0	0.0	0.49	0.48	5.90	3.11	0.89	0.0
Cropland	11.39	0.96	0.0	0.0	0.41	0.0	0.0	0.0	3.68	4.28
Shelterbelts	3.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.56	3.51
Choppy Sandhills										
Upland Woodland	9.40	0.0	0.09	0.0	0.0	0.82	0.0	0.0	0.0	0.03
Open Grasslands	5.29	0.0	0.0	0.0	0.0	0.0	0.0	0.18	0.0	1.01
River Terrace										
Riparian Forest	4.37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cropland	1.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation Routes										
Railroad	0.08	0.0	0.0	0.0	0.0	0.0	68.91	0.0	59.24	161.26
Gravel roads	0.52	0.0	0.0	0.0	0.0	0.0	7.89	3.66	1.04	0.0
Asphalt roads	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(N) =		3642	958	117	638	350	780	210	3524	1248

Habitat Association. Prairie chickens did not use the Choppy Sandhills Habitat Association but sharp-tailed grouse did have some use in that Habitat Association during all four seasons. Generally, there was very little difference between the relative seasonal habitat use indeces of prairie chicken and sharp-tailed grouse.

Most of the prairie grouse activity was in the Hummocky Sandhills Habitat Association during spring and summer. Activity shifted to the Deltaic Plain Habitat Association during fall and winter. Sharp-tailed grouse shifted their activities from the Hummocky Sandhills Habitat Association to the Deltaic Plain Habitat Association later in the fall than prairie chicken and they shifted their activities back to the Rummocky Sandhills Habitat Association earlier in the spring than prairie chicken.

Habitat Type Use

Prairie grouse used a wide diversity of habitat types in each seasonal period and their relative habitat usage varied with the activity and seasonal period (table 2). Habitat usage during spring was primarily the Upland and Midland Habitat Types of the Hummocky Sandhills Habitat Association. Birds active in spring courtship rituals used areas of short native vegetation primarily on Upland and Midland Habitat Types with areas of taller vegetation adjacent or near. Birds not actively displaying during courtship used areas with taller vegetation primarily the Midland Habitat Type. Prairie chickens continued to feed on agricultural residue in the Cropland Habitat Types of the Deltaic Plain and Hummocky Sandhills Habitat Associations during early spring. Sharp-tailed grouse fed in the Cropland Habitat Type of the Hummocky Sandhills Habitat Association but did not use the Cropland Habitat Type of the Deltaic Plain Habitat Association during spring.

Summer habitat use was principally in the Hummocky Sandhills Habitat Association with all available habitat types selected. Prairie grouse disbanded into small groups or singles after spring courtship. Several male grouse continued to stay near display ground areas for a large portion of the summer. Hens were very mobile and used a wide variety of habitat types. Shrubs on the Midland and Lowland Habitat Types were used for cover and shade during the hot portions of summer. Areas with alfalfa (Medicago sativa) cropland were used for feed and cover.

Fall was a period with several changes. Hens left their broods which broke up and dispersed. Small flocks of adult and juvenile birds would gather on or near fall display grounds. These small flocks were very mobile and would travel several miles during a day. Habitat use shifted from primarily grassland vegetation to cropland. This shift in habitat usage was earlier for prairie chicken than sharp-tailed grouse.

Winter was a stressful period for prairie grouse. During severe weather, small flocks joined together and formed packs (flocks larger than 60 birds). Activities of these large flocks centered around cropland and adjacent shelterbelts, primarily in the Deltaic Plain Habitat Association. A very small amount of winter activity was conducted on grassland habitats of the Deltaic Plain and Hummocky Sandhills Habitat Associations. Spilled grain along transportation routes and in cropland and crop residue from harvested cropland were the primary sources for high energy winter food. Spilled wheat along the railroad right of way was used by most large flocks for food during late fall and winter. Trees in shelterbelts were used for cover and their buds, fruit and samaras used for food.* Standing corn (Zea mays) and sunflowers (Helianthus annuus) were used for food when snow covered the spilled grain and other crop residue.

