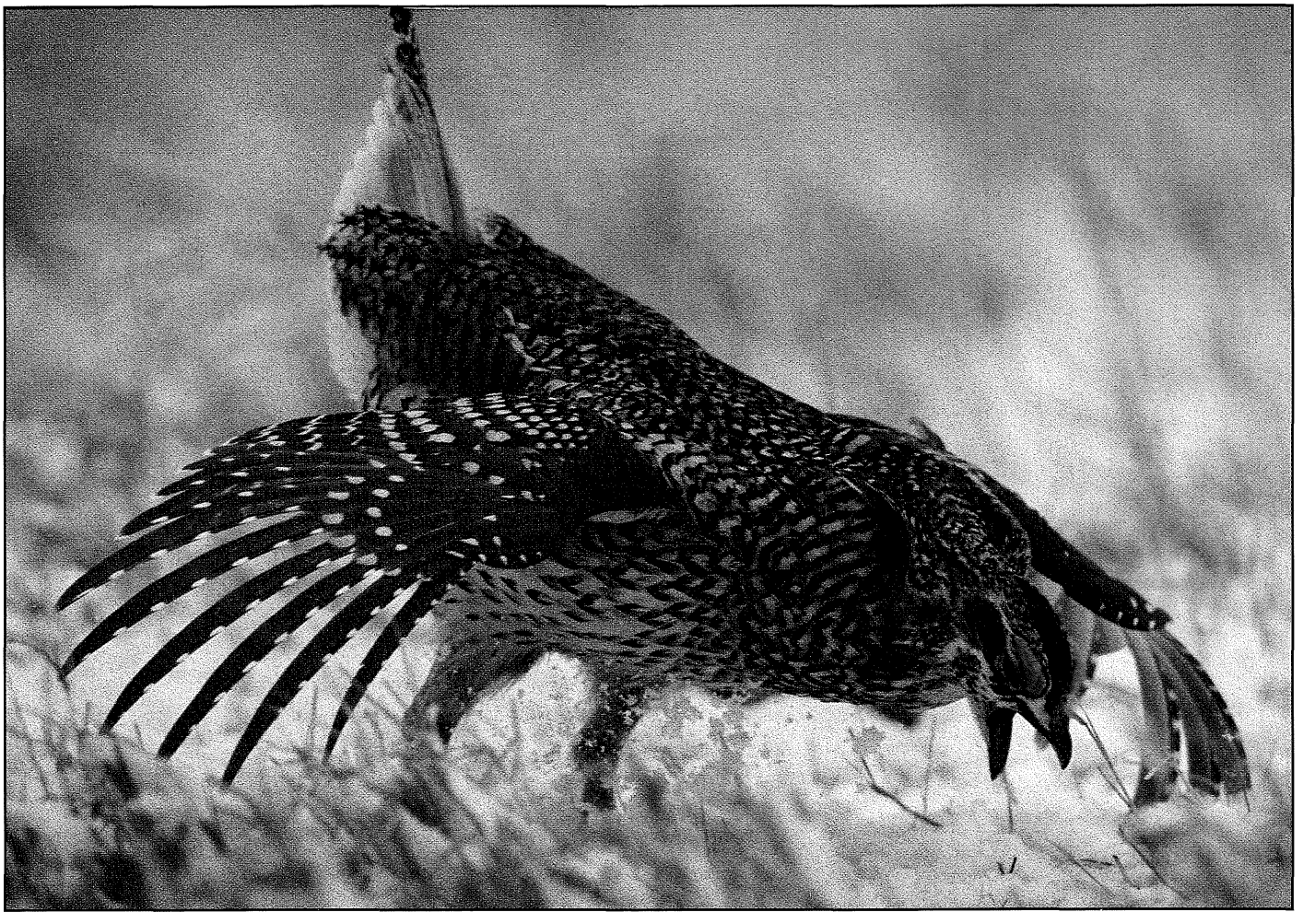
E SHARP-TAILED GROUSE IN MINNESOTA



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By William E. Berg

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THE SHARP-TAILED GROUSE IN MINNESOTA

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HISTORICAL REVIEW

The prairie sharp-tailed grouse (*Tympanuchus phasianellus campestris*) is the only prairie grouse indigenous to Minnesota (Roberts 1936). Its cousin the greater prairie chicken (*T. cupido*) is considered to have entered the state with the onset of agricultural development in the early 1800's (Partch 1970). Although sharptails in Minnesota have been classified as the prairie race *T. p. campestris* (Aldrich 1963), their primary habitat in Minnesota is an open landscape of grass, brush, savanna, and boreal peatland.

