Conservation of Columbian sharp-tailed grouse, with special emphasis on the upper Blackfoot Valley, Montana

Benjamin D. Deeble

The University of Montana

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Date 3/1/96

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CONSERVATION OF COLUMBIAN SHARP-TAILED GROUSE,

WITH SPECIAL EMPHASIS ON

THE UPPER BLACKFOOT VALLEY, MONTANA.

Master's Thesis

by

Benjamin D. Deeble

M.S. The University of Montana, 1996

presented in partial fulfillment of the requirements

for the degree of

Master of Science

The University of Montana

1996

Approved by:

Chairperson

Dean, Graduate School

3-2-96

Date
Columbian sharp-tailed grouse (Tympanuchus phasianellus columbianus) historically occupied much shrub-steppe habitat of the Intermountain West. In Montana, the subspecies formerly occurred in major river valleys west of the Continental Divide. The subspecies is believed to occur at present only in two small and isolated populations, one near Eureka in the Kootenai Valley, and one near Helmville in the upper Blackfoot Valley. These populations constitute an important faunal remnant of what once was the most abundant native gallinaceous bird occurring in the shrub-steppe of western Montana.

Current sharp-tailed grouse distribution and minimum population size in the upper Blackfoot Valley was determined by collecting anecdotal reports of grouse sightings and conducting field surveys of leks and winter feeding aggregations. Two leks attended by a minimum of sixteen grouse were documented on private lands in the study area. Winter sightings of groups of up to eleven birds in riparian areas provide additional information on distribution, abundance, and seasonal movements, as do anecdotal reports by knowledgeable individuals of birds in other areas of the valley. This small minimum population size suggests that without effective management intervention the likelihood of extirpation of this population is high.

Information on present population status and management methods employed to conserve Columbian sharp-tailed grouse in other parts of their range was collected by on site interviews with wildlife managers. This information is integrated into recommendations for conserving and restoring sharp-tailed grouse populations in the upper Blackfoot Valley.

Recommendations include protecting critical habitats such as breeding complexes and winter range, rehabilitating degraded habitats through improved land management practices and restoration actions, educating the public to reduce human-caused mortalities, and including private landowners in the development of a grouse conservation strategy.
Acknowledgments

Many people have assisted with efforts to research the grouse of the upper Blackfoot Valley. Many thanks to Len Broberg, Mary O'Brien, Joe Ball, Jeff Marks, Fred Allendorf, Erick Greene, and Dick Hutto of the University of Montana for their support and advice in undertaking the project; to Tom France, Rich Day, Carol Alette, and in particular, Mike Roy of the National Wildlife Federation Northern Rockies Resource Center for an internship and grant writing assistance; to photographers Ken Furrow and Richard Mousel; to Randy Simmons for his field survey assistance; to Guy McWethy for mapping assistance; to Terry Lane for manuscript review; to dog-trainer Earl Twist; to landowners Phil and Bonnie Henault, the Geary brothers, Mary Bradshaw, Otto Eder, Frank Potts, Geoff and Kathy Foote, Roy O'Conner, Derek and Sophie Craighead, Tracy and Shelly Manley, Don and Anne Sullivan; to ranch managers Ben Harbour and Sid Johnson; and to Jim Stone, Dave Cochran, Mike Settevendemie, and Jack Thomas of the Blackfoot Challenge. In addition, I thank John Firebaugh, Mike Thompson, Heidi Youmans and Bob Greene (ret.) of the Montana Department of Fish, Wildlife and Parks; Marilyn Wood of The Nature Conservancy; Alan Sands and Dave McCleerey of the Bureau of Land Management; Jack Connelly of the Idaho Department of Fish and Game, and Gary Sullivan and Greg Neudecker of the U.S. Fish and Wildlife Service for sharing their knowledge and advice about the grouse and study area. Finally, I thank all funders, particularly the Cinnabar Foundation and Ecology Center, for their financial support.
## CONTENTS

<table>
<thead>
<tr>
<th>Abstract</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgments</td>
<td>iii</td>
</tr>
</tbody>
</table>

### I. INTRODUCTION

<table>
<thead>
<tr>
<th>Background</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present Distribution and Population Status</td>
<td>1</td>
</tr>
<tr>
<td>Taxonomy and Subspecific Affinity</td>
<td>3</td>
</tr>
<tr>
<td>Study Scope and Objectives</td>
<td>5</td>
</tr>
</tbody>
</table>

### II. METHODS

<table>
<thead>
<tr>
<th>Study Duration</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area Description</td>
<td>6</td>
</tr>
<tr>
<td>Population Distribution and Minimum Size</td>
<td>7</td>
</tr>
<tr>
<td>Lek Counts</td>
<td>10</td>
</tr>
<tr>
<td>Lek Sites Descriptions</td>
<td>11</td>
</tr>
<tr>
<td>Grouse Conservation and Management</td>
<td>11</td>
</tr>
<tr>
<td>Range-Wide Analysis</td>
<td>12</td>
</tr>
</tbody>
</table>

### III. RESULTS

<table>
<thead>
<tr>
<th>Blackfoot Valley Field Surveys</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anecdotal Reports of Grouse in the Blackfoot Valley</td>
<td>15</td>
</tr>
<tr>
<td>Conservation and Management Planning</td>
<td>19</td>
</tr>
<tr>
<td>Range-Wide Status and Management Review</td>
<td>20</td>
</tr>
</tbody>
</table>

### IV. DISCUSSION

<table>
<thead>
<tr>
<th>Blackfoot Valley Surveys</th>
<th>23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop. Status and Conservation Range-Wide</td>
<td>23</td>
</tr>
<tr>
<td>Reintroduction History</td>
<td>30</td>
</tr>
<tr>
<td>Genetic Analysis</td>
<td>32</td>
</tr>
<tr>
<td>Habitat Associations and Food Habits</td>
<td>36</td>
</tr>
<tr>
<td>Implications of Natural History for Conserv.</td>
<td>38</td>
</tr>
<tr>
<td>Min. Population Counts and Pop. Estimate</td>
<td>40</td>
</tr>
<tr>
<td>Min. Viable Pop. and Extinction Potential</td>
<td>40</td>
</tr>
<tr>
<td>Current Conservation Implementation</td>
<td>41</td>
</tr>
<tr>
<td>Federal Legal Protection</td>
<td>42</td>
</tr>
<tr>
<td>Land Ownership and Coop. Opportunities</td>
<td>43</td>
</tr>
</tbody>
</table>
V. RECOMMENDATIONS

Conservation Planning 4 5
Habitat Conservation and Restoration Needs 4 5
Winter Forage Supplementation 4 7
Population Supplementation 4 8
Pheasant Releases and Hunter Education 4 9
Additional Research Needs 4 9

VI. CONCLUSION 5 2

VII. REFERENCES CITED 5 5

LIST OF FIGURES
1. Map- historic and present distribution range-wide. 2
2. Map- study site, lek and sighting locations. (pocket)
3. Upper Blackfoot Valley lek counts 1994-95. 1 5

LIST OF TABLES
1. Spring Lek Counts, 1994-95. 1 4
2. Other Sightings, 1994-95. 1 6
3. Field Survey Locations 1 7
4. Vegetation Condition, Easter Lek 1 8
5. Vegetation Condition, Helmville Lek 1 8
6. Range-Wide Information Summary 2 2

APPENDICES
II. Grouse Conservation Article
III. Menu of Conserv. Measures and Habitat Mngmnt. Options
IV. Topics discussed with wildlife and land managers during range-wide survey.
V. A Review of Sharp-tailed Grouse Habitat in Western Montana by J.W. Connelly and A. R. Sands.
I. INTRODUCTION

Background

A western subspecies of sharp-tailed grouse, the Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*), has declined dramatically throughout its historic range. Its geographic distribution, which formerly included all states west of the Continental Divide except Arizona and New Mexico (Aldrich 1963), has contracted by an estimated 90% (Miller and Graul 1980). Today the subspecies exists in substantial numbers only in Colorado and Idaho; exists in only remnant populations in Utah, Washington, Wyoming, and Montana; is extirpated but reintroduced in Oregon; and is extirpated from Nevada and California (Fig. 1, Table 6).

In Montana, sharp-tailed grouse historically occurred in the larger river valleys west of the Continental Divide (Siloway 1901). Sharp-tailed grouse have been present in the Blackfoot Valley since it was first settled by Anglo-Europeans in the 1870's (T. Geary 1994). In western Montana, rapid declines were noted at the turn of the century (Saunders in Wood 1991), and by the early 1980's populations persisted west of the Divide only in those portions of the Kootenai and Blackfoot valleys that retained stands of native shrub-steppe vegetation.

Present Distribution and Population Status in Montana

Today, only two isolated sharp-tailed grouse populations are known to survive in western Montana: one in the Tobacco Plains near Eureka in the northwest corner of the state, and a second in the upper Blackfoot Valley forty-five miles northeast of Missoula. Prior to the initial field surveys conducted here, no studies have reported substantially on the status of the sharp-tailed grouse population in the upper Blackfoot Valley. The Tobacco Plains population has experienced a constant downward trend despite supplementation by the introduction of additional birds, and is presently estimated to consist of fewer than ten grouse (Young 1995). Initial information on the upper Blackfoot Valley population suggests that only a critically small population survives there also.
Figure 1. Sharp-tailed Grouse—original distribution of all subspecies, and present *T. p. columbianus* distribution.¹

Taxonomy and Subspecific Affinity

The sharp-tailed grouse is one of sixteen grouse species throughout the Northern Hemisphere (Johnsgard 1973), and of nine grouse species indigenous to North America north of Guatemala. The Columbian sharptail is one of six currently recognized, extant subspecies of sharptails in North America (AOU 1957).

It is generally accepted that there are two allopatric subspecies of sharp-tailed grouse present in Montana: the plains sharp-tailed grouse \((T.p. jamesi)\) distributed east of the Continental Divide; and the Columbian sharp-tailed grouse \((T.p. columbianus)\) distributed west of the Continental Divide. No zones of introgression between the two subspecies have been described.

Taxonomists have historically relied upon behavioral and morphometric methods to classify prairie grouse. Behaviorally, male Columbian sharp-tailed grouse are reported to exhibit exaggerated "flutter jumps" during lek displays (Eng 1995), behavior not observed in plains sharp-tailed grouse (Youmans 1995) perhaps due to an evolutionary association with taller and denser vegetation characteristic of shrub-steppe habitat, as opposed to shorter grassland vegetation types dominant east of the Divide. Although there exists no systematically collected, range-wide set of morphological data on Columbian sharp-tailed grouse, generally the western subspecies is reported to have darker plumage and to weigh approximately 12-15% less than the plains sharp-tailed grouse (Schroeder 1995; Braun 1993; Giesen 1992).

Examinations of two study skins\(^2\) originating from the Blackfoot Valley to determine plumage characteristics attributable to either the Columbian sharp-tailed grouse or the plains sharptail have been inconclusive (Wright 1993). In addition, similar examination of seven study skins collected in the Flathead Valley by M.J. Elrod in 1897 has also been ambiguous (Wright 1993). No weights at time of collection accompany these specimens.

\(^2\) specimen numbers MSUZ 6352-1961 and UMZ 17159-1984
Because the morphometric and plumage distinctions are too minor to allow field identification, management decisions relating to taxonomy are often made based on general geographic range, behavioral differences, or habitat affinity (Wright 1993; Eng 1993). The birds observed in the upper Blackfoot Valley for this study are assumed to be Columbian sharp-tailed grouse due to their: location west of the Continental Divide, outside the documented geographic range of the plains sharptail; execution of an elevated "flutter jump," documented on video; and association with shrub-steppe vegetation.

The nearest population of putative plains sharp-tailed grouse to the study population is reported to have been present in the 1980's approximately 35 miles from Helmville, east of the Continental Divide at Canyon Creek (Herbert 1995; Brewer 1995); the present status of this population is unknown. There have been few reports of sharp-tailed grouse between Helmville (elev. 4,300 feet), the eastern-most known distribution of the Blackfoot Valley population, and Rogers Pass (elev. 5,600) on the Continental Divide. Typical shrub-steppe habitat for sharptails appears to be replaced by dense evergreen forest at approximately 5,000 feet. The unsuitable habitat present at these higher elevations may present a significant barrier to movement between the two populations.

Furthermore, Columbian sharp-tailed grouse are not known to be migratory, or to undertake long-distance dispersal. Sharp-tailed grouse are highly philopatric, with seasonal movements limited to less than a 6.5 kilometer radius around the lek (Meints et al. 1991; Prose 1987). Longer distance movements have been documented however, particularly for females (Giesen 1987; Sisson 1976; Caldwell 1976; Shiller 1973), and inferred from historical accounts of "invasions" of sharp-tailed grouse (Snyder in Edminster 1954) in Michigan. However, the longest recorded movements by Columbian sharptails are approximately 20 km between lek and winter range (Meints 1991). Other subspecies such as the plains sharp-tailed grouse are known to disperse greater distances, however, they are not known to undertake regular long-distance migrations. The absence of records of longer movements by Columbian sharptails might be due to a lack of
data or might reflect a behavioral difference between subspecies (Weddell 1992).

It is not known if the Blackfoot Valley population of sharp-tailed grouse is connected by gene flow to the plains sharptail population found east of the Divide. It seems unlikely that the Blackfoot Valley population experiences gene flow with Columbian sharptail populations located westward, given that the closest known populations are located at Eureka (150 miles northwest) or in western Idaho (200 miles southwest).

If the Blackfoot Valley population is determined to be the plains subspecies, it would represent the first known distribution of this race west of the Continental Divide. If the population is confirmed instead as the Columbian subspecies it comprises an important faunal remnant. Also, as the only known population of Columbian sharp-tailed grouse which has persisted without supplementation in Montana, the population would represent the only genotypically endemic stock, and potentially possesses superior adaptations to local conditions. Thus conservation of the sharp-tailed grouse population present in the Blackfoot Valley is warranted regardless of subspecific taxonomy.

Study Scope and Objectives

This study analyzes the population status and conservation of Columbian sharp-tailed grouse at two geographic scales, the upper Blackfoot Valley and range-wide.

In the upper Blackfoot Valley the study objectives are twofold: determine the minimum population size and distribution; and recommend specific habitat management actions that landowners and agencies can implement to conserve the grouse population.

