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The Wild Turkey in South Dakota

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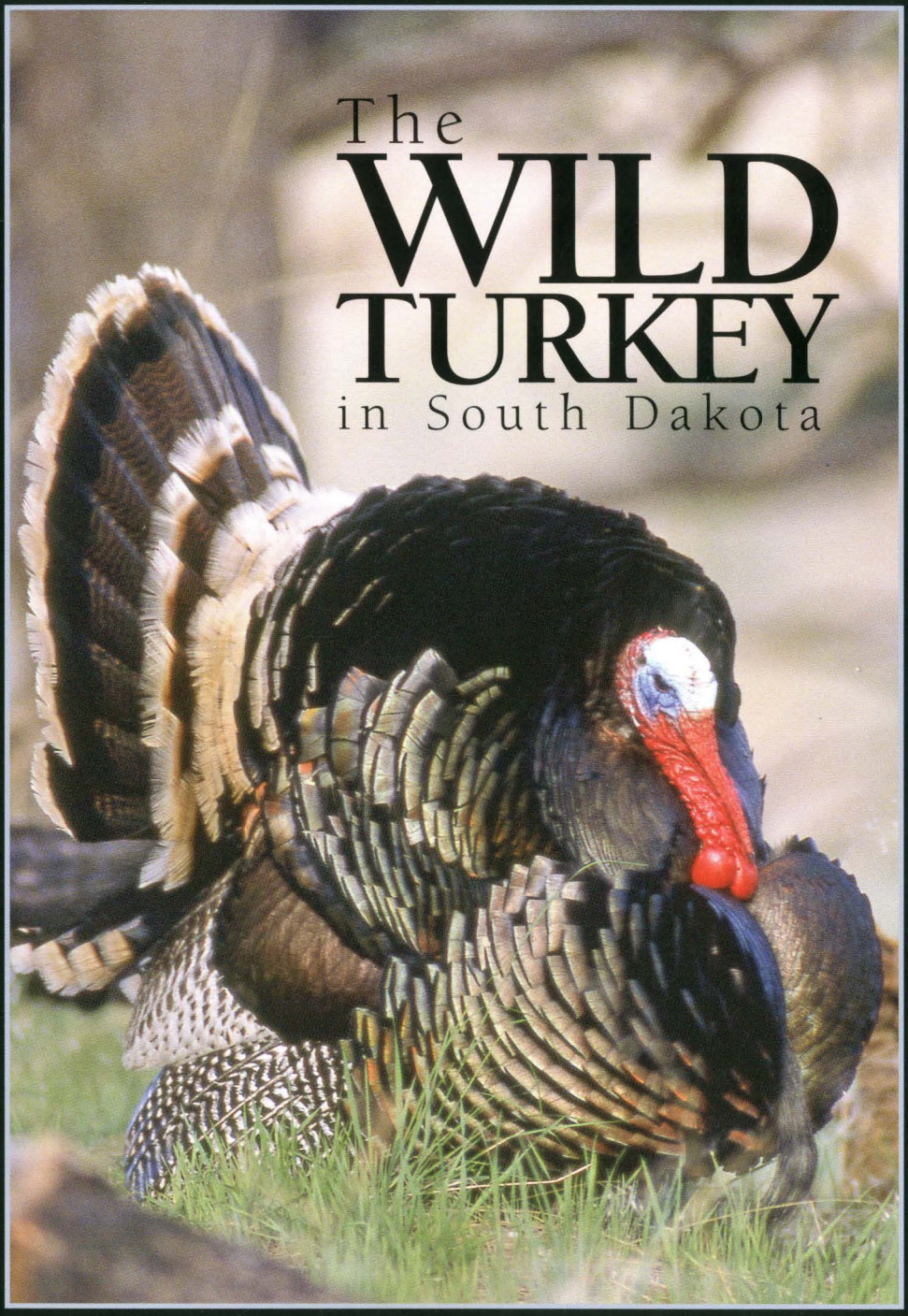

South Dakota State University
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On the cover: A Merriam's turkey gobbler in full strut. On back cover: Adult gobblers chasing before breeding season. (Both photos by Martin Tarby, Prairie Hills Photography, Rapid City, S.D.)

ABOUT THE AUTHORS

Order of junior authors is alphabetical—all were broadly involved in developing this publication.

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Dan Thompson is currently pursuing a Ph.D., studying mountain lions in the Black Hills of South Dakota. Dan has worked on wild turkeys in northeastern South Dakota and in Missouri and completed a master's degree at SDSU, assessing roosting habitat and poult survival of Merriam's turkeys in the southern Black Hills (2003).

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We thank the many people and organizations who have allowed us to use their photos; contributors are listed in the captions. Photos that have captions with only initials listed were provided by authors of this book, the South Dakota Department of Game, Fish and Parks (SDGFP), or South Dakota State University (SDSU).

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We appreciate the invaluable help of W. M. Healy in obtaining photographs of poults and brood hens. Bill Healy suggested acknowledgment of the U.S. Forest Service (Northeastern Research Station, Amherst, Mass.) on those photos but his involvement in taking photos and in helping us find them was critical. T. J. Maier at the Northeastern Research Station assisted in locating and having brood photos sent to us. Thanks to Bob Klaver (U.S. Geological Survey National Center for Earth Resources) for helping us obtain satellite photos. K.C. Jensen (SDSU) shared ongoing research results of gobbler harvest rates in the Black Hills. Gary Larson (SDSU) provided answers to many questions related to plants and plant communities.

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We especially thank South Dakota landowners who allowed us to conduct research on wild turkeys on their lands and the many others that provide habitat for South Dakota's wild turkeys.

CONTENTS

FOREWORD

Wild turkeys have expanded their range and much has happened in wild turkey research and management since *The Wild Turkey in the Black Hills* by L.E. Petersen and A.H. Richardson was published in 1975. These developments have raised interest in a follow-up book that would hopefully become as popular and as important a reference on all wild turkeys throughout South Dakota. We have attempted to write for a broad audience while also including information for wildlife managers, conservation officers, and wildlife administrators who may be involved with wild turkey management. We hope readers will enjoy the photographs we have gathered.

We have focused primarily on South Dakota wild turkeys. The chapters include an array of topics covering origin and distribution, physical characteristics, behavior, ecology, and management. Depredation is related to nutritional needs and is included in the nutrition chapter as well as in the final chapter on management.

For readers seeking a book with broader coverage of wild turkeys across their range in North America, we recommend J. G. Dickson's (editor) *The Wild Turkey: Biology and Management*. Management guidelines for Merriam's turkeys are presented in depth in Hoffman et al. (1993). Publications such as the Proceedings of the National Wild Turkey Symposium and a variety of research journals provide current information. We hope that hunters, naturalists, landowners, and others with an interest in wild turkeys also will find valuable information and enjoyment in reading *The Wild Turkey In South Dakota*.

Literature cited in the text is included in a section at the end of the book. We have avoided giving scientific names (genus and species) in the text except for wild turkeys and their subspecies when first used in Chapter 1 and for some disease organisms. Common names of plants and wild vertebrates are listed along with their scientific names in Appendix A.

Chapter 1

RESTORATIONS AND INTRODUCTIONS

The exhilarating gobble of wild turkeys (*Meleagris gallopavo*) has long been associated with the woodland habitats of North America. Presettlement wild turkeys were closely linked to forested habitats—the woodlands of eastern, southeastern, central, and portions of southwestern North America—that provided not only essential cover but also food sources. In South Dakota, native wild turkeys lived only where woodland vegetation could supply adequate food (mast) during the late fall, winter, and early spring (Over and Thoms 1946).

Wild turkeys came to be important as food and in ceremonies, and their bones were shaped into tools by many native American tribes (Kennamer et al. 1992). However, in a too familiar pattern of exploitation, the spread of settlement west from the Atlantic coast reduced turkey abundance due to the clearing of woodlands for agriculture and to unregulated harvest of birds.

Turkey populations continued to decline until they bottomed out in the 1930s (Mosby 1975, Kennamer et al. 1992). By the early 1930s, however, a general awareness of wildlife conservation began sweeping the nation, and wild turkeys benefited.

In the early 1940s biologists attempted mass rearing of turkeys of wild genetic strains for use in restoring wild populations. However, these captive-reared birds lacked the survival instincts found in free-roaming wild turkeys and were unable to establish self-sustaining wild populations (Kennamer et al. 1992).

Following World War II, state wildlife agencies began trapping wild turkeys and releasing them (trap and transfer) into suitable habitat with great success. Release areas included sites where the original wild turkey population had become extirpated as well as new areas beyond the historic range of wild turkeys.

Five different subspecies of wild turkeys occur in North America. These are the eastern (*M. g. silvestris*), Merriam's (*M. g. merriami*), Rio Grande (*M. g. intermedia*), Florida (*M. g. osceola*), and Gould's (*M. g. mexicana*). Of these, the Florida and Gould's turkeys have constricted ranges in North America and do not occur in South Dakota. The other three subspecies or their hybrids are found in South Dakota.

Eastern turkeys historically occupied woodland habitats in southeastern South Dakota. Wild turkey range stretched northwest along the Missouri River all the way to the mouth of the Cheyenne River (Smith 1953) (Fig 1-1). It is possible that native turkey populations were also found along the Cheyenne River as far west as southwestern Ziebach County and in the woodlands of central Bennett County near Martin (Smith 1953).

However, by 1920, no wild turkeys existed in South Dakota (Over and Thoms 1920). Consequently, all populations of wild turkeys in South Dakota today are the result of introductions or, in portions of their native range, reintroductions (Fig 1-2).

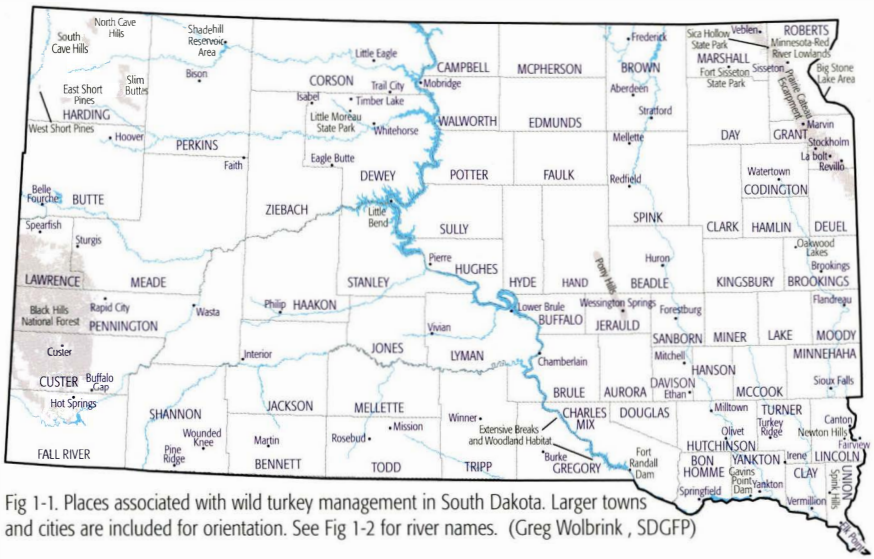


Fig 1-1. Places associated with wild turkey management in South Dakota. Larger towns and cities are included for orientation. See Fig 1-2 for river names. (Greg Wolbrink , SDGFP)

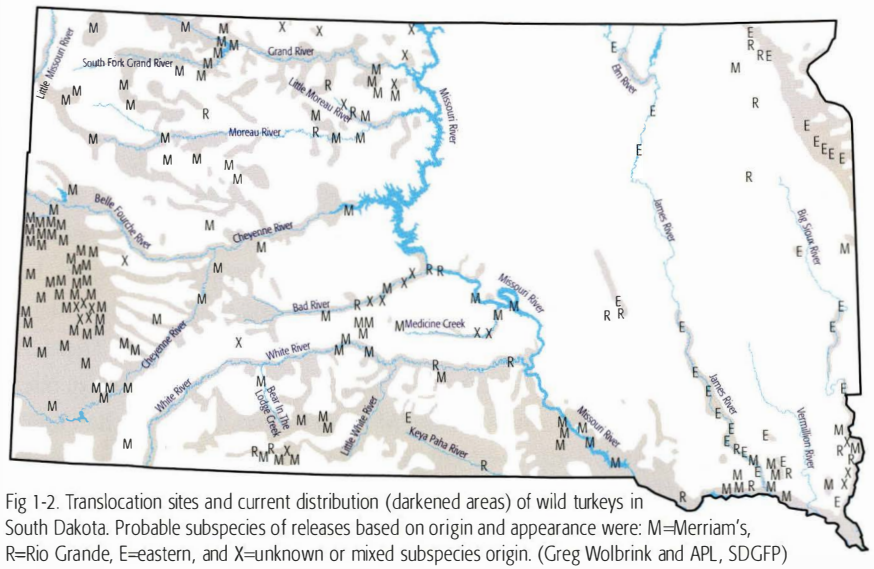


Fig 1-2. Translocation sites and current distribution (darkened areas) of wild turkeys in South Dakota. Probable subspecies of releases based on origin and appearance were: M=Merriam's, R=Rio Grande, E=eastern, and X=unknown or mixed subspecies origin. (Greg Wolbrink and APL, SDGFP)

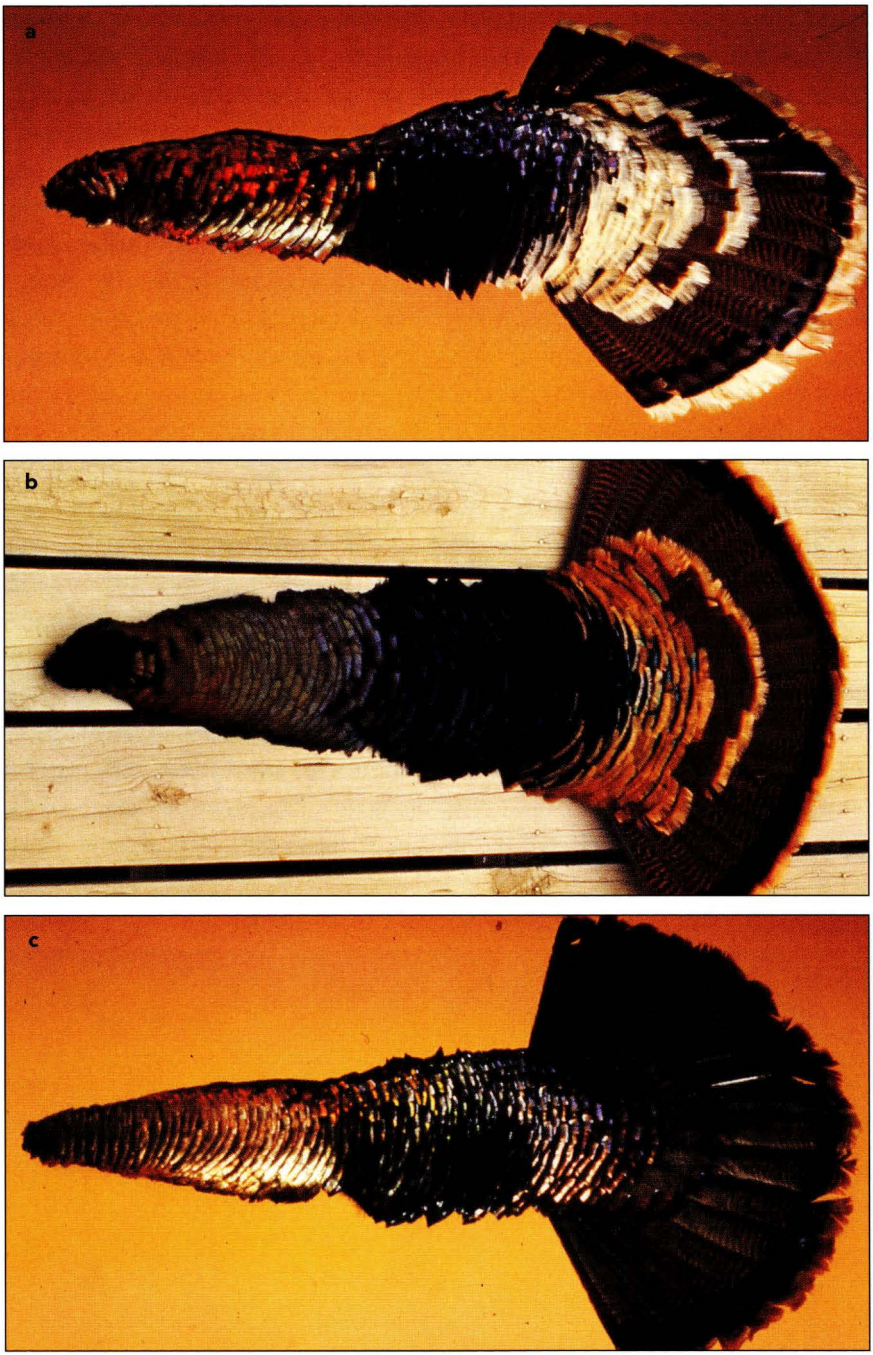


Fig 1-3. Typical plumage colors for males of Merriam's (a), Rio Grande (b), and eastern (c) subspecies of wild turkey (National Wild Turkey Federation). Feather color varies considerably within subspecies, and intermediate colors are common in zones where subspecies have interbred (Stangel et al. 1992).

The South Dakota Department of Game, Fish and Parks (SDGFP) released over 5,400 wild turkeys from 1930 through 2004 from sources both within and outside the state's borders. These releases included the Merriam's, Rio Grande, and eastern subspecies (Fig 1-3) and were almost all from trap and transfer. Additional turkey releases by SDGFP likely went undocumented.

Turkeys may also populate South Dakota where tribal and neighboring state wildlife agencies have released birds. In addition, it is legal in South Dakota for citizens to acquire and release turkeys of wild or domestic genetic strains, although releasing wild strain or dark-colored domestic turkeys by the public is discouraged by the SDGFP and the National Wild Turkey Federation. Numerous sources of turkey populations confound the problem of identifying subspecies distributions and the exact origin of turkey populations in the state.

Initial Stocking Attempts

B.J. Rose (SDGFP) reported that 85 pairs of eastern turkeys were released in the Black Hills in 1930 and that a "few" eastern turkeys were released at the same time in the Little Bend area of the Missouri River in Sully County in 1930 (unpublished report, 1968 annual meeting of South Dakota Ornithologists Union). The origin of these turkeys is unknown, but most introduced turkeys at this time were raised on game farms, a method that usually failed (Kennamer et al. 1992). Both the Black Hills and Sully County turkey introductions failed to establish populations. In 1953, five eastern turkeys of undocumented origin (although likely game-farm raised) were released in the Cactus Hills 3 miles east of Sioux Falls. These birds also failed to establish a population.

Fig 1-4. In the walk-in-trap (also called funnel trap) turkeys walk through baited funnel openings on each end of the trap to obtain grain but cannot find their way out. (LDF)

Early Merriam's Turkey Introductions

The first successful introduction of wild turkeys was in the Black Hills in 1948 when two gobblers and six hens were released west of Spearfish in Lawrence County. These wild-trapped Merriam's turkeys came from New Mexico as a part of a trade arrangement that sent 25 greater sage-grouse to New Mexico. Two years later in 1950, 14 Merriam's turkeys were acquired from Colorado. These birds were released near the town of Custer (two toms and six hens) and in Hell Canyon (four gobblers and two hens) about 15 to 20 miles west of Custer. Five more Merriam's turkeys from New Mexico (one tom and four hens) were released in Falls Canyon, 8 miles west of Hot Springs (Fall River County), in 1951. Also in 1951, SDGFP biologists constructed three walk-in traps (Fig 1-4) and were able to trap and transfer wild turkeys from the Spearfish area to Pennington County.