Past Distribution

Most of the state was inhabited by sharptails until the 1880's (Fig. 1). Prior to human settlement, sharptails likely never inhabited all of Minnesota at any one time. Through millennia, they have been consistent inhabitants of open bogs associated with glacial lake beds (Fig. 1), and other habitats such as savannas, barrens, parklands, and meadows that have been maintained by natural and human-caused disturbance such as wildfire.

Human settlement in Minnesota was generally from the southeast, and as the brushlands, savannas, and lowlands were cleared and drained for agriculture, sharptail habitat was progressively depleted. By the early 1900's, sharp-tailed grouse were scarce in southeastern Minnesota. The prairie chicken which followed the land clearing prospered temporarily, but also became scarce by the 1930's as agriculture intensified (Nelson 1939). Eventually, prairie chickens became restricted to the remaining relict grasslands in west-central Minnesota (Partch 1970, Svedarsky, Wolfe and Toepfer 1997). Prairie grouse were thus extirpated from southern Minnesota.

As settlement progressed to the north, additional (although temporary) sharptail habitat was created by land clearing, logging, and small farms, and in the 1930's both the sharp-tail and prairie chicken were plentiful in northwestern Minnesota (Johnson 1934).

By the late 1930's, sawtimber was mostly depleted and homesteading ended. The era of wildfire suppression began, and gradually logged areas, abandoned homesteads, open peatlands, natural meadows and savannas matured to decadent brushlands and forests. This habitat maturation caused concern for the future of sharptails and prairie chickens in Minnesota (Shrader and Erickson 1944). Advancing succession aided by fire suppression squeezed the sharptail into the remaining transitional habitats which extended from northwestern to east-central Minnesota (Farmes 1957, Nelson 1980) (Fig. 2).