The range-wide analysis summarizes the current distribution and population status of the Columbian sharp-tailed grouse in the West, and the management measures undertaken on public and private lands to conserve the subspecies. The objective of the range-wide analysis is to identify successful conservation methods employed elsewhere that may be applicable to the conservation of the Blackfoot Valley population.
II. METHODS

Study Duration

The study commenced in October 1993 with the author's first observation of sharp-tailed grouse in the Blackfoot Valley. Systematic searches for additional birds began in March 1994 and were repeated during spring, 1995. Searches also were conducted during the winter of 1994-95. A range-wide tour was conducted in August 1995, and a grouse conservation workshop for landowners was held in September 1995.

Study Area Description

The upper Blackfoot Valley study site is located in Powell County, Montana, 45 miles northeast of Missoula. For the purposes of this study, the upper Blackfoot Valley is defined as the portion of the Blackfoot River watershed generally bounded on the west by the junction of Highway 200 and Woodworth Road; on the north by Ovando Mountain; on the east by the junction of Hwy. 200 and State Route 141; on the southeast by Nevada Lake; and on the south by Campbell Mountain (Fig. 2). Elevation of the study site ranges between 4,000 and 5,000 feet and mean annual precipitation is 14 inches (USDA 1974).

The areas surrounding the towns of Ovando and Helmville have the most consistent anecdotal sighting reports of grouse, and large tracts of native habitat. Surveys were conducted primarily on the valley floor and bench lands down slope of conifer-dominated hill sides (which begin at the elevation of approximately 5,000 feet), concentrating on the sagebrush/bunchgrass benches, valley grasslands, and riparian habitats strongly associated with the species (Kessler and Bosch 1982).

The study area is transected by two rivers, the north fork and main fork of the Blackfoot River, and by several creeks, the largest of which is Nevada Creek. The largest lakes in the study area are Brown's Lake and Kleinschmidt Lake.
Native vegetation communities of the study site are of two general types:

riparian areas along creeks and river bottoms, characterized by Black cottonwood (*Populus trichocarpa*), quaking aspen (*Populus tremuloides*), willow (*Salix sp.*), hawthorn (*Crataegus douglasii*), birch (*Betula sp.*), snowberry (*Symphoricarpos albus*) and rose (*Rosa sp.*); and,

shrub-steppe uplands (Daubenmire 1988), comprised of Rocky Mountain big sagebrush (*Artemesia tridentata*), bunchgrasses (*Agropyron sp.*), fescues (*Festuca sp.*), and forbs such as yarrow (*Achillea millefolium*), salsify (*Tragopogon dubius*), arrowleaf balsamroot (*Balsamorhiza sagittata*), broken into a mosaic by seasonal wetlands, and pioneering evergreen trees (*Pinus ponderosa, Pseudotsuga menziesii*).

Much of the landscape has undergone significant modification by agriculture. Large areas have been converted to small grain culture, haylands, exotic grass pasture, and intensively grazed rangeland.

**Population Distribution and Minimum Size**

To determine the distribution and minimum population size of sharp-tailed grouse in the Blackfoot Valley study area, a combination of methods was used:

**Interviews**

Interviews of resource managers and residents were conducted to collect information on recent and historic sightings. Forty-five residents, landowners and land managers in the upper Blackfoot Valley were queried about recent or historic sightings of sharp-tailed grouse. Personnel of the Montana Department of Fish, Wildlife and Parks (MDFWP), the U.S. Fish and Wildlife Service (USFWS), the U.S. Forest Service (USFS), the Bureau of Land Management (BLM), and the University of Montana were contacted. These individuals and agencies own land areas within the study area comprising more than 35,000 acres of potential sharp-tailed grouse habitat. In addition, individuals
affiliated with Montana State University, the Salish-Kootenai Tribe, and four non-governmental conservation organizations (The Nature Conservancy, National Wildlife Federation, Ecology Center, Montana Heritage Program) were consulted for any information on Columbian sharp-tailed grouse in Montana. To solicit additional anecdotal sighting reports, a brochure was distributed to landowners and managers that describes and illustrates the subspecies, its habits and habitats, and which requests reports of observations (Appendix I).

Field Surveys
Field surveys were conducted beginning in March 1994 and continuing through June 1995 to confirm sighting reports and to obtain new sightings. Time, labor, and private property access prevented surveying all habitat with a potential for harboring grouse. Survey effort was concentrated in areas selected and prioritized, when possible, in the following manner (high to low):

i. lek sites active within the past two years;
ii. lek sites active within the past five years, and the area within a five kilometer radius;
iii. breeding season grouse sighting areas;
iv. areas with residual vegetation densities and composition characteristic of high quality grouse habitat (e.g. undisturbed sagebrush and bunchgrass tracts);
v. non-breeding season grouse sighting areas.

A. Call Broadcasts
Grouse can be highly responsive to conspecific calls during lekking periods in the spring and fall, particularly in the morning hours around dawn on clear, calm days. Prior investigators have located prairie grouse leks by listening for grouse vocalizations (Kumm 1995, Schroeder 1995) or searching from aircraft (Youmans 1995; Schroeder 1992; Grensten 1987). Broadcasts of grouse calls have been used successfully in mitigation and reintroduction projects to
attract sharptails and sage grouse (*Centrocercus urophasianus*) to new lek sites (Eng *et al.* 1979; Rodgers 1992).

Greene (1993) was the first to broadcast grouse calls to attempt to locate leks in the Blackfoot Valley, reporting directional flight responses of up to one-half mile toward broadcast locations. However, he was constrained by equipment which required an automobile-based power source that limited broadcasts to locations accessible by vehicle. Birds at active leks have also been observed to respond strongly to broadcasts by vocalizing, flying, or walking toward the sound source, making them potentially easier to detect (author's notes 10/10/93).

For this study, various locations, referred to here as "calling stations," were used as broadcast sites. A high quality cassette tape of sharp-tailed grouse vocalization was duplicated from a collection of bird songs (Peterson 1991). Calls were broadcast using a pair of 2.5 watt, amplified, battery-powered speakers, and a compact cassette tape player. Initially, calls were broadcast from right-of-ways along public roads. This provided an efficient method of conducting preliminary visual assessments of habitat, while broadcasting in several different areas over a short period of time. In addition, broadcasts were conducted when public and private property (by permission) was accessed on foot.

Generally, broadcasts were begun approximately 30 minutes before dawn, and conducted for the next 3-4 hours after sunrise. An effort was made to try a calling station once every mile along roads bordering promising habitat. Ground converted to pasture or crops was avoided. Sometimes this distance interval was shortened if a road course abruptly entered a new exposure (e.g., an elevated site overlooking promising habitat where broadcasted calls might carry particularly well). The taped broadcasts were played for a minimum of 10 minutes at each calling station, while watching and listening for vocalization or flight responses by grouse. Observations continued for two minutes after broadcasts were terminated.
B. Trained Dogs

Beginning in March of 1995, trained bird dogs were used to aid surveys. A single dog was used to walk transects across sections of ground increasing search effort and effectiveness, particularly during non-lekking periods. Use of dogs was halted in late May because of potential harm to grouse chicks. In addition, volunteers were used during six days for surveys to increase survey effort.

C. Visual Winter Searches

Sharp-tailed grouse shift feeding patterns once snow reduces availability of warm season food resources, such as leafy material and insects (Edminster 1954; Jones 1966; Marks and Marks 1987). Counts of winter feeding aggregations are potentially less discrete than lek counts, due to flock mixing and the more widely ranging daily movements that may occur. Nevertheless they are very useful for determining winter distribution, forage resources, and habitat use. Once a snow pack was established, winter searches were conducted during November to February 94-95. These searches focused on riparian areas and grain fields visible from roads and accessible by skis. Deciduous vegetation and fields were scanned with binoculars for evidence of feeding birds.

Lek Counts

When birds were found, the locations were marked with flagging tape, and later revisited to listen passively for grouse lek vocalizations, to broadcast calls, and/or to search again with dogs. Once a lek is confirmed, subsequent observation can render a minimum count of birds attending that lek. Lek surveys should minimize double-counting individual birds, because unless established leks are closely spaced (< 1 mile), individual birds exhibit a high level of lek fidelity, not straying to other lek locations (Marks and Marks 1987). Minimum sharp-tailed grouse numbers and distribution were determined by locating and observing aggregation sites such as leks and winter feeding areas. Minimum population size was derived by combining the counts of all birds that could reasonably be distinguished from each other by location and time of sighting.
Lek Site Description

Active lek locations were described in terms of vegetation visual obstruction readings (VOR), plant species diversity, dominant plant species composition, percent dead vegetation, and percent cover.

A Robel pole was used to measure VOR (Robel et al. 1970), with one hundred readings taken per lek, radiating outward from the approximate lek center. Twenty-five readings were taken at two meter intervals in each of the four cardinal directions. Community diversity, dominant species, and percent cover was documented using random quadrat methods, with a one meter square quadrat being thrown twenty times in the immediate area of the lek. A simple assessment of community diversity (the number of different grass, forb, and shrub species appearing in each quadrat) was recorded. Only "dominant" plants, defined as comprising an estimated 25% or more of any quadrat, were keyed-out to the species level. Percent dead vegetation and percent bare ground were also estimated and recorded. Estimations were rounded to the closest five percent.

Grouse Conservation and Management

To determine what management measures can be undertaken to expand the population size and distribution of sharp-tailed grouse in the upper Blackfoot Valley, a literature review and direct consultations with authorities was conducted. The literature review emphasized natural history, genetic, and habitat management issues relevant to conserving small populations of grouse. Expert consultation was accomplished in part by bringing two sharp-tailed grouse authorities (employed by the BLM and the Dept. of Fish and Game) from Idaho to assess habitats and provide advice on sharptail management.

In addition, local authorities and landowners were consulted regarding appropriate and acceptable techniques for implementing management measures beneficial to sharp-tailed grouse on public and private lands in the Blackfoot Valley. Part of this consultation was facilitated by a workshop attended by local landowners and managers, held to exchange information about sharp-tailed grouse conservation,
and to initiate preliminary discussions for implementing a local grouse conservation strategy.

**Range-Wide Analysis**

To better understand the current range-wide distribution and population status of the Columbian sharp-tailed grouse, and to collect information on promising conservation methods employed in other regions, interviews with wildlife managers were undertaken and habitat inspections were conducted in all states that still possess and manage grouse populations. During August 1995 managers were interviewed and habitats were toured in eastern Oregon and Washington, western and southern Idaho, northern Utah, southern Wyoming, and northern Colorado. Wyoming managers were only available by phone. In addition, the author attended the biennial prairie grouse technical committee meeting in North Dakota.

Managers in all states were asked to discuss a standard range of issues (Appendix IV). Information on population status, distribution, harvest, and habitat management was acquired through these interviews, as were anecdotal impressions.
III. RESULTS

Blackfoot Valley Field Surveys

Approximately seventy broadcasts of grouse vocalizations were performed at fifty-five separate calling stations on twenty-two different mornings. Of these broadcasts, eight were conducted in the known vicinity of sharp-tailed grouse (at a known lek, or in the process of confirming a lek). Of these eight broadcasts, two elicited apparent flight and search responses. No responses were observed at calling stations not known to be in the vicinity of grouse. Bird dogs were used on twenty-three days in 1995 to survey for grouse. They were successful in locating a total of eight sharptails on two different days at three locations. See Table 3 for survey locations.

Easter Lek: One previously undocumented lek, with a minimum of five grouse (at least one female), was discovered at T14N,R12W, S23 (Fig. 2). These birds were first observed flying, during which their flight direction and landing location were noted. The birds were then followed to a site where a lek was confirmed and documented the following day. This lek, named "Easter lek" because of its discovery in late May, is on private ground with native vegetation.

Lek vegetation condition, as documented by Robel pole and random quadrat methods, appear in Table 4. The section immediately surrounding Easter Lek is grazed seasonally (mid-May to early July) by cattle (T. Geary 1994). Presently it offers only poor to fair grouse breeding habitat (Connelly and Sands 1995), due to apparent declines in residual cover, grasses and forbs. Adjoining land sections on three sides have been plowed, with one sown in wheat, and two presently in non-native grasses. The wheat field with documented winter use by sharp-tailed grouse will be re-seeded in native grasses, with the financial assistance of the U.S. Fish and Wildlife Service (USFWS) (G. Sullivan 1995).

Helmville Lek: One additional lek, known previously by R. Greene, was observed on the bench one-half mile east of Helmville, at 13N/11W/26 (Fig. 2). This second lek, named "Helmville Lek," had a minimum of eleven birds present on 4/17/94 (Greene 1994). Helmville Lek is located at the eastern edge of a privately-owned field
presently sown in non-native grasses and legumes (primarily alfalfa) for hay production and cattle grazing. This site was broken-out of native vegetation in 1989, but retains some sagebrush and native bunchgrass vegetation on the periphery. The ground on bench slopes immediately to the south and north of the lek still have native vegetation cover, primarily bunchgrasses and sagebrush, as does the bench extending eastward. Lek vegetation condition, as documented by Robel pole and random quadrat methods, appear in Table 5.

**Minimum Count:** Combining the highest 1994 lek counts, a minimum of sixteen birds were present at the two sites. These leks were still active in spring 1995, but fewer birds were observed at each (Fig. 3). A minimum population size that is supported by direct observations in 1995 is fourteen birds: seven at Helmville lek, three at Easter lek (Table 1) and four birds at a location where a lek is suspected, but unconfirmed (Table 2). The active leks are located approximately nine miles apart (Fig. 2).

### Table 1. Spring Lek Counts, 1994-95

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<th>Year</th>
<th>Helmville Lek</th>
<th>Easter Lek</th>
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<td>Date</td>
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<td>15 Apr.</td>
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<td></td>
<td>26 Apr.</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>6.25</td>
</tr>
<tr>
<td></td>
<td>SE</td>
<td>.25</td>
</tr>
</tbody>
</table>
Lesser numbers of birds were observed during the winter at five different locations, principally on private lands (Table 2, Fig. 2). An aggregation of eleven birds was observed feeding on bog birch (*Betula glandulosa*) catkins on private land, then moved to an adjacent public property where feeding continued on birch catkins. Other aggregations of three birds each were observed feeding in three different privately-owned wheat fields.