Display Ground Habitat

Prairie grouse spring courtship display grounds were primarily located on Upland and Midland Habitat Types on the Hummocky Sandhills Habitat Association (fig. 2 and table 3). A few prairie chicken display grounds were located on the Deltaic Plain Habitat Association. No sharp-tailed grouse display grounds were on the Deltaic Plain Habitat Association. No prairie chicken or sharp-tailed grouse display grounds were located on the Choppy Sandhills or River Terrace Habitat Associations.

Livestock tended to graze vegetation near some watering facilities to a shorter height than vegetation away from water. Distance from center of display ground to nearest livestock watering facility was measured for 176 prairie chicken and 87 sharp-tailed grouse display grounds. One hundred eighteen (67.1%) prairie chicken and 48 (55.2%) sharp-tailed grouse display grounds were less than 1500 feet from livestock water. Mean distance was 601 feet for prairie chicken and 569 feet for sharp-tailed grouse. Fifty-eight (33.0%) of the prairie chicken grounds were further than 1500 feet from livestock water. Twenty of these grounds had been mowed the previous year. Thirty-six had not been mowed of which 31 were restricted to the Upland Habitat Type. Only five (2.8%) of the prairie chicken display grounds had member male birds displaying on the Midland Habitat Type that had not been mowed the previous year and was greater than 1500 feet from livestock water. No prairie chicken males displayed on unmowed.Lowland Habitat Types that were greater than 1500 feet from water.

Thirty-nine (44.8%) of the sharp-tailed grouse display grounds were further than 1500 feet from livestock water. Eleven of these grounds had been mowed the previous year.