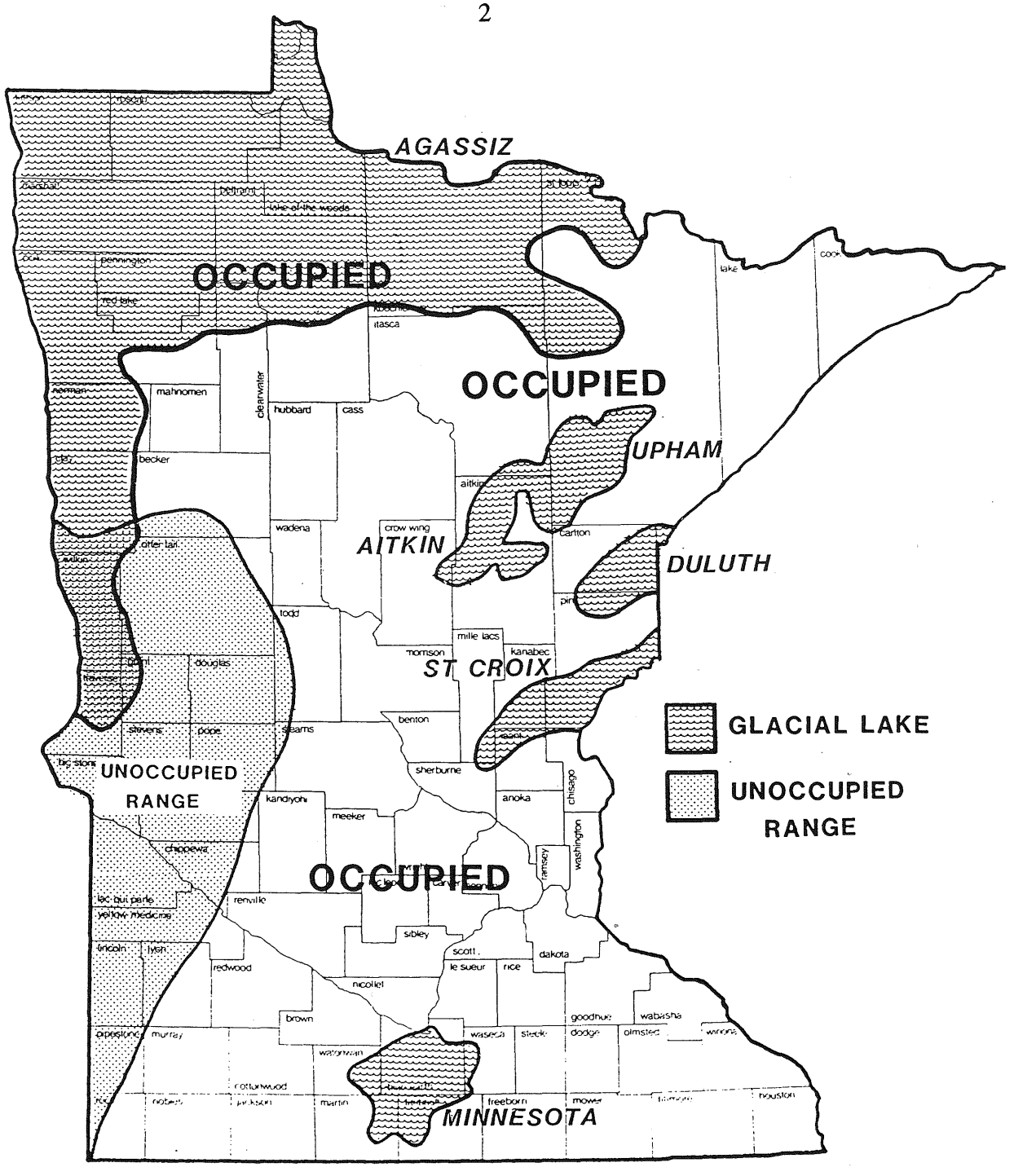

Figure 1. Pre-settlement (circa 1880's) distribution of sharp-tailed grouse in Minnesota in relation to the six major glacial lake beds (in italics). Glacial lake beds contained the larger peatlands which contain much of the present day sharptail range. Sharptails likely were not resident of the shaded area labeled "unoccupied range". Modified from Aldrich (1963).