![Graph showing lek counts for Helmville and Easter, 1994-95.](image)

**Figure 3.** Upper Blackfoot Valley lek counts, 1994-95 (capped bars denote 2 SE).

**Anecdotal Reports of Grouse in the Blackfoot Valley**

Five anecdotal reports of sharp-tailed grouse sightings within the study area suggest that more birds are present in adjoining areas than have been directly documented by this investigation. Two summer sighting reports have come from adjoining ranches located approximately six miles southwest of Helmville (Manley 1995; Darr 1995), and three other winter and spring reports have come from the Bandy Ranch located ten miles west of Ovando (Getz 1994; Nicely 1995). One lek at a site on the west side of highway 141 at mile post 30, was active up until 1992 (Greene 1994), but now apparently has either moved to an unknown location or been abandoned. Another lek reportedly occurred one-half mile west of the Helmville lek into the 1980's, at a grassy opening created by a lightning strike in a well-developed sagebrush stand. That lek became inactive after the entire sagebrush stand was burned and tilled (D. Sullivan 1995). See Table 2 for a summary of all recent anecdotal reports and off-lek sightings, and Fig. 2 for locations of anecdotal reports.
<table>
<thead>
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<tbody>
<tr>
<td>No. Birds</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>11</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Owner</td>
<td>Geary</td>
<td>Hensult</td>
<td>Potts</td>
<td>Potts</td>
<td>Stranahan/MT</td>
<td>Geary</td>
<td>Gravely</td>
<td>Stranahan</td>
<td>Geary</td>
<td>Stranahan</td>
</tr>
</tbody>
</table>

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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Birds</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Owner</td>
<td>MT DOT</td>
<td>Gravely</td>
<td>Geary</td>
<td>Stranahan</td>
<td>Cochran</td>
<td>Univ. of MT</td>
<td>Hensult</td>
<td>Stranahan</td>
<td>Manley</td>
<td>Darr</td>
</tr>
<tr>
<td>Observer</td>
<td>Neal</td>
<td>Bradshaw</td>
<td>M. Voss</td>
<td>Bradshaw</td>
<td>Cochran</td>
<td>Ossowski</td>
<td>E. Voss</td>
<td>Bradshaw</td>
<td>Manley</td>
<td>Darr</td>
</tr>
</tbody>
</table>
Table 3. Field Survey Locations.

<table>
<thead>
<tr>
<th>Location</th>
<th>Methods</th>
<th>Attempts</th>
<th>C/IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>T12N,R11W</td>
<td>5 B.D.</td>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>6 BV</td>
<td>1</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>8 B.D.</td>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td>T12N,R12W</td>
<td>14 D</td>
<td>1</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>15 D</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>23 BV</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>26 B</td>
<td>1</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>34 B</td>
<td>1</td>
<td>IC</td>
</tr>
<tr>
<td>T13N,R10W</td>
<td>19 BV</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>30 BV</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>32 BV</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td>T13N,R11W</td>
<td>1 B.D.</td>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>2 B.D.</td>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>5 D.V.</td>
<td>5</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>8 D.V.</td>
<td>5</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>9 D.V.</td>
<td>5</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>11 B.D.</td>
<td>3</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>12 B.D.</td>
<td>3</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>13 B</td>
<td>1</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>22 B</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>25 D.V.</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>26 B.V.</td>
<td>4</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>27 B</td>
<td>1</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>36 D.V.</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td>T14N,R12W</td>
<td>7 B.D.</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>15 B.D.</td>
<td>4</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>16 B.D.</td>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td>T14N,R11W</td>
<td>11 B.D.</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>12 B.D.</td>
<td>3</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>13 B.D.</td>
<td>5</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>14 B.D.</td>
<td>4</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>15 B.D.</td>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>16 B.D.</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>22 B.D.</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>23 B.D.</td>
<td>5</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>27 B</td>
<td>1</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>34 B.D.</td>
<td>3</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>35 B.D.</td>
<td>3</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>36 B.D.</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td>T15N,R13W</td>
<td>9 B.D.</td>
<td>2</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>17 B</td>
<td>1</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>21 B.D.</td>
<td>2</td>
<td>IC</td>
</tr>
</tbody>
</table>

3 listed by township, range and section.
4 search methods: call broadcasts (B), bird dogs (D), or visual searches (V).
5 section completely searched (C), or incompletely searched (IC).
Table 4. Vegetation Condition, Easter Lek (June 14)

**Vegetation Composition and Coverage - Random Quadrats**

<table>
<thead>
<tr>
<th># Grass Sp.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Bare Ground</td>
<td>30</td>
<td>10</td>
<td>&lt;5</td>
<td>25</td>
<td>30</td>
<td>30</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>30</td>
<td>20</td>
<td>30</td>
<td>20</td>
<td>30</td>
<td>10</td>
<td>&lt;5</td>
<td>10</td>
<td>15</td>
<td>0</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># Shrub Sp.</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>1</th>
<th>1</th>
<th>1</th>
<th>1</th>
<th>1</th>
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<th>1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>% Dead</td>
<td>&lt;5</td>
<td>20</td>
<td>50</td>
<td>20</td>
<td>&lt;5</td>
<td>10</td>
<td>&lt;5</td>
<td>&lt;5</td>
<td>&lt;5</td>
<td>5</td>
<td>25</td>
<td>10</td>
<td>30</td>
<td>25</td>
<td>25</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>&lt;5</td>
<td></td>
</tr>
</tbody>
</table>

**Dominant Sp.**
- A.t. - Artemisia tridentata, big sage
- A.i. - Agropyron intermedium, intermediate wheatgrass
- A.c. - Agropyron cristatum, crested wheatgrass
- M.s. - Medicago sativa, alfalfa
- B.p. - Bromus polyanthus, mountain brome
- F.i. - Festuca idahoensis, Idaho fescue

Table 5. Vegetation Condition, Helmlville Lek (June 20)

**Vegetation Composition and Coverage - Random Quadrats**

<table>
<thead>
<tr>
<th># Grass Sp.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Bare Ground</td>
<td>10</td>
<td>30</td>
<td>35</td>
<td>10</td>
<td>&lt;5</td>
<td>25</td>
<td>25</td>
<td>&lt;5</td>
<td>20</td>
<td>40</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>60</td>
<td>15</td>
<td>0</td>
<td>35</td>
<td>10</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

| # Shrub Sp. | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
|-------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| % Dead | 30 | 10 | <5 | 25 | 40 | 10 | 10 | 20 | 0 | 10 | 15 | 25 | 20 | 10 | 0 | 25 | 0 | <5 | 30 |

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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>% Dead</td>
<td>30</td>
<td>&lt;5</td>
<td>10</td>
<td>&lt;5</td>
<td>25</td>
<td>40</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>0</td>
<td>10</td>
<td>15</td>
<td>25</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>25</td>
<td>0</td>
<td>&lt;5</td>
</tr>
</tbody>
</table>

A.t. - Artemisia tridentata, big sage
A.i. - Agropyron intermedium, intermediate wheatgrass
A.c. - Agropyron cristatum, crested wheatgrass
M.s. - Medicago sativa, alfalfa
B.p. - Bromus polyanthus, mountain brome
F.i. - Festuca idahoensis, Idaho fescue

Conservation and Management Planning

In an effort to involve local residents in the preparation of a valley-wide voluntary conservation strategy, a public meeting was held on Sep. 25, 1995 at the Helmville Community Center to exchange information with landowners about sharp-tailed grouse and the study.

The workshop was co-sponsored by the Blackfoot Challenge and the Powell County Conservation District. A packet of information was mailed to invitees, which included an article introducing the conservation initiative (Appendix II). Fourteen key landowners were invited to participate in the meeting. Eight major landowners, plus personnel of MDFWP, USFWS, and the Natural Resources Conservation Service (NRCS), attended.

A slide show and information was presented by the author on conservation of sharp-tailed grouse throughout their range, particularly west of the Continental Divide. Items from a menu of conservation measures and habitat management options (Appendix III) were discussed.

One landowner expressed skepticism that current land stewardship practices reduce grouse abundance. Others suggested that predation from increased predator populations (particularly coyotes, ravens and raptors) could be driving grouse populations downward. Two landowners extended invitations to survey their property for grouse (two other landowners present at the meeting had already permitted surveys). One rancher provided new reports of birds, and two other landowners expressed particular interest in habitat rehabilitation prospects.

The MDFWP offered funds to landowners, through their upland game bird enhancement program (MCA 1995) for habitat enhancement projects, such as fencing for grazing management and planting of deciduous shrubs. This is the first time these state funds have been offered to enhance habitat for a non-hunted bird population. Funds are available subject to the property being available to public hunting for legal game species, "in accordance with reasonable use limitations imposed by the landowner (MCA 1995)."

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6 Title 87, chap. 1, parts 246-249.
The USFWS offered funds to landowners to delay cutting hay until July 15 to improve brood survival, if brood rearing activity can be confirmed in specific hay fields. The landowners present agreed to meet again in early 1996 to continue discussion of conservation strategies.

Range-wide Status and Management Review

The range-wide status review reveals that throughout much of its historic range, the Columbian sharp-tailed grouse occurs in reduced and isolated populations. The subspecies appears to be highly vulnerable to extinction in some regions (i.e. western Idaho, Washington, Oregon and Montana) due to low estimated population sizes of less than 200 birds per population, and reduced but less vulnerable to extinction in others (i.e. Wyoming, northern Colorado) (Table 6).

The grouse population is thought to be significantly increasing only in south-central Idaho. The health of this single core population is attributed largely to the Conservation Reserve Program (CRP) (Hemker 1995). The CRP is a federal program begun in 1984 that has been used to set-aside private agricultural land to reduce soil erosion. The program has coincidentally created and maintained artificial grasslands that sharp-tailed grouse utilize heavily for nesting and brood rearing. Should Idaho lose its private CRP land to renewed agricultural production, a much greater responsibility for maintaining the sharp-tailed grouse population will fall upon public lands, where managers will need to prioritize conservation of the subspecies if it is to survive in the state.

Grouse populations in Utah, Oregon, Colorado and Montana are also presently distributed primarily on private lands. In Washington, the majority of the known grouse population survives on tribal lands of the Colville Reservation. This suggests that managers should pursue strategies which actively seek and incorporate the needs and values of private landowners (and in the case of Washington, tribes). Only in Wyoming does an estimated 50% of the land area occupied by Columbian sharp-tailed grouse appear to be public. This suggests that conservation strategies could be developed in Wyoming which
encourage resource managers to prioritize protection of the bird and its habitats on public lands.

See the Discussion and Table 6 for a summary of additional management information gathered range-wide.
Table 6. Range Wide Information Summary

<table>
<thead>
<tr>
<th>State</th>
<th>WA</th>
<th>OR</th>
<th>ID</th>
<th>CO</th>
<th>MT</th>
<th>UT</th>
<th>WY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop. Size (est.)</td>
<td>380</td>
<td>25-50</td>
<td>20,000-65,000</td>
<td>20,000</td>
<td>&lt;40</td>
<td>1000</td>
<td>300</td>
</tr>
<tr>
<td>Pop. Trend</td>
<td>decreasing</td>
<td>unknown</td>
<td>increasing</td>
<td>stable</td>
<td>decreasing</td>
<td>decreasing</td>
<td>unknown</td>
</tr>
<tr>
<td>Habitat Privately Owned</td>
<td>50% +</td>
<td>100%</td>
<td>55%</td>
<td>75%</td>
<td>95% +</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>Annual Hunting Harvest (est.)</td>
<td>No season</td>
<td>No season</td>
<td>9,800</td>
<td>500</td>
<td>No season</td>
<td>No season</td>
<td>No season</td>
</tr>
<tr>
<td>Reintro. Plans</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Habitat Acquisition</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Private Lands Habitat Improvement</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Public Grazing Mgmt.</td>
<td>Y/N</td>
<td>-</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>-</td>
<td>N</td>
</tr>
<tr>
<td>Fire Mgmt.</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>CRP Dependency</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

2 Cogias 1995; Crawford 1993.
5 Young 1995; author's notes.
7 Hnilicka 1995; Rothwell 1993.
8 Estimates by managers (OR, CO, UT, WY), approximated from managers' distribution maps (WA, ID), or author's observations (MT).
9 1993 Season closed, but small numbers shot by duck and deer hunters (Davis 1995; W. Geary 1994).
10 Season closed for first time after 1994, but wing collections document small numbers still harvested (Hnilicka 1995).
11 Tobacco Plains 1996 augmentation proposed, but source population availability uncertain (Wood 1995).
12 No public lands acquired, however the Nature Conservancy owns 600+ utilized acres near Eureka.
13 As an initiative of state or federal agencies, emphasizing sharptail habitat improvement.
14 Management prohibits livestock grazing on 10,000 acre Swanson Lakes WMA, to enhance sharptail habitat.
15 A 12,000 acre BLM tract adjoining the state WMA permits grazing for the next 10 years (Anderson 1995).
16 Category can include fire suppression or prescribed burns, if either intended for improving grouse habitat.
IV. DISCUSSION

Blackfoot Valley Surveys

Fewer grouse were observed on leks during spring 1995 than during spring 1994. This observation could represent a cyclic population decline, a downward population trend, or a random artifact of sampling. Sharp-tailed grouse populations are known to undergo dramatic population fluctuations. Some have suggested that for plains sharp-tailed grouse cyclic population fluctuations occur at intervals of approximately 10 years, as measured by harvest levels (Baydack 1995) or lek counts (Kobriger 1995). Knowledgeable individuals have reported significantly larger numbers of sharp-tailed grouse in the upper Blackfoot Valley as recently as 1988, observing single aggregations of over 25 birds (Mutch 1989). One game manager indicated that a local population peak had occurred around 1987-88 (Davis 1995). It is possible that the population may presently be experiencing a natural low population ebb if the peak date is accurate, and a 10 year cycle applies to Columbian sharp-tailed grouse.

Population Status and Conservation Range-wide

It appears unlikely that any one factor has caused the decline of the Columbian sharp-tailed grouse throughout their range or in Montana. Starkey and Schnoes (1976) suggest that the initial limiting factors may have been replaced by others. They hypothesize that hunting and overgrazing around the turn of the century caused initial declines, followed by habitat changes resulting from fire suppression, continued overgrazing, and cultivation.