Biologists began using cannon-propelled nets to capture turkeys in 1952 (Fig 1-5). These efforts were more effective and resulted in the capture of 25 turkeys that were released elsewhere in the Black Hills. By 1953, turkeys were expanding throughout the Black Hills and their estimated population was over 1,000 (Petersen and Richardson 1975).

Trap and transfer of Merriam's turkeys continued in the Black Hills for 6 more years, and SDGFP expanded efforts to include releases in the riparian woodland habitats of western South Dakota in 1953. Merriam's turkeys trapped in the Black Hills were released in Haakon, Harding, and Jackson counties in 1953 and 1959; Perkins County in 1953, 1955, 1956, and 1959; Gregory County in 1958 and 1959; Dewey County in 1959 and 1960; and eastern Pennington County in 1959 (Table 1-1).

By 1963, Merriam's turkeys had established populations along the Cheyenne River north of Wall, along Bear in the Lodge Creek southeast of Interior, and in unspecified portions of Harding, Perkins and Gregory counties. In addition,

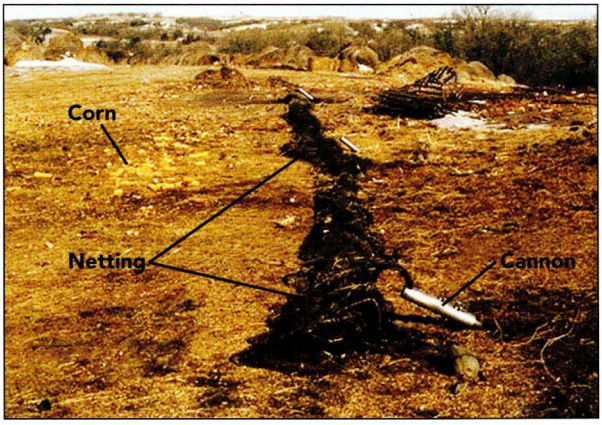


Fig 1-5. A cannon-propelled net set to capture wild turkeys at a cattle feeding area in Gregory County. Cannons are propelled by a shotgun shell-type propellant ignited through wire connections in series and a small battery. (LDF)

Table 1-1. Records of turkey releases made to establish or enhance wild turkey populations in South Dakota. In many cases release sites (other than county) were not recorded or represented multiple sites. Release sites in areas outside of the Black Hills were along rivers, streams, woody ravines and draws, glacial escarpments, pine covered uplands, or where other features supported woodland vegetation. Subspecies (Ssp.): eastern (E), Rio Grande (R), Merriam's (M), or probable hybrids (Hyb). Unknown = Unk.

Year	County or region, release site if known	Subspecies[a]	No. released	Source
1930	Black Hills	E	170	Pen reared
	Sully Co., Little Bend	E	Unk	Pen reared
1948	Lawrence Co., west of Spearfish	M	8	New Mexico
1950	Custer Co., near Custer & Hell Canyon	M	14	Colorado
1951	Fall River Co., west of Hot Springs	M	5	New Mexico
	Lawrence Co., Black Hills	M	3	Near Spearfish
	Pennington Co., Black Hills	M	21	Near Spearfish
1952	Butte Co., Black Hills	M	8	Black Hills
	Lawrence Co., Black Hills	M	9	Black Hills
	Meade Co., Black Hills	M	7	Black Hills
	Pennington Co., Black Hills	M	1	Black Hills
1953	Custer Co., Black Hills	M	16	Black Hills
	Haakon Co., east of Philip	M	3	Black Hills
	Harding Co., Short Pines, N Cave Hills, Slim Buttes	M	33	Black Hills
	Jackson Co., Pine Creek	M	11	Black Hills
	Lawrence Co., Black Hills	M	24	Black Hills
	Meade Co., Black Hills	M	5	Black Hills
	Minnehaha Co., east of Sioux Falls	Hyb	5	Unk
	Pennington Co., Cheyenne River	M	41	Black Hills
	Perkins Co., Grand River north of Bison	M	9	Black Hills
1954	Lawrence Co., Black Hills	M	2	Black Hills
1955	Lawrence Co., Black Hills	M	5	Black Hills
	Perkins Co., Shadehill Reservoir area	M	8	Black Hills
1956	Lawrence Co., Black Hills	M	7	Black Hills
	Perkins Co., Shadehill Reservoir area	M	8	Black Hills
1958	Gregory Co., Lower Whetstone	M	6	Black Hills
	Lawrence Co., Black Hills	M	10	Black Hills
	Meade Co., Cedar Canyon	M	10	Black Hills
	Todd Co., NE of Mission	Hyb	3	Farm Island
1959	Dewey Co., south of Isabel	M	Unk	Black Hills
	Gregory Co., NE of Burke	M	28	Black Hills
	Haakon Co., Cheyenne River	M	10	Black Hills
	Harding Co., Short Pines area	M	8	Black Hills
	Jackson Co., Bear in The Lodge Creek	M	10	Black Hills
	Pennington Co., Cheyenne River north of Wasta	M	10	Black Hills
	Perkins Co, Shadehill Reservoir area	M	7	Black Hills
1960	Dewey Co., Moreau River near Highway 63	M	5	Black Hills

Year	County or region, release site if known	Subspecies[a]	No. released	Source
1963	Bon Homme Co., Missouri River SW of Springfield	R	31	Texas
	Day Co., Waubay Nat. Wildl. Refuge	R	25	Texas
	Jackson Co., along the White River	M	16	Perkins Co.
	Jones Co., along the Bad River	R	25	Texas
	Lyman Co., along the White River	R	21	Texas
	Mellette Co., along the White River	M	21	Perkins & Jackson cos.
	Yankton Co., Missouri River	R	14	Texas
1965	Dewey Co., Little Moreau Game Prod. Area	R	14	Oklahoma
	Jerauld Co., north of Wessington Springs	R	11	Oklahoma
	Perkins Co., along the Moreau River	R	Unk	Oklahoma
	Tripp Co., along the Keya Paha River	R	16	Oklahoma
1968	Jerauld Co., west of Wessington Springs	R	6	Jerauld Co.
	Lincoln Co., Big Sioux River near Fairview	R	24	Jerauld Co.
	Yankton Co, SW of Irene	R	12	Jerauld Co.
1970	Union Co.	Hyb	15	Unk
1972	Charles Mix Co., Gray Game Prod. Area	M	27	Gregory Co.
	Gregory Co., NE of Burke	M	21	Gregory Co.
	Marshall Co., Fort Sisseton area	M	20	Gregory Co.
	Marshall Co., Sica Hollow	R	19	Jerauld Co.
1975	Lyman Co., south of Vivian	R	Unk	Unk
1979	Corson Co., north of Isabel	R	35	Lyman Co.
	Dewey Co., south of Isabel	R	14	Lyman Co.
	Dewey Co., Little Moreau Game Prod. Area	R	6	Sica Hollow
	Marshall Co, west of Veblen	R	5	Sica Hollow
1981	Hughes Co., Farm Island and LaFramboise Island near Pierre	R	67	Dewey Co.
1982	Dewey Co., south of Isabel	R	13	Lyman Co.
1983	Corson Co., north of Trail City	M	14	Black Hills
	Yankton Co., James River north of Lesterville	R	11	Turner Co.
	Corson Co., north of Trail City	M	13	Black Hills
	Dewey Co., Moreau River near Whitehorse	M	11	Black Hills
1985	Corson Co., north of Trail City	M	72	Black Hills
	Custer Co., near Buffalo Gap	M	18	Black Hills
	Lincoln Co., Big Sioux River south of Canton	M	52	Black Hills
	Union Co., Union State Park	M	19	Black Hills
1986	Corson Co, south of Little Eagle	M	24	Black Hills
	Lyman Co., Lower Brule Indian Reservation	M	32	Black Hills
	Meade Co., SW of Faith	M	67	Haakon Co.
	Yankton Co., multiple sites	M	109	Black Hills
1987	Corson Co., east of Trail City	M	14	Black Hills
	Corson Co., east of Trail City	Hyb	26	Brown Co.
	Custer Co., Cheyenne River east of Buffalo Gap	M	33	Black Hills

Year	County or region, release site if known	Subspecies[a]	No. released	Source
	Dewey Co., Little Moreau Game Prod. Area	M	39	Black Hills
	Dewey Co., south of Timber Lake	Hyb	5	Potter Co.
	Jones Co., multiple sites	M	74	Black Hills
1988	Bennett Co., multiple sites	M	84	Jackson Co.
	Charles Mix Co., White Swan Bottoms	M	23	Gregory Co.
	Corson Co., Standing Rock Indian Reservation	M	90	Brown & Potter cos.
	Pennington Co., Black Hills	Hyb	149	Mellette Co.
	Stanley Co., along Cheyenne River	M	31	Gregory Co.
	Todd Co., Rosebud Sioux Tribe	M	86	Jackson Co.
1989	Butte Co., SW of Belle Fourche	M	16	Perkins Co.
	Custer Co., near Buffalo Gap	M	70	Fall River Co.
	Harding Co., south of Buffalo	M	12	Perkins Co.
	Lawrence Co., Black Hills	M	72	Meade & Perkins cos.
	Meade Co., west of Faith	M	25	Meade Co.
	Pennington Co., Black Hills	M	65	Pennington Co.
	Perkins Co., multiple sites	M	126	Meade Co.
	Union Co., SE of Alcester	Hyb	13	Turner Co.
1990	Union Co., Spink Hills north of Elk Point	E	13	Iowa
1991	Charles Mix Co., White Swan Bottoms	M	26	Charles Mix Co.
	Custer Co., Black Hills	M	140	Fall River Co.
	Fall River Co., Black Hills	M	88	Fall River Co.
	Meade Co., west of Faith	M	13	Fall River Co.
	Pennington Co., Black Hills	M	54	Pennington Co.
1992	Brookings Co., Oak Lake area	M	20	Jackson Co.
	Yankton Co., Marindahl Lake area	M	21	Jackson Co.
	Bennett Co.	M	4	Jackson Co.
	Haakon Co.	M	33	Jackson Co.
	Meade Co., Black Hills	M	162	Meade Co.
1993	Jones Co., along the Bad River	Hyb	51	Mellette Co.
	Sanborn Co., James River SE of Forestburg	E	20	Iowa
1994	Hanson Co., James River east of Mitchell	E	19	Missouri
	Spink Co., James River SE of Mellette	E	17	Missouri
	Custer Co., SE of Hermosa	Hyb	47	Jackson Co.
	Meade Co., SE of Sturgis	Hyb	31	Mellette Co.
	Pennington Co., SE of Wall	Hyb	24	Mellette Co.
	Bennett Co., south of Martin	Hyb	16	Mellette Co.
	Jones Co., Bad River area	Hyb	25	Mellette Co.
	Stanley Co., SW of Ft. Pierre	Hyb	22	Mellette Co.
1995	Hanson Co., James River east of Ethan	E	21	Missouri
	Hutchinson Co., James River (3 sites)	E	62	Missouri
	Spink Co., James River east of Mellette	E	16	Missouri
	Meade Co., Black Hills	M	115	Meade
	Lyman Co., SW of Kennebec	Hyb	53	Mellette Co.
	Jones Co., along the Bad River	Hyb	46	Mellette Co.

Year	County or region, release site if known	Subspecies[a]	No. released	Source
1996	Lincoln Co., along the Big Sioux River	Hyb	15	Union Co.
	Yankton Co.	Hyb	38	Union Co.
	Meade Co., Black Hills	Hyb	62	Mellette
	Pennington Co., Black Hills	Hyb	85	Corson Co.
	Pennington Co., Black Hills	Hyb	64	Mellette Co.
	Marshall & Roberts cos., east escarpment of coteau	E	58	Missouri
1997	Meade Co., Black Hills	M	116	Meade Co.
	Haakon Co.	M	14	Haakon Co.
	Butte Co., west of Hoover	M	11	Butte Co.
1998	Lincoln Co, Big Sioux River SE of Alcester.	Hyb	8	Union Co.
	Union Co., along the Big Sioux River	Hyb	6	Union Co.
	Butte Co., near Belle Fourche	M	32	Butte Co.
	Lawrence Co., Black Hills	M	44	Butte Co.
1999	Grant Co., east escarpment of coteau	E	99	Iowa & Kentucky
2000	Grant Co., east escarpment of coteau	E	36	Iowa
	Marshall Co., Sica Hollow area	E	5	Kentucky
	Turner Co., Turkey Creek	E	24	Iowa
	Yankton Co.; James River, Turkey and Clay creeks	E	41	Missouri & Kentucky
2001	Meade Co., Black Hills	M	96	Butte & Meade cos.
	Bennett Co., south of Martin	R	28	Jerauld Co.
	Brookings Co., Oakwood Lakes	E	23	Missouri & Kentucky
	Brown Co., Elm River	E	14	Missouri & Kentucky
2002	Brookings Co., Oakwood Lakes	E	2	Kentucky
	Brown Co., James River near Stratford	E	19	Missouri & Kentucky
	Codington Co., Long Lake Game Prod. Area	R	31	Jerauld & Roberts Co.
	Lawrence Co., Black Hills	M	101	Butte Co.
	Pennington Co., Black Hills	M	46	Meade Co.
	Jerauld Co., north of Wessington Springs	E	30	Missouri & Kentucky
2003	Moody Co., Big Sioux near Flandreau	E	34	Kentucky
	Lawrence Co., Black Hills	M	28	Butte Co.
	Meade Co., Black Hills	M	24	Butte Co.
	Pennington Co., Black Hills	M	157	Fall River Co.

[a] Subspecies designation was dependent on source or sources of original releases in or near the areas where turkeys were trapped. We attempted also to look at any information on the early success of trap and transfer operations. For example, some releases of Rio Grande turkeys were known to have failed while others spread along river corridors for some distance. In general, Merriam's releases have been much more common than releases of Rio Grande turkeys and color characteristics of most prairie populations are more similar to those of Merriam's turkeys. No work on subspecies genetics has been conducted in South Dakota so our recorded subspecies is a probable designation for birds trapped and transferred within the state.

Merriam's turkeys had pioneered from Nebraska stockings into Tripp County along the Keya Paha River and in the Pine Ridge area (F. R. Henderson, SDGFP, unpublished document). A hybrid population of Merriam's and Rio Grande turkeys from Texas (private stocking) occupied habitat along the Little White River in south-central South Dakota (F. R. Henderson, SDGFP, unpublished document).

Rio Grande and Merriam's Turkey Introductions of the 1960s and 70s

Based on recommendations from F.R. Henderson (SDGFP, unpublished document), 100 wild-trapped Rio Grande turkeys from the King Ranch in Texas were brought to South Dakota in January 1963 and released near the Bad River in northwestern Jones County, the White River in southeastern Lyman County, the Missouri River in Bon Homme and Yankton counties, and on the Waubay National Wildlife Refuge in Day County.

Along with the shipment of "new" turkeys, SDGFP continued to trap and transplant Merriam's turkeys. In 1963, 37 Merriam's were trapped on the south fork of the Grand River in Perkins County and were transferred to Mellette and Jackson counties (Fig 1-6).

In 1965, SDGFP acquired additional Rio Grande turkeys from Oklahoma in exchange for Merriam's turkeys. The Oklahoma birds were released in riparian woodlands in southern Tripp County along the Keya Paha River, Dewey County at the Little Moreau Game Production Area, and in the Pony Hills of Jerauld County near Wessington Springs. Records indicated that some turkeys from Oklahoma were also released in southern Perkins County.

C. B. Whittaker (SDGFP unpublished document) documented the status of introductions of Rio Grande turkeys in the state in 1967 based on reports from SDGFP district game managers. No Rio Grande turkeys could be found in Perkins and Yankton counties, while releases appeared to be moderately successful in Tripp and Lyman counties. In the winter of 1966–67, observations were made of about 50 Rio Grande turkeys in Bon Homme County, 100 in Jones County, and 200–250 in Dewey County. These three releases of Rio Grande turkeys resulted in established turkey populations on a 30-mile stretch of the Little Moreau River, a 30–40 mile portion of the lower Missouri River, and an "extensive" distribution along the Bad River. Whittaker reported that these releases were most successful due to woodland habitats being interspersed with cultivated cropland.

Although the status of Rio Grande releases in Day and Jerauld counties was not reported by Whittaker, the population in the Pony Hills (Jerauld County) was apparently sufficient to provide a source of Rio Grande turkeys for trap and transfer just 3 years following their introduction. In 1968, 42 Rio Grande turkeys were

Fig 1-6. Gobblers, such as this adult male in the Black Hills, are more difficult to capture with cannon nets, rocket nets, and drop nets than are hens. Fortunately, trap and transfer operations primarily need large numbers of females and few adult males. (M. Tarby)

trapped in the Pony Hills 2 miles northwest of Wessington Springs and were transferred to sites along the Big Sioux River and to western Jerauld County. Four years later (1972), 19 more Rio Grande turkeys were trapped in the Pony Hills and transferred to Sica Hollow State Park in Marshall and Roberts counties.

Also in 1972, SDGFP resumed trap and transfer of Merriam's turkeys in the state when 68 birds were captured in Gregory County. These turkeys were released at another site in Gregory County, Fort Sisseton in Marshall County, and the Gray Game Production Area in Charles Mix County.

Only one wild turkey trap and transfer was documented from 1973 through 1978, when Rio Grande turkeys were released along the White River in southwestern Lyman County in 1975.

In 1979, 49 turkeys of probable Rio Grande lineage were trapped in Lyman County and released in Dewey and Corson counties. Six Rio Grande toms from Sica Hollow State Park were freed on the Little Moreau Game Production Area along the Little Moreau River in Dewey County, and five Rio Grande hens from Sica Hollow were moved 16 miles northwest of the park in Marshall County, both releases augmenting existing Rio Grande populations.

Thus, populations of Merriam's and Rio Grande turkeys and hybrids of these two subspecies were present in South Dakota. In addition, eastern turkeys from neighboring Iowa likely moved into portions of southeastern South Dakota, particularly where the Big Sioux River forms a common border.

Because of the diversity of wild turkey subspecies in the state by 1979, capture records without subspecies or trap location could only be described as "possibly" Merriam's, Rio Grande, or a Merriam's x Rio Grande hybrid.

Trap-and-Transplant of Merriam's and Rio Grande Turkeys—1980–2004

The first 5 years of the 1980s were relatively quiet in terms of turkey transfer in South Dakota. No releases occurred in 1980. In 1981, 67 turkeys of probable Rio Grande genetics were captured in Dewey County and released on Farm Island (45) and LaFramboise (22) Island near Pierre in Hughes County. In 1982, 13 turkeys of probable Rio Grande lineage were trapped in Lyman County and transferred to western Dewey County (Fig 1-7).

In 1983, 11 Rio Grande turkeys were trapped along the Vermillion River near Parker and released along the James River in northwestern Yankton County. During the winter of 1983–84, 27 Merriam's turkeys were trapped in the Black Hills and transferred to a ranch 5 miles northwest of Trail City in Corson County. An additional 11 Merriam's turkeys from the Black Hills were released along the Moreau River southwest of Whitehorse in a cooperative effort between SDGFP and the Cheyenne River Sioux Tribe.

In just 3 years, the Whitehorse flock grew to over 60 turkeys, and by 2000 the Cheyenne River Sioux Tribe was trapping birds for transfer to tribal reservations in Montana.