FIGURE 2. PRAIRIE GROUSE DISPLAY GROUNDS ON THE SHEYENNE NATIONAL GRASSLANDS-1980

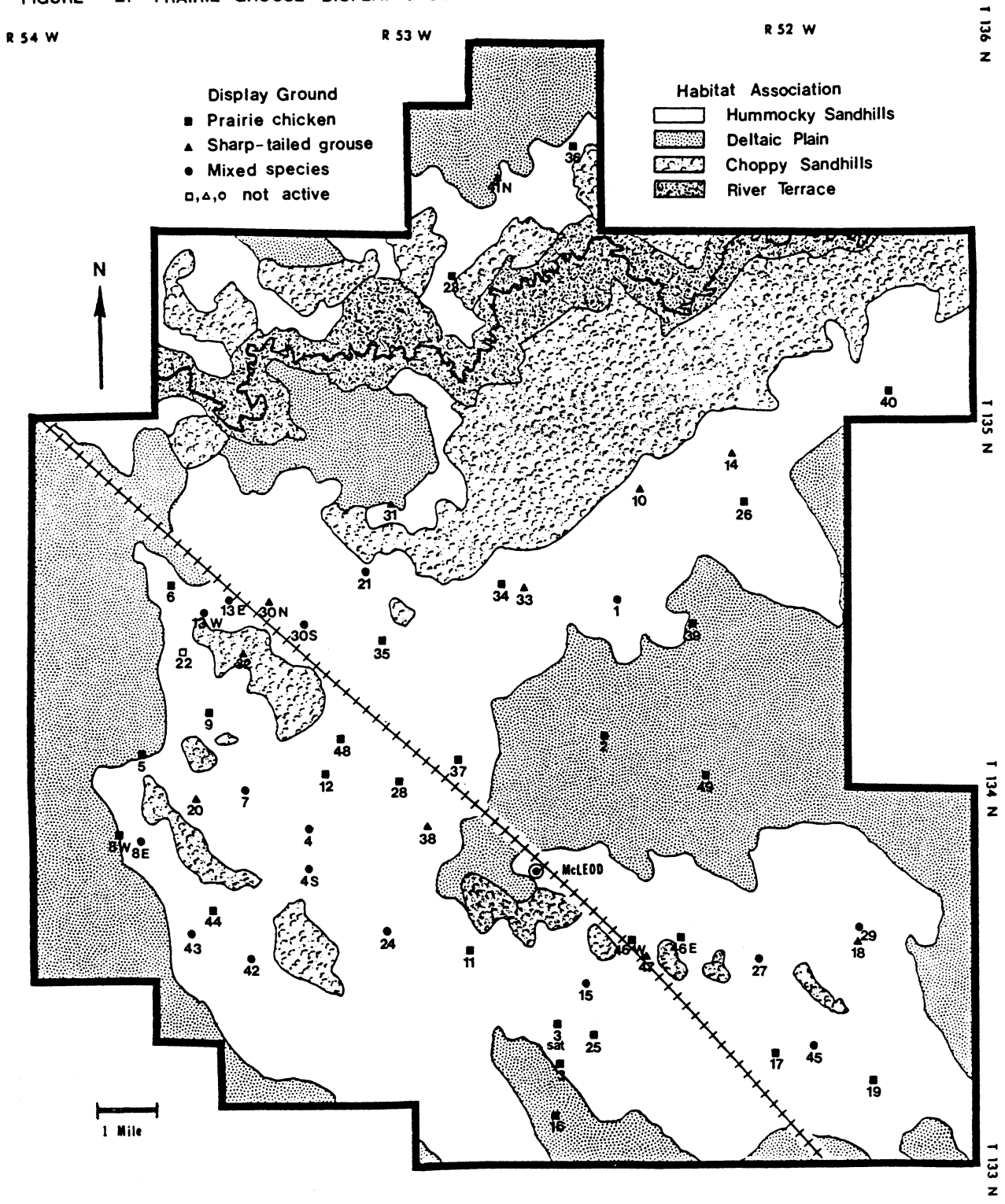


Table 3. --Habitat use index for spring courtship display grounds used by prairie grouse on the Sheyenne National Grasslands (SNG).

Habitat Association Habitat Type	% of SNG	Prairie Chicken	Sharptailed Grouse	Hybrid
Hummocky Sandhills				
Upland Grasslands	26.34	1.90	2.76	1.93
Midland Grasslands	12.68	2.56	2.15	3.72
Lowland Grasslands	9.76	0.99	0.0	0.0
Cropland	1.36	0.0	0.0	0.0
Shelterbelts	0.03	0.0	0.0	0.0
Deltaic Plain				
Upland Grasslands	0.01	131.58	0.0	0.0
Midland Grasslands	11.09	0.40	0.0	0.17
Lowland Grasslands	4.13	0.32	0.0	0.0
Cropland	11.39	0.08	0.0	0.0
Shelterbelts	3.08	0.0	0.0	0.0
Choppy Sandhills				
Upland Woodlands	9.40	0.0	0.0	0.0
Open Grasslands	5.29	0.0	0.0	0.0
River Terrace				
Riparian Forest	4.37	0.0	0.0	0.0
Cropland	1.09	0.0	0.0	0.0
(N) =		228	88	53

Twenty-eight had not been mowed of which 23 were restricted to the Upland Habitat Type. Five (5.75%) of the sharp-tailed grouse display grounds had member male birds displaying on the Midland Habitat Type that had not been mowed and was greater than 1500 feet from livestock water. No male sharp-tailed grouse displayed on the Lowland Habitat Type.

Vegetation for prairie grouse courtship display needed to be short. The plants that were present on the Upland Habitat Type were of short stature and acceptable to prairie grouse for courtship display activity with or without mowing and grazing management. Vegetation on the Midland and Lowland Habitat Types was generally too tall and unacceptable for courtship display activity unless it had been mowed the previous year or grazed short which occurred near some livestock watering facilities.

Concealment cover adjacent or near spring display grounds was considered to be important and 181 prairie chicken and 87 sharp-tailed grouse display grounds were evaluated for availability of concealment cover. Good concealment cover was considered to be vegetation with mean 100% VOM of greater than 1.5 decimeters (Manske and Barker, 1981 and Higgins and Barker, 1982). Respectively, 72.9% and 80.5% of the spring display grounds with prairie chickens and sharp-tailed grouse had very good concealment cover adjacent or very near. Courtship display areas with less than good concealment cover were 14.9% and 12.6% for the prairie chicken and sharp-tailed grouse, respectively. The remaining courtship display areas, 12.2% and 6.9% with prairie chickens and sharp-tailed grouse, respectively,. had very poor or no concealment cover near the grounds. Most of the display grounds, 87.9% of the prairie chicken and 93.1% of the sharp-tailed grouse, had some concealment cover adjacent or near. Spring courtship display ground habitat appears to be a combination of short vegetation for display purposes and adjacent or very near areas with good cover for concealment.