A review of the literature on the subspecies reveals that the causes of this extensive decline are assigned universally to human activities. Increased mortality and decreased reproductive success have been hypothesized and attributed to several factors, ranked here in the order of their potential contribution to grouse population declines:
i. Overgrazing by livestock;
ii. Conversion of shrub-steppe habitat to cultivation;
iii. Fire management that creates unfavorable habitat;
iv. Direct and indirect effects of agricultural chemicals;
v. Hunting;
vi. Conflicts with exotic species; and
vii. Predation

**Overgrazing by livestock**

Currently, livestock grazing is cited by several land managers as contributing to degradation of sharp-tailed grouse habitat, both in the upper Blackfoot Valley (Connelly and Sands 1995) and range-wide (Shroeder 1995; Kumm 1995; Mitchell 1995; Haskins 1995). Mitchell (1995) noted an interesting case where grouse habitat was degraded when domestic sheep grazing was prescribed to improve habitat for pronghorn antelope. Reformed grazing practices have sometimes been credited with local improvements in sharptail habitat (Anderson 1995; Coggins 1995).

Over-grazing by domestic livestock is the activity most frequently attributed to causing grouse declines. Kessler and Bosch (1982) surveyed biologists who manage both Columbian and plains sharptails, and found that grazing intensity and subsequent effects on residual cover were overwhelmingly identified as the major conflict confronting sharp-tailed grouse. Marks and Marks (1987) found that grouse appeared to select areas that were least modified by livestock grazing. Similarly, Klott and Lindzey (1990) recommended in relation to Columbian sharptail brood habitats that heavy livestock grazing be avoided to maintain vegetative species diversity of forbs and grasses. Notably, one researcher found that plains sharp-tailed grouse avoided nest initiation in pastures occupied by livestock, but birds which did nest there had comparable nesting success (Sedivec 1994).
The second most frequently cited conflict is livestock distribution, especially in regard to riparian zone management and damage caused to woody vegetation within sharptail wintering areas. Kessler and Bosch (1982) wrote, "The majority of respondents express a belief that specialized systems such as deferred and rest-rotation grazing are beneficial to sharptails; however, the available experimental evidence does not support this contention."

Livestock over-grazing and distribution both contribute to degrading sharp-tailed grouse habitat in the upper Blackfoot Valley by reducing residual cover necessary for nesting and brood rearing, and by damaging deciduous shrubs found in riparian zones that are critical to grouse over-wintering. Grazing is most intensively practiced in areas with available surface water, often riparian zones, leading to degradation of crucial grouse forage resources and escape cover.

Conversion of shrub-steppe habitat to cultivation

Conversion of grouse habitat to cultivation is cited as a contributor to sharptail declines (Kessler and Bosch 1982). For example, researchers attributed the rapid decline around 1925 of Columbian sharptails in Washington almost entirely to agricultural conversion of native shrub-steppe habitat to grain culture (Buss and Dziedzic 1955). However, outside of Montana, present-day conversion of shrub-steppe habitat to cultivation is cited by only a few managers as continuing to contribute to population declines (Shroeder 1995). Of more concern is the possibility that the CRP program will be discontinued, potentially returning to crop production millions of acres of artificial grasslands, much of it documented to be used by sharp-tailed grouse (Hemker 1995; Sands 1995; Connelly 1995; Kumm 1995; Haskins 1995; Coggins 1995; Mitchell 1995).

Lands in the upper Blackfoot Valley do not qualify for CRP, thus this particular conservation program is not directly relevant. However, habitats in the upper Blackfoot Valley face immediate threats of conversion to cropland and intensively managed rangeland. U.S. Department of Agriculture statistics show that nearly 10,000 acres of native shrub-steppe in the Blackfoot Valley have been converted to hayland and cropland since 1985 (MDFWP 1993). This trend is
expected to continue, with individual tracts in excess of 700 acres broken in both 1993 and 1994 (author's notes). Such tracts often have structural characteristics unfavorable to grouse nesting or brood rearing. For example, in June the hayland where the Helmville Lek is located had a mean vegetation visual obstruction reading (VOR) of 0.9 decimeters (Table 5), significantly less than the 2.5 dm vegetation height-density recommended for nesting and brood rearing habitat (Giesen and Connelly 1993). Such a low VOR may be acceptable or even preferable to grouse for a lek site, but also reflects the sparse vegetation of typical hay culture that renders large areas poorly suited to grouse for subsequent nesting or brood rearing.

Fire management that creates unfavorable habitat

The fire history of the upper Blackfoot Valley was not investigated for this report, but fire suppression probably has significant bearing on the availability and long-term quality of presently occupied sharptail habitat. Fire suppression is very active in the valley, where residents' concerns about wildfire lead them to favor cattle grazing, mechanical treatments or herbicides over prescribed burns for brush control (Johnson 1994; Neudecker 1995). Only one large controlled burn occurred in the upper Blackfoot during this study (Mannix 1995). One noteworthy anecdotal observation is that a now-abandoned lek site near the Helmville lek occurred in an opening created in a sagebrush stand by a lightning strike (D. Sullivan 1995).

Areas of the study site, particularly the sagebrush tracts to the north and west of Easter lek, are being colonized by Douglas fir and Ponderosa pine, probably as a result of fire suppression. This is likely degrading the habitat quality for sharp-tailed grouse, and will continue into the future as coniferous trees shade out sagebrush, grasses and forbs, and contribute to increased avian predation. Conifer encroachment has also been implicated in the isolation of the Tobacco Plain population from neighboring sharptail habitat in British Columbia (Manley and Wood 1990).

Controlled burns are prescribed elsewhere for maintaining sharp-tailed grouse habitat in areas otherwise prone to successional colonization by trees (Dickson 1993). To offset tree colonization in
shrub-steppe habitat, mechanical removal of evergreen trees occurred on approximately 200 acres of USFWS land, and additional acres have been proposed for the same treatment (G. Sullivan 1995).

In contrast, fire control is advised for several areas where burns are perceived to degrade sharptail habitat, particularly deciduous shrub and residual cover. Mitchell (1995) attributes extensive sharptailed grouse habitat loss to wildfires which burned areas of northern Utah in 1994. Kumm (1995) has suggested that control be prioritized on fires that threaten to consume more than 25% per year of the mountain shrub habitat in the Malad district of Idaho. Shroeder (1995) has recommended fire exclusion under a 10-year management for the Swanson Lakes WMA in Washington.

Direct and indirect agricultural chemical effects

It is not known how extensively pesticides have been applied historically or at the present time in the upper Blackfoot Valley. However, unknown formulations of the herbicide "Tordon" containing the active ingredient picloram (Tordon 101 also includes 2,4-D as an active ingredient) (O'Brien 1987) have been applied to tracts of the upper Blackfoot Valley in recent years to eliminate sagebrush and other foliage unpalatable to cattle (Neudecker 1995; Johnson 1994). Picloram does not bioaccumulate, and the results of three avian acute dietary studies suggest picloram to be practically nontoxic to birds (Mooney 1988).

2,4-D is reportedly used on some wheat fields in the study area to control competition from weeds (G. Sullivan 1995). The oral toxicity of 2,4-D is greater in birds than picloram (Brown 1978). It has also been reported that fertile eggs of pheasant and gray partridge sprayed with 2,4-D amine in water at 0.5 lb/acre showed approximately 75% mortality of embryos by the nineteenth day of incubation, with the survivors developing malformations particularly in the gonadal region (Lutz-Ostertag and Lutz 1970 in Brown 1978).

The BLM is implementing a new treatment policy prohibiting the spraying of pesticides to control Mormon crickets and grasshoppers on public rangeland in southern Idaho between 1 May and 15 July in Columbian sharp-tailed grouse range. Concerns have been raised that
the use of malathion and carbaryl, both contact pesticides, could negatively affect sharptails and their insect food resources (Kumm 1995).

Ritcey (1993) relates anecdotal reports of sharptail mortalities caused by the application of insecticides for the control of grasshoppers, and surface application of Compound 1080 used as a rodenticide. Others have suggested that Columbian sharp-tailed grouse population declines were precipitated by the use of insecticides to control grasshoppers, causing both direct mortalities and the loss of a critical insect food resource (Bown 1980).

Even if herbicide treatments are not directly affecting sharp-tailed grouse through toxicity, herbicide treatment further fragment native vegetation communities critical to grouse for feeding, nesting, and wintering habitat. Connelly (1995) has recommended reducing herbicide spraying of field margins as part of an effort to increase plant and insect diversity, thus grouse habitat values, of agricultural fields.

**Hunting**

Some natural resource managers have expressed concern that sharptails, because they display on traditional lek sites in the fall, may be especially vulnerable to over-hunting, particularly if the population is low and in fragmented habitats (Klott 1993). Hunters sometimes focus hunting effort on lek sites (Pullman 1994). Even though sharp-tailed grouse hunting is prohibited west of the Continental Divide (MDFWP 1992) and has been for over 30 years, small numbers of sharp-tailed grouse have been shot by both duck and deer hunters during the 1980's in the Blackfoot Valley (Davis 1995; W. Geary 1994). While hunting is not considered a primary factor contributing to the small sharptail population size of the upper Blackfoot Valley, small levels of additive mortality may be suppressing population size or slowing growth.

Other upland bird populations appear small. Gray partridge (*Perdix perdix*) densities seem very low; they have been observed only slightly more often than sharptails (author's notes). Ring-necked pheasants (*Phasianus colchicus*), despite multiple introduction
attempts, have never been self-perpetuating in the valley due to extreme winter weather conditions (Greene 1994). As a result, it is thought that very little upland game bird hunting occurs in the study area at the present time. However, upland bird hunting may be increased or promoted locally. During the summer of 1993, approximately 400 pheasants were released at the Meyer's Ranch (located between Easter and Helmville leks) for sport hunting (Greene 1994), increasing the possibility of sharptails being shot incidental to pheasant hunting. Recent mild winters and availability of grain may allow a local pheasant population to persist for some time even while being hunted. Mixed bags of sharptails and other game bird species occur east of the Divide where hunting seasons coincide (Roos 1995).

Conflicts with exotic species

Interspecific competition has been reported between sharptails, prairie chickens, pheasants, and gray partridges (Toepfer et al. 1990; Vance and Westemeier 1979; Greene 1994). Pheasants may disrupt breeding by aggressive harassment of lekking sharptails by cock pheasants and by nest parasitism. Vance and Westemeier (1979) documented the harassment of a sharptail cogener, the prairie chicken (T. cupido pinnatus), by pheasants which resulted in both male and female prairie chickens being driven from lek grounds. This harassment was particularly disruptive to small leks which are common in declining, remnant flocks, and in most reintroduction attempts. They also documented nest parasitism by pheasants of prairie chicken nests. Parasitized prairie chicken nests were less successful than non-parasitized nests. They concluded that both harassment and parasitism could adversely affect small remnant flocks of prairie chickens and preclude successful attempts to preserve or reintroduce prairie chickens in areas within pheasant range.

Pheasants and sharp-tailed grouse coexist in many areas, however it is not known if harassment or nest parasitism by pheasants exerts deleterious affects on sharptails, particularly on remnant populations of Columbian sharptails. Johnsgard (1973) reported a 23-24 day incubation period for sharptails, which may make them less vulnerable to nest parasitism by pheasants (which
require a 23 day incubation) than prairie chickens which require at least a 25 day incubation. It is generally accepted that nest parasites which have a shorter incubation time than their hosts, depress the nesting success of the host (Payne 1977, Toepfer et al. 1990). However, it may be more than coincidental that sharptails were extirpated from the Bitterroot and Flathead Valleys almost simultaneously with the successful establishment of pheasants there, and that sharptails have persisted in the upper Blackfoot Valley where pheasants have never been successfully established.

Predation

Predation is often posited, particularly anecdotally, as a significant cause of declines in sharp-tailed grouse population (T. Geary 1994; McCormick 1995). Local changes in habitat, such as forest encroachment or power pole installation may favor avian predators by providing structures from which to ambush grouse. Similarly, decreased nesting or escape cover, or increased travel distance to forage resources may increase vulnerability to predation (Connelly 1995; Sands 1995). Newly introduced predators, such as red fox (Vulpes vulpes) have been suggested as potentially significant sharptail predators (Haskins 1995; Mitchell 1995). However, none of these predation scenarios are primary; rather all are secondary to other human-driven processes that alter habitat or wildlife community composition.

Wildlife managers were asked to generally assess the influence predators have on their sharp-tailed grouse populations (Appendix IV). Only in Oregon, where sharptail reintroduction is underway, is suppression of the local coyote population considered to contribute to sustaining the grouse population (Coggins 1995). No other managers consider predator control a worthwhile means of conserving sharp-tailed grouse (Shroeder 1995; Kumm 1995; Sands 1995; Mitchell 1995; Giesen 1995).

Reintroduction History

Of the upland game birds of North America, prairie chickens, sage grouse, and sharp-tailed grouse have the poorest record when it
comes to establishing populations in unoccupied habitat (Toepfer et al. 1990; Hoffman 1992). Grouse lek at traditional sites; new leks commonly form on the periphery of existing dancing grounds. The prospects of establishing viable leks may be reduced when sharptails are released into new range where no prior social tradition exists (Rodgers 1992).

Attempts have been made to supplement declining Columbian sharp-tailed grouse populations, as well as to reintroduce birds into unoccupied habitat, with varying levels of success. In Montana, an effort to reestablish a population at the National Bison Range (Lockie and Kessler 1980) failed in the 1980's. During this one-time translocation, a small number of hens with broods were captured in Idaho. One or more of the hens died en route to the release site, and the broods were released, possibly in poor physical condition (Ball 1995). There are no reports of subsequent sightings of these birds.

In addition there has been a multi-year effort to supplement Montana's Tobacco Plains population with additional birds captured from source populations in Idaho and British Columbia. The Tobacco Plains population has been augmented five times beginning in 1987, with a total of 70 birds. While total birds observed in this population trended upward in the period of 1987 to 1991 (Wood 1991; Cope 1992), more recent census counts are down. Lek counts in 1995 located only one active lek with three males (Young 1995). One possible explanation for low counts could be habitat fragmentation which has accelerated in the Eureka area with rapid property subdivision and building of commercial and residential structures.

In Idaho's Shoshone Basin and Oregon's Enterprise area, the initial results of reintroductions are being characterized as successes, with reproduction having been documented in both regions (Hemker 1995). One-hundred and fifty birds have been released at the Idaho site, and 127 in eastern Oregon. A minimum of twenty-six birds are known from three leks in eastern Oregon (Coggins 1995).

Rodgers (1992) has reported successful establishment of self-sustaining populations of plains sharp-tailed grouse at three of four attempted sites in Kansas, by using decoys, broadcasts of lek
vocalizations, special release boxes, and single season releases of >100 winter-trapped grouse to initiate lek activities.