Turkey trap and transfer efforts of SDGFP stepped up in 1985 when 159 Merriam's were trapped along the eastern foothills of the Black Hills. These birds were released near the Saddle Buttes in south-central Corson County, along the Big Sioux River in Lincoln County, in Union State Park in central Union County, and in eastern Custer County. In 1986, 232 Merriam's turkeys from the Black Hills were released in Corson, Meade, and Yankton counties (seven sites) and the Lower Brule Indian Reservation in Lyman County (three sites). In 1987, 160 Merriam's turkeys were trapped in the Black Hills and released in eastern Custer, Jones (six sites), and Corson counties and at the Little Moreau Game Production Area in Dewey County. Also in 1987, 26 Merriam's x Rio Grande hybrid turkeys were captured at the Richmond Lake Recreation Area near Aberdeen and released in Corson County.

By the late 1980s, the primary focus of turkey trapping efforts shifted. No longer was the main effort expended to locate source populations of wild turkeys from which birds could be transferred into suitable habitat. Now the focus was on removal of turkeys from populations that had become large enough that landowners complained about damage to stored livestock feed. From 1988 through 2004, 4,200 Merriam's and Rio Grande or Rio Grande x Merriam's hybrid turkeys were captured in or adjacent to farmsteads where landowners were con-

Fig 1-7. Wild turkeys are most vulnerable to trapping when they are traveling in groups during winter and searching for any available food sources. (CPL)

cerned about what they perceived as excessive turkey numbers. Most (56%) of these birds came from Butte, Fall River, Meade, Mellette, and Roberts counties.

Just over 1,000 captured turkeys were shipped to California, Idaho, or Utah for release. Of the remaining turkeys, almost all were released on sites that already supported wild turkey populations. Just over half (53%) of the wild turkeys captured and released in the state from 1988 through 2004 were released on public land in the Black Hills.

Turkey trapping will likely continue to play an important role in addressing turkey depredation in the future.

Eastern Turkey Restoration—1990s

By 1990, introductions of wild turkeys into suitable but unoccupied habitats shifted from Merriam's and Rio Grande subspecies to the eastern subspecies.

It was at about this time that reintroduction efforts were mostly complete in states like Iowa and Missouri; consequently, sources of the eastern subspecies became available. A trade arrangement between the Iowa Department of Natural Resources and SDGFP of turkeys for sharp-tailed grouse facilitated the first releases of eastern turkeys in South Dakota. In February 1990, four toms and nine hens were released 8 miles north of Elk Point in the Spink Hills of Union County.

Over the next couple of years, SDGFP searched for and inventoried other suitable habitat for eastern turkeys in South Dakota. One corridor of habitat with potential was along the James River, and SDGFP personnel launched a research

Fig 1-8. Eastern wild turkey hens from Iowa were fitted with necklace-type radio transmitters and leg bands by researchers before being released in northeastern South Dakota. (SDSU)

project to evaluate the survival and reproduction of turkeys released at these sites. This research helped identify the essential components of habitat that would sustain eastern turkey populations in sparsely wooded landscapes.

The first of the James River turkey introductions occurred in January 1993 when five eastern gobblers and 15 hens were acquired from Iowa and released 3 miles southeast of Forestburg in Sanborn County (Fig 1-8). All 20 turkeys were marked with radio transmitters. The following year, an arrangement with the Missouri Department of Conservation traded additional turkeys for South Dakota in exchange for ring-necked pheasants. In January and February of 1994, 15 hens and four gobblers were radiomarked and released 3 miles southeast of Mitchell and 14 hens and three gobblers were released in northern Spink County 4 miles southeast of Mellette.

The largest turkey release effort along the James River occurred in 1995 when 99 eastern turkeys from Missouri were released at five sites from January through March. New release locations along the James River in 1995 were in Hanson County east of Ethan and in Hutchinson County near Milltown and Olivet. Four hens on each of the four new release sites along the James River carried radio transmitters that would record their movements, survival, and reproduction (Leif 1997, 2001).

Wild turkey populations (predominately Rio Grande subspecies) in Marshall and Roberts counties in northeastern South Dakota plummeted from near 1,000 in the late 1980s to around 200 in 1996. It was possible that this was the result of the Rio Grande subspecies being less adaptable to this northern climate.

Fig 1-9. Eastern wild turkey female being released in late winter 1999 by SDGFP personnel in Grant County, northeastern South Dakota. Trade arrangements with Iowa, Missouri, and Kentucky provided most of the initial birds for restoration of eastern turkeys to South Dakota. (LDF; inset, G. Wolbrink)

Two sites in northeastern Marshall and western Roberts counties were selected for eastern turkey introductions. In 1996, 29 eastern turkeys were released 5 miles northwest of Veblen and 29 were released near Sica Hollow State Park. Four years later, five more eastern gobblers were released near Sica Hollow. All turkeys released in 1996 originated from Missouri, but the five gobblers released in 2000 were from Kentucky. Concurrent with eastern releases in Marshall and Roberts counties, attempts were made to remove existing Rio Grande birds by using drop nets over baited sites in winter; these attempts were only marginally successful.

In 1999, SDGFP began releasing turkeys at five sites in Grant County along the escarpment of the Prairie Coteau and the Minnesota-Red River Valley (Fig 1-9). Twenty eastern turkeys were released 2 miles east of Marvin in 1999 and another seven were released at the same location in 2000. Eighteen eastern turkeys in 1999 and another two gobblers in 2000 were released along the Yellow Bank River 5 miles south of Twin Brooks. These eastern turkeys originated from Iowa.

Also in 1999, 38 eastern turkey hens from Kentucky and six males from Iowa were introduced to two Grant County locations near Stockholm and Revillo. In 2000, six more hens and one male from Iowa were released to supplement the wild turkeys at Revillo. The final turkey release location in Grant County was 2 miles northwest of La Bolt where 18 (15 hens and three males) were released in 1999 and another 20 (16 hens and four males) in 2000. These turkeys originated from Iowa. Many of the turkeys released in Grant, Marshall, and Roberts counties were fitted with necklace-type radio transmitters (Fig 1-8) for collection of data on reproduction, survival, habitat use, and movements.

Survival and reproduction of transplanted eastern turkeys were excellent in these northeastern counties in the 2 or 3 years following releases (Lehman 1998, Lehman et al. 2001, Shields 2001, Lehman et al. 2002). Field observations indicate the eastern or eastern x Rio Grande hybrids in Grant, Marshall, and Roberts counties were still thriving as of 2005.

Eastern Turkey Releases of 2000 and Beyond

In 2000, turkey introduction efforts shifted to southeastern South Dakota. Despite previous releases of Merriam's and Rio Grande turkeys along Turkey and Clay creeks and the James River in northern Yankton County, SDGFP biologists believed that the available habitat in this area could support more turkeys than were present, suspecting that the eastern subspecies might be better adapted to these surroundings. Consequently, 41 eastern turkeys (from Missouri and Kentucky) were released at two sites in Yankton County (8 miles north of Yankton and 3 miles southwest of Irene). In addition, 24 eastern turkeys from Iowa were released 4 miles northwest of Turkey Ridge along the Turkey Creek drainage in Turner County (Fig 1-10).

Fig 1-10. Eastern wild turkeys (18 hens and 6 gobblers) from Iowa were released into the Turkey Ridge area in southeastern South Dakota in 2000 to reestablish the native subspecies. (R. Schauer, SDGFP)

In 2001, eastern introduction efforts shifted to isolated but unique woodland habitats. The first of these was in the Oakwood State Park in Brookings County, stocked with 23 eastern turkeys (22 hens from Kentucky and one gobbler from Missouri) in 2001 and two more males from Kentucky in 2002. In 2001, 12 hens from Kentucky and two males from Missouri were released 9 miles southwest of Frederick along the Elm River; three males from Kentucky were released at this site the following year. In 2002, 19 eastern turkeys (11 from Missouri and five from Kentucky) were released along the James River 4 miles north of Stratford in Brown County.

Since their introduction in 1965, Rio Grande turkeys had inhabited the hills and valleys separating the Missouri Coteau from the James River lowland near Wessington Springs. Although the constant presence of wild turkeys in livestock feedlots during winters resulted in depredation complaints, SDGFP biologists believed that the turkey populations in the Wessington Hills should be more than the 100–150 birds found there in 2001. A plan was initiated to replace the Rio Grande population that had been introduced 35 years earlier with a population of the eastern subspecies.

Beginning in March 2001, a variety of techniques including drop nets, aggressive hunting license allocation, anesthetizing with drugged corn, and shooting effectively removed approximately 95% of the Rio Grande turkeys (Wolbrink 2003). Twenty-eight of the Rio Grande hens were transferred to two sites south of Martin in Bennett County and seven more were moved to the Long Lake Game

Fig 1-11.This research biologist in the Black Hills is able to locate radio-transmittered wild turkeys throughout the year using a receiver and a hand-held antenna. Similar techniques were used in turkey research in the South Dakota prairie woodlands. (MAR)

Production Area in western Codington County (along with 21 Rio Grande turkeys trapped from Roberts County). Other birds were sent to Utah.

After removal of Rio Grande turkeys from the Wessington Hills, 20 eastern turkeys from Missouri and 10 from Kentucky were released just northwest of Wessington Springs in 2002. Data from birds with radio transmitters (Fig 1-11) and visual observations of these birds indicate that this turkey population established wintering areas in 2002–03 and 2003–04 that were independent of farmsteads. Thus, one of the primary objectives for management of wild turkeys in the Wessington Hills area was successful as of 2004.

Midway in its passage through Moody County, the Big Sioux River floodplain narrows and the uplands begin to gain definition from the flat expanses along the river in Brookings County. It was in this area that SDGFP released two last groups of eastern turkeys as of the publication of this book. Seventeen eastern turkeys from Kentucky were released on each of two sites along the Big Sioux River 2 miles northwest and 8 miles southwest of Flandreau.

Review

Attempting to identify the precise origin and subspecies of wild turkeys present in South Dakota is not a simple proposition. At best, one can only identify a likely predominant bloodline in a population, based on recorded sources of released birds. Confounded with these interpretations are three issues: (1) poorly or totally undocumented releases of turkeys, (2) releases of turkeys by private citizens or tribal wildlife agencies, and (3) inward movement (ingress) of wild turkeys from adjacent states.

With these caveats in mind, populations west of the Missouri River are predominantly the Merriam's subspecies, although a few areas probably have a strong presence of Rio Grande turkey genetics. The Merriam's turkey lineage appears strongest in the Black Hills populations, although recent trap and transfer of wild turkeys from central South Dakota prairie woodlands probably introduced some genetic lineage of Rio Grande turkeys. Turkey populations in the prairie counties adjacent to the Black Hills and in the northwestern South Dakota counties of Harding and Perkins are also likely a Merriam's-dominated bloodline, although the strength of that lineage is likely weaker than in the Black Hills, due to the influence of private stockings.

Turkey populations in most of central South Dakota are probably best described as Merriam's x Rio Grande hybrids. These would include populations along the White, Keya Paha, and Bad rivers and their tributaries and in those parts of Corson and Dewey counties that support turkey populations. These bloodlines likely vary from predominantly Merriam's to predominantly Rio Grande. Release records indicate that turkey populations in Gregory and Charles Mix counties likely carry a predominantly Merriam's bloodline.

In comparison to western South Dakota, turkey populations in eastern South Dakota include several populations arising from eastern turkey releases. Eastern turkey releases in Marshall, Roberts, and northern Grant counties were highly successful but have likely hybridized with remnant Rio Grande or Rio Grande x Merriam's hybrids in the release areas. Turkey populations in central and southern Grant County and northern Deuel County are predominantly eastern turkeys.

Southeastern South Dakota has the most diverse turkey bloodlines in the state. While populations in Moody County are predominantly eastern turkeys, based on release records, populations in Minnehaha, Lincoln, and Union counties as well as Yankton County are likely hybrids of eastern, Rio Grande, and Merriam's turkeys. Of all southeastern counties, Bon Homme County likely has the strongest presence of the Rio Grande bloodline as a result of the first documented release and establishment of Rio Grande turkeys in the state in 1963.

Wild turkey populations along and adjacent to the James River north of Yankton County were all established within the 15 years prior to the publication

Fig 1-12. Oakwood Lakes in Brookings County saw a successful release of eastern turkeys from Kentucky in January 2001. The light brown tipping on the breast identifies the bird in the foreground as a bearded female. (R. Schauer, SDGFP)

of this book. Based on the source of released birds and phenotype (appearance), these populations are nearly pure eastern subspecies, although semi-domesticated turkey flocks have somewhat polluted the gene pool in some areas. Similarly, turkey populations along Turkey Creek in Turner County, Oakwood State Park in Brookings County, and the upper James River and its tributaries in Brown and Spink counties are predominantly eastern turkeys (1-12). Despite a possible remnant Rio Grande component, the turkey population of the Pony Hills in Jerauld County is of predominantly eastern descent.

Wild turkeys in South Dakota are as genetically diverse as the state's assortment of different landforms and habitats. Both pure and hybrid populations have proven highly productive and well adapted to this variety of habitats. Considering the diversity of turkeys and the unique beauty of the various landforms and vegetative communities around South Dakota, turkey hunters with a desire to travel can fill a lifetime with new birds to hunt and scenic views to enjoy along the way.

Chapter 2

LANDSCAPES AND HABITATS

At first glance, areas of South Dakota that can support turkeys outside of the Black Hills would seem to be extremely limited. However, both residents and visitors might be surprised at the variety and beauty of landscapes that do contain wild turkeys in the state.

South Dakota is divided into eastern and western halves by the Missouri River—halves commonly referred to as East River and West River. Most of the eastern half of the state has been greatly influenced by glaciers from as recently as 10,000 to 12,000 years ago, while the western half remained unglaciated (Fenneman 1938, Westin and Malo 1978).

The state's dominant natural vegetation from east to west was tall-grass prairie on the eastern border transitioning into northern mixed-grass prairie in much of eastern and south-central South Dakota. Northern wheatgrass-needlegrass plains are still common over much of West River. The western edge, excluding montane areas with ponderosa pine, is dominated by big sagebrush-wheatgrass plains (Johnson and Larson 1999).

Tillage agriculture is most common in the eastern third to half of the state, but considerable variation in the proportions of grassland and cropland occurs over the entire state. Glacial history, along with a general decline in precipitation from the eastern to western edge of the state, has a strong influence on plant communities and soils. In general, the best soils are found in the eastern third, but even these are highly variable by area (Westin and Malo 1978).

With the exception of the Black Hills, South Dakota is a prairie-dominated landscape. Yet woodland habitats outside of the Black Hills are locally abundant in many parts of the state. We use the term "woodlands" for the less extensive patches and corridors of trees associated with prairie regions and "forests" for the extensive woodlands of the Black Hills, but some interchange of the terms is used here as it also is in the literature.

The extent and nature of woodlands in South Dakota was strongly influenced by frequent prairie fires in the past. Debate still occurs regarding the extent of woodlands prior to settlement. However, woodlands along the Missouri River and other major rivers in western South Dakota were well documented by explorers prior to 1900 (Rumble et al. 1998).

Fire protection in the recent past likely has caused woodland habitats to increase in some parts of the state. Other woodland habitats—such as the floodplain woodlands along the Missouri River—have been largely inundated by reservoirs. On the free flowing areas of the Missouri River, the shifting and evolving nature of riverside woodlands has been altered due to the lack of periodic spring flooding and the reduction in channel meandering (Johnson et al. 1976).

Planted woodlands associated with shelterbelts and farmstead windbreaks did not exist historically and are of limited value to wild turkeys unless they are found in close association with native woodlands.

Indeed, forest and woodland cover is sparse over much of South Dakota, but within specific areas the habitat is not only adequate but highly productive for wild turkeys.

Turkey habitats in South Dakota are closely linked with mountainous and butte areas that support ponderosa pine forests and with deciduous woodlands along prairie streams, rivers, and associated river breaks. Abrupt changes in glacial topography (i.e., steep slopes, ravines, draws) that are moist enough to support deciduous woodlands also provide turkey habitat. The various species of trees and shrubs found in association with these areas form the foundation of essential turkey habitat requirements. Grasslands with patches of shrubs and agricultural fields that are adjacent to forested habitats also play an important role in creating a mosaic of habitat features essential to the prosperity of wild turkey populations in South Dakota.

The Black Hills

The Black Hills includes roughly 1.2 million acres and covers an area over 100 miles in length and approximately 50 miles in width in southwestern South Dakota and the eastern edge of Wyoming. This montane area is the most heavily forested region in South Dakota and is generally dominated by ponderosa pine (Fig 2-1). Most of the Black Hills falls within the Black Hills National Forest, although portions of the Hills have interspersed private ranches and acreages.

The northern Black Hills receives more annual precipitation and has an increased coverage of quaking aspen and white spruce compared with the southern Black Hills (Fig 2-2). Forests in the southern Black Hills have a lower density of trees and shrubs because of a drier climate (Fig 2-3). Bur oaks are locally abundant at lower elevations, particularly in the northern Black Hills, and periodically provide important crops of acorns for wintering turkeys and other wildlife. Throughout the Black Hills, meadows and riparian (streamside) habitats are interspersed with the dominant coniferous forest (Fig 2-4).

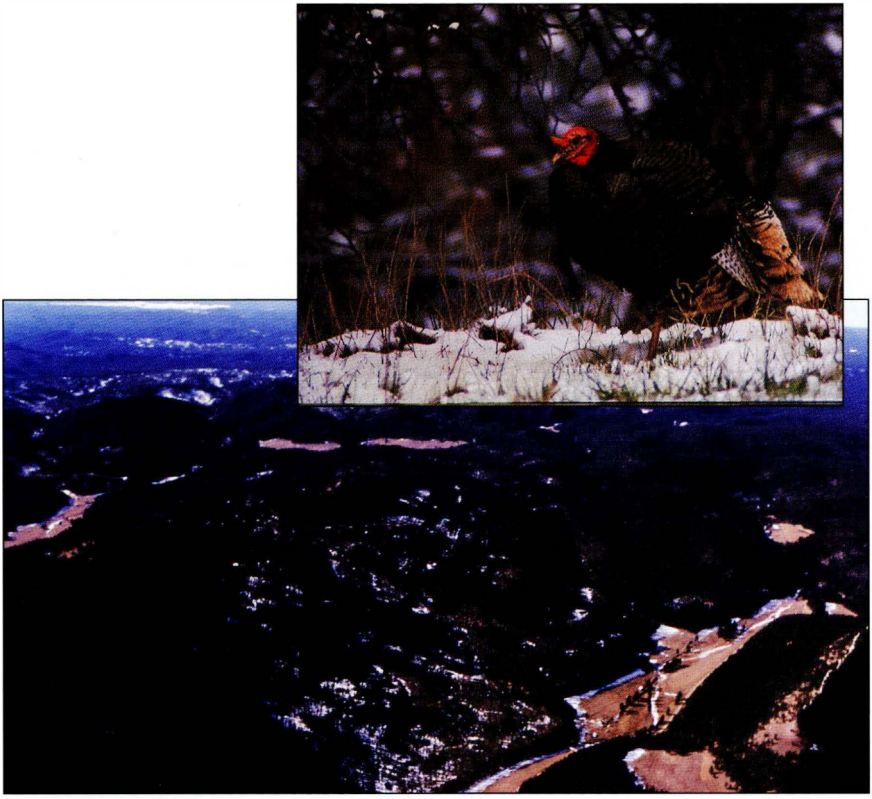


Fig 2-1. Ponderosa pine forests with intermixed meadows characterize the central Black Hills. Wild turkeys were not native to the Black Hills but were established through introduction of wild-trapped Merriam's turkeys from Colorado and New Mexico in the late 1940s and early 1950s. (MAR; inset: M. Tarby)

Fig 2-2. The northern Black Hills features a rugged topography and a more mesic (moist) environment than the southern Black Hills. Quaking aspen is more abundant in the northern Black Hills than in the central or southern Black Hills. (LDF)

Fig 2-3. The southern Black Hills features a markedly drier (more xeric) and warmer environment than the northern Black Hills. (CPL)

Fig 2-4. Meadows are abundant throughout much of the Black Hills and provide important habitat for Merriam's turkeys, especially during the brood rearing period. (MAR)

Additional uplift areas with interspersed ponderosa pine and meadow habitat are part of a sandstone Hogback forming the perimeter of most of the Black Hills (Larson and Johnson 1999). Interstate 90 from Rapid City to Spearfish is located within the Red Valley separating the Hogback from the main Black Hills (Fig 2-5). Both the main Black Hills and the perimeter Hogback provide excellent Merriam's turkey habitat.