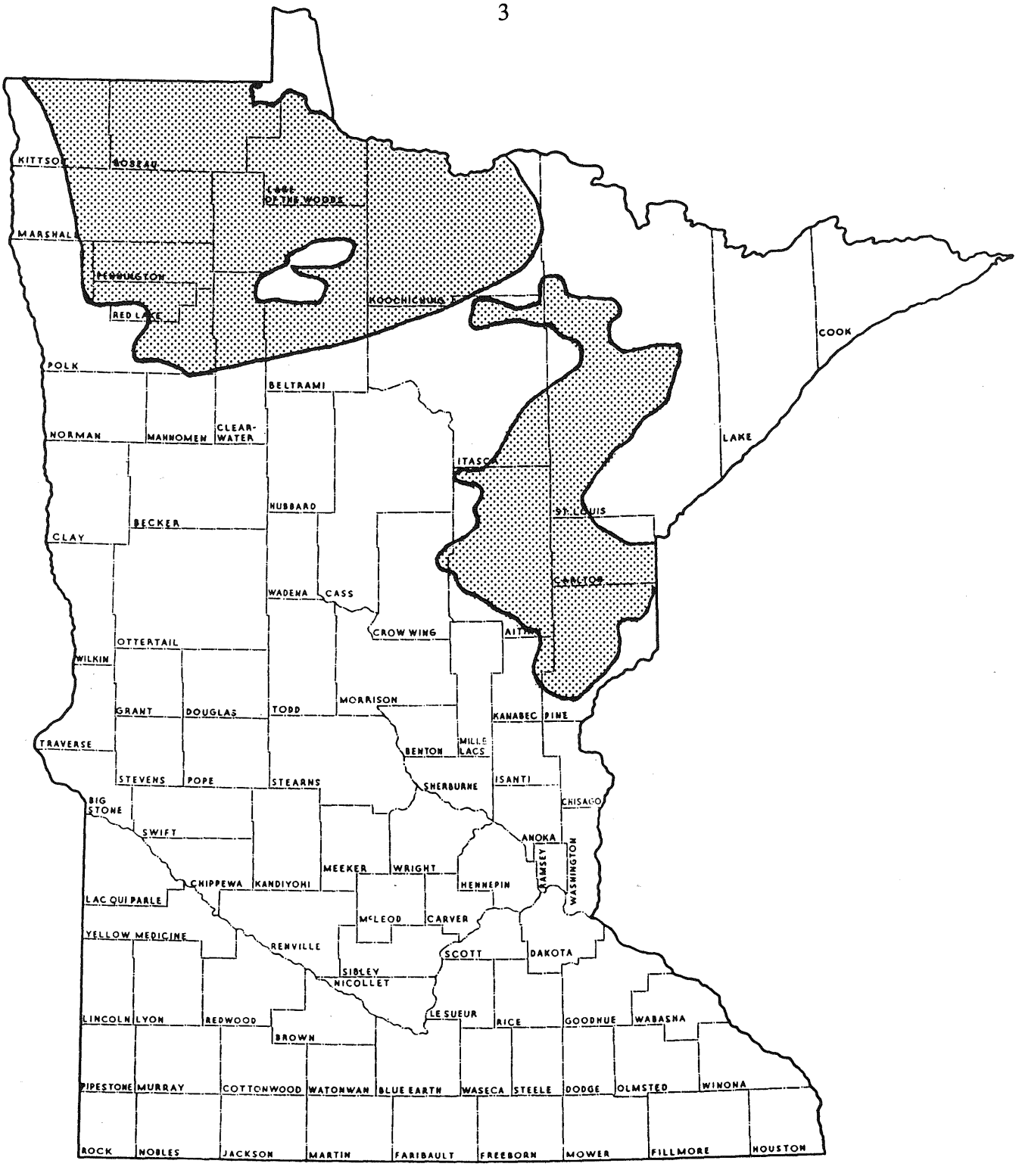

Figure 2. Northwest and east-central Minnesota sharp-tailed grouse ranges, 1995. Sharptails inhabit only scattered (usually disjunct) open landscapes in both ranges.

Present Distribution

Sharptails occur in less than one-third of their historical range in Minnesota, and viable populations remain in two disjunct primary ranges (Fig. 2). The northwestern range holds about two-thirds of the state's sharptails.

Primary sharptail habitat in Minnesota is open grass-brushland dominated by various grasses, sedges (*Carex* spp.), and willows (*Salix* spp.) (Fig. 3a). These habitats are sometimes associated with small grain and livestock farming. Other open habitats that support sharptails (but in usually lower densities) include the large open boreal peatlands (Niemi and Hanowski 1992) (Fig. 3b) which exist mainly on glacial lake beds (Glaser 1992), and the large man-made taconite ore tailings basins and overburden dumps related to northeastern Minnesota iron mining operations (Berg 1991).

Populations and Density

Few attempts have been made to estimate local or range-wide sharptail populations, and population indices have been based on (1) hunter harvests since 1949 which provide long-term trend data, and (2) annual dancing ground counts.

Historical accounts suggest that in the 1930's sharptails were extremely numerous in their northwestern range, and locals often described semi-migratory flocks numbering in the hundreds (Johnson 1934). Other reports in the mid-1930's suggest that large die-offs occurred, as indicated by numerous dead sharptails found in muskegs and old fields (L. White, pers. comm.)

Sharptail population declines were forecast in the early 1940's (Shrader and Erickson 1944), and various attempts to census the bird commenced. Mail carrier surveys in the spring of 1962 found birds in 21 northern counties, with most northwestern counties having 0.9-2.7 sharptails/100 km of roads, and most counties in the east-central range having 0.1-0.9 sharptails/100 km (Ruos 1962). A warden questionnaire in the late 1960's provided additional insight into sharptail distribution, and adult male densities in spring were estimated to exceed 0.2/km^2 in only nine northwestern and two east-central counties (Minnesota Department of Natural Resources (MDNR), unpub. data). By the early 1990's, huntable sharptail numbers remained in only ten northwestern and six east-central counties (Fig. 2).

Adult male sharptail populations in spring were estimated for two study townships in northwestern Minnesota from 1964 to 1980. Male densities varied from 0.3/km^2 to 1.5/km^2 ($\bar{x}$=0.9/km^2), and trends were correlated between the two townships ($r=0.68$, $p < 0.01$, $n=17$). Thus approximately 1.5 males/km^2 may be a maximum density for a township-sized (94 km^2) area in typical Minnesota sharptail range; however, within sharptail

Figure 3a. Typical sharptail habitat in Minnesota, showing the open grass and brush vegetation types.

Figure 3b. Boreal peatland muskeg sharp-tailed grouse habitat typically found in large undeveloped glacial lake beds in Minnesota.

habitat complexes, square mile-sized (2.6 km^2) areas containing more than 40 displaying males have been documented (W. Berg, unpub. data).

In 1975, range-wide dancing ground surveys were begun to document long-term population trends. These surveys have identified minor annual fluctuations, but the population trend has been unmistakably downward. Sharptail numbers declined in most years of the survey, and during 1981-1995 there was a net loss of 77% in both the northwest and east-central ranges (Table 1). Thus, the range-wide sharptail decline first documented in the 1950's (Farmes 1957) continues a half century later.