Nest Habitat

Nineteen prairie grouse nest sites were located during this study. Eleven were prairie chicken and eight were sharp-tailed grouse nests. Six prairie chicken and six sharp-tailed grouse nests had completed clutches. Five prairie chicken and two sharp-tailed grouse nests had only partially completed clutches. Two prairie chicken nest scrapes were located with the hens present. Nine prairie chicken and eight sharp-tailed grouse nests were found in native grassland vegetation. All seventeen of these nests were in the Midland Grassland Habitat Type of the Hummocky Sandhills Habitat Association (table 4). Switchgrass (Panicum virgatum) was the dominant species at all of the nest sites in

Table 4.--Habitat use index for nest site locations used by prairie grouse on the Sheyenne National Grasslands (SNG).

Habitat Association Habitat Type	% of SNG	Prairie Chicken Full Clutch	Prairie Chicken Partial Clutch	Prairie Chicken Nest Scrape	Sharptailed Grouse Full Clutch	Sharptailed Grouse Partial Clutch	Sharptailed Grouse Nest Scrape
Hummocky Sandhills							
Upland Grasslands	26.34	0.0	0.0	0.0	0.0	0.0	0.0
Midland Grasslands	12.68	3.58	1.43	1.43	5.91	1.97	0.0
Lowland Grasslands	9.76	0.0	0.0	0.0	0.0	0.0	0.0
Cropland	1.36	0.0	0.0	0.0	0.0	0.0	0.0
Shelterbelts	0.03	0.0	0.0	0.0	0.0	0.0	0.0
Deltaic Plain							
Upland Grasslands	0.01	0.0	0.0	0.0	0.0	0.0	0.0
Midland Grasslands	11.09	0.0	0.0	0.0	0.0	0.0	0.0
Lowland Grasslands	4.13	0.0	0.0	0.0	0.0	0.0	0.0
Cropland	11.39	0.80	0.80	0.0	0.0	0.0	0.0
Shelterbelts	3.08	0.0	0.0	0.0	0.0	0.0	0.0
Choppy Sandhills							
Upland Woodlands	9.40	0.0	0.0	0.0	0.0	0.0	0.0
Open Grasslands	5.29	0.0	0.0	0.0	0.0	0.0	0.0
River Terrace							
Riparian Forest	4.37	0.0	0.0	0.0	0.0	0.0	0.0
Cropland	1.09	0.0	0.0	0.0	0.0	0.0	0.0
(N) =		6	3	2	6	2	0

native vegetation except for one sharp-tailed grouse nest where spiraea (Spiraea alba) and Kentucky bluegrass (Poa pratensis) were dominant species and switchgrass was subdominant. Two prairie chicken nests were found in alfalfa (Medicago sativa) of the Cropland Habitat Type. No sharp-tailed grouse nests were found in cropland. No prairie grouse nest sites were located in the Choppy Sandhills or River Terrace Habitat Associations.

Nest sites were characteristically completely covered by vegetation. Sides and top concealment at nests had very dense residual and growing vegetation. The mean 100% visual obstruction measurements (VOM) from six prairie chicken and eight sharp-tailed grouse nests at nest center was 2.9 ± 1.2 decimeters for prairie chicken nests and 2.6 ± 0.9 decimeters for sharp-tailed grouse nests. Some nest sites had a pathway through the vegetation where the hen passed in or out. The mean height-density at the 100% VOM of nest habitat within four meters of the nest site was 2.5 ± 1.0 decimeters for prairie chicken and 2.4 ± 0.6 decimeters for sharp-tailed grouse. There was no difference between prairie chicken and sharp-tailed grouse nesting habitat (P>0.05). The range in measurements for the 100% VOM for nest habitat was 1.5 to 3.5 decimeters. The 1.5 decimeter level at the 100% visual obstruction measurement (VOM) was considered from these data to be the minimum level for good nest habitat for both prairie chicken and sharp-tailed grouse. Prairie chicken and sharp-tailed grouse nest habitat was the switchgrass portion of the Midland Habitat Type of the Hummocky Sandhills Habitat Association with mean 100% VOM of 1.5 decimeters or greater. Prairie chicken also nested in alfalfa cropland.