Landscapes and habitats in the Black Hills resemble much of that in the Merriam's turkey native range in southern Colorado and portions of New Mexico and Arizona. The maximum altitude reached in the Black Hills is 7,242 feet at Harney Peak; wild turkeys occupy areas up to about 6,700 feet during the late spring, summer, and early fall months. In late fall and winter, most Merriam's turkeys in the Black Hills migrate to wintering habitat at lower elevations.

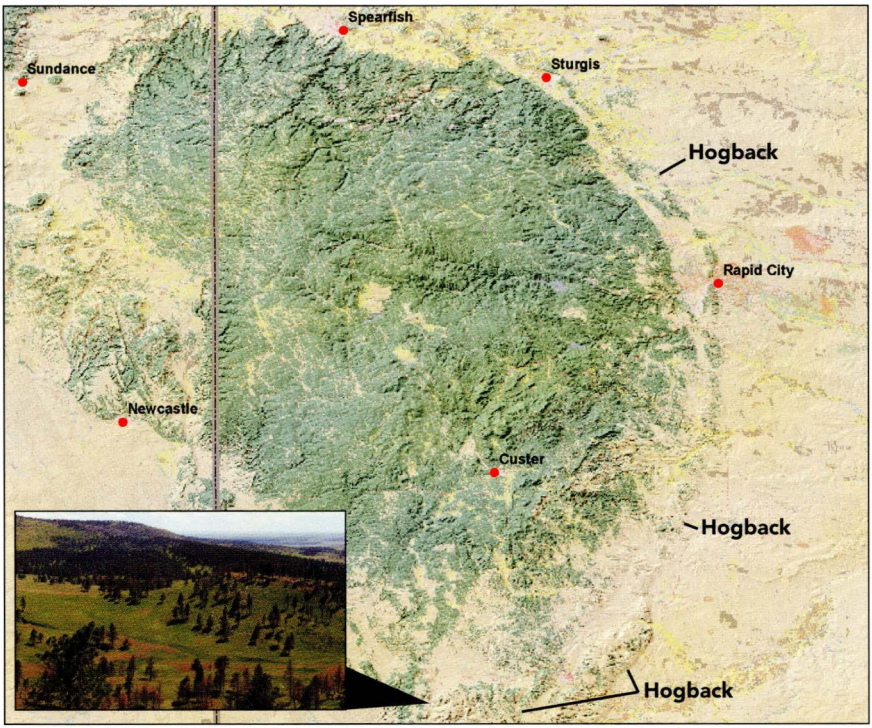


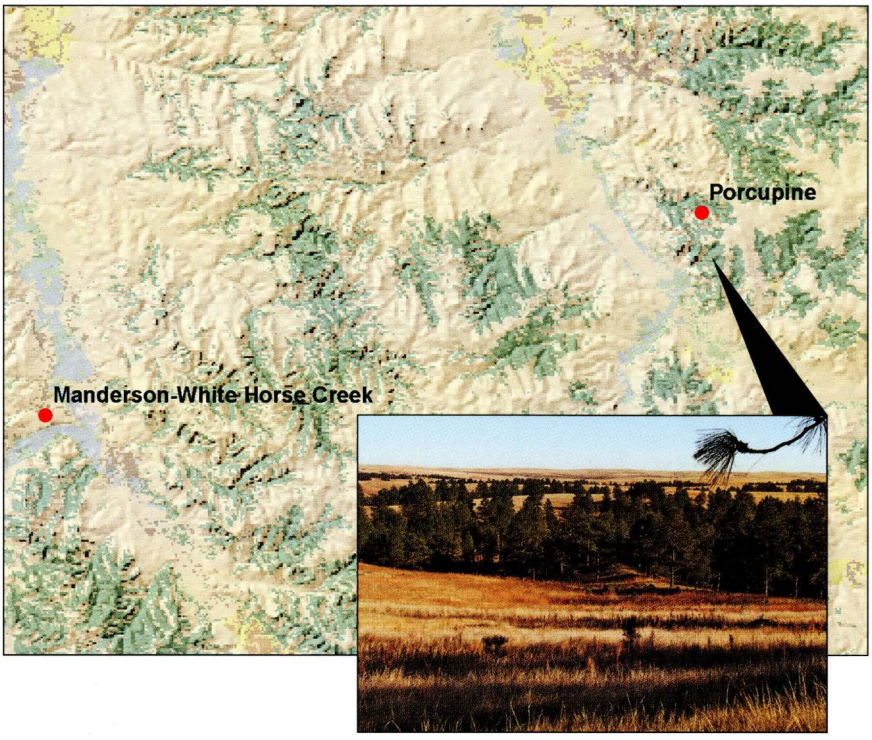
Fig 2-5. The Hogback extends around much of the periphery of the Black Hills and is characterized by a mosaic of ponderosa pine and grassland. The Hogback provides excellent Merriam's turkey habitat. (U.S. Geological Survey National Center for Earth Resources; inset, CPL)

Pine Habitats Outside of the Black Hills

In western South Dakota, islands of ponderosa pine habitat can be found on the Pine Ridge Indian Reservation east-southeast of the southern Black Hills (Fig 2-6). Ponderosa pine woodlands occupy many of the ridges, slopes, and draws in a mosaic with grasslands and shrub patches, providing excellent wild turkey habitat and picturesque scenery. The breaks of the Little White River on the Rosebud Indian Reservation also feature this type of ponderosa-grassland mosaic and provide excellent turkey habitat (Fig 2-6).

In northwest South Dakota in Harding County, the prairies are interrupted by highlands that include the North Cave Hills, South Cave Hills, East Short Pines, West Short Pines, and Slim Buttes. Steep cliffs that abruptly rise up out of the prairies are particularly characteristic of some of these areas. All of these highland areas have extensive ponderosa pine forests and are primarily within Custer National Forest (Fig 2-7).

Grass and grass-shrub communities dominate private rangelands surrounding the buttes. These buttes and highlands also support deciduous growth such as plains cottonwood near intermittent streams and green ash-chokecherry woodlands in ravines, draws, and moist slopes (Rumble et al. 1998). The buttes sup-



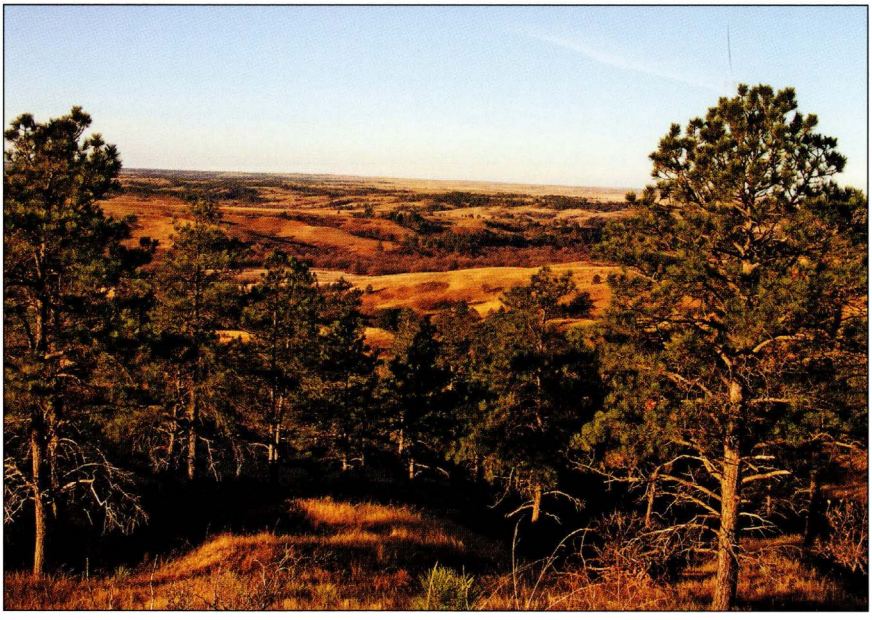


Fig 2-6. Extensions of ponderosa pine habitat supporting wild turkeys are found considerably east of the Black Hills on the Pine Ridge Sioux Reservation (above) and along the breaks of the Little White River on the Rosebud Sioux Reservation (below). Turkey hunting on tribal lands within Indian reservations is under the jurisdiction of each individual tribe. (satellite photo, U.S. Geological Survey National Center for Earth Resources; other photos, LDF)

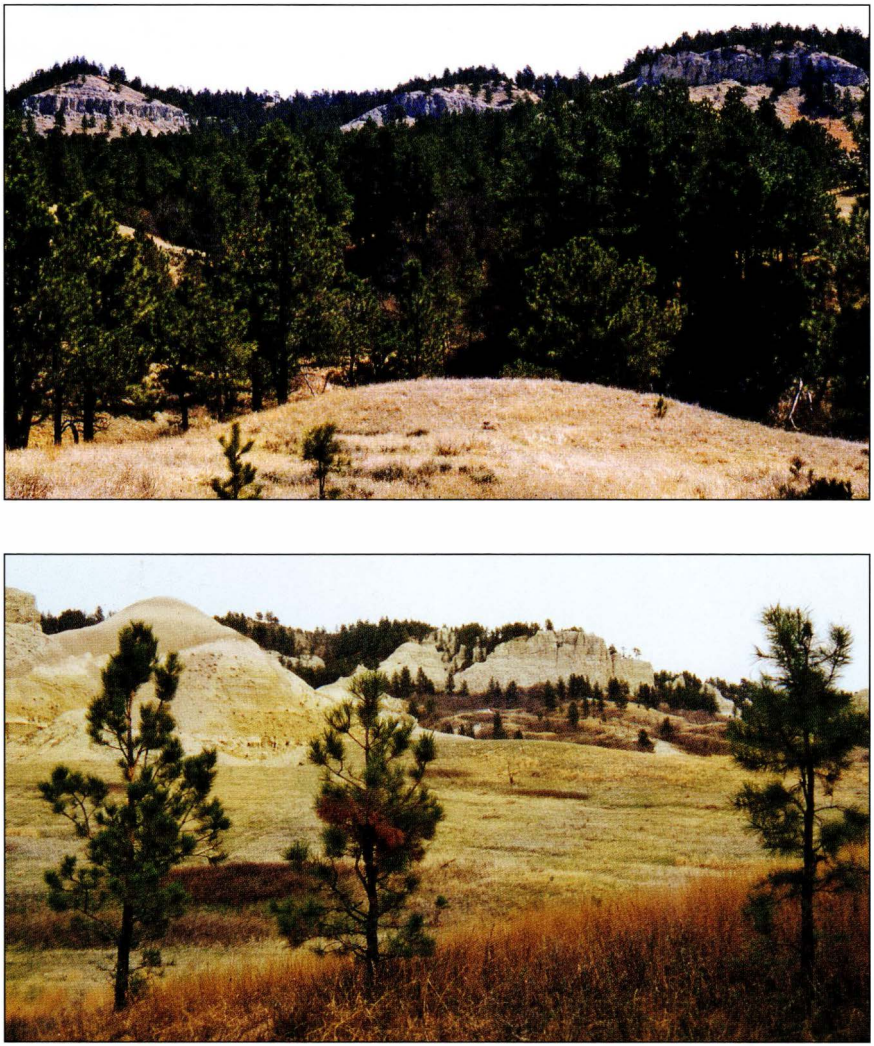


Fig 2-7. Ponderosa pine, upland plateaus, and steep cliffs are characteristic of areas such as the Slim Buttes (photos), North Cave Hills, and East Short Pines in northwestern South Dakota. Introduced Merriam's turkeys are well established in and near these islands of pine in Harding County. (LDF)

port wild turkeys throughout much of the spring, summer, and fall, although severe winter conditions will push the birds down to ranches and associated agricultural fields in search of food.

Hunting or hiking in South Dakota's butte regions such as Slim Buttes and North Cave Hills provides some of the most aesthetic outdoor experiences available. You will see the surrounding plains for many miles from numerous vantage points. It is an impressive view. But hunters and other outdoor enthusiasts using these butte areas need to know the terrain, since hiking the Hills can lead to a serious fall from an abrupt cliff—it has happened.

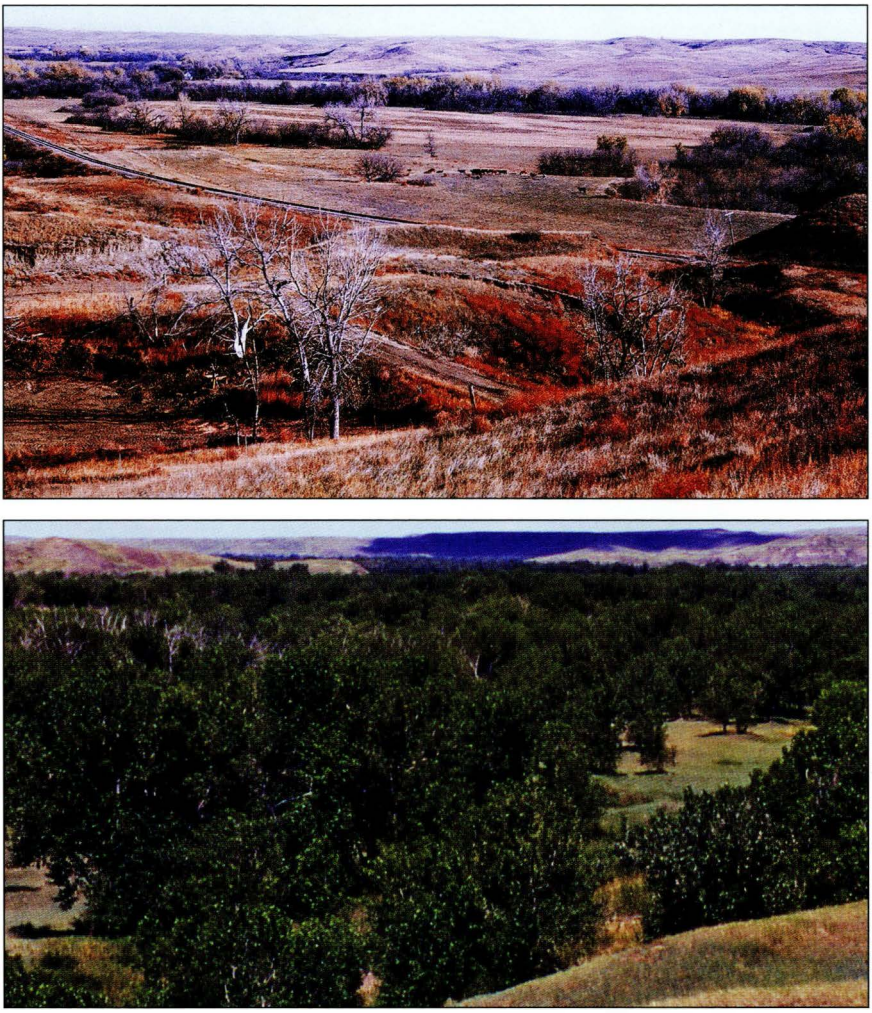


Fig 2-8. Deciduous woodlands, shrublands, and grasslands along rivers in western South Dakota, such as the Bad (top) and Cheyenne (bottom), support a surprising abundance of wild turkeys. (LDF; D. Uresk, Rocky Mountain Research Station, USFS)

Western Rivers and Their Tributaries

Along the primarily west-to-east-running river systems in the nonglaciated West River region are deep river canyons, ravines, draws, and steep slopes with a variety of turkey habitats. Plains cottonwood forests often dominate floodplains and channel banks of major rivers and tributaries. In the deeper trenches of the Cheyenne, White, and Bad rivers, many of the moist ravines, draws, and north- and east-facing slopes support deciduous communities of green ash, boxelder, chokecherry, and other tree and shrub species (Knupp-Moore and Flake 1994). Some of these wooded ravines can extend for a mile or more away from the main river bottom. Many of the drier slopes surrounding the deciduous forest support

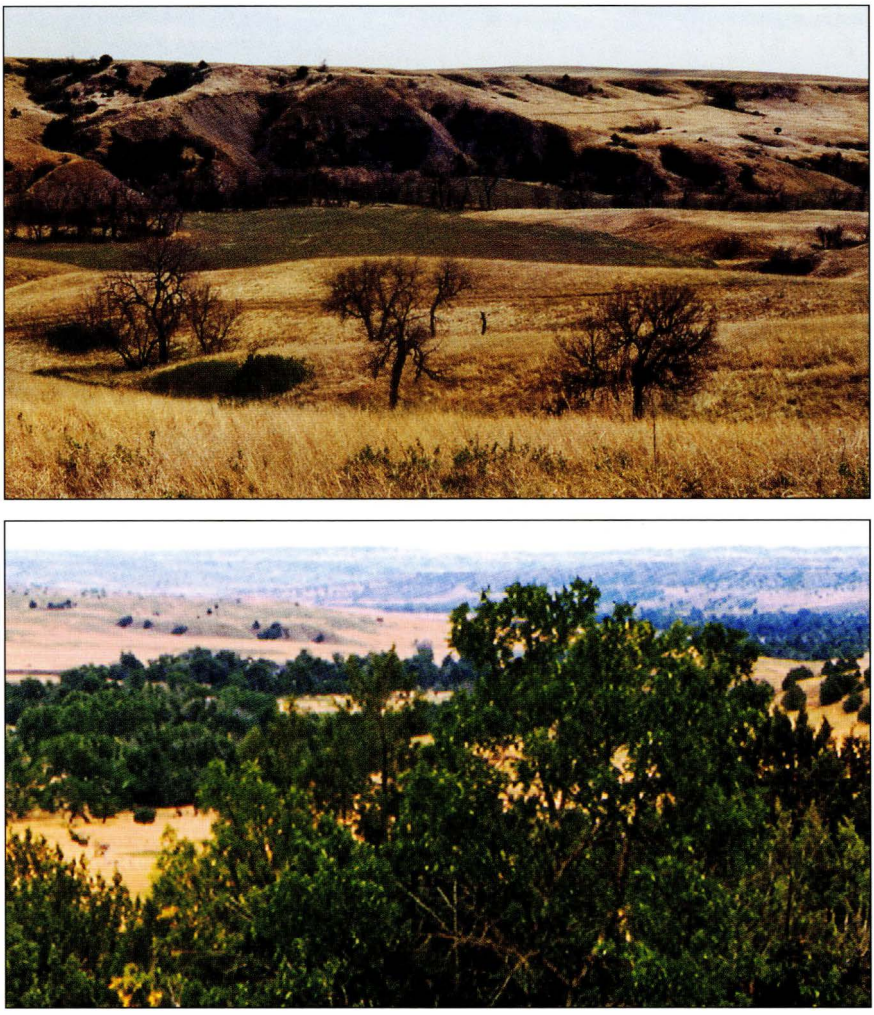


Fig 2-9. Upland draws associated with riparian habitats on small tributary streams and rivers in western South Dakota provide plentiful nesting and brood rearing habitat for wild turkeys. (LDF)

scattered juniper trees and shrub communities of snowberry, a shrub commonly used by wild turkeys for nesting cover. These deciduous habitats in the floodplains and associated uplands, along with abundant grassland edge, provide superb turkey habitat (Fig 2-8).