Research Summary

Early research identified foods eaten by sharptails in Minnesota. Swanson (1940) found 15 items in sharptail droppings in Hubbard County (which contains no sharptails today). These were dominated by bearberry (*Arctostaphylos uva-ursi*), wild rose hips (*Rosa* spp.), and wild buckwheat (*Polygonum convolvulus*). Harris (1967) examined the contents of crops removed from birds killed in September and found that small grains (oats, wheat, and flax) comprised more than one-half of the total crop volume. Small grains were followed by wild seeds dominated by blueberry (*Vaccinium* spp.), green leaves dominated by clover (*Trifolium* spp.), and by insects dominated by grasshoppers (*Orthoptera*). During spring, sharptails fed on the leaves of clover, Labrador tea (*Ledum groenlandicum*), and leather leaf (*Chamaedaphne angustifolia*) (Swanson 1940). In winter, foods are the same as those eaten in Wisconsin and include the buds and twigs of arctic birch (*Betula. pumila*) (especially in muskeg areas), white birch (*B. papyrifera*), aspen (*Populus tremuloides*), and willow (Schmidt 1936).

The sharptail population decline prompted several research studies in the early 1960's, all located in northwestern Minnesota. One from 1964 to 1979 investigated the effects of hunting on sharptail populations by conducting intensive spring dancing ground counts and autumn bag checks in two township-sized (94 km^2) areas and found that 2%-20% of the available autumn population was removed by hunting (Watt 1973).

A companion study in the same townships investigated land use changes in relation to sharptail populations and dancing grounds, and concluded that continued large-scale agricultural clearing would destroy nearly all sharptail habitat by the mid-1990's (Corey 1981).

Two studies in the late 1960's identified and quantified nesting and brood habitat. A mix of grass and brush found optimum for spring and summer comprised 35% grass-legume, 15% cropland, 7% sedge marsh, 25% lowland brush, and 13% young aspen and white birch (Artmann 1971, Schiller 1971). Grassy roadsides also provide some nesting habitat (Svedarsky 1977).

Table 1. Percent change in total number of sharp-tailed grouse males counted on comparable dancing grounds in east-central and northwestern Minnesota, 1981-1996.

Year	Northwest	East-Central
1981	-20%	stable
1982	stable	-34%
1983	-22%	-24%
1984	-29%	-20%
1985	-18%	-24%
1986	+3%	-28%
1987	+8%	+4%
1988	+11%	+21%
1989	+4%	stable
1990	+10%	+25%
1991	-8%	-3%
1992	-21%	-41%
1993	-26%	-23%
1994	stable	-9%
1995	-11%	-4%
1996	-24%	+15%

Another study investigated the importance of fire for creating and maintaining sharptail habitat. A 4.6 km^2 block (1.6 x 3.2 km) of mature but unmerchantable aspen in a mature forest 32 km from existing sharptail range was burned in spring four times between 1968 and 1975 and converted to aspen savanna. Although some sharptails used the island-like area (Berg 1979, Berg and Watt 1986), a permanent dancing ground was not established until the late 1980's (MDNR, unpub. data).

Wells (1981) documented the importance of large muskeg landscapes in the boreal patterned peatlands for maintaining sharptail populations. Subsequent unpublished investigations categorized dancing ground vegetation type and calculated distances to nearby brush and trees. Most (>90%) dancing grounds occurred on grass, sedge, stubble, or pasture, with the remainder occurring on recently-planted small grain, scattered brush, drained wild rice (*Zizania aquatica*) paddies, taconite tailings basins, and dirt roadways. Measurements of vegetation adjacent to dancing grounds indicated that woody vegetation density and height increased proportionately with the distance from the dancing ground ($r=0.98$, $p<0.05$, $n=4$) (Table 2). The openness and low-growing character of sharptail breeding habitat in lowlands was also quantified by Hanowski and Niemi (1986).

CENSUS METHODS AND BAG-CHECKS

Experimental roadside census routes were established in 17 northern counties in 1941. These were discontinued in the east-central range in 1944, but were conducted in the northwest until 1960 (Farmes 1960). Mail carrier surveys were used from 1959 to 1962 (Ruos 1962). Both methods yielded questionable annual indices of sharptail abundance. From 1964 to 1979, counts made in the two northwest study townships served as the range-wide sharptail population index. Since 1975, dancing grounds and displaying males have been counted on 17 routes in 13 counties range-wide (Berg 1981a).

Range-wide hunter bag checks were begun in 1949 to obtain sharptail age-sex composition and hunter effort (Table 3) (Berg 1977). Initially, data were obtained only from wing envelopes; from 1960 to 1978 data were obtained from roving and fixed point hunter bag checks over a wide geographical area in the northwest range. Since 1979 bag checks have only been conducted at one site in Kittson County in extreme northwestern Minnesota.