Brood Habitat

Fifty-four prairie chicken and twenty-eight sharp-tailed grouse broods were located. Prairie grouse broods were very mobile and traveled over a considerable amount of area. Prairie chicken used all the available grassland habitat types and alfalfa cropland of the Hummocky Sandhills and Deltaic Plain Habitat Associations (table 5). Sharp-tailed grouse broods used the grassland habitat types of the Hummocky Sandhills Habitat Association and the Lowland Habitat Type of the Deltaic Plain Habitat Association. Sharp-tailed grouse broods also used the Upland Woodland Habitat Type of the Choppy Sandhills Habitat Association. These sharp-tailed grouse broods used the areas of shrubs and young trees on the edge of groves. No broods were located within the groves of mature trees. Prairie chicken broods did not use the Habitat Types in the Choppy Sandhills Habitat Association. Prairie chicken and sharp-tailed grouse broods did not use the Habitat Types of the River Terrace Habitat Association.

Table 5. --Habitat use index for prairie grouse broods on the Sheyenne National Grasslands (SNG).

Habitat Association Habitat Type	% of SNG	Prairie Chicken	Sharptailed Grouse
Hummocky Sandhills			
Upland Grasslands	26.34	1.27	1.56
Midland Grasslands	12.68	3.12	2.34
Lowland Grasslands	9.76	1.12	1.58
Cropland	1.36	1.41	0.0
Shelterbelts	0.03	0.0	0.0
Deltaic Plain			
Upland Grasslands	0.01	0.0	0.0
Midland Grasslands	11.09	0.46	0.0
Lowland Grasslands	4.13	0.62	0.69
Cropland	11.39	0.56	0.0
Shelterbelts	3.08	0.0	0.0
Choppy Sandhills			
Upland Woodlands	9.40	0.0	1.17
Open Grasslands	5.29	0.0	0.0
River Terrace			
Riparian Forest	4.37	0.0	0.0
Cropland	1.09	0.0	0.0
(N) =		54	28

Areas of short vegetation that had been mowed and grazed with adjacent areas of dense residual and growing vegetation were used considerably as feeding areas. The dense cover was used mainly for escape cover and loafing but very little for feeding. Broods usually used areas that had relatively high amounts of forbs and shrubs. These areas usually provided good canopy cover and relatively open understory. The percentage of broods observed in woody vegetation consisting of short shrubs was 47.3% of the prairie chicken and 51.7% of the sharp-tailed grouse broods. Most of the broods observed in the Upland Habitat Type, 93.7% of the prairie chicken and 81.8% of the sharp-tailed grouse broods, were in woody vegetation. The mean 100% VOM for Upland, Midland and Lowland Habitat Types used for brood cover was 1.6, 2.2, and 1.9 decimeters, respectively. The mean 0% VOM for the three habitat types was 3.6, 6.3, and 5.7 decimeters, respectively.

Prairie grouse brood habitat was a wide diversity of plant communities and height-densities. Generally broods were associated with vegetation with relatively larger amounts of forbs and short shrubs that provided good canopy cover and relatively open understories.

Night and Day Roost Habitat

Prairie grouse spent a considerable amount of time on ground roosts. They were on night roosts from dusk to dawn and on day roosts for a large portion of the day between morning and evening feeding periods. Roosting activity occupied the greatest amount of time in the life of a prairie grouse.

Prairie grouse night roost sites with the birds present were primarily in the Midland and Lowland Habitat Types of the Hummocky Sandhills Habitat Association during spring, summer and fall (table 6). The switchgrass portion of the midland grassland community was more important for night roosting than the upper portion. Night roost habitat shifted to Cropland and adjacent shelterbelts during winter. Some night roosting activity was continued in the midland grassland community with switchgrass in the winter. Tree shelterbelts were very important for night roosting in winter. This shelterbelt habitat included the rows of planted trees on the edge of cropland and also small areas of volunteer willow (*Salix spp.*), cottonwood (*Populus deltoides*) and/or aspen (*Populus tremulides*) that were located in or near cropland. Trees provided some protection from the winter weather and deeper snow drifts developed in or near trees. Prairie grouse often burrowed into these snow drifts to roost at night. Most snow burrows were found in snow that

Table 6.--Habitat use index for prairie grouse night roost sites on the Sheyenne National Grasslands (SNG).