Unlike East River streams and rivers, only limited portions of western rivers and streams have cropland nearby. Consequently, turkeys must search elsewhere for the food necessary to survive during difficult winter conditions. This search has evolved into a pattern of establishing winter ranges in and adjacent to livestock feeding operations in western South Dakota. This pattern can and often does lead to problems of turkey depredation.

Fig 2-10. Wild turkeys, such as this group of gobblers, can be commonly observed in the woodlands associated with rivers and streams in western South Dakota. (CPL)

Fig 2-11. Much of the Missouri River floodplain in southeastern South Dakota is now inundated or, where free flowing, in cropland. Woodlands on the adjacent uplands and ravines still provide good habitat and support a thriving wild turkey population. (LDF)

For anyone familiar with the forested habitats of the eastern United States, the woodlands along the rivers, streams, ravines, and associated moist slopes of western South Dakota would seem too sparse to support many wild turkeys (Fig 2-9). Woodland cover makes up only an estimated 7.8 % of the area along these tributary streams (Knupp 1990).

Yet these riparian woodlands and adjacent upland areas support substantial turkey populations (Fig. 2-10). These birds are surviving and reproducing in extremely sparse woodland habitat and finding nesting areas in a variety of shrub patches in the floodplain and adjacent uplands. The number of wild turkeys found in the sparse woodlands along small tributary streams in western South Dakota is nothing short of impressive.

Fig 2-12. Gregory County in south-central South Dakota provides an ideal mosaic of woodlands and intermixed grasslands. This area was within the original range of eastern turkeys but currently supports a thriving population of Merriam's turkeys derived primarily from translocation from the Black Hills in the late 1950s. (LDF)

The Missouri River Valley

Much of the floodplain forest associated with the Missouri River in South Dakota is now inundated by the Lewis and Clark, Francis Case, Sharpe, and Oahe reservoirs. Floodplain forests below Lake Sharpe were within the state's historical range of eastern wild turkeys before the turkeys were extirpated (Over and Thoms 1946).

Remaining floodplain forests below Pickstown Dam and Gavins Point Dam still provide considerable habitat for wild turkeys (Fig 2-11). The river breaks along much of the Missouri in southeastern South Dakota contain extensive ravines and smaller draws. These escarpments contain a variety of woodland types including eastern redcedar (juniper) and bur oak on many slopes and, in the more moist sites, American basswood, green ash, boxelder, American elm (mostly dead or dying from dutch elm disease), and plains cottonwood (Knupp-Moore and Flake 1994). Many of the larger ravines are drained by intermittent streams that typically support large plains cottonwoods, a tree species often selected by wild turkeys for roosting.

The larger ravines associated with the Missouri River in Gregory County often extend 10 miles or more from the Missouri River. This rugged topography of ravines and steep hillsides features an array of habitats including riparian stream-side habitat, wooded hillsides, and intermixed grassland-shrub openings (Fig 2-12). Patches of smooth sumac, wild plum, and chokecherry are common.

An elk population even roams the rugged Gregory County terrain and you will see especially interesting birds such as black-headed grosbeaks and blue grosbeaks. Today this vicinity of Gregory County represents some of the best wild turkey range in South Dakota outside of the Black Hills (Fig 2-13).

Fig 2-13. Woodland cover and deep ravines in the extensive Missouri River Breaks in Gregory County protect wild turkeys from wind chill during cold periods. (LDF and MAR)

Much of the turkey habitat along the Missouri River is south of the Chamberlain area where draws and ravines support forest ecosystems of picturesque beauty. North of Chamberlain, the breaks of the Missouri become drier and less wooded and thus have a reduced capacity to support turkey populations. Yet sufficient habitat for turkeys still occurs in the river breaks where streams like Medicine Creek flow into the Missouri River on the Lower Brule Sioux Reservation. In this area, turkeys can be found in the eastern redcedars, plum thickets, and chokecherries of the upland breaks as well as the limited riparian woodlands. Farther north, few areas along the Missouri River support sufficient forested habitat for turkey populations, although some woodlands such as the cottonwood-dominated forest of LaFamboise and Farm islands near Pierre contain sufficient habitat to support turkeys.

Eastern Glacial Escarpments

Two major highland areas in eastern South Dakota rise hundreds of feet above the adjacent lowland regions. These glaciated landforms are the Prairie Coteau in northeastern South Dakota and the Missouri Coteau in east-central South Dakota (Johnson et al. 1995). The eastern edge of the Prairie Coteau provides an impressive overlook of the adjacent Minnesota-Red River Lowlands. The escarpments

Fig 2-14. The Prairie Coteau breaks off into extensive patches of deciduous forest along the ravines and slopes on its eastern edge. Eastern turkeys were released in several areas along this escarpment in 1999 and are doing well. (CPL; inset: Eastern turkey poults, USDA Forest Service, Northeastern Research Station, Amherst, Mass.)

along portions of the eastern flanks of these coteaus provide the moist microclimatic conditions and fire protection necessary for woodland habitat.

Where the Prairie Coteau drops off to the Minnesota-Red River Lowlands in Marshall, Roberts, Grant, and Deuel counties, the topography is characterized by a series of large ravines with sometimes steep slopes. Some of these large ravines (often called "coulees") may extend for over a mile. These ravines and their cooler and more moist east and north exposures support diverse deciduous woodlands while the adjacent, somewhat drier slopes support intermixed grassland-shrub communities along with some woodland habitat (Fig 2-14). The deciduous woodlands of these ravines contain a rich diversity of tree species including bur oak, American basswood, plains cottonwood, boxelder, quaking aspen, and sugar maple (Knupp-Moore and Flake 1994) (Fig 2-15). These woodlands along with the intermixed pastureland and cropland provide excellent turkey habitat.

At the base of this steep topography, several small streams meander out into the adjacent lowlands; their narrow riparian woodlands are seasonally important to wild turkeys. These habitats in combination with agricultural fields or livestock feeding operations are especially important during more severe winters in northeastern South Dakota when turkeys must descend from snow-laden forests to survive.

Fig 2-15. Wild turkeys seek out harvested agricultural fields and cattle feeding sites at the base of forested ravines during harsh winters where the Prairie Coteau drops off to the Minnesota-Red River lowlands in northeastern South Dakota. (CPL)

The Missouri Coteau also features wooded ravines on some of the eastern moist slopes where the Missouri Coteau falls off into the James River Lowland; these woodland landscapes are less extensive than those on the escarpments of the Prairie Coteau. The most pronounced of these forests are found near Wessington Springs (locally known as the Pony Hills) in central Jerauld County (Fig 2-16). Combinations of deciduous woodlands, shrubs, and pasture in the Pony Hills region form a core base of turkey habitat that is complemented by crop fields on adjacent lowlands.

The beautiful forested Coteau slopes overlooking the adjacent lowland plains provide some of the most interesting topography in South Dakota.

Eastern Rivers and Their Tributaries

The lower reaches of the James, Vermillion, and Big Sioux rivers were likely within the ancestral range of the eastern wild turkey. Steep topography associated with ravines, draws, and river trenches still supports deciduous woodlands, particularly on cooler east- or north-facing slopes.

The woodland habitat along the lower Big Sioux includes a diversity of tree species in the floodplain and in the upland breaks (Fig 2-17). Species such as plains cottonwood, green ash, boxelder, American elm (mostly dead or dying from Dutch elm disease), silver maple, peachleaf willow, and hackberry are found on the Big Sioux River floodplain (Knupp-Moore and Flake 1994). Bur oak, American basswood, black walnut, and many of the species found within the floodplain can also be found on upland slopes and draws.

Fig 2-16. In east-central South Dakota, the Pony Hills near Wessington Springs provided promising sites for release of eastern turkeys in 2002. Observation of numerous broods and adults in the few years following release indicate the birds are doing well. (G. Wolbrink, SDGFP)

Fig 2-17. Eastern turkeys have been successfully reintroduced along sections of the lower Big Sioux River near Canton and Newton Hills State Park. Eastern turkeys have also likely moved in from Iowa where the Big Sioux forms the border between the two states. (T. Petry, SDGFP)

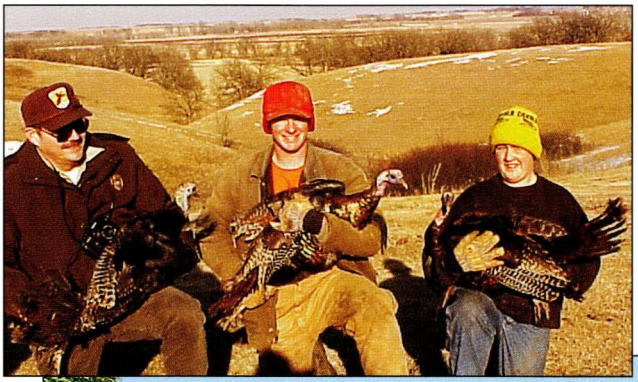
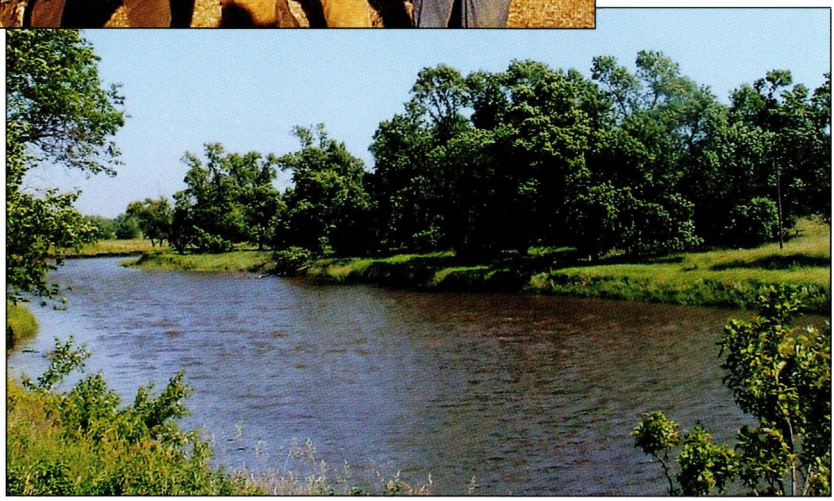


Fig 2-18. Eastern turkeys were released at two sites on the middle Big Sioux in 2003. (R. Schauer, SDGFP) The middle portion of the Big Sioux River near Flandreau features a shallower trench and lower diversity of tree species than the lower Big Sioux. (W. Jackson)



Some of the most extensive and diverse deciduous woodlands in eastern South Dakota occur in areas along the Big Sioux south of Sioux Falls in or near Newton Hills State Park. From Sioux Falls north into Moody County, the Big Sioux generally supports a narrow band of deciduous woodland along much of its length (Fig 2-18). The adjacent river breaks are not nearly as steep or rugged as reaches south of Sioux Falls and do not contain as much woodland habitat. Yet this vicinity still contains more than sufficient resources necessary to support wild turkeys.

The James River traverses approximately 450 miles of South Dakota prairie from where it enters the state from North Dakota to its confluence with the Missouri River near Yankton. Green ash, boxelder, plains cottonwood, and American elm (mostly dead or dying) dominate the floodplain woodlands (Knupp-Moore and Flake 1994). North of Highway 212 near Redfield, many parts of the floodplain contain extensive well-developed woodland habitat. However, the river breaks and tributaries on these reaches of the James River harbor little woody vegetation.

Fig 2-19. The James River near Mitchell (above) and south of Mitchell (below) provides woody habitat along portions of the floodplain, wooded upland draws, pastureland, and nearby crop fields. Eastern turkey releases on the James River began in 1993 and populations have expanded. (APL)

The area of the James River north of Redfield appears capable of supporting wild turkeys, but populations would be susceptible to periodic loss of use of the forest corridor during years when above-average precipitation causes intermittent flooding. We lack information to determine if wild turkeys would adapt to flooding of riparian forests north of Redfield by temporarily switching to upland shelterbelts.

Sufficient turkey habitat is also found on portions of one major tributary of the James River in northern South Dakota, the Elm River in Brown County.

The James River cuts a deeper trench in the South Dakota prairie as it moves south through the state. From the Forestburg area south, the floodplain woodlands along with pastures and agricultural fields provide the necessary resources to support turkeys (Fig 2-19). The breaks and tributaries of the James River

Fig 2-20. This area along Turkey Creek in Turner County has a surprising amount of bottomland hardwood forest to help support a rapidly expanding population of eastern turkeys. Adjacent ravines and slopes support bur oak woodlands that also provide important habitat and winter food. (R. Schauer, SDGFP; inset, MAR)

become increasingly conducive to the development of woodland habitat along its southern portions. Consequently, turkey habitat conditions improve. As in western South Dakota, the pastures on and adjacent to the James River breaks contain patches of snowberry that are important for nesting.

Turkey habitat associated with the Vermillion River is restricted to its extreme southern reaches in the state. However, the upper reaches of two Vermillion River tributaries, Clay and Turkey creeks, contain some of the most extensive woodland habitat east of the Missouri River. In Clay County, the channelized Clay Creek offers little turkey habitat, but Clay and Turkey creeks cut deep winding trenches in northeastern Yankton County and on into Turner County. Riparian woodlands along these creeks and bur oak in the upland draws provide ample woody cover to support wild turkeys (Fig 2-20).

Other Habitats

In addition to the major waterways in eastern South Dakota, small tracts of woodland habitat exist near many lakes and some streams. Most of these isolated woodlands are too small to support turkey populations. However, on occasion, viable turkey populations can be found. Two prime examples are around the Oakwood Lakes in Brookings County and Big Stone Lake in Roberts County. Although lakeside forests will never support the numbers of turkeys found in many of the other more extensive turkey habitats of South Dakota, their ability to

maintain locally abundant populations provides an excellent recreational opportunity close to some of the larger population centers of the state.

The final form of woodland habitat in South Dakota is found on prairie sites planted to trees, often referred to as shelterbelts. Shelterbelts alone provide minimal turkey habitat. Yet research in the state has shown that wild turkeys often utilize shelterbelts if they are located within a mile of naturally occurring woodlands.

A beneficial aspect of shelterbelts is that they are usually located near crop fields. Foraging turkeys frequently use complexes of shelterbelts and cropland, especially during winter months. These complexes can seasonally fulfill an important turkey habitat requirement as long as nearby tracts of naturally occurring woodlands are available.

Review

The most favorable habitats for wild turkeys in South Dakota are closely linked with two landscapes. One is mountainous or other highland areas that support ponderosa pine forests. The other is deciduous woodlands associated with prairie streams, rivers, river breaks, and glacial escarpments with steep slopes, ravines, and draws.

The Black Hills in southwestern South Dakota, a landscape dominated by ponderosa pine forests, is the state's most extensive area of wild turkey habitat, and most of it is public land. Buttes and other highland areas outside of the Black Hills in northwestern and southwestern South Dakota feature picturesque ponderosa pine-grassland mosaics that have proven to be excellent wild turkey habitat.

Much of the Missouri River floodplain is now inundated by reservoirs, but woodlands associated with free flowing portions of the river along with moist slopes, ravines, and draws in the adjacent breaks still provide considerable habitat for wild turkeys within the eastern turkey's original range in southeastern South Dakota.

Deciduous woodlands along tributaries of the Missouri River and river break topography provide considerable wild turkey habitat in West River and, to a lesser extent, East River South Dakota. Wild turkeys are also doing well in woodlands found on moist topography associated with glacial escarpments in east-central and northeastern South Dakota.

South Dakota features a variety of scenic landscapes with adequate forest or woodland habitats to support surprisingly robust populations of wild turkeys in many areas of the state.

Chapter 3

PHYSICAL CHARACTERISTICS

Wild turkeys could hardly be mistaken for most domesticated turkeys. If you know some of their unique physical traits and their functions, your sightings of these magnificent wild birds will be even more enjoyable.

Wild turkeys possess several characteristics that are integral to their survival. One is their ability to take sudden but powerful flight when necessary.

Most of their flight power is in two major breast muscles, one lifting the wing (supracoracoideus) through a pulley system in the shoulder (pectoral girdle) and one pulling it down (pectoralis major) in the power stroke. Their wings will sustain them for flight distances of at least one mile but this usually involves considerable gliding. If repeatedly flushed in quick succession, wild turkeys can tire to the point of total exhaustion. Domestic white turkeys are usually incapable of flight; however, game-farm turkeys with dark coloration often can fly.

Wild turkeys have long and powerful legs and they are swift runners, generally preferring to escape danger by running instead of flight. Their slender, streamlined bodies are an asset when running or flying and are in stark contrast to the short legged, robust, and earth-bound bodies of most domestic strain turkeys (Fig 3-1). Even a wild turkey's head is more streamlined than that of a domestic turkey (Mosby and Handley 1943).

Some physical characteristics, including feather shape and color, are important in estimating age or determining the sex of wild turkeys. Our information on weights of wild turkeys may give you a better idea of expected weights than those you have heard in hunting stories.

Feather Types

Wild turkeys, like other birds, are covered with several types of feathers. Natal down is the fluffy plumage covering the turkey at hatch. On a juvenile or older turkey, the feathers you see are contour feathers that range from smaller feathers on the breast, back, and other parts of the body to large wing and tail feathers. Contour feathers have a central shaft with numerous interlocking barbs branching off to the side. They can have considerable strength and yet flexibility as in large flight feathers, or they may be quite soft and more insulative as in a breast feather (Fig 3-2).

Fig 3-1. An adult female turkey on the run illustrates the streamlined appearance of wild turkeys. (CPL)

Beneath the small contour feathers on the body are softer insulative feathers such as the longer shafted semiplumes or the shorter adult down feathers—these lack interlocking mechanisms and both are "downy" or "fluffy" in appearance. Most body contour feathers also have much downy- or fluffy-type featheration (barbs) on portions of the feather shaft closer to the body surface. With the insulative advantage of these feathers it is little wonder turkeys are so winter hardy.

The contour feathers most important to flight include the primaries on the outer portion of the wing (similar to the area beyond your wrist) and secondaries on the middle portion of the wing (similar to your forearm) (Fig 3-3). The smaller wing feathers overlapping the flight feathers in multiple rows are the primary and secondary coverts. The largest upper surface coverts over the secondaries are the greater secondary coverts. The outermost two primaries, numbered 9 and 10, and the greater secondary coverts are important in age determination, as explained later in this chapter.

If you look closely, you will see small hair-like bristle feathers on the bare areas of the head and neck. The beard is similar to feathers in its origin but obviously is quite different in appearance and, unlike feathers, grows continuously throughout the turkey's life.