If adequate habitat can be protected in the upper Blackfoot Valley, particularly known lek sites and surrounding breeding complexes, it may be appropriate to attempt to supplement the population with additional sharp-tailed grouse from source populations in Idaho.

**Genetic Analysis**

Genetic analysis may be useful to satisfactorily answer questions about the subspecific affinity of the sharp-tailed grouse population of the upper Blackfoot Valley.

While some analysis of genetic data has occurred for the Plains subspecies and cogeners (Ellsworth *et al.* 1994; Ellsworth *et al.* 1993; Gutierrez *et al.* 1983; Gutierrez and Barrowclough, in prep.) none has been undertaken for the Columbian subspecies. Therefore, there is no information regarding what degree of genetic divergence, if any, is detectable between these two subspecies.

The purpose of undertaking any genetic analysis would be to attempt to modify or confirm current taxonomic assignments of populations throughout the Intermountain west and populations immediately east of the Continental Divide. Relevant to this study would be the determination of whether the Blackfoot population is more similar to plains or Columbian sharp-tailed grouse. Similar approaches have been used for analyzing subspecies of house sparrows (*Passer domesticus*) (Parkin 1987).

**Analytic Difficulties**

As an analytic technique, gel electrophoresis is both relatively simple and inexpensive. Evans (1987) contains an excellent overview of techniques for the collection and storage of tissues, and for laboratory techniques for protein gel electrophoresis. In birds, 20-60 different proteins can be examined for polymorphisms (Quinn and White 1987). However several factors make genetic analysis of avifauna using gel electrophoresis difficult, particularly as it relates to confirming or revising current taxonomic classification. In particular,
the generally low level of genetic variance observed among conspecific populations of birds is problematic. Genetic distances among and between different taxonomic levels show birds to have the least differentiation of any other similar taxon (Evans 1987).

Regarding galliform birds, some research shows they may have a higher level of differentiation than passerine taxa (Gutierrez et al. 1983). This suggests that genetic analysis within galliform taxa such as Phasianidae may have a greater likelihood of detecting differentiation at the species, subspecies, and population level than has been observed among passerine birds. As Leberg (1991) has noted, most reports of high levels of genetic variation among avian populations involve studies comparing different recognized subspecies, isolated populations, or both. Specifically he noted that for galliforms, high differentiation among populations is atypical when populations are continuous or do not exhibit conspicuous morphological differences. But other researchers failed to find electrophoretic evidence supporting subspeciation when comparing two putative subspecies of willow grouse (Lagopus lagopus) for genetic divergence between discontinuous populations that exhibited morphological differences (Gyllensten et al. 1985).

Another examination found little genetic differentiation of allozymes and mitochondrial DNA (mtDNA) of the prairie-grouse complex comprised of three sister taxa (Ellsworth et al. 1994). They found in their analysis of the greater prairie-chicken (Tympanuchus cupido), lesser prairie-chicken (T. pallidicinctus), and sharp-tailed grouse, that allozyme frequencies were similar across taxa and could not distinguish populations belonging to different species. This in spite of the fact that greater and lesser prairie-chickens are recognized as distinct species because of differences in habitat preferences and behavior, as are sharp-tailed grouse due to distinct plumage and skeletal characteristics (AOU 1983). Ellsworth et al. (1994) suggested that recent population isolation and fragmentation could explain the lack of clear genetic distinctions among species, and that morphological differences resulted from sexual selection. An alternative explanation is that of present and ongoing gene flow between the species.
In 1988, Toepfer proposed to the USFWS that a range-wide analysis of isozymes and mtDNA of sharp-tailed grouse be undertaken. He estimated that the total cost of that effort could exceed $50,000 to collect and analyze 300 samples for mtDNA variability and 280 samples for isozymes (Toepfer 1988). This ambitious proposal was never realized. Toepfer's cost estimate was based on substantial lab time required to develop a specific DNA probe and preliminary work on determining which isozymes would work best. It is assumed that costs would be reduced or eliminated by the subsequent work that has been done on grouse (Gutierrez and Barrowclough, in prep.; Ellsworth et al. 1994) and chickens (Moran 1993; Levin et al. 1994).

**Promising Methods**

Both microsatellite and restriction fragment length polymorphism (RFLP) analysis may hold some advantages over gel electrophoresis. Information derived from nuclear and mtDNA comparisons can be used to answer questions with a much finer resolution of genetic difference than is possible using protein polymorphisms.

Microsatellite analysis is one particularly powerful method for assessing genetic divergence both within and between populations. This involves sampling approximately ten individuals per population (preferably unrelated individuals) and examining their microsatellite sequences at five to ten loci.

An analytic advantage with grouse may be that there are an abundance of previously cloned chicken genes which may be suitable for detecting homologous sequences. Many chicken genes have been sequenced and microsatellite markers identified. Primer sequences for amplifying these microsatellites have also been developed (Levin et al. 1994; Moran 1993; Gutierrez 1994). However, one researcher has reported difficulties using chicken-based primers for lesser prairie chicken sequence analysis (Silvy 1995).

Another method of genetic testing is restriction fragment length polymorphism (RFLP) analysis. It may be possible to use a chicken gene as a probe to detect appropriate restriction fragments on a gel of
grouse DNA. Quinn and White's (1987) strategy for detecting RFLPs in lesser snow geese has lead to screening about 13 birds.

An obvious challenge with any critically small vertebrate populations is acquiring adequate tissue samples by methods that do not injure the organism. One advantage of either microsatellite or RFLP methods is that a small blood, feather, or egg sample can be collected in the field and stored below 0° C. to retain unaltered DNA for interpretation (Forbes 1994). Analysis may be possible using naturally molted feathers (Allendorf 1994). A small number of molted feathers have already been collected from both leks.

The University of Montana houses laboratory facilities and equipment suitable for undertaking microsatellite analysis. However it is unclear at this time what the costs of such analysis would be, where funds would come from to finance such analysis, and if qualified researchers are available to undertake the work (Allendorf 1994; Forbes 1994).

Any grouse captures should be preceded by an assessment of the effects of capture and disturbance on mortality and reproduction. Collection of samples could occur if, after consultation with grouse capture experts, it is determined that up to ten samples can be obtained with insignificant negative affects to the local grouse population.

Four grouse researchers have already suggested they could make available blood, feather, and/or tissue samples of sharp-tailed grouse from other geographic areas for genetic analysis (Meints 1994; Schroeder 1994; Gutierrez 1994; Sands 1995). Three offers are of the putative Columbian subspecies, and one offer is of the putative plains subspecies. It could be most useful to sample at least three populations with the objective of obtaining genetic information specific to the taxonomic nature and conservation of the Blackfoot Valley population: the Blackfoot Valley population; a plains population east of the Continental Divide in Montana; and a Columbian population from elsewhere in the range (i.e. Idaho, Colorado).

Since the Eureka population was supplemented with birds from both British Columbia and Idaho before the original population could be taxonomically identified, genetic analysis of this population might
confound efforts to draw conclusions about genetic divergence between the Columbian and plains subspecies.

Habitat Associations and Food Habits of Columbian Sharptails

Habitat relationships have been well documented in numerous studies (Parker 1970; Oedekoven 1985; Marks 1986; Marks and Marks 1987; Weddell 1992; Cope 1992). Sharp-tailed grouse prefer mid-successional sagebrush and grassland communities for nesting and summer feeding, and croplands and shrub areas for winter foraging and shelter. Continuous evergreen forests, one of the dominant habitat types of the region, are avoided (Prose 1987; Marks and Marks 1987). Thus sharp-tailed grouse distribution is constrained by patchy habitat, perhaps more so in regions where fire suppression has reduced early and mid-successional vegetation communities.

Formerly, Columbian sharptails occupied much of the mesic shrub-steppe and grasslands of the Intermountain West, particularly in vegetative associations of fescue-wheatgrass (*Festuca-Agropyron*) and sagebrush-grass (*Artemesia-Agropyron*) (Kessler and Bosch 1982). Columbian sharptail habitat use does, however, vary significantly between sites and seasons.

Summer habitat use in western Idaho favors big sage (*Artemesia tridentata*) sites more than low sage (*A. arbuscula*), and avoids shrubby eriogonum (*Eriogonum* spp.) sites. Sharptails in Idaho also select areas with high density and canopy coverage of arrowleaf balsamroot (*Balsamorhize sagittata*), canopy coverage of decreaser forbs (i.e., those which decrease when grazed by livestock), and canopy coverage of bluebunch wheatgrass (*Agropyron spicatum*) (Marks and Marks 1987).

Winter habitat requirements are relatively narrow, and are associated with riparian and upland areas with deciduous shrub and tree cover (Giesen and Connelly 1993). Marks and Marks (1987) found mountain shrub and riparian cover types to be critical sources of winter food and cover. Buds of serviceberry (*Amelanchier alnifolia*) and chokecherry (*Prunus virginiana*), and fruits of hawthorn (*Crataegus douglassii*) were primary winter foods. This research concluded that the availability of suitable winter habitat was the most
critical component in determining the ability of an area to support sharptails.

Similarly, Zeigler (1979) observed and reviewed numerous reports of wintering sharptails consuming buds of several woody plant species in eastern Washington, including water birch (*Betula occidentalis*), willow (*Salix* sp.), and rose hips (*Rosa* sp.). In particular, Zeigler noted a winter association with birch, noting that leks are rarely found far from deciduous trees, and that when the snow is deep, the birds are frequently seen roosting in and feeding on the buds and catkins of birch trees. Ritcey (1993) also documented extensive winter feeding by sharptails on both water birch and bog birch (*Betula glanulosa*) in British Columbia. During the Blackfoot Valley study an aggregation of up to eleven birds was observed feeding on bog birch buds and catkins on multiple occasions (Bradshaw 1995; author's notes). Catkin (and pollen) consumption was supported by examination of feces that were colored bright yellow. Grouse were also repeatedly observed foraging in snow-covered wheat stubble.

Structural diversity of habitat, including well-developed forbs, grasses, and shrubs, is an important component of sharptail nesting habitat (Parker 1970; Oedekoven 1985; Marks and Marks 1987; Weddell 1992). Nest sites are located from 50 to 1100 m from leks, with the majority (75%) within 1 km of a lek site. Bunchgrasses and sagebrush are frequently important components of high-quality nesting habitat, possibly because their growth forms offer a combination of visual obstruction and visibility that provides escape cover while allowing approaching predators to be detected (Bergerud 1988c in Weddell 1992). Thus it appears that optimum habitat consists of a mosaic of grass, deciduous tree, various shrub and shrub/grass communities. Pure stands of any single community do not seem optimum (Starkey and Schnoes 1976).

Spring and summer food habit studies of sharptails underscore the importance of grasslands to this species. One researcher found that grassblades of Idaho fescue (*Festuca idahoensis*) and other grass varieties comprised 75% of the sharptails' summer diet (Jones 1966), while another ranked grassblades and seeds first as the summer food
of sharptails (Hart et al. in Zeigler 1979). Sharp-tailed grouse are also insectivorous, with grasshoppers in particular comprising up to an estimated 20% of their summer diet (Grange in Johnsgard 1973). Observations of sharptails bred in captivity indicates that grouse chicks, particularly in the first few weeks after hatching, are almost entirely insectivorous (Merker 1995).

Implications Of Natural History for Conservation

Little is known about such basic Columbian sharp-tailed grouse life-history parameters as reproductive success, natal dispersal, and longevity (Marks and Marks 1987). However, production of an annual crop of young is probably the single most important factor affecting the abundance of sharp-tailed grouse. This is due chiefly to the sharptail's short life span: annual survival of adult males as determined from lek attendance ranges from 24-47% (Brown 1966, Robel et al. 1972, Cope 1992). Also, one breeding season with high nesting failure can result in a marked drop in population numbers, while two successive failures can be disastrous (Cartwright in Parker 1970). Clutch sizes reported for Columbian sharp-tailed grouse in Montana are 11-12 eggs per nest (Cope 1992). Smaller clutch sizes of seven and nine eggs have been reported for Columbian sharptail nests in Idaho (Parker 1970).

Several aspects of sharp-tailed grouse life history and reproductive behavior predispose them to small effective population size (N_e) and increase their vulnerability to local extinction. Sharp-tailed grouse are one of several grouse species which conduct group breeding displays at traditional sites. These sites are comprised of a cluster of territories held by male birds exclusively for the purposes of mating. Multiple males gather at leks each spring, where their group displays attract females for mating. Sharp-tailed grouse are a polygynous species. Observation of sharp-tailed grouse mating at leks indicates that a small proportion of males, particularly those near the center of the lek site, do the majority of mating (Weddell 1992). This breeding regime skews the sex ratio by limiting the number of males contributing during any breeding season to the gene pool, and reduces N_e.
Evans (1987) has noted that *N*<sub>e</sub> is reduced and genetic divergence between populations is enhanced if some individuals obtain more matings than others, or if there are overlapping generations so that offspring can mate with their parents. Sharp-tailed grouse meet both conditions, increasing the likelihood for difference between isolated sharp-tailed grouse populations being present due to genetic drift.

Additional genetic factors may constitute a threat to the persistence of the Blackfoot Valley population. Small, isolated populations, such as the sharp-tailed grouse population being examined here, may be subject to increased mating between close relatives ("inbreeding"), with the increased possibility of expression of normally recessive, deleterious alleles in a homozygous state (Ralls *et al.* 1986). In laboratory and natural conditions inbreeding markedly effects breeding performance of Japanese Quail and Great Tits, with depression of fertility and increased nestling mortality (Sittman *et al.* 1966; Greenwood *et al.* 1978 in Greenwood 1987). Inbreeding depression has been recognized as a contributor to decreased fitness in many other wild and domesticated animal populations (Allendorf and Leary 1986; Roelke *et al.* 1993).

Highly social animals may face different minimum population size constraints than less social ones. Sharp-tailed grouse are apparently dependent for breeding success on the formation of lek aggregations (Evans 1969). There may be a minimum population threshold needed to maintain these traditional lek locations and breeding activities. If so, this minimum aggregation threshold may increase vulnerability to stochastic events.

Finally, aggregating predictably on traditional breeding grounds may expose the birds to higher levels of predation. The dysfunction of such social behavior may be particularly evident when birds face increased hunting pressure from natural predators or humans who are known to focus hunting efforts on lek grounds during spring and fall display seasons.