HARVESTS AND HUNTING

Sharp-tailed grouse hunting seasons in Minnesota date to 1858, when a 215 day no bag limit season began July 15. Succeeding years saw various changes. Since 1972, 70-80 day seasons have been in effect with a daily limit of 3. Beginning in 1993, sharptail hunting was allowed only in part of northern Minnesota.

Harvest data through 1941 are somewhat clouded by combined sharptail and prairie chicken totals (the prairie chicken season was permanently closed in 1943). Since 1949, when

Table 2. Relationship between sharp-tailed grouse dancing grounds (n=22) and four types of woody vegetation in northwestern Minnesota.

Vegetation type	Mean distance (m)[1]	Mean height (m)[2]
Scattered brush	179	1.2
Dense brush	209	2.1
Brush-trees combined	252	4.9
Trees	275	7.0

[1] Mean of measurements taken at the cardinal directions to the nearest vegetation type at each dancing ground.

[2] Measured at the center of brush or brush-tree clump, or first stand of trees.

Table 3. Opening weekend sharp-tailed grouse hunter success and percent juveniles in bag-checks and state-wide harvests in Minnesota, 1949-1995. Missing or insufficient data indicated by (-).

Year	Sharptails Seen/hr	Sharptails Bagged/hr	Sharptails Killed/hunter day	% Juveniles	State-wide harvest (1,000's)
1949	-	0.4	-	75	154
50	-	0.1	-	74	83
51	-	0.4	-	51	98
52	1.8	0.3	-	66	116
53	-	0.4	-	48	75
54	1.1	0.2	-	66	60
55	1.7	0.8	-	70	62
56	0.9	0.2	-	74	44
57	1.2	0.2	-	73	54
58	-	-	-	56	67
59	-	-	-	60	45
1960	1.2	0.2	1.0	73	42
61	1.4	0.3	1.1	76	53
62	0.9	0.2	1.0	61	27
63	1.1	0.2	0.8	75	20
64	0.6	0.1	0.4	57	8
65	0.6	0.2	0.6	11	4
66	1.2	0.2	0.6	47	7
67	1.8	0.3	0.8	78	16
68	1.2	0.1	0.8	58	13
69	1.8	0.2	0.9	63	17
1970	1.1	0.2	0.8	60	23
71	1.8	0.2	1.1	73	41
72	1.5	0.2	0.9	67	31
73	0.8	0.2	0.7	74	36
74	1.0	0.2	0.8	77	24
75	0.9	0.2	0.8	75	15
76	1.5	0.3	1.1	78	22
77	1.8	0.3	1.3	77	44
78	1.4	0.3	1.5	70	43
79	0.9[1]	0.3[1]	1.6[1]	74[1]	54
1980	1.2	0.2	1.2	54	56
81	1.6	0.2	0.9	63	34
82	0.6	0.1	0.7	43	14
83	0.6	0.2	0.7	66	5
84	1.4	0.2	0.9	77	5
85	0.6	0.2	1.2	58	7
86	1.2	0.2	1.1	39	9
87	0.8	0.2	1.3	73	17
88	1.2	0.2	0.7	74	20
89	1.3	0.2	1.4	81	25
1990	1.1	0.2	1.1	61	26
91	0.7	0.1	0.6	72	24
92	0.3	0.1	0.2	-	15
93	0.1	0.0	-	-	9
94	-	-	-	-	6
95	-	-	-	-	5

[1] Hunter data after 1978 are derived from one check site only.

over 150,000 sharptails were harvested, totals have generally fluctuated downward (Table 3). Although it is unknown whether sharptails in Minnesota are cyclic, ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse harvests from 1949 to 1988 were correlated ($r=0.63$, $p=<0.05$, $n=39$), suggesting either that sharptail hunting is a function of ruffed grouse hunting pressure, or that some cyclic synchrony exists between the species.

Sharptail hunters in Minnesota comprise 2-3% of small game hunters when sharptails are few, and more than 7% when birds are abundant (MDNR 1990). An average of 4 hours (range 2-10) is expended per bird killed, and from 0.6 to 1.8 hour per sharptail seen (Table 3). Hunter success varies from 0.4 birds per hunter day during population lows to 1.6 birds when birds are more abundant. Fifty percent of sharptail hunters use dogs; these hunters flush and retrieve about 50% more birds than hunters without dogs (Berg 1977).