Habitat Association Habitat Type	% of SNG	Spring 1 Apr - 15 Jun	Summer 16 Jun - 31 Aug	Fall 1 Sep - 15 Nov	Winter 16 Nov - 31 Mar
Hummocky Sandhills					
Upland Grasslands	26.34	0.20	0.0	0.0	0.07
Midland Grasslands without switchgrass	12.68	0.10	0.0	1.17	0.14
Midland Grasslands with switchgrass	12.68	4.57	6.12	5.70	1.94
Lowland Grasslands	9.76	3.64	2.30	1.33	0.0
Deltaic Plain and Hummocky Sandhills					
Cropland	12.75	0.0	0.0	0.0	2.61
Shelterbelt	3.11	0.0	0.0	0.0	12.41
(N) =		76	49	54	57

was 12 inches or greater in depth. Snow drifts also tended to accumulate on the back and foot slopes on the lee side of hummocks in the grassland habitats. Prairie grouse also used these snow drifts to make burrows for night roosting.

The mean 100% visual obstruction measurements (VOM) for night roost sites was 1.9 ± 0.4 decimeters with a range from 1.5 to 2.2 decimeters. From these data, it was considered that 1.5 decimeters was the minimum level for good night roost habitat. This was the same as the minimum level determined for prairie grouse nesting habitat.

Prairie grouse day roost sites with the birds present were primarily in the Midland Grassland with switchgrass Habitat Type of the Hummocky Sandhills Habitat Association during spring and fall and primarily in the Upland and Lowland Habitat Types during summer (table 7). In summer, day roosts were associated with shrubs. Summer day roosts were mainly in lead plant (Amorpha canescens) in the upland and willow (Salix spp.) in the lowlands. Shrubs provided shade from the hot sun and good canopy cover in the summer. No day roost sites were found in the winter.

The mean 100% visual obstruction measurements (VOM) for day roost sites was 1.5 ± 0.4 decimeters with a range from 1.1 to 1.9 decimeters. The 100% VOM values were lower for day roosts than night roosts. Day roost sites characteristically had one of the four sides with very low vegetation. The birds head was at the side with low vegetation and the pile of feces developed at the opposite side. Mean 100% VOM for the three high sides of day roost sites was 1.9 decimeters.

Night roosting habitat was primarily the switchgrass portion of the Midland Habitat Type of the Hummocky Sandhills Habitat Association with mean 100% VOM of 1.5 decimeters or greater. During winter, night roosts were primarily in snow burrows. These snow burrows were located in areas where snow accumulated to 12 inches or greater in depth. Day roosting habitat was primarily the switchgrass portion of the Midland Habitat Type of the Hummocky Sandhills Habitat Association with mean 100% VOM of 1.1 decimeters or greater. Shrubs on the Upland and Lowland Habitat Types of the Hummocky Sandhills Habitat Association were used during the summer.

SUMMARY

The Hummocky Sandhills Habitat Association was the primary spring and summer prairie grouse habitat and the Deltaic Plain Habitat Association was the primary winter habitat. All of the grassland and cropland habitat types of the Hummocky Sandhills and Deltaic Plain Habitat Associations were used by prairie chicken and sharp-tailed grouse during some seasonal period of the year and should be considered as valuable prairie grouse habitat. The switchgrass portion of the Midland Habitat Type of the Hummocky Sandhills Habitat Association was by far the primary grassland habitat used by prairie chicken and sharp-tailed grouse on the Sheyenne National Grasslands. It was used for concealment cover during spring courtship. It was the only native grassland habitat selected for nesting. It was one of the major brood habitats. It was the primary night roosting habitat and an important day roosting habitat. The Cropland and associated tree shelterbelt Habitat Type was the primary prairie grouse habitat used in winter. The Cropland Habitat Type was used by prairie grouse for the source of high energy food from spilled grain, crop residue and unharvested

Table 7. --Habitat use index for prairie grouse day roost sites on the Sheyenne National Grasslands (SNG).

Habitat Association Habitat Type	% of SNG	Spring 1 Apr - 15 Jun	Summer 16 Jun - 31 Aug	Fall 1 Sep - 15 Nov	Winter 16 Nov - 31 Mar
Hummocky Sandhills					
Upland Grasslands	26.34	0.23	3.16	0.0	0.0
Midland Grasslands without switchgrass	12.68	0.0	0.0	0.0	0.0
Midland Grasslands with switchgrass	12.68	7.10	0.0	7.89	0.0
Lowland Grasslands	9.76	0.0	1.71	0.0	0.0
Deltaic Plain and Hummocky Sandhills					
Cropland	12.75	0.0	0.0	0.0	0.0
Shelterbelt	3.11	0.0	0.0	0.0	0.0
(N) =		10	6	23	0

standing row crops that they needed during the winter.