The persistent use of traditional lek sites by grouse dictates that such locations be maintained in conditions which offer habitat features favorable to the bird. Otherwise as habitat conditions surrounding a
lek deteriorate, it is more likely that the grouse population attending the lek will be extirpated than pioneer a more favorable lek location.

Minimum Population Counts and Population Estimate

Generally, sporadic lek counts are not in themselves precise indicators of total population size. Most, sometimes all, grouse observed at leks are males. Females generally visit leks in small numbers relative to number of males present, and only for brief periods. Only two birds believed to be hens were observed on leks during 1994, with one copulation observed (author's notes).

Minus these two hens, if the remaining fourteen birds observed on leks during 1994 were cocks, and if equal sex ratio is assumed, the estimated population size can be doubled to twenty-eight sharp-tailed grouse. Small lek counts in 1995 lead to an estimate of only eighteen birds, but additional birds potentially constituting additional breeding units were observed distant from either documented lek.

Minimum Viable Population and Extinction Potential

Assessment of extinction potential requires an estimation of taxon Minimum Viable Population (MVP). The term "MVP" includes both demographic and genetic components. Genetic MVP assesses the loss of genetic variation, and potential for decreased fitness associated with random genetic drift. Demographic MVP is concerned with the total extinction of a population due to random forces (Ewens et al. 1987). Unfortunately, there is not, and perhaps cannot be, a universally valid MVP for all species and situations (Soulé 1987).

Numerous MVP "rules of thumb" have been advanced, including early estimates of 50 individuals (Franklin 1980), populations that result in a 99% chance of remaining extant for 1000 years (Shaffer 1981), or the retention of 500 sexually mature individuals in equal sex ratio (Frankel and Soulé 1981). This range of MVP estimates has been referred to as the "50-500 rule" to maintain genetic variability in small populations for the short or long-term (Primack 1993). A censused population size of at least 200 individuals, which falls within this range, has been observed generally as the minimum necessary for persistence of sharp-tailed grouse populations (Toepfer et al. 1990).
Small populations are challenged by the interaction of predictable and unpredictable natural and human-caused events (Roy and Deeble 1993). Apparently unrelated interactions may result in long-term population bottlenecks and eventual extinction. One historic example of this process is that of a sharptail cogener, the heath hen (*T. cupido cupido*). This bird, which was once common along the eastern seaboard, first declined upon European settlement, later was affected by high predation rates and nest loss attributed to major wildfires, and was finally reduced to remnant numbers by disease. The subspecies became extinct in 1932 (Trefethen 1975).

Sharp-tailed grouse in western Montana exhibit several of the characteristics of a critically endangered taxon (Mace and Lande 1991): their total estimated population size may be <30 birds in the upper Blackfoot Valley and <10 in the Tobacco Plains, with a smaller effective population size; the two known subpopulations are isolated from each other, and are likely subject to occasional crashes with >50% reduction in numbers; and both known subpopulations are subject to current and projected habitat degradation and fragmentation.

Thus a distinct but similar set of conditions that led to the extinction of the heath hen appear to be converging on the sharptailed grouse in western Montana, creating a population decline that if not reversed, will lead to the extinction of the species here.

**Current Conservation Implementation**

Management jurisdiction for sharp-tailed grouse is generally given to state wildlife agencies because the species is non-migratory. Exceptions to this practice are when birds are found on federal lands where management is usually joint between federal and state agencies. Montana has not undertaken efforts to list the bird under either the federal or state ESA.

Columbian sharptail recovery efforts in Montana are currently guided by a mitigation implementation plan prepared by MDFWP (Wood 1991). Sharp-tailed grouse cannot be legally hunted in Montana west of the Continental Divide. Beyond this, neither the bird nor its habitat are afforded any enforceable protections by the state.
Instead, the MDFWP plan presents a prioritized series of conservation measures, including habitat protection and enhancement on the Tobacco Plains, upper Blackfoot River Valley, and National Bison Range. To date, implementation of the voluntary plan is essentially non-existent in the Blackfoot and Flathead Valleys, and failing at the Tobacco Plains.

Observations suggest a minimum of approximately 10 square miles (Toepfer et al. 1990) is needed to sustain a sharp-tailed grouse population. Implementation of the MDFWP plan at the Tobacco Plains has led to procurement of less than 25% of this land area for sharp-tailed grouse habitat, and has not resulted in any persistent grouse population increases.

The MDFWP plan, by managing for only low or remnant populations and protecting only a small fraction of requisite habitat, sets recovery goals for sharptails in western Montana that can arguably be termed "management for extinction" (Tear et al. 1993). In fact, the Tobacco Plains population appears to face imminent extinction, with the 1995 lek count the lowest since 1987. Failure to implement any of the plan's proposed habitat protection or management objectives for the upper Blackfoot Valley area is similarly inadequate.

Federal Legal Protection

When a population is protected under the federal Endangered Species Act (ESA), responsibility for management of the entire listed population falls primarily to the USFWS. In March of 1995, the Biodiversity Legal Foundation petitioned the USFWS to list the Columbian sharp-tailed grouse as "threatened" or "endangered" under the Endangered Species Act (ESA) throughout its range in the West (Biodiversity Legal Foundation 1995). Total populations in Montana are likely to be much smaller than the median number (1075 individuals) for vertebrate taxa that have been listed under the federal Endangered Species Act since 1985 (Wilcove et al. 1993).

It is unclear how rapidly the petition will proceed, how potential legislative changes to the ESA might impact listing, or the resources the agency will be able to commit to the subspecies should it be listed.
However, USFWS jurisdiction might substantially improve conservation efforts in Montana, particularly in the upper Blackfoot Valley where the agency already has established habitat conservation programs for waterfowl.

**Land Ownership and Cooperative Opportunities**

Approximately 70,000 acres of land in the upper Blackfoot Valley are of interest as current or potential sharp-tailed grouse habitat.

Some authorities have suggested that grouse management efforts should reflect habitat potential and not land ownership status or political boundaries (Braun et al. in press). Nevertheless, it is crucial to understand the land ownership patterns in relation to grouse distribution to effectively approach the development of a local grouse conservation strategy.

Land in the valley is owned predominantly by private citizens who use large tracts for wheat and hay farming, and as grazing lands for cattle. The rangelands are generally of two types: ground plowed first for growing grain then converted to pasture by planting exotic grasses; and ground which has not been plowed and is still characterized by native vegetation such as sagebrush, bunch grasses and forbs.

Approximately 3,000 acres are fee titled to the USFWS, with an additional 12,000 acres of private lands in grassland conservation easement (Neudecker 1995). MDFWP owns and manages 1,490 acres, with 3,000 acres held in private conservation easement (Thompson 1995a). Approximately 12,000 acres are owned and managed by the Montana Department of Natural Resources Conservation (DNRC) (Lane 1995). The BLM and USFS control a negligible amount of suitable habitat, with most of their land holdings in evergreen forest.

Only one MDFWP tract of 1,200 acres in the Blackfoot River corridor, the "Aunt Mollie," is known to be allotted but ungrazed. This parcel is currently under preliminary scoping for MEPA review. One of the proposed alternatives may be to manage the property with high priority given to the protection of sharptail habitats (Thompson 1995b). This could ensure the maintenance of some wintering habitat
documented during this study to be utilized by at least one part of the population.

Domestic livestock grazing is not prohibited on any land in the valley. Essentially all public lands have either grazing allotments or periodic grazing "treatments." However, some private landowners have elected to halt livestock grazing on substantial portions of native and converted pasture lands (Bradshaw 1995; Craighead 1995), thereby enhancing habitat conditions for sharp-tailed grouse (Connelly and Sands 1995).

It should be possible for conservationists to develop coalitions with farmers and ranchers to maintain and improve wildlife habitat, while supporting traditional land-ownership patterns. This is already manifested by the proliferation of public and private conservation easements. Also innovative efforts to implement livestock grazing swaps that move herds off critical wildlife habitats, and to manage areas to the simultaneous benefit of a number of native species, are being increasingly employed in the Blackfoot Valley and elsewhere, and might be applied to improving grouse habitats here (Thompson 1995b; Bugbee 1995).

One group that has already begun to facilitate the cooperative development of a conservation strategy for the upper Blackfoot Valley's sharp-tailed grouse population is the Blackfoot Challenge. The Blackfoot Challenge is a forum of landowners, agencies, and conservationists in the Blackfoot drainage, dedicated to improving cooperation among competing users and finding ways for working together on conservation and restoration issues (Farling 1993). Such forums have potential for bridging gaps between interest groups and jurisdictions which will be critical to successfully conserving these birds.
V. RECOMMENDATIONS

Conservation Planning

A working group of landowners, land managers, grouse experts, and conservation interests should develop a recovery strategy for the upper Blackfoot population, then meet annually to guide implementation. Review of the MDFWP mitigation implementation plan for the Tobacco Plains could be a starting point, but planning must incorporate new information about the Blackfoot grouse population and sharptail management range-wide to create a valley-specific plan.

Habitat Conservation and Restoration Needs

Giesen and Connelly (1993) recommend guidelines for management practices within sharp-tailed grouse breeding complexes (all lands within a 2-km. radius of lek sites), and occupied habitat. Their recommendations, supported by the author for application to both public and private lands in the Blackfoot Valley, are:

(1) Prohibit physical, mechanical, and audible disturbances within the breeding complex during the breeding season (March-June), if such disturbances might impact courtship activities and breeding during the daily display period;

(2) Avoid manipulation or alteration of vegetation within the breeding complex during the nesting period (May-June). Management practices should not reduce height, canopy cover, or density of chokecherry, snowberry, sagebrush, serviceberry, or other shrub species locally important for nesting. In bunchgrass-prairie communities, adequate height-density (Robel pole x = 2.5 dm) of residual grasses should be maintained for nesting.

(3) No vegetation manipulation or disturbance that results in loss of deciduous tree or shrub height, canopy cover or density should occur within 100 meters of streams, including seasonally
dry and intermittent secondary drainages. Cottonwoods, willows, and deciduous shrubs in riparian areas should be protected and maintained. Livestock use of riparian areas should be managed or eliminated to minimize destruction of associated shrubs and trees.

(4) Avoid the manipulation or disturbance of vegetation, including herbicide application, burning, or mechanical destruction that results in long-term (i.e., >5 yr.) or permanent reduction of height, canopy cover, or density of mountain shrub habitats within occupied ranges if shrubs comprise <10% of the cover within occupied areas. Management practices to rejuvenate or increase mountain shrub communities within breeding complexes or winter ranges should be restricted to <25% of this cover type annually.

To accomplish this, it may be necessary for the MDFWP, the USFWS, or other parties to:
(a) negotiate grazing swaps, conservation easements, or other agreements with the landowners of known lek sites and surrounding breeding complexes. Eliminating grazing, mechanical disturbance or chemical applications that target native vegetation or insects, may allow the ecological community to return to its natural condition;
(b) purchase lands containing known breeding complexes and manage them by the above guidelines; and/or
(c) undertake vegetation rehabilitation projects where deciduous shrub patches are created adjoining leks to enhance over-winter escape cover and grouse forage, and controlling evergreen tree encroachment into sagebrush-grasslands by cutting or prescribed burns.

One model for sharp-tailed grouse protection on private lands is Washington's Upland Wildlife Restoration Program, which negotiates agreements with landowners for habitat enhancement, including use of lands for nonconsumptive recreation or research (WDFW 1995).
Winter Forage Supplementation

Some researchers believe wintering habitat and the forage it provides to be the most important factors determining whether or not an area will support a population of sharptails (Marks and Marks 1988). One resident recalls that sharptails historically could be found in large numbers at stacks of wheat straw in fields mid-winter, feeding on waste grain (T. Geary 1994). More efficient harvest methods eradicated this agricultural practice and forage resource many years ago. For the short-term it may be advantageous to restore some such feeding opportunities near occupied grouse habitat, with the cautionary note that this should only be undertaken if it will not likely increase vulnerability to predation. Placing the forage resource near escape cover for grouse is essential. It may be possible to provide artificial winter forage to sharptails, in the form of domestic grains, to improve their over-winter survival. Small 1-2 acre food plots of grains such as wheat, barley, or oats can be left standing, and, barring consumption by other species, would be available to grouse in all but the heaviest snow years.

Long-term winter forage improvement will require the rehabilitation of the native shrub community, particularly that of riparian areas (Connelly and Sands 1995). Restoration of hawthorn (*Crataegus douglassii*), chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier alnifolia*), and birch (*B. glanulosa* or *occidentalis*) in patches along water courses, or in pockets of suitable soils could provide sharptails forage in even the most severe winter conditions. Exotic species, such as apple, Russian olive, and Silver buffalo berry (*Sheperdia argentea*) are known to provide important winter forage in other areas, and may be suitable for living snow fences or hedgerows, but their use and distribution should be carefully considered.

In late April 1995 two-hundred and fifty *B. glanulosa* saplings were planted in soils adjoining wetlands on the H2-0 Ranch near Helmville, as part of efforts to begin restoration of riparian areas where livestock are no longer grazed. Surplus saplings were obtained from MDFWP, from Ovando-origin birch originally intended for stream bank stabilization projects. All saplings were protected by hardware
cloth exclosures to reduce browse damage from deer. Sapling survival will be assessed next year.

Elsewhere land managers have undertaken vegetation rehabilitation projects to enhance habitats of sharp-tailed grouse and other upland birds (Ogden and Fite 1995; Sands 1995a) on both public and private lands. These involve hand and mechanical planting (CDNR 1983) to create perennial native shrub patches, and annual grain plot contracts with private landowners. On the Hixon sharp-tailed grouse preserve, 8,000 acres established by the BLM in western Idaho to conserve the state's western-most Columbian sharp-tailed grouse population, a planting program has been initiated to restore native deciduous shrub destroyed by wildfire (Sands 1995a).

**Population Supplementation**

If a suitable release site and source of transplant stock can be found, it may be advisable to attempt to supplement existing leks in the upper Blackfoot Valley by translocating birds from other populations (Connelly and Sands 1995). This stop-gap measure may be critical to maintaining leks in the short-term (Sands 1995c).