Plumages and Molts

This description of plumages and molts is taken primarily from extensive research in Florida (Williams and Austin 1988) and to a lesser extent from early research in Wisconsin (Leopold 1943). Molts and plumages of wild turkeys in

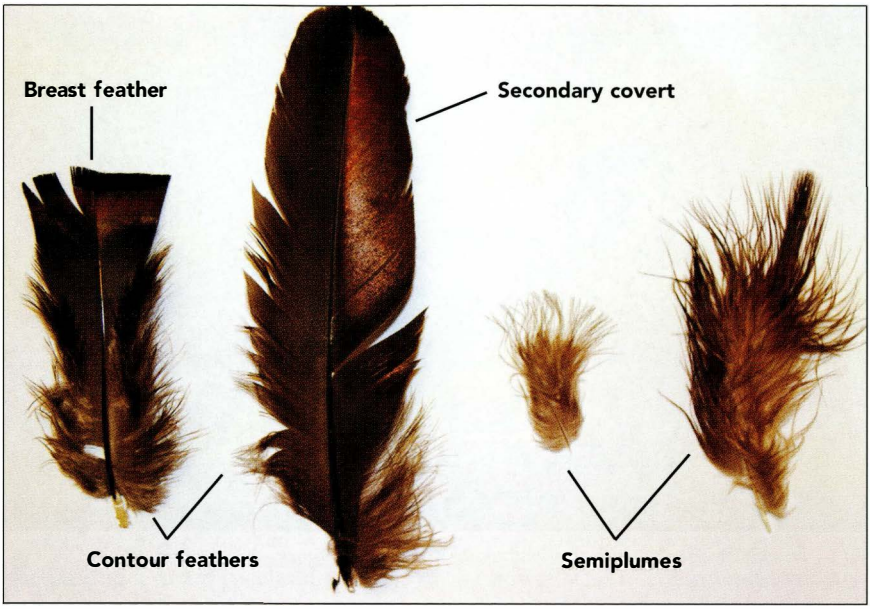


Fig 3-2. Surface feathers from the breast and wing (secondary covert) are examples of contour feathers while semiplumes provide additional insulation under the contour feathers for much of the body. (K.C. Jensen, SDSU)

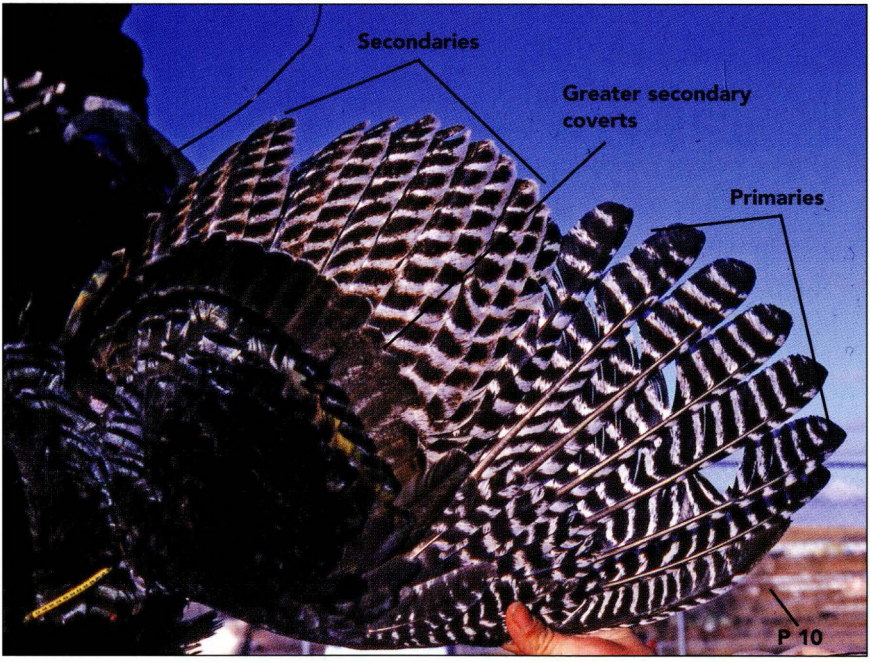


Fig 3-3. The outer 10 flight feathers on this turkey wing are the primaries while those flight feathers closer to the body are secondaries. P 10 refers to the 10th primary feather. Note the radio transmitter and harness on the left. (MAR)

South Dakota should be similar although there are probably some differences in timing related to geographic regions and possibly subspecies.

Molting in wild turkeys and other birds is complex and can be a confusing topic—only the basics are given here.

A young turkey goes through three molts and is in its fourth plumage by its first winter of life (Table 3-1). Each molt and plumage, particularly after losing the natal down of a newly hatched poult, occurs gradually, so that molts and plumage replacement are in progress most of the time.

Molts are termed complete if they involve all of the feathers on the body or incomplete or partial if some feather regions are not involved. After the fourth plumage in young turkeys, the sequence becomes much simpler with only one plumage and molt occurring each year.

Primary molt in young or adult wild turkeys is gradual; they can still fly while replacing the flight feathers. Of the 10 primary feathers numbered from inside out (see Fig. 3-3), the molt in juveniles proceeds from primary 1, beginning in about the 6th week post hatch, to primary 8 in about the 19th week. Juvenile females complete the primary molt about a week ahead of the males (Williams and Austin 1988). At South Dakota's latitude, the 9th and 10th juvenal primaries (P 9 and P 10) are seldom if ever replaced until the annual prebasic molt at about one and a half years of age (see age determination in this chapter). In Florida, most wild turkeys retained only the 10th juvenal primary and some retained no juvenal primaries by the time they reached full alternate plumage in early December, 29-32 weeks after hatching (Williams and Austin 1988). The sequence of primary molt can be used to estimate age to the nearest week in young turkeys.

Juvenal tail feathers, also called rectrices, are completely replaced by postjuvenal rectrices by about the 14th week after hatching, but another replacement of the central three or four pairs begins almost immediately in the prealternate molt (Williams and Austin 1988). Replacement of the central rectrices in the prealternate molt with new rectrices leads to the diagnostic elongated middle rectrices in juvenile turkeys of both sexes and is evident by the start of winter (Fig 3-4). The primary and secondary flight feathers are not replaced in the prealternate molt.

The single annual basic plumage and prebasic molt in yearling and adult turkeys may take 4 to 5 months to complete. Yearling males that are not involved in breeding are the first to begin prebasic molt in late winter or early spring. Nesting females delay prebasic molt until after their last nesting attempt but progress in molt faster than the males (Williams and Austin 1988).

Table 3-1. Sequence of molts and plumages in wild turkeys. Adapted from Williams and Austin (1988).

Plumage	Plumage timing and characteristics	Lost by	Completeness of molt
Natal plumage	Characteristic of poults at hatch. Already being replaced at hatch as evidenced by the first emerging primaries. Some natal down remains until about 75 days but it is most evident the first few weeks of life.	Postnatal molt	Complete
Juvenal plumage	The drab feathers replacing the natal down, including body feathers, rectrices (large tail feathers), and primaries, represent juvenal plumage.	Postjuvenal molt	Nearly complete
Postjuvenal plumage (1st basic)	Plumage replacing most juvenal body plumage by mid fall. First evident in replacement of juvenal rectrices in post juvenal molt starting from center out after about 4 weeks of age and in replacement of most juvenal flight feathers starting at about 6 weeks of age. The two outer juvenal primaries are retained in this plumage at South Dakota's latitude.	Prealternate molt	Partial
1st Alternate or first winter plumage	First alternate plumage replaces most of the postjuvenal body feathers and the central 3 to 4 pairs of postjuvenal rectrices. These new rectrices are longer than the surrounding post juvenal rectrices as can be observed in strutting jakes. Plumage is similar to adult basic plumage but, in males, breast feathers not as lustrous as in adult.	1st prebasic molt	Complete
Basic plumage	Year round plumage characteristic after 1 year of age. Plumage is replaced once per year over a period of several months and starts in early spring for nonbreeding males. Nesting females delay most feather replacement until after incubation.	Annual prebasic molt	Complete

External Differences Between Gobblers and Hens

Perhaps the most striking feature you'd expect to identify a male turkey would be his beard. However, a bearded female is not uncommon in South Dakota turkey populations, even if her beard is generally rather short and thin. In the southern Black Hills, 19% of adult hens had beards, according to recent trapping records (C.P. Lehman, South Dakota State University, unpublished data) (Fig 3-5).

The black tips and iridescence on the feathers of the breast, belly, sides, and upper back are good characteristics for identifying males. These feathers give the male a blackish body appearance compared to the female. Contour feathers on the breast, belly, and sides of female Merriam's turkeys have pinkish white to buff tips, while these feathers are generally tipped with buff to cinnamon on Rio Grande females and brown to reddish brown on eastern females (Fig 3-6).

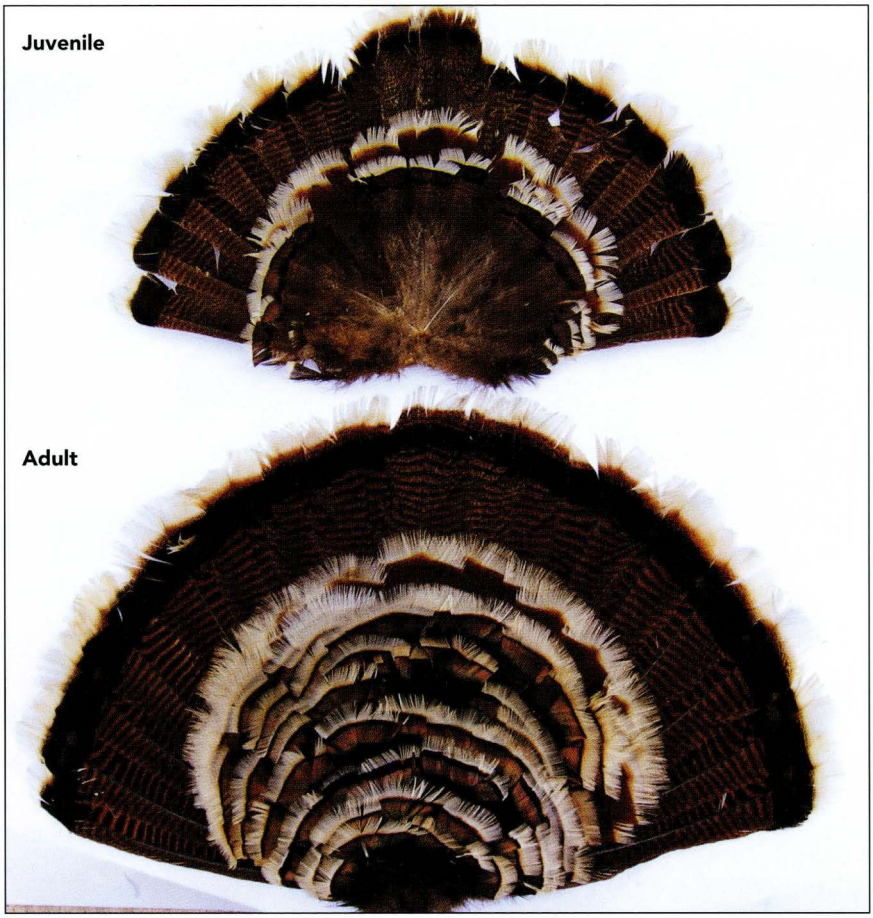


Fig 3-4. The central rectrices are lost in the prealternate molt and replaced by first winter (first alternate) plumage, leading to the diagnostic elongated middle rectrices in juvenile turkeys by the start of winter. (CPL)

Considerable color variation can occur in the tips of these body feathers in females or in the tips of rump and tail feathers in both sexes in all subspecies in South Dakota. Whether this color variation is due to natural variation, hybridization between subspecies, or hybridization with dark domestic or game farm turkeys is difficult to determine.

The male turkey's nearly bare head and neck can be distinguished from the more feathered head and neck of a female at a distance, although hens also have much bare skin in the head area. When the male becomes sexually excited during strutting and gobbling, blood rushes to the head, causing color changes and giving beautiful hues of red, white, and even a little blue. Along with these striking head colors, the male's strutting, tail fanning, gobbling, and drumming can't be missed. Female wild turkeys occasionally will strut and fan the tail (Schleidt 1970, Lehman 2002).

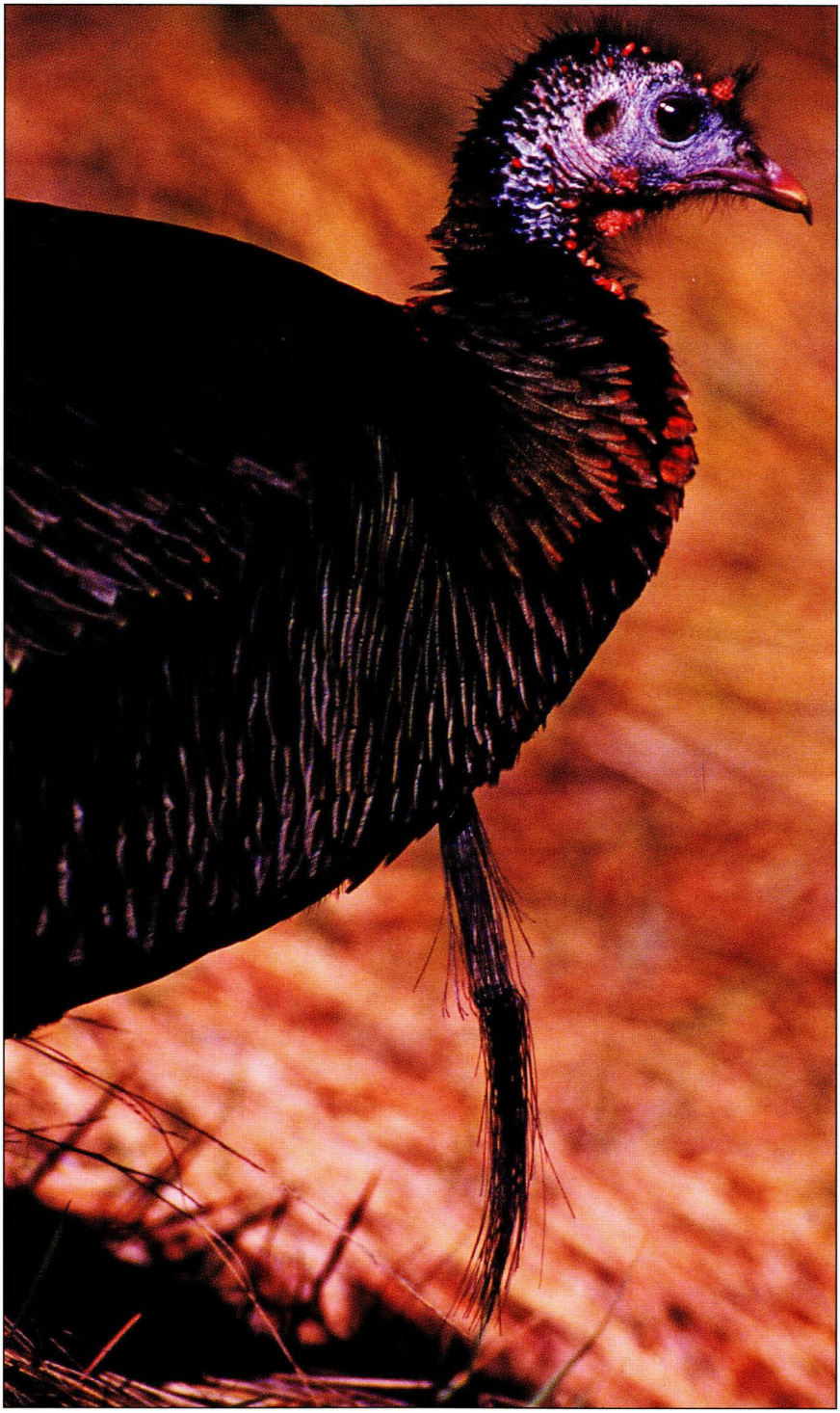


Fig 3-5. In a southern Black Hills study, nearly 19% of adult female turkeys had beards. (M Tarby)

Fig 3-6. Unlike males, the contour feathers on the breast, belly, and sides of female Merriam's turkeys are tipped with pinkish white to buff. (M. Tarby)

Gobblers have small and large bumps on the head and neck called caruncles, a fold of skin stretching from below the bill down the front of the upper neck called a dewlap, and a fleshy elongated structure, the snood or leader, projecting from the forehead and hanging over the bill (Pelham and Dickson 1992). The extension of the snood as it engorges with blood in the strutting male is particularly noticeable (Fig 3-7). Females also have small caruncles and a small snood on the head, while bare portions of their necks and heads have a bluish-grey skin color.

Turkey signs such as fecal droppings also indicate sex (Bailey 1956). Fecal droppings of males are generally more L or J shaped and are straighter, longer, and larger in diameter than those of hens. Female droppings are usually smaller and more curled into a lump (Fig 3-8). Using fecal droppings to identify sex of turkeys is more accurate with adult birds (Williams and Austin 1988).

Track size from the tip of the middle toe to the back of the heel pad can also be used to determine sex—in Merriam's turkeys a distance equal to or greater than 4.1 inches is almost always that of a male (Rumble et al. 1996).

Fig 3-7. The change in coloration of the skin on the head and neck and expansion of the snood (also called the leader or dewbill) are evident between this male in a nonexcited state and a sexually excited state. (M. Tarby)

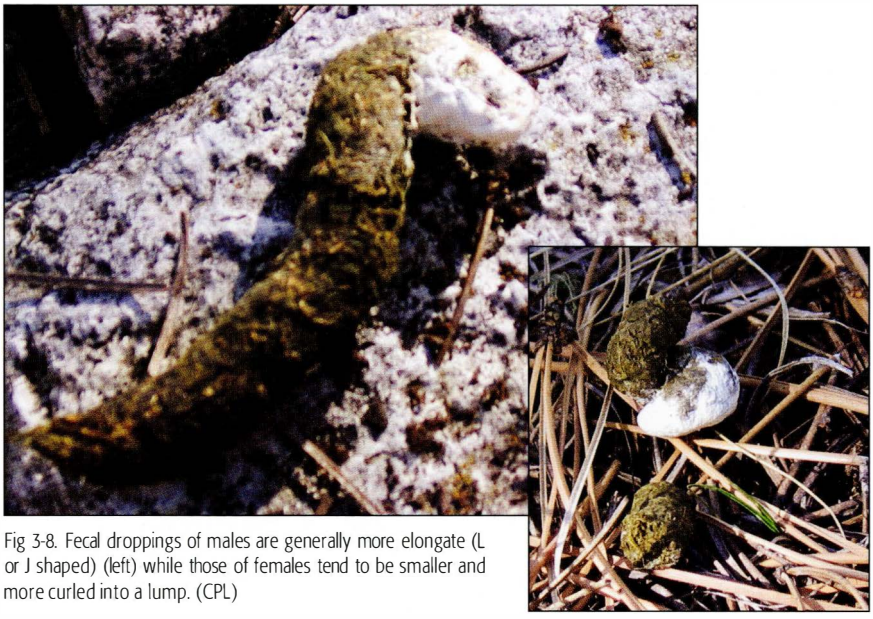


Fig 3-8. Fecal droppings of males are generally more elongate (L or J shaped) (left) while those of females tend to be smaller and more curled into a lump. (CPL)

Age Terminology

Terminology for the standard age groupings in wild turkeys can sometimes be confusing and varies among publications. Here are our terms.

Poults: Turkeys from hatch up to 12 weeks of age. At 12 weeks poults have attained their juvenal plumage.

Juveniles: From 12 weeks up to the next nesting season for hens. For males, commonly from 12 weeks post hatching until January of the second winter of life. (The term juvenal is used for a plumage stage and should not be confused with juvenile, an age category.)

Yearlings: Usually used in reference to hens and includes the period from the start of their first nesting season until the beginning of their second breeding season. Males can also be referred to as yearlings from 1 year of age until the following spring, but the term is not as commonly used.

Jakes: Young males from the period their beards become visible during the first winter until the start of their second winter. The term overlaps with juvenile.

Adults: From the start of their second breeding season on.

Age Determination

A jake generally has a visible beard of 1–5 inches, with the length varying in relation to nutrition, genetics, and possibly hatch date. There is considerable overlap between beard length in 2- and 3-year-old gobblers (Kelly 1975). We do not recommend using beard length to reliably separate ages of gobblers beyond the jake vs. adult status (Fig 3-9).