Management for prairie chicken and sharp-tailed grouse habitat should consider all available Habitat Types of the Hummocky Sandhills and Deltaic Plain Habitat Associations as important. Habitat types of the Choppy Sandhills and River Terrace Habitat Associations were not selectively used by prairie grouse and should be managed for purposes other than for prairie grouse. Two habitat types were more important to the prairie grouse than the other habitat types. These two habitat types were the switchgrass portion of the Midland Habitat Type of the Hummocky Sandhills Habitat Association and the Cropland and associated tree shelterbelts Habitat Type. The Midland Habitat Type should be manipulated by mowing or burning on a 5 or 6 year cycle to maintain high quality habitat. Portions of the Lowland Habitat Type should be manipulated by mowing and burning annually to draw grazing pressure away from the Midland Habitat Type. A conscious effort should be made by state and federal agencies to provide unharvested high energy food on the Cropland Habitat Types for use by prairie grouse during winter.

LITERATURE CITED

Grange, W.B. 1948. Wisconsin grouse problems. Wisconsin Conserv. Dept., Madison. 318 pp.

Hanson, J.D. 1976. A phytosociological study of the oak savanna in southeastern North Dakota. M.S. Thesis, NDSU, Fargo, N.D. 135 pp.

Higgins, K.F. and W.T. Barker. 1982. Changes in vegetation structure in seeded nesting cover in the prairie pothole region. USDI, Fish and Wildlife Service. Special Scientific Report - Wildlife No. 242, Washington, D.C. 26 pp.

Higgins, K.F., L.M. Kirsch, and I.J. Ball, Jr. 1969. A cable-chain device for locating duck nests. Jour. of Wildlife Mgt. 33(4): 1009-1011.

Higgins, K.F., L.M. Kirsch, H.F. Duebbert, A.T. Klett, J.T. Lokemoen, H.W. Miller, and A.D. Kruse. 1977. Construction and operation of cable-chain drag for nest searches. U.S. Fish and Wildlife Service, Wildlife Leaflet 512. 14 pp.

Jensen, R.E. 1972. Climate of North Dakota. National Weather Service, NDSU, Fargo, N.D. 48 pp.

Kirsch, L.M. 1956. Spring grouse census and habitat inventory methods. U.S. Fish and Wildlife Service, Wildlife Mgt. Series, Leaflet No. 13. 7 pp.

Kirsch, L.M. 1974. Instructions for use [of] a height-density pole for obtaining vegetative measurements on upland habitats. Unpublished. 3 pp.

Manske, L.L. 1980. Habitat, phenology and growth of selected sandhills range plants. Ph.D. Thesis, NDSU, Fargo, N.D. 154 pp.

Manske, L.L. and W.T. Barker. 1981. The prairie grouse on the Sheyenne National Grasslands, North Dakota. NDSU Research Report, Fargo, N.D. 238 pp.

Nelson, P.W. 1964. The forest of the lower Sheyenne River Valley, North Dakota. M.S. Thesis, NDSU, Fargo, N.D. 148 pp.

Robel, R.J., J.N. Briggs, A.D. Dayton, and L.C. Hulbert. 1970a. Relationships between visual obstruction measurements and weight of grassland vegetation. Jour. of Range Mgt. 23(4):295-297.

Robel, R.J., J.N. Briggs, J.J. Cebula, N.J. Silvy, C.E. Viers, and P.G. Watt. 1970b. Greater prairie chicken range, movements, and habitat usage in Kansas. Jour. of Wildlife Mgt. 34(2):286-306.

Thompson, D.G. and L.L. Joos. 1975. Soil survey of Richland County and Sheyenne National Grassland area of Ransom County, North Dakota. U.S. Government Printing Office, Washington, D.C. 141 pp + 124 plates.

U.S. Dept. of Commerce. 1973. Climatography of the United States. No. 81, North Dakota. N.O.A.A. Env. Data Serv., Asheville, N.C.