Grouse translocation methods have been analyzed and are improving (Toepfer *et al.* 1990). At Eureka, translocations of small numbers of birds over five years (Cope 1992) likely prolonged the population's persistence by a decade. A transplant of six birds from Idaho experienced 100% mortality, possibly due to habitat differences between the source population's locale and the Eureka destination (Wood 1995). Critical to short-term translocation success appears to be multiple breeding season translocations to active leks, prompt transportation to release sites, and matching the ecotype of the source population to that of the release site.

While Colorado in undertaking intrastate translocations (Giesen 1995), only Idaho has adequate populations to offer Columbian sharptails to other states such as Oregon for release (Crawford 1995). However, even Idaho is increasingly scrutinizing translocation proposals to offer birds only to projects deemed most likely to succeed (Connelly 1995).
One ranch-owner has offered property to construct a release facility if it is deemed suitably located (Craighead 1995). Sharp-tailed grouse, even translocated birds, have been reported to have an unexplained tendency to establish leks at historic lek locations, sometimes years after lek abandonment (Sands 1995a; Wood 1995). Perhaps they are keying in on site conditions that are particularly favorable to lek activities. Thus it is possible that currently abandoned sites will be important to reestablishing leks; protecting such sites should be an additional focus of a conservation strategy.

**Pheasant Releases and Hunter Education**

Due to documented aggression at leks and nest parasitism by pheasants on sharptail cogeners, it is recommended that the introduction or supplementation of pheasant populations in habitat occupied by remnant sharptail populations be suspended until effects of interspecific aggression and nest parasitism can be further assessed.

In addition, it is recommended that upland game bird hunting be prohibited in all documented sharp-tailed grouse habitat until a hunter education program is implemented. At a minimum, signs should be posted at traditional hunting access sites illustrating the bird and explaining its protected status, as has been done by Washington state (WDFW 1995). Also it could be useful to make educational outreach efforts to young people in the valley, both to provide basic information about a local wildlife species, and potentially to incorporate them into conservation efforts. For example, it is possible that local youths could be recruited to contribute to lek search and survey efforts.

**Additional Research Needs**

In addition to those research needs already mentioned for the upper Blackfoot Valley population, several others are critical: continue efforts to locate lek sites and critical wintering areas, using increased effort and improved survey methods (e.g., higher powered broadcasting equipment, parabolic microphones, radio tracking, horses, or aircraft); conduct taxonomic work on birds to determine their relationship to other sharptail populations. This could
be undertaken by obtaining accurate weights of lekking birds, or by developing genetic profiles from blood, egg, feather or other tissue samples.

**Morphological Examination**

Most field ornithologists have demonstrated that external morphological features are significantly and sometimes highly heritable. As Boag and van Noordwijk (1987) have noted, studies of natural bird populations suggest that most external morphological characters have heritabilities of 60-70%. They also caution that the quality and quantity of data required to fully partition the phenotypic variation into its causal components are often impossible to obtain.

With the above cautions in mind, it could nevertheless be useful to attempt to confirm taxonomy via morphological examination. It is anticipated that additional specimens will become available for analysis, as individuals become aware of an interest in procuring grouse specimens, such as road kills, opportunistically. One authority has offered to examine all available skins in an effort to determine subspecific affinity, claiming that he can readily employ plumage characteristics to distinguish the two races (Dickerman 1994). I would recommend that this occur when more than two specimens are available from the Blackfoot Valley population. It may be advantageous to ship additional specimens of various origins already in the Univ. of Montana collection for simultaneous analysis.

Morphometric measurement could also be attempted. This may be possible non-invasively by constructing live traps at leks (Toepfer *et al.*, 1988), or providing low perching platforms that guide birds onto an electronic scale for weighing. This could provide grouse body mass data for comparison to weights of confirmed Columbian sharp-tailed grouse.

**Behavioral Documentation**

Ellsworth *et al.* (1994) concluded that morphological and behavioral differentiation among prairie grouse has probably been driven by sexual selection and appears to have progressed rapidly relative to either mtDNA or allozymes. A reasonable implication of
his conclusion would be to attempt to identify behavioral differentiation that can distinguish the subspecies. It could be useful to record additional video and audio tape of lekking behavior and vocalizations of the various populations in an effort to document characteristics distinguishing these populations from each other.
VI. CONCLUSION

Conserving avian diversity is an increasingly challenging task. It is estimated that some 70% of the world's 9,600 bird species are declining, with perhaps 1,000 species threatened with extinction (Youth 1994). In the case of sharp-tailed grouse, as well as most bird species, habitat loss is the leading cause of decline.

The distribution of sharp-tailed grouse has declined dramatically in western Montana, primarily as a result of practices which damage critical grouse habitats. The decline of the sharp-tailed grouse, once the most abundant native game bird in Montana's shrub-steppe habitats, reflects the broad degradation and fragmentation of the region's native shrub-steppe communities. If extirpated, the Columbian sharp-tailed grouse would be only the second avian species or subspecies, after the whooping crane, to vanish from Montana in historic times.

This study assumes, based on location, habitat association, and behavior that the Blackfoot Valley's sharp-tailed grouse population is \textit{T.p. columbianus}. Legitimate question has arisen regarding the possibility that this population is instead comprised of the subspecies \textit{T.p. jamesi}, the more abundant eastside plains sharp-tailed grouse (Wright 1993; Youmans 1995). Answering the question of subspecific affinity is an important one, particularly when assessing options for conserving this population by translocating grouse from other regions. In either subspecific determination, the population will continue to be the subject of considerable conservation interest.

Only two, small, isolated sharp-tailed grouse populations are known to persist in western Montana, and their chance of extirpation without aggressive management intervention appears high. The upper Blackfoot Valley population consisted in April of 1994 of a minimum of sixteen birds observed during one day of lek observations. A minimum count that is supported by direct observations in 1995 is fourteen birds. This is Montana's largest population of sharp-tailed grouse known to occur west of the Continental Divide.
All sharp-tailed grouse breeding complexes, and most wintering areas presently identified in the Blackfoot Valley, occur on private land. The preponderance of potential habitat in the study area is also private. Any public or private management actions will therefore need to carefully incorporate the needs and cooperation of private landowners, or face certain resistance and failure. These results strongly suggest that sharp-tailed grouse persist in the upper Blackfoot Valley in very small numbers, principally on private lands. The implication is that immediate steps need to be taken to conserve the population, and that these management measures need to be embraced by the private landowners involved.

Likely the greatest immediate socio-economic impediment to effective conservation of Columbian sharp-tailed grouse and their habitats are the economic interests embedded in the land management practices of the modern ranching and agriculture industries. However, *vis a vis* grouse habitat, many of the land use practices of the ranching and farming communities are preferable to other land use options such as subdivision and development.

Institutional impediments to grouse conservation may include unofficial biological *triage*, with some resource managers arguing that there are neither adequate sharp-tailed grouse populations nor habitats remaining in western Montana to warrant a commitment of public and private resources to concerted protection and recovery efforts. It is premature and inappropriate to draw any such conclusions. For example, there are almost certainly more birds in the upper Blackfoot Valley than are presently documented. Robust Columbian sharptail populations still exist in south-central Idaho for potential translocation to this region. There are large tracts of historic habitat, such as the National Bison Range and other federal, state, and tribal lands in the Flathead Valley, which appear to offer high quality sites for sharp-tailed grouse reintroduction (Connelly and Sands 1995). Improved land management, including better livestock grazing practices, are being applied in some areas, with the potential of further increasing the quality and quantity of sharptail habitat on public and private lands in western Montana.
Additional efforts are needed to conserve the subspecies. The current MDFWP mitigation implementation plan appears inadequate to assure the persistence of Columbian sharptail populations in Montana over the long-term. Continuing field surveys are needed to assess the total population size and to identify critical breeding and wintering habitats. Genetic analysis of the grouse populations may be one method for assessing how to meet the objectives of slowing or reversing population declines, providing data which assists both in the prioritization of conservation efforts and the adoption of management methods most likely to meet these objectives. Public education and habitat protection programs need to be implemented in regions containing occupied grouse habitat and potential recovery zones to reduce direct grouse mortalities and encourage public participation in recovery projects.

The private sector and states have much work ahead if they are to implement a recovery program for Columbian sharp-tailed grouse in western Montana and other regions that promises positive results. Nothing short of effective implementation of cooperative efforts between the states and private landowners will forestall calls for federal intervention in the bird's conservation.
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The Sharp-tailed Grouse, once the most abundant native game bird in western Montana's sagebrush and bunch grass range lands, is now rarely observed. Only two populations are known to survive in Montana west of the Continental Divide. One of the populations is here in the upper Blackfoot Valley near Ovando and Helmville.

These birds may be a subspecies known as the Columbian Sharp-tailed Grouse (Tympanuchus phasianellus columbianus), a race that has declined throughout the West. Or they may be more closely related to the Plains sharptail, a bird common in some places east of the Divide. The remnant population residing in the upper Blackfoot is the most south-westerly of the state's known sharptail populations, and there probably isn't another flock within forty miles.

Old-timers tell of the birds being abundant until about WW II, not only here but also earlier in the Flathead and Bitterroot valleys. Sharp-tails were shot and even caught by hand by children when they roosted beneath fresh snow in the dead-of-winter. The first Blackfoot game warden, Harry Morgan, expressed concern about the birds fifty years ago. Nevertheless today a good shotgunning with two boxes of shells might eliminate the valley's known sharptail population in an afternoon, even though the birds haven't been legal to shoot here for decades.

This March a Colorado organization asked the federal government to list the Columbian Sharp-tailed Grouse as "threatened" or "endangered" throughout the West. For a number of reasons the petition will probably take years to be processed. This presents a unique opportunity for an initiative from landowners and managers... a voluntary, locally developed conservation and recovery plan for sharptails in the upper Blackfoot.

The Blackfoot Valley already benefits from a community of people with years of experience and involvement in land stewardship and resource management, with extensive lands already under beneficial types of use and protection.

Areas like the Blackfoot waterfowl production area, the Bandy Ranch, the Aunt Molly, and private lands under conservation easement comprise an impressive block of potential and currently occupied grouse habitat. Private ranch lands, hay lands, and grain crops complete the mosaic of habitat the birds are using, and up to now, surviving in.

The Sharp-tailed Grouse isn't like the Spotted Owl for several reasons:

- Sharptails don't need vast areas of undisturbed habitat. These birds thrive in mixed brush and grass lands which can be created or maintained by some types of grazing, logging, agriculture and fire cycles. For example, cutting evergreen trees would probably benefit sharptails in summering habitat, particularly where forests are encroaching on sagebrush and grassland areas.
Because grouse may lay a dozen eggs a season, sharptail populations have the potential to undergo explosive growth when habitat conditions are favorable for successive years. Also unlike owls, grouse are sometimes successfully transplanted.

For several years sportmen and biologists alike have worked elsewhere to restore Sharp-tailed Grouse populations. Thus, an abundance of information already exists on sharptail management and restoration. Several potential grouse conservation projects are available which could include everyone from 4-H kids to local wildlife professionals.

The benefits to local people and resources from restoring sharptails to the valley could be many:

- The native grasses and forbs needed by sharptails are some of the best forage for livestock and big game; the wheat, wild berries, willow, birch, and other shrubs the birds need in winter complement fishery and waterfowl conservation efforts.
- Grouse recovery efforts might attract public and private funds for additional conservation easements and local projects.
- Some tree stands that are encroaching on grouse habitat could be harvested for valuable timber, and smaller wood might be used nearby for fencing, etc.
- Some people would appreciate improved upland bird hunting, particularly in a valley where harsh winters freeze out the pheasant population every decade or so. Sharpie hunting is occasionally big business for guest ranches and merchants on the east-side.
- Biologists and bird watchers are drawn to the ornate mating displays performed on traditional "dancing grounds" each spring.
- It could be another positive model for how a community can work together to conserve a valued resource and natural heritage.

All this suggests a feasible future for sharptails in the Blackfoot, but only if we can develop a restoration approach which considers both the grouse and local people’s needs. With careful choices we may steer clear of the political, economic, and ecological train-wrecks that have derailed and mangled conservation projects and communities elsewhere.

And perhaps the only way to have Sharp-tailed Grouse thrive again in the Blackfoot is to have a new conservation train depart from our station with a cargo of local information and regional initiative. Give it a few years to find a wise course and proper speed. Then perhaps we can navigate the track needed to perpetuate good life for all in the upper Blackfoot.

Ben Deeble is a graduate student at the University of Montana, an intern with the National Wildlife Federation, and spends too much time in the upper Blackfoot Valley kicking bushes looking for grouse.

Call 721-6705 if you would like:
• more information about Sharp-tailed Grouse;
• to report sightings of grouse;
• to have your land surveyed for grouse;
• to contribute to the preparation of a grouse conservation plan.
Appendix III

Menu of Possible Sharp-tailed Grouse Conservation Measures and Habitat Management Options

Voluntary landowners actions might fall into three general areas:

A. further document the status of the Blackfoot Valley Sharp-tailed Grouse population;

B. start local participation in developing a grouse conservation strategy;

C. maintain and improve existing grouse habitat, while attempting to create additional habitat.

A. Documenting Grouse Status
• consistent and accurate reporting of sharp-tailed grouse sightings by landowners and managers, and collection of road kills or other specimens.
• access to additional private ground for grouse surveys and habitat analysis (including: access on foot, horseback, or motorized; the aid of dogs or electronic calling; low elevation over flights).
• access to known lek sites for seasonal monitoring, possible trapping.

B. Developing a Conservation Strategy
• landowners may want to participate in the preparation of a valley-wide Sharp-tailed Grouse conservation strategy.
• it may be useful for a working group of landowners, biologists, and managers to meet a few times a year to specifically discuss grouse populations, and implementation of conservation plans.

C. Managing and Enhancing Grouse Habitat
All suggestions in this section are offered in recognition that they may be consistent or at odds with various other resource conservation and economic objectives. It is hoped that some of these management options can be adopted where they are compatible with established programs for soil and wildlife conservation, and agricultural production. Other suggestions presented here may be at the present time much more challenging, and in some cases impossible, for particular landowners or managers to adopt.