Fig 3-9. Beard length can easily be used to separate 1- year old males (jakes) from older males, but beard lengths in 2- and 3-year-old or older gobblers may overlap and cannot be reliably separated. Still, unusually long beards are probably from older adults. (CPL)

The beard grows continuously and is not molted, but it does wear off at the tip from dragging against vegetation or the ground (Pelham and Dickson 1992). Gobblers may also grow multiple beards and sometimes have beards broken off by ice in more northern regions.

Jakes can sometimes be recognized by their higher pitched and more poorly developed gobbles, but this method is not reliable. Perhaps the most accurate method of identifying jakes at a distance in the spring is to observe the fanned tail during strutting. The contrast between shorter postjuvenal tail feathers (rectrices) on the outside and the middle three or four pairs of longer first-winter rectrices is normally visible (see Fig 3-4). When jakes are in the presence of an older dominant adult, they often will not strut.

Other characteristics, such as the short spur in a jake, can be used with the bird in hand to tell jakes from birds nearing or passing their second year. Identification of 2-, 3-, and 4-year-olds based on spur length is more difficult, but length does provide an indication of increasing age (Fig 3-10). Spur length can be broken into age classes of 1, 2, 3, and greater than 3 years based on length (Backs and Weaver 2001). In Missouri during the spring, eastern jakes had aver-

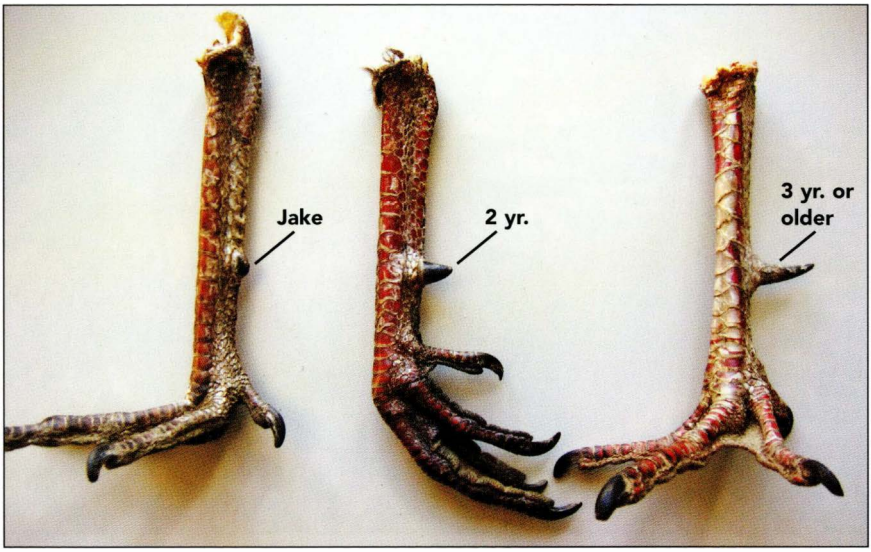


Fig 3-10. Studies indicate that spur length can be used to separate gobblers into ages of 1, 2, and 3 years or older. (CPL)

age spur lengths of 1/4 inch, 2-year olds averaged 7/8 inch, and gobblers 3 or more years old averaged 1 1/8 inches (Kelly 1975). Because of variation in spur length, a few gobblers with intermediate-length spurs might be difficult to separate as 2-year-olds or older.

In both males and females the configuration of the greater secondary coverts can be used to estimate age in male and female wild turkeys until the first summer after hatch (Fig 3-11). Another characteristic used to separate juvenile or yearling birds from adults is the shape of the outer two primaries (Fig 3-12). These 9th and 10th primaries are more rounded and wider in adult than juvenile or yearling turkeys. During breeding season, the wear on the tip of the outer primaries from dragging the wings while strutting obliterates the pointed tip but the width of the primary is still evident.

The outer two primaries on yearlings in South Dakota retain their narrow shape into the second fall after hatch (1.5 years) at which time they are replaced. The 9th and 10th primaries on wild turkeys in South Dakota nearing 1.5 years are still from juvenal plumage origin but are faded in color compared to those of juvenile turkeys in their first fall or winter. In addition to shape, the 9th and 10th primaries of wild turkeys younger than about 1.5 years lack the distinctive white barring near the tip found on adults (Petrides 1942).

Turkeys also change from a darker leg color to pinker or reddish color after the first year of age.

Fig 3-11. The greater secondary coverts on both male and female adult turkeys (above) are longer, wider, brighter colored, and more evenly lined up at the tips than those in juvenile turkeys. (MAR)

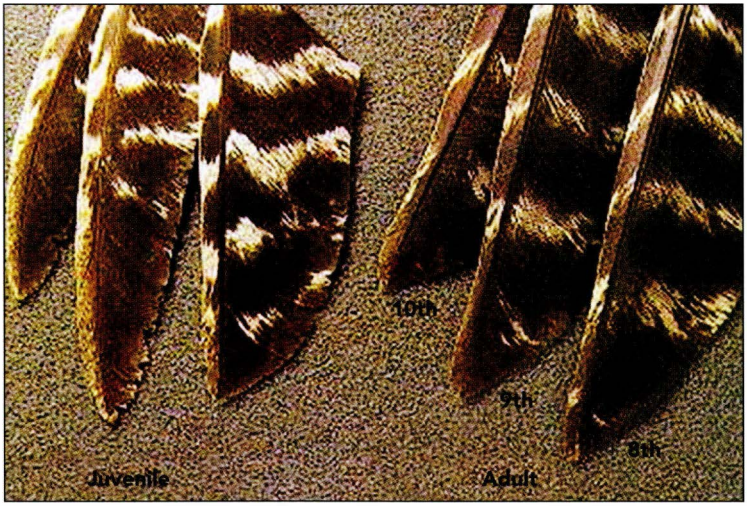


Fig 3-12. The ninth and tenth primaries in juvenile turkeys at South Dakota's latitude are retained until early in the second fall after hatch and are narrower near the tips and more pointed than those on adults. They also have less white cross barring near the tips than those on adults. (North Dakota Fish and Game Department)

Weights

Adult male wild turkeys typically weigh 17–21 lb and adult females 8–11 lb (Pelham and Dickson 1992). Maximum weights in adult gobblers are generally reached in early spring when the breast sponge, an accumulation of stored fat, is at its maximum size (Pelham and Dickson 1992).

There are some differences between subspecies, and individual gobbler records can considerably exceed the normal range. As of 2003, the National Wild Turkey Federation had recorded 34 eastern turkeys and 3 each of Merriam's and Rio Grande subspecies that exceeded 30 lb. Few Merriam's or Rio Grande subspecies records actually exceed 26 lb; weights above this level are much more common for eastern wild turkeys. Most of the records for heavier wild turkeys are from areas where the birds have fed extensively on agricultural foods, particularly corn.

Adult male eastern turkeys from Missouri that were released in Marshall and Roberts counties and recaptured the following winter and early spring averaged 18.8 lb, the same as adult Rio Grande males in that area. Adult male Merriam's turkeys captured in winter in the southern Black Hills averaged 18.5 lb. In the central Black Hills, average weights of adult males during winter ranged from 16.4 lb during winter 1988–99 to 18.1 lb during winter 1990–91. These weight differences between years were attributed to variation in winter food resources.

Weights of adult gobblers indicate minimal differences among subspecies in South Dakota. Winter-trapped juvenile males in the northeast averaged 14.8 lb for Rio Grande birds, but we have no data on eastern juvenile males. Winter to early spring weights of juvenile male Merriam's averaged 12.2 lb in the southern Black Hills.

According to the National Wild Turkey Federation (unpublished data, 2003), the record Merriam's turkey from South Dakota as of 2003 was a 26.3-lb gobbler killed in 1987. Only one other Merriam's gobbler weighing more than 25 lb has been recorded for South Dakota. Any wild gobbler weighing more than 22 lb live weight in South Dakota is a very large wild turkey regardless of subspecies or time of year (Fig 3-13). However, given the numbers of unusually heavy eastern turkeys recorded by the National Wild Turkey Federation, recent restorations of eastern turkeys may lead to more large gobblers and new state records.

Winter weights of trapped adult female Merriam's from the southern Black Hills averaged 10.1 lb compared to 10.4 lb for adult Merriam's hens in the central Black Hills. Adult Rio Grande females in Marshall and Roberts counties in northeastern South Dakota averaged 11.4 lb during winter compared to 11.5 lb for adult eastern females trapped in Missouri and released in northeastern South Dakota. Winter-captured juvenile hens in Marshall and Roberts counties weighed 8.5 lb for both eastern and Rio Grande subspecies while juvenile Merriam's hens in the central and southern Black Hills averaged 8.4 lb.

Fig 3-13. Merriam's gobblers in South Dakota average 18–19 lb (live weight) and seldom weigh more than 22 lb when checked on an official scale. The record Merriam's gobbler harvested in South Dakota weighed 26.3 lb and was taken in 1987, according to unpublished records kept by the National Wild Turkey Federation through 2003. (CPL)

Review

Wild turkeys are more streamlined than domestic turkeys and are capable of sudden and powerful flight. Flights of up to a mile can occasionally occur, but these involve considerable gliding.

After loss of natal down, turkeys are protected and warmed by a variety of feathers including contour feathers such as those visible on the outer surface of most of the body or making up the larger wing (primaries and secondaries) and tail feathers (rectrices). Adult down and semiplume feathers beneath the contour feathers have excellent insulation value. A young turkey goes through three molts and is in its fourth plumage by its first winter of life. Plumage stages in wild turkeys during their first year of life include natal down, juvenal plumage, post-juvenal plumage, and first alternate plumage (also called first winter). These plumages may represent complete or nearly complete replacement of the previous plumage (complete molts) or only partial replacement (partial molts). After the first alternate plumage, yearling and adult wild turkeys have a single complete molt once a year and remain in a basic plumage.

A male is darker in appearance than a female from a distance due to the black tips and iridescence of feathers on the breast, belly, sides, and upper back. Females of Merriam's, Rio Grande, and eastern turkey subspecies typically have pinkish white to buff, buff to cinnamon, or brown to reddish brown tips on feathers of the breast, belly, and sides.

The presence of a longer beard is usually good evidence of a male but a portion of the females (19% in the southern Black Hills) may have beards. At closer range, males have more pronounced caruncles (fleshy bumps) on the head as well as a distinct dewlap (fold of skin below bill) and a snood that engorges with blood and lengthens during courtship display.

Spur length is a general indicator of age in males and can be used to categorize males as 1-, 2-, 3-year and sometimes 3-year-plus birds. Beard length can easily be used to separate 1-year-old males from adults but, while sometimes indicative, is not dependably related to age for 2 year-old and older males.

The outer two juvenal primaries (9 and 10) in wild turkeys in South Dakota are retained until about 1.5 years of age and can be identified by their more pointed and narrower tips—these are important in aging. During the late winter and spring, strutting adult males can be distinguished from jakes at a distance by the elongated central pairs of rectrices in the jakes and the even-length rectrices (even contours) in the adults.

Live weights of most adult male wild turkeys in South Dakota during the spring range from 17 to 21 lb; males weighing more than 22 lb are unusually large in size. Adult female wild turkeys in the state that have been weighed in winter and early spring range about 10–11.5 lb.

Chapter 4

FOODS, FEEDING, AND DEPREDATION

Wild turkeys, except females during incubation, spend most of their time searching for high quality food during daylight hours. Consequently, food sources largely determine habitats.

Wild turkeys consume a variety of seeds, fruits, flowers, leaves of grasses, dandelions, other forbs, insects, spiders, and other invertebrates. These food sources are often widely distributed and easy to find during spring, summer, and early fall. During late fall and winter, high-energy food sources are usually less abundant and, with the exception of cereal grains, often more difficult to locate.

Comprehensive studies on foods of wild turkeys in South Dakota are limited. It's nearly impossible to get close enough to observe what wild turkeys are eating. Biologists rely on examining the crops of harvested birds or on collecting fresh fecal droppings for microscopic evaluation (Fig 4-1). Both techniques have advantages and disadvantages.

Examining crops necessitates a supply of dead birds that have recently been feeding. Thus, short of extensive scientific collecting of birds, diet studies from wild turkey crops are usually restricted to the fall and spring hunting periods. Microscopic evaluation of fecal droppings is expensive and underestimates seeds with a relatively large carbohydrate core, such as pine seeds and acorns (Rumble and Anderson 1996a) and soft-bodied insects. Collecting fresh fecal droppings is relatively easy and provides a good approximation of the important foods of wild turkeys.

In South Dakota, studies on wild turkey food habits have been conducted in the Black Hills (Peterson and Richardson 1975, Rumble and Anderson 1996a, Twedt 1961), Cave Hills-Slim Buttes area and Cheyenne River breaks in eastern Pennington County (Twedt 1961), and in Gregory County near the Missouri River (Laudenslager and Flake 1987). Limited food habits data have been collected for Merriam's turkeys from the southern Black Hills (Lehman 2005). Research in eastern South Dakota has shown the association of agricultural foods, such as waste grains in harvested fields and cattle feeds, with winter home ranges of wild turkeys (Leif 2001, Shields 2001, Lehman et al. 2003).

Fig 4-1. The content of a turkey's crop or microscopic examination of fecal matter is commonly used to determine food habits because of the difficulty of trying to observe what wild birds are eating. (CPL)

General Nutrition and Food Habits

Wild turkeys are considered omnivorous because they eat plant parts and invertebrates. The turkey diet is extensive and varies greatly among seasons, years, locations, and the birds' physiological needs. For example, hens need increased dietary calcium and protein during egg laying, which influences the foods they select (Hurst 1992). New-growth vegetation in the spring is high in protein and provides a source of vitamin A, which may stimulate breeding in some birds (Hungerford 1964). Calcium comes from a variety of sources such as snail shells, high calcium soil particles, small bone fragments, and old egg shell remains. Fats and carbohydrates are important throughout the year but are critical for energy needs during winter.

Wild turkeys are able to select the food items most important to their physiological needs. In feeding trials, turkeys of game farm origin were allowed to select diets from choices that differed only in energy content due to variable amounts of intermixed vegetable oil (unpublished data, Rocky Mountain Research Station, Rapid City, S.D.). Turkeys usually selected the feed with the greatest energy value. Items consumed in smaller proportions also may be important to wild turkeys because they contain necessary nutrients.

Seasonal Foods of Wild Turkeys

Black Hills and other pine dominated habitats

The most complete set of information on wild turkey diets in South Dakota is for the central Black Hills and was based on microscopic analysis of fecal matter collected year-round for several years (Rumble and Anderson 1996b). The central Black Hills data illustrates seasonal changes in major food items (Figure 4-2).

Pine seeds and kinnikinnick (bearberry) strongly dominated the diet of Merriam's turkeys from October until April (Fig 4-3). The reduced consumption of ponderosa pine seed and kinnikinnick fruits in late spring is evident. Corn or other cereal grains were also used in winter, particularly when snow cover was greater than 6 inches, but grains were much less important than natural sources of hard mast. When turkeys did feed on cereal grains around farmsteads or other sources in the central Hills, they generally came early each day and then spent most of the rest of the day seeking pine seeds in the forest. By early May, grass seeds, grass foliage, arthropods (insects, millipedes, etc.), forb foliage, forb seeds, and flowers became increasingly important. Dandelion flowers, pasque flowers, and grass leaves were commonly consumed during the spring. Soft mast was consumed only during the late summer and early fall. (Soft mast is defined here as seeds and fruits such as raspberries, wild currants, grapes, and chokecherry that do not persist through the winter. Some examples of hard mast are acorns and ponderosa pine seeds.)

Acorns were not an important food source in the central Black Hills, probably because bur oak forest comprised less than 1% of the habitats. Acorns are also a favorite of white-tailed deer, fox squirrels, and other wildlife, which would rapidly reduce the already limited availability of oak mast. In contrast to the central Black Hills study, acorns were common in Merriam's turkey diets in an earlier study of the general Black Hills area (Peterson and Richardson 1975) (Table 4-1).

In earlier studies of wild turkey food habits in the Black Hills, many of the crop contents were collected from birds harvested in the spring or fall when samples were available from hunters (Table 4-1). If crop contents are not collected somewhat evenly throughout an entire season it can cause a bias in estimating seasonal diets. For example, in Peterson and Richardson (1975), the abundance of kinnikinnick fruits, ponderosa seeds, and pasque flowers in spring-summer diets (April to September) in the Black Hills indicates that many of the samples in this study were from males harvested in April.

Another consideration in Table 4-1 relates to Twedt's 1961 study in the Black Hills, Cave Hills-Slim Buttes area, and Cheyenne River breaks where over 80% of the turkey crops collected were from the Black Hills. Because the areas were not analyzed separately, the results are much more representative of the Black Hills than for the Cheyenne River breaks and Cave Hills-Slim Buttes areas.

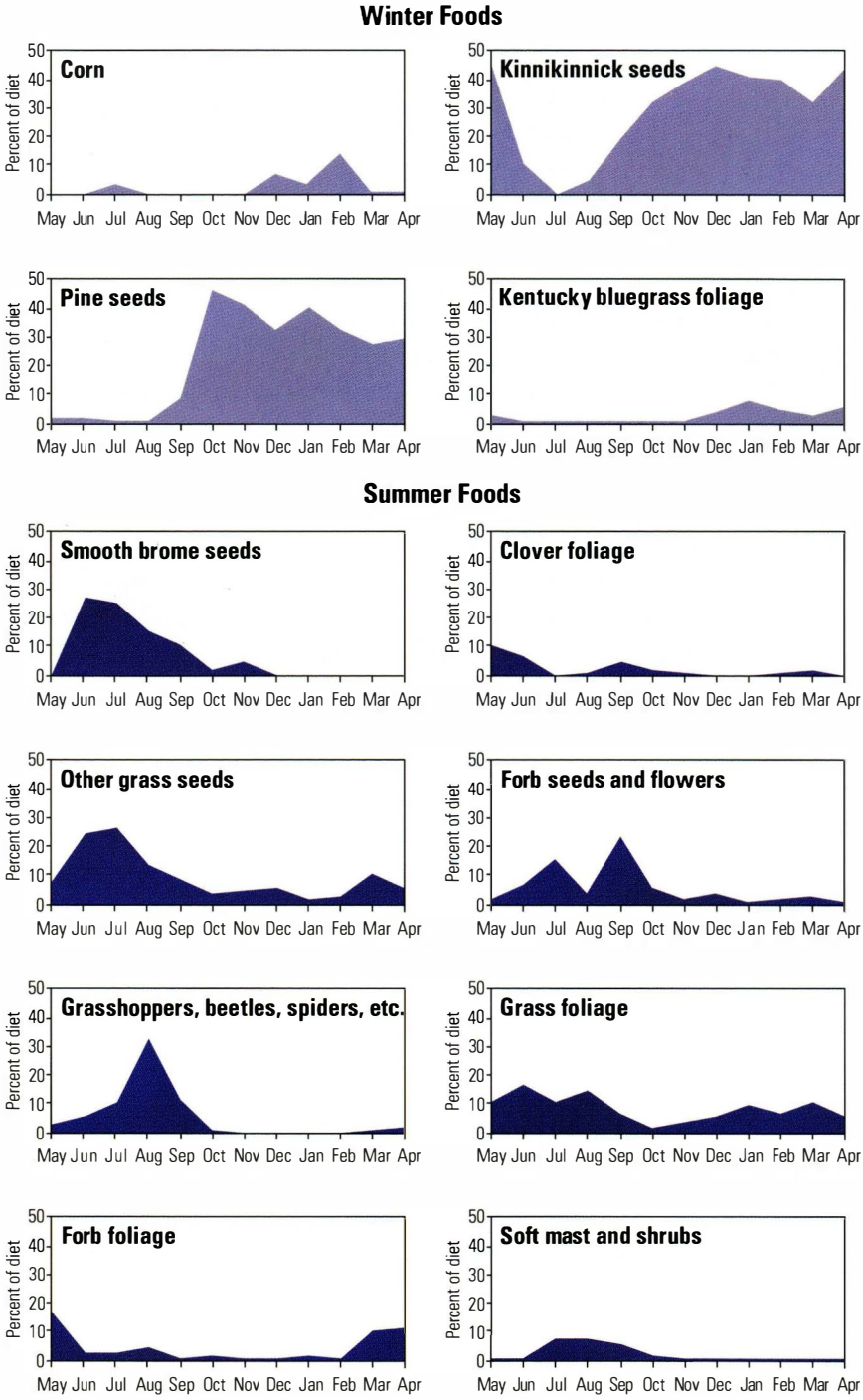


Fig 4-2. Average monthly percent composition based on dry matter intake of twelve food items or categories for Merriam's turkeys in the central Black Hills, 1986–1988. These results were based on microscopic analysis of fecal droppings (from Rumble and Anderson 1996b).