The sharptail hunter clientele has diminished as sharptail habitat and populations have declined. Since 1940 Minnesota small game license sales have varied slightly ($\bar{x}=299,000$; range = 184,000-377,000) whereas the proportion of sharp-tailed grouse hunters has decreased from 12% to 4%. The Minnesota Sharp-tailed Grouse Management Plan (MDNR 1990) proposes to restore the sharptail population to a level that would sustain an annual harvest of 40,000 birds. The plan to date has fallen far short of its goal.

SPECIES NEEDS AND MANAGEMENT PROBLEMS

The prairie sharp-tailed grouse which inhabits the entire prairie-to-forest transition zone from Saskatchewan, southwestern Manitoba, and southern Ontario into northern Minnesota, Wisconsin and Michigan (Aldrich 1963, Berg 1990) requires an open landscape of grasslands, scattered brush and deciduous trees. Sharptails avoid conifer stands throughout the transition zone except: (1) in muskeg areas where stunted, low-density black spruce (*Picea mariana*) and tamarack (*Larix laricina*) are tolerated in winter, and (2) in the pine and oak barrens of northern Wisconsin and Michigan where sharptails tolerate stunted, usually fire-maintained jack pine (*Pinus banksiana*) growing in large grassy areas (Grange 1948, Ammann 1957).

The quality of the open grass-brushland mosaic favored by sharptails increases with size. In Minnesota, blocks of contiguous habitat must be at least 5 km^2, and complexes of inter-connected smaller areas must contain parcels of at least 15 ha.

The sharptail population decline in the last 50 years has been caused by drastic changes in land use and fire suppression technology. These problems can be categorized as: (1) natural succession, (2) conversion to agriculture, and (3) conversion to conifer plantations.

Natural Succession

Natural succession causing fragmentation and closing of the open landscape is the primary reason for the declining sharptail habitat base in Minnesota's east-central sharptail

range, and to a lesser extent, in the northwest. This range-wide successional trend has been most pronounced in the more fertile transitional grass-brushlands, and slowest in the more acidic muskegs. Although these muskegs support the lowest sharptail densities (Niemi and Hanowski 1992), they comprise the most secure sharptail habitats in Minnesota (Wells 1981), Wisconsin (Hamerstrom and Hamerstrom 1951), and Ontario (Hanson 1953). The habitats of the prairie sharptail in Minnesota are like those of other sharptail races in that they have been historically fire maintained. With the advent of efficient fire suppression technology, many natural muskegs, meadows, and brushlands, and man-made agricultural openings have grown to either decadent brush or forests of low commercial quality. Prescribed burning is being increasingly used to control succession in Minnesota, but for several reasons falls far short of potential.

Conversion to Agriculture

Although agriculture is not a necessary habitat component, sharptails flourish in brushland habitats with small farms in pasture or small grains. However, sharptails disappear once open grass and brushland habitats have all been converted to large agricultural monotypes. Until the mid-1980's this large-scale agricultural development was the primary cause of sharptail habitat loss in the northwest range (Corey 1981). With the 1985 Federal Farm Bill it has become the least important threat; in fact, by 1990 approximately 200,000 ha of northwestern Minnesota farmland has either been abandoned or planted to wildlife cover under the Conservation Reserve Program.

Conversion to Conifer Plantations

Since the mid-1930's old fields and natural upland and lowland openings have been planted to conifers, mainly red (*Pinus resinosa*) and white pine *(P. strobus*), and white *(Picea alba*) and black spruce, without regard for the open landscape that sharptails and other species require. Although some forestry practices in Minnesota have addressed this problem, conifer planting on open lands, many of which never were forested, continues essentially unabated on both public and private ownerships, thus further fragmenting open landscapes.

PUBLIC NEEDS

Hunting and non-hunting demand for sharptails exceeds the supply. Although the hordes of sharptail hunters of yesteryear are largely gone, about 10,000 remain in Minnesota. Approximately one-half of them also hunt sharptails in other states and provinces--evidence of their dedication to the sport (Lally 1987). Recent information on the economic value of sharptail hunting in Minnesota bolsters the importance of the bird. Approximately $40 is added to the economy (MDNR 1990) for each sharptail harvested. In addition, observing and photographing the spring mating ritual from blinds is a rapidly increasing activity with an incalculable economic value.

Northern Minnesota has abundant public land for sharptail hunting. About 20 large state managed wildlife areas totaling more than 200,000 ha contain sharptail habitat. Extensive private lands are also available for sharptail hunting and viewing.