Appendix III (cont.)
C.1 Breeding and Brood Rearing Habitat.
In breeding complexes (leks, and associated nesting and brooding areas generally within 1.5 miles of leks), attempt to:

- encourage dense growth of vegetation preferred for nesting and brood cover (bunchgrasses, some exotic grasses, snowberry, rose, sagebrush, dandelion, prickly lettuce, goats beard, other forbs);
- optimize habitat condition and breeding success by achieving a 10 inch visual obstruction reading (VOR) using Robel pole methods;²
- delay first hay cut until July 1 (or later);
- cut hay from interior of field outward toward edges to reduce brood mortalities;
- reduce use of agricultural chemicals which reduce forb and insect crops during spring, particularly on field edges;
- when possible, reduce livestock in grouse breeding complexes from March 1 to July 1 (or later);
- control colonization of firs and pines into sagebrush grasslands. Control might be accomplished by cutting encroaching trees or carefully using controlled burns;
- implement grazing swaps with public or private land lacking grouse to improve occupied grouse habitat. One approach is "grass banking" where during drought landowners with occupied grouse habitat can apply to get public grazing allotments in unoccupied habitat elsewhere.

C.2 Wintering Habitat.
Promote restoration of wintering habitat by:

- planting native deciduous shrub species, such as Hawthorn, Chokecherry, Bog Birch, or Serviceberry (non-natives suitable in other areas include Apple, Russian Olive, and Silver Buffalo Berry);
- creating fenced exclosures around plantings or natural shrub patches to keep out big game and/or livestock year-round, or at least manage to limit grazing of deciduous shrub to the dormant season;
- establishing shelter belts or roadside "living snow fences" of shrubs alongside roads subject to drifting snow;
- as a stop-gap measure, establish food plots of small grain (wheat, barley, oats) on margins of established fields near cover, to be left standing to aid over-wintering of grouse.

C.3 Promote Support of Grouse Habitat Conservation
- landowners may want to suggest public and private compensation programs for grouse management and habitat conservation.

APPENDIX IV

Topics discussed with wildlife and land managers in August 1995 range-wide survey regarding Columbian sharp-tailed grouse population status, habitat management and conservation.

- Current estimated population size.
- Current distribution.
- Distribution on public and private lands.
- Seasonal movements.
- Nesting, forage, and wintering resources.
- Predation/competition issues.
- Grazing and fire management.
- Chemical application problems.
- Habitat rehabilitation plans.
- Habitat acquisition or protection plans.
- Private sector participation or initiatives.
APPENDIX V

A REVIEW OF COLUMBIAN SHARP-TAILED GROUSE HABITAT
IN WESTERN MONTANA

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Introduction

The historic range of Columbian sharp-tailed grouse (Tympanuchus phasianellus columbianus) included the lowlands of the Great Basin and extended from the Rocky Mountains to the Sierra Nevadas (Yocom 1952). Bendire (1892) considered this species to be one of the most abundant and well known game birds of the Pacific Northwest. However, by 1940 Gabrielson and Jewett (1970) suggested that this grouse was headed for early extinction. The historic range of the Columbian subspecies in Montana does not seem to be well understood. Bergeron et al. (1992) show an almost continuous distribution of sharp-tailed grouse across the state but they do not differentiate between subspecies. Ridgeway and Friedmann (1946) suggest that the Columbian subspecies was confined to extreme western Montana, but Edminster (1954) indicated that the subspecies occurred in the southwestern part of the state. Conversations with biologists throughout western Montana suggest that the Columbian subspecies is known to occur in the Tobacco plains area of northwestern Montana and is the likely subspecies occurring in the Blackfoot River Valley of western Montana (J. W. Connelly, unpubl. data). As recently as the 1960's or 1970's the Columbian sharp-tailed grouse occurred in the Flathead Indian Reservation and National Bison Range of western Montana as well as in the Centennial Valley of southwestern Montana (Aldrich 1963, Brown 1971, I. J. Ball, pers. commun., J. W. Connelly, unpubl. data).

The purpose of this paper is to assess the habitats presently
available in parts of western Montana for Columbian sharp-tailed grouse. We also recommend actions that could be taken to enhance these habitats and provide for the recovery of Columbian sharp-tailed grouse in this part of its range.

Methods

On July 26 and 27 1995 we visited the Blackfoot River Valley, National Bison Range, and Flathead Indian Reservation in western Montana to assess habitats for Columbian sharp-tailed grouse. The Blackfoot River Valley currently supports a remnant population of this sharp-tailed grouse and the other areas recently supported (i.e., within the last 30 years) Columbian sharp-tailed grouse (B. Deebles, pers. commun.). On the July 26th trip to the Blackfoot River Valley we were accompanied by Dr. Joe Ball (Montana Cooperative Wildlife Research Unit), Ben Deebles (National Wildlife Federation) and Guy McQuelthy (University of Montana). On July 27th we traveled through the National Bison Refuge and the Flathead Indian Reservation. Joe and Ben also accompanied us on this trip as did John Gobeille (Confederated Salish and Kootenai Tribes of the Flathead Reservation).

During our July field trip we did not make any quantitative measurements of sharp-tailed grouse habitat. Our assessments of potential and actual sharp-tailed grouse habitat in western Montana are based on the following: 1) field trips to the three areas previously mentioned; 2) discussions with biologists that
accompanied us on the trips; 3) a review of literature dealing with the distribution of Columbian sharp-tailed grouse; 4) previous visits to Columbian sharp-tailed grouse habitat in every state and province that currently support populations of this subspecies; 5) supervision of four research projects including two transplant programs to restore this subspecies to historic ranges; 6) over 30 years combined experience in rehabilitating shrub steppe habitats; and 6) our knowledge of the biology of this subspecies.

Habitat Assessments

Blackfoot River Valley

Breeding habitat - Generally, this valley has a large amount of agricultural land but most appeared to be pasture rather than cereal grains. Pastures and hay fields could provide suitable nesting and brood rearing habitat. However, these areas were mowed for hay or heavily grazed by livestock. In either case, the cover values for grouse were fair to poor. Overall, there appeared to be a low amount of high quality (i.e., dense) nesting habitat. We observed 3 areas that should provide adequate nesting and brood rearing cover. One area was dominated by sagebrush and bunch grass and was not grazed by domestic livestock. The other two areas were seeded to bunch grasses and alfalfa and contained a number of other forbs. It is our understanding that all three of these areas will be grazed by cattle in the near future. Regulated grazing may not always be detrimental to sharp-tailed grouse. However, given the
limited numbers of sharptails in this valley and the scarcity of quality nesting habitat, grazing these areas may not be a wise choice at this time. Overall, we would characterize breeding habitat for sharp-tailed grouse in the Blackfoot River Valley as poor to fair with a few areas containing good breeding habitat.

**Winter habitat** - Sharptail winter range within this valley consists almost solely of riparian zones and a few scattered grain fields. Observations by Ben Deeble indicate that grouse winter in three distinct and widely separated areas. In all of these areas mountain shrub communities are scarce or absent and the riparian zones are largely dominated by willow (*Salix* spp.) which is not a preferred forage plant for Columbian sharp-tailed grouse during winter. A few areas support bog birch (*Betula glandulosa*) and other deciduous species that provide sharptails with winter food. However, winter habitat is generally fragmented and very limited. Overall, we would characterize winter range for sharp-tailed grouse in the Blackfoot River Valley as poor. Presently, lack of quality winter range is the major limiting factor for sharp-tailed grouse in the Blackfoot River Valley.

**National Bison Range**

**Breeding habitat** - The National Bison Range encompasses about 7500 ha and provides a large block of contiguous native uplands. These areas tend to be dominated by native bunchgrasses including bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), and rough fescue (*Festuca scabrella*). Generally, the
cover provided by these bunchgrass areas appeared to be sparse to moderate. The reasonably large expanse of this area would provide birds with some security from nest predators. Relatively dense patches of snowberry (Symphoricarpus spp.) are common throughout the uplands and could provide secure nesting cover. Noxious weeds are abundant on parts of the refuge, but this should pose few problems for nesting sharp-tailed grouse. Overall, we would generally characterize nesting habitat for Columbian sharp-tailed grouse on the Bison Range as fair.

**Winter habitat** - Winter habitat for sharp-tailed grouse is largely confined to riparian areas around springs at higher elevations and along rivers at lower elevations on the Bison Range. Riparian zones are in better condition than those of the Blackfoot River Valley and appeared to have a greater diversity of trees and shrubs that would provide winter forage for sharp-tailed grouse. Red osier dogwood (Cornus stolonifera), bog birch, and hawthorne (Crataegus spp.) appeared common along riparian areas. In many areas of southeastern Idaho, sharp-tailed grouse winter habitat contains both riparian zones and mountain shrub stands. We did not see any significant patches of mountain shrubs (i.e., serviceberry [Amelanchier spp.], chokecherry [Prunus spp.], bitterbrush [Purshia tridentata], hawthorne) and these communities appear rare on the bison range. Overall, we would characterize winter range for Columbian sharp-tailed grouse on the Bison Range as fair to good.

**Flathead Indian Reservation**

The Flathead Indian Reservation (not including the National
Bison Range) has two distinct habitats for Columbian sharp-tailed grouse. The east side lies east of the Flathead River, west of highway 93, south of Polson and north of St. Ignatius. This area is characterized by farmland, including grain fields, and state and federal waterfowl management areas. Winter range for sharp-tailed grouse is very limited and generally confined to established shelterbelts and a few riparian areas. Grain fields may also provide some winter habitat.

The west side provides potential sharp-tailed grouse habitat west of the Flathead River, east of highways 382 and 28, and from highway 200 north to the reservation border. The west side is characterized by native uplands intermixed with some farmland. The reservation does not appear to be as intensively farmed in this area compared to the east side. Winter habitat is provided by stands of mountain shrubs and riparian zones. This habitat is generally distributed throughout the area.

**Breeding habitat** - Good to excellent breeding habitat occurs on the east side especially in association with waterfowl nesting areas on state and federal management areas. We would expect sharp-tailed grouse nest success and juvenile recruitment to be very high in these areas.

Breeding habitat on the west side seems fair to good. Many of the uplands appear to have been heavily grazed by livestock. Overall, herbaceous cover is much more sparse than on the east side. However, this cover occurs over relatively large areas, thus providing some security for ground nesting birds. Overall,
reproduction by sharp-tailed grouse should be lower on the west side than on the east side but this grouse should still do reasonably well with the breeding habitats found on the west side of the reservation.

**Winter habitat** - The east side contains a very patchy distribution of winter habitat for sharp-tailed grouse. Generally, this habitat occurs in linear shelterbelts and along a few riparian areas. Overall, we rate the winter range in this part of the reservation as poor to fair, largely because of its very limited distribution. Local biologists also report high concentrations of raptors in this area during the winter. Over winter survival of grouse may be a problem on the east side and may prevent the successful reestablishment of sharp-tailed grouse in this area.

The west side contains native stands of mountain shrubs and some suitable winter habitat in riparian areas. The winter habitat in this area is widespread but most common in the northern portion of this section of the reservation. We would expect higher winter survival of sharptails in this area than in winter habitat on the east side. However, the distance between good quality winter habitat and the better quality nesting habitats may be >6 km, thus reducing the overall quality of sharp-tailed grouse habitat.

**Management Recommendations**

**Blackfoot River Valley**

1. Inventory the complete valley systematically for sharp-tailed grouse leks and monitor lek attendance each year.
2. Use an established technique (Meints et al. 1992) for evaluating the quality of sharp-tailed grouse habitat throughout the valley.

3. Continue reestablishing deciduous trees and shrubs in riparian areas.

4. Retain high quality nesting/brood rearing areas (i.e., existing grass/forb seedings) while managing sagebrush uplands to achieve good or excellent ecological condition.

5. Use fire and reseeding with native grasses, forbs and sagebrush to rehabilitate depleted sagebrush uplands.

6. Establish foodplots next to established winter cover.

7. If possible, implement a rest rotation grazing system or obtain grazing easements on parcels that are ≥160 acres. Regardless of the grazing system used, assure that proper livestock stocking rate is maintained and that together with wild ungulate use, the utilization rate of bunchgrasses does not exceed 40%.

8. Establish shelterbelts and shrub thickets with plant species that can provide forage during winter. Native plants that you should consider include: bog birch, chokecherry, serviceberry, buffaloberry (Sheperdia spp.), skunkbrush sumac (Rhus trilobata), hawthorne, snowberry, mountain ash (Sorbus americana), and rose (Rosa spp.). Russian olive (Elaeagnus angustifolia) and crabapple (Malus spp.) are exotics that would be used by sharp-tailed grouse. However, Russian olive is difficult to control in moist sites, so we recommend confining its use to relatively dry, irrigated shelterbelts on upland sites.
9. Develop a program that addresses both winter and breeding habitat. If a dual program is not possible then address winter habitat first.

**National Bison Range**

1. Use an established technique (Meints et al. 1992) for evaluating the quality of sharp-tailed grouse habitat throughout the bison range.

**Flathead Indian Reservation**

1. Use an established technique (Meints et al. 1992) for evaluating the quality of sharp-tailed grouse habitat on both the east and west sides of the reservation.
2. Use fire and reseeding with native grasses, forbs and sagebrush to rehabilitate depleted sagebrush uplands on the west side.
3. If possible, implement a rest rotation grazing system or obtain grazing easements on parcels that are ≥160 acres.
4. Prune or remove tall trees from existing tree rows on the east side of the reservation to reduce perch sites for raptors. Consider adding chokecherry, serviceberry, and buffaloberry to existing shelterbelts if they are lacking.
5. Establish additional shelterbelts on the east side with plant species that can provide forage during winter.

**Overall Management Recommendations**

1. Use a habitat evaluation model to compare and rank (in terms of
quality) potential and actual Columbian sharp-tailed grouse habitats in western Montana.

2. Include the Tobacco Plains in the assessment.

3. Unless funding is exceptionally good, confine habitat improvement and translocation activities to the area with the best overall habitat (assuming the work is feasible from a political standpoint).

4. Identify sources of transplant stock. Keep in mind that trapping is difficult and transplanting may be politically unpopular.

5. If a translocation program can be developed, plan on relocating >50 grouse each year for a minimum of three years. At least 20 of these birds must be females.

6. For translocation, use a soft release technique in open areas well away (>2km) from trees and power lines and other areas where raptors may perch or nest.

   Based on our cursory examination, habitat conditions on the east side of the Flathead Valley may offer the best and most immediate opportunity to restore Columbian sharp-tailed grouse to this portion of their historic range. Although this area is highly modified from its original native state, the mix of protected areas (state and federal lands) and protection afforded by reservation lands, intermingled with grain and alfalfa fields appears very favorable to sharp-tailed grouse. Birds reestablished in this area may also be likely to expand their range to the National Bison Range.
Literature Cited