Concern for the sharptail's future in Minnesota prompted the formation of the Minnesota Sharp-tailed Grouse Society (MSGS) in 1985. Comprised of more than 400 hunters, non-hunters, and farmer cooperators, MSGS works through the legislative and educational processes to "re-establish and maintain the sharptail as a significant upland game bird in Minnesota." MSGS accomplishments include lobbying for funds to be dedicated to public and private lands sharptail management, education of the public and resource professionals regarding the habitat needs of sharp-tailed grouse, and publishing a brochure on managing sharptails on private lands (Davis 1987).

MANAGEMENT AND RESEARCH NEEDS

Sharptail management in Minnesota is based on results of extensive research done in the 1960's and 1970's, establishment of dancing ground criteria, and annual population surveys. With the exception of possible work on winter sharptail ecology, no additional research is contemplated. The Forestry-Wildlife Habitat Management Guidelines for Sharp-tailed Grouse (Berg 1981b) describes sharptail habitat needs, and the Minnesota Sharp-tailed Grouse Management Plan (MDNR 1990) establishes sharptail population and habitat management goals.

The primary management needs are to maintain the open character of lands currently supporting sharptails, and to rejuvenate decadent habitat having a recent sharptail history. A prerequisite for this management is close cooperation between wildlife managers and foresters. Habitat management techniques include extensive prescribed burning, mechanical treatment (shearing, hydroaxe, roller chopping, hand cutting), and limited herbicide application. Timber management is most often by clearcutting which provides temporary sharptail habitat. Cooperative efforts continue to identify open landscapes that contain sharptails, and restrict tree planting in these areas. Experimental management techniques include mowing and hand-cutting of encroaching brush near dancing grounds, and the construction of new dancing ground sites. Sharptails were reintroduced to Sherburne National Wildlife Refuge in central Minnesota in winter 1988-89 with little success (J. Toepfer, unpub. data); additional reintroductions are not anticipated.

RECOMMENDATIONS

The future of the sharp-tailed grouse as an upland game bird in Minnesota is less than certain. Unless (1) the management recommendations contained in the Forestry- Wildlife Habitat Management Guidelines for Sharp-tailed Grouse (Berg 1981b) are implemented, (2) the Division of Forestry and Division of Fish and Wildlife of the Department of Natural

Resources cooperatively work to manage the open grass-brushland ecosystem, and (3) funding for management is increased, the sharptail will cease to remain a hunted species in Minnesota.

Implementation of the Minnesota Sharp-tailed Grouse Management Plan (MDNR 1990) is hampered by lack of funding. A similar problem exists for the draft plan to manage brushlands in Minnesota (Berg et al. 1987), which defines the extent of brushland management needed annually. Maintaining the existing public land base in Minnesota and managing private lands are prerequisites for maintaining sharptail numbers. The economic benefits derived from sharptail hunting and viewing need to be determined and publicized.

The Minnesota Sharp-tailed Grouse Society must play a key role in influencing legislation and funding for sharptail management, and in educating the public and agricultural clienteles of the sharptail's economic, aesthetic, and recreational attributes. Because the future of the sharptail is uncertain in all of its range in the western Great Lakes States (Berg 1990), in autumn 1989 the Lake States Sharp-tailed Grouse Management Task Force was formed under the auspices of the Prairie Grouse Technical Council. It is charged with developing sharptail management guidelines for state, federal, and private lands in Michigan, Wisconsin, and Minnesota.

To quote from the Minnesota Sharp-tailed Grouse Management Plan (MDNR 1990): "The sharptail is not an artifact species of one point in time in Minnesota to be managed in remnant isolated populations; rather, it is an indigenous species which plays an important role in Minnesota's wildlife heritage."

ACKNOWLEDGEMENTS

This publication is dedicated to the late Robert Farmes, who, as a MDNR Wildlife Manager in northwestern Minnesota, championed the cause of the sharptail during a career that spanned four decades. His premature passing prevented the fulfillment of many personal goals. I am indebted to P. G. Watt for his initial work on sharptails, G. Davis for his dedication in continuing the lone remaining hunter check, B. Phillipe for 18 years of work on the sharptail projects, and R. Lally for his leadership in the Minnesota Sharp-tailed Grouse Society. Appreciation is expressed to R. Lake, D. Svedarsky, and L. Gregg for critically reviewing the manuscript, and J. Summers and M. Olund for manuscript typing. Financial assistance for printing the cover was from the Minnesota Sharp-tailed Grouse Society and the Minnesota Prairie Chicken Society. The cover photo was graciously provided by Craig Borck of the St. Paul Pioneer Press.

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