Fig 4-3. Merriam's turkeys in the Black Hills spend much of their time searching for pine seeds in the fall and winter. (M. Tarby)

Interestingly, Twedt's study of birds killed from October to mid-November indicated almost 50% dependence on cereal grains, much more than reported for the central Black Hills. In the southern Black Hills from mid-December until mid-March (2001–2004), 50 to 91% of Merriam's turkeys fed intermittently on cereal grains near farmsteads or other sources of concentrated grain (Lehman 2005). However, as in the central Hills, Merriam's turkeys also spent much of the rest of the day seeking pine seeds or other hard mast in the adjacent forest. Pine seed crops may be less dependable and kinnikinnick plants and fruits are scarce in the drier and warmer southern Black Hills when compared to the central and northern Black Hills. During years of poor pine seed production in the southern Black Hills, wintering turkeys fed on increased amounts of green grass, forbs, and cereal grains (Lehman 2005).

Prairie woodlands

Unfortunately, there is minimal information on food habits of wild turkeys in areas of South Dakota outside of the Black Hills and other pine dominated areas. Based on studies in other areas, wild turkeys in South Dakota's prairie woodlands consume a diversity of foods during the warmer months including flower heads,

Table 4-1. Food items[a] comprising more than 3% of the diet volume or occurring in more than 16% of the crops (frequency: in parentheses) in wild turkey females in at least one of three areas in western or south-central South Dakota. Studies cited are Peterson and Richardson (1975) in the Black Hills (BH); Twedt (1961) in the Black Hills, Cheyenne River in Pennington County, and ponderosa dominated buttes in Harding County (BH-West); and Laudenslager and Flake (1987) in the Missouri River (MR) breaks in Gregory County.

Type of matter	Part used	BH Apr–Sep (1959–69; n=31)	BH Oct–Mar (1959–69; n=31)	BH-West[b] Oct–Nov (1958–59; n=144)	MR Oct–Nov (1984–85; n=30)
Plant matter					
Cereal grains	seeds	3.1 (--)	36.0 (--)	43.0 (50.3)	19.4 (--)
Ponderosa	seeds	16.3 (29.0)	12.9 (48.5)	10.1 (26.4)	
Bur oak	acorns	15.8 (12.9)	12.2 (24.2)	0.1 (4.0)	28.2 (40)
Kinnikinnick	fruits	16.7 (32.2)	9.1 (36.4	11.9 (32.3)	
Pasque flower	flower head	8.2 (29.0)			
Snowberry	fruit	3.0 (19.4)	3.3 (45.4)	2.3 (26.4)	
Poison ivy	fruit	3.9 (16.1)	tr (3.0)	0.9 (19.3)	
Summac	fruit			3.4 (9.4)	4.6 (--)
Forbs	leaves	1.5 (--)	2.8 (--)	4.1 (48.9)	0.4 (--)
Grass	seeds		2.8 (--)	6.4 (71.5)	6.8 (--)
Grass or grasslike	leaves	8.6 (83.9)	5.9 (81.8)	6.5 (80.8)	1.0 (50.0)
Animal matter					
Grasshoppers		6.3 (22.6)	3.7 (66.7)	2.7 (33.0)	26.4 (76.7)
Millipedes		0.7 (38.7)	tr (18.2)	tr (16.5)	
Beetles		0.2 (16.1)	0.1 (36.4)	tr (27.9)	
Leaf hoppers				tr (24.6)	tr (16.2)

Partial list of miscellaneous items-- Plant matter: Rose hips (fruit), knotweed seeds, pigeongrass seeds, hawthorne fruit, groundcherry fruit, currant fruit, Russian olive fruit, hackberry fruit, grapes, chokecherry fruit, wild plum fruit, juniper fruit, sorghum seeds, wild onion bulbs, aster seeds, several types of grass seeds, ironwood seeds, downy brome seeds, bluegrass seeds, sunflower seeds, ragweed seeds, hoary vervane seeds, false gromwell seeds, unidentified forb seeds, dandelion leaves. Animal matter: Crickets, spiders, snails, wasps, caterpillars, small bones, and earthworms.

[a] Sample size in each study is indicated by "n" in column headings, and tr in columns refers to trace amounts or less than 0.1 percent of the diet volume. Where % frequency is not given (--), we were unable to find the information or compute it from the original tables.

[b] Most samples in BH-West are from the Black Hills with less than 20% from the Cheyenne River breaks and Cave Hills-Slim Buttes areas combined.

leaves of grasses and forbs, various seeds, soft mast such as raspberries or chokecherries, and various arthropods (grasshoppers, beetles, millipedes, etc.).

Information on food habits of eastern turkeys in mixed agriculture-deciduous woodland habitats in southwestern Wisconsin is pertinent to wild turkeys in similar habitats in South Dakota (Paisley et al. 1996b). In Wisconsin, waste corn was 54% of the diet volume in the spring and 39% in the fall but was of minor importance in the summer (Fig 4-4). Oats, primarily from harvested or wind lodged fields, made up 28% of diet volume in summer but were much less important in the spring and fall. Soybeans received minimal use. Eastern turkeys in Wisconsin also fed heavily on insects (68% of diet volume), primarily grasshoppers, in summer.

Crop contents of Merriam's turkeys collected in the Missouri River breaks illustrated the importance of bur oak acorns, cereal grains (corn and oats), and grasshoppers in the diet from mid-October until mid-November (Table 4-1).

Because of lack of consistent and diverse hard mast crops in South Dakota's deciduous woodlands, waste grains, stored grains (or hay bales containing grain), and grains fed to cattle fill in as the primary food sources for wild turkeys during late fall, winter, and early spring.

Adapting to Annual Fluctuations in Food Availability

Food availability fluctuates widely among years for turkeys in South Dakota. Contributing to this, for example, is bur oak, the only oak species native to the state and a sporadic producer of acorns.

Fig 4-4. Wild turkeys near croplands often feed on waste corn or other grains close to woodland escape cover. (CPL)

Studies demonstrate the irregular nature of wild turkey foods and the ability of turkeys to find secondary sources of food. Acorns were absent from Merriam's turkey diets in Gregory County in Fall 1984 but comprised 56% of the fall diet the following year (Fig 4-5). Grasshoppers made up 50% of the diet from late September to mid-October 1984 when acorns were scarce but only 3% in 1985.

An inverse relationship between ponderosa pine seed and kinnikinnick seeds in the diet of turkeys in the Black Hills was also found by Rumble and Anderson (1996b). Kinnikinnick seed dominated Merriam's turkey diets in winter when ponderosa pine seed production was low due to drought (Fig 4-6). Ponderosa pine seed had greater energy content than kinnikinnick but was absent from turkey diets by December during years of very low pine seed production.

The value of alternate high energy food sources from a diversity of mast-producing species is revealed by turkey foraging. Wild turkeys prefer hard mast foods during winter if they can find them. Some people consider wild turkeys opportunistic foragers. However, these data suggest the contrary—wild turkeys are picky about finding the best available foods, but annual fluctuation in availability leads to diverse dietary composition.

Adapting to Seasonal Shifts in Abundance and Scarcity—Habitat Linkages

With warming temperatures and growth of new vegetation in the spring, wild turkeys change from diets of high energy cereal grains and hard mast to new growth of grasses and forbs. This dietary shift may relate to the nutritional

Fig 4-5 Bur oak (over 60% of trees in photo) in south-central South Dakota can produce heavy crops of acorns that are valuable to wild turkeys and several other wildlife species, but the production is irregular and not dependable from year to year. (LDF; inset, J.R. Johnson, SDSU)

Fig 4-6. The berries on bearberry (kinnikinnick) in the central and northern Black Hills are an important alternate food for wild turkeys in the fall and winter, especially in years when the pine seed crop is poor. (J.R. Johnson, SDSU)

demands associated with reproduction, the abundance of new plant and invertebrate foods, or the lack of mast items from the previous fall.

This spring transition in diet is often associated with dispersal to new habitats needed for nesting and brood rearing. While food availability is important to habitat selection at the landscape scale during this spring transition, females also select for nesting areas based on additional criteria.

The abundance of food from midspring through summer allows for wide dispersal of birds in spring and summer periods when they are much less dependent on restricted areas and sources of food compared to winter.

In addition to the shift from high energy foods to new growth vegetation in spring and early summer, there are also shifts in diet during the summer as new food items such as various fruits (i.e., raspberries, chokecherries, etc.) and invertebrates, especially grasshoppers, become available.

Habitats particularly important for feeding in late spring and summer include pine forests and deciduous woodlands with open overstories featuring abundant herbaceous vegetation (i.e., grasses and forbs). Meadows and pastures can also be extremely important for feeding during this time.

About late September, high-energy foods like waste grains, ponderosa pine seeds, or acorns become available to wild turkeys. As indicated by the Wisconsin study, wild turkeys may incorporate small grains such as oats into their diet even well before the start of fall (Paisley et al. 1996b). In the Black Hills, as soon as ponderosa pine seeds are cast, Merriam's turkeys shift their diets to include pine seeds and adjust their habitat use patterns to include mature ponderosa pine for-

est. Hard mast, such as pine seeds and acorns, has high energy content and becomes available about the time that soft mast is gone and nutritional quality of herbaceous vegetation, like grasses or forbs, is declining. Grasshoppers may remain important in the diet through October (Laudenslager and Flake 1987).

Winter—Harsh Conditions and Fewer Choices

Wintering turkeys in northern latitudes of their range at temperatures averaging 32°F require an estimated 0.26 lb/day of food per bird on a mixed diet of acorns, corn, rose hips, and eastern redcedar berries (Haroldson 1996). This would equate to 31.2 lb/winter (120 days) on this type of diet. In this same study, it was estimated that each turkey would require 28.2 lb/winter of corn per bird on a straight corn diet with an average winter temperature (averaged daily means) of 32°F. If winter temperatures average 14°F, food requirements increase and wild turkeys require 33.1 lb of corn per bird per winter.

These estimates are useful for landowners or biologists planting food plots for wild turkeys. However, don't forget that deer, squirrels, ring-necked pheasants, and other wildlife also use food plots and in some cases, deer can eat seven to eight times more than a wild turkey. In severe winters, wild turkeys may totally depend on these cereal grains, particularly in many of the prairie woodland habitats.

The availability of adequate food controls the habitat used by wintering turkeys and the extent of their northern distribution, which historically has varied naturally with winter conditions (Fig 4-7). A series of mild years allows wild turkeys to extend their distribution north; cold years bring them back south.

Fig 4-7. Wild turkeys were historically limited in their northern distribution by winter conditions. The success of turkeys in many areas of South Dakota outside of their original range is made possible by the availability of cereal grains during late fall and winter. (M. Tarby)

In South Dakota, most of the current range of wild turkeys was not originally occupied because they could not survive severe winters. Snow depths exceeding about 12 inches can essentially stop movements of wild turkeys on the ground (Austin and DeGraff 1975, Healy 1992b). Wild turkeys can sustain several days of severe weather, provided high-energy food sources are readily available (Ligon 1946), but without a concentrated food supply, birds soon face starvation (Wunz and Hayden 1975). Consequently, migrations from summer to winter ranges may occur in mountainous terrain where snow accumulations are common. Migrations of up to 45 miles have been observed in the Black Hills. Merriam's turkeys summering at higher altitudes in the Black Hills would face certain starvation during winter unless they migrate to lower elevations or locate concentrated food supplies.

In the central Black Hills, Merriam's turkeys began dying one week after snow accumulations of about 11 inches, despite mild conditions and eventual snowmelt within about a week (M.A. Rumble, unpublished observation) (Fig 4-8). For approximately 4 days following this storm, birds stayed in sunny areas and made no effort to obtain food. Similarly, juvenile hens in the southern Black Hills began dying within 9 days following 9 inches of snowfall followed by persistent snow cover (C.P. Lehman, unpublished observation).

In another instance, Merriam's turkeys in the Black Hills were found frozen in roost trees and on the ground below a roost following nighttime conditions of approximately -30°F with 40 mph winds (John Wrede, personal communication, SDGFP). Wild turkeys, however, can withstand extremely cold nighttime temperatures if they have high-energy food available. Eastern and Rio Grande turkeys in northeastern South Dakota survived temperatures of -30 to -40°F, high winds,

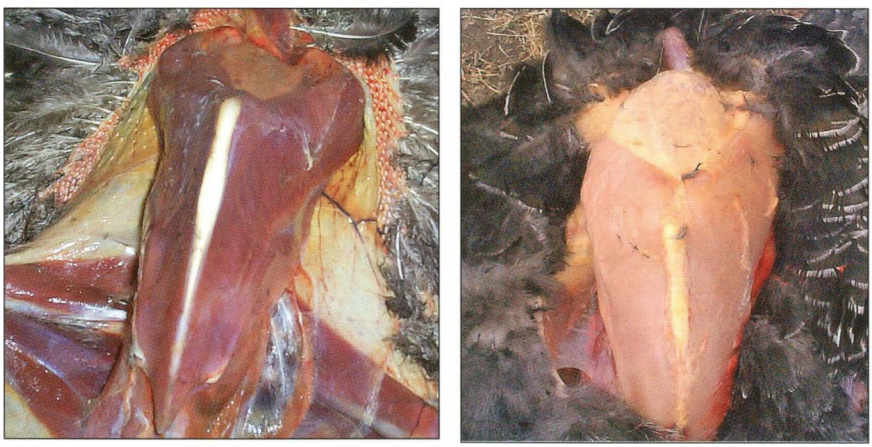


Fig 4-8. Carcasses obtained from wintering wild turkey females in emaciated (left) and healthy (right) condition. Without access to high energy foods, turkeys caught in 10–12 inches of persistent snow can die of starvation within a week. Juveniles are the most vulnerable. Turkeys lose 40–41% of their weight before dying of starvation. (CPL)

and deep snow as long as cereal grains were available at farmsteads or in windswept crop fields.

Merriam's turkeys in the Black Hills spend much time seeking ponderosa pine seeds, but the abundance of this source of food varies greatly from year to year. Ponderosa pine is a dependable producer of seed 3 of 4 years in the Black Hills, with bumper crops and crop failure occurring about 1 of 4 years (Boldt and Van Deusen 1974). The greatest abundance of ponderosa pine seeds in the central Black Hills occurred in mature stands with high densities of ponderosa pine (averaging about 12 inches diameter-at-breast height). In the southern Black Hills, the greatest densities of pine seeds were found under moderately open stands of mature ponderosa averaging 12–14 inches diameter at breast height (Lehman 2005).

Stands of ponderosa pine on south-facing slopes are important winter sites for feeding on pine seeds throughout much of the Merriam's range (Hoffman et al. 1993). The ability of birds to find ponderosa pine seeds appears to be enhanced in high density stands because there is little vegetation in the understory. Turkeys searching for ponderosa pine seeds can scratch through the litter of needles in dense stands easier than in stands with substantial grass cover such as occurs in open stands. The pine needle litter can end up looking as if it has been raked. This habit of scratching the litter is also common as a food searching technique in areas such as the deciduous woodlands in northeastern South Dakota or under the woodlands along the Missouri River breaks.

Pine seeds are so valuable that Merriam's turkeys are sometimes observed pecking and tossing pine cones in the air in years of low pine seed production, apparently in an effort to extract seeds that did not naturally cast from the cone at opening (Fig 4-9).

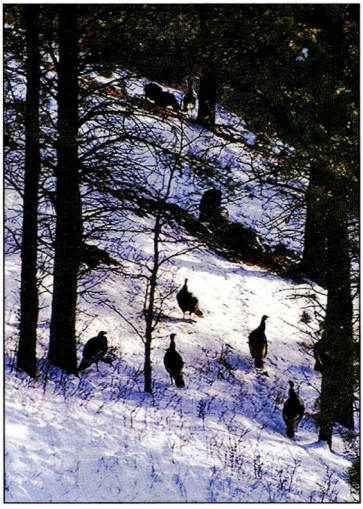


Fig 4-9. Pine seed feeding sites: Merriam's turkeys scratch for pine seed in a stand of ponderosa pine in the central Black Hills (left, M. Tarby). The stand of ponderosa pine on the right is typical of sites with high densities of pine seed that attract turkeys in the fall and winter in the southern Black Hills. (CPL)

Food plots or other sources of cereal grains enable wild turkeys to live in many areas of South Dakota where they would otherwise starve. In Minnesota, eastern turkeys inhabiting a deciduous forest region with unharvested corn nearby had high survival over winter while those in a similar area lacking agricultural food sources had much poorer survival (Porter et al. 1980). Plantings of tall sorghum also may provide food.

In northeastern South Dakota, female eastern wild turkeys brought from Missouri were released in midwinter. The birds released near cropland found and used the waste grain while those birds released in a more isolated area of deciduous forests and grasslands had difficulty finding food and suffered high mortality (Lehman et al. 2001).

Wild turkeys appear to learn the location of winter feed sites before heavy snowfall and remember them from year to year. In Arizona, Merriam's turkeys returned to sites to find food where baiting for trapping had occurred in the previous winter (Shaw 2004).

In Pennsylvania, corn cribs and hoppers did not alleviate starvation in isolated wild turkey populations during a severe winter (Wunz and Hayden 1975). Apparently, the flocks that were not close to feeder stations would not fly down from the roosts and seek the stations when the snow was deep and powdery. In another area of Pennsylvania, eastern turkeys were regularly provided corn along a 2.5-mile plowed trail and survival was good. Nonetheless, concentrating birds at feeding stations can expose birds to diseases spread by close contact and possibly to increased predation.

Biologists generally agree that food plots more closely mimic natural conditions than feeding stations or bins. If food is put out or otherwise made available, the birds will likely become habituated to and dependent on these food sources. Consequently, once initiated, food should be consistently available throughout the winter. Keep in mind that feeding wild turkeys also can attract and concentrate wild ungulates, particularly white-tailed deer, increasing the chances of spreading diseases such as chronic wasting disease among these mammals.

The Depredation Dilemma

Food availability signals where you find turkeys in the winter, as long as there is adequate woodland cover for roosting and escape from predators. High-energy food is the main ingredient for winter survival. It does not take much in terms of woodland roosting and escape cover if the food is available.

In most winters, a large portion of the wild turkeys in South Dakota supplement their diet of natural seeds, fruits, and grass with agricultural foods from waste grains in crop fields, cattle feedlots, silage piles, oat bales, or other human-related food sources. A variable percentage of Merriam's turkeys in the central and south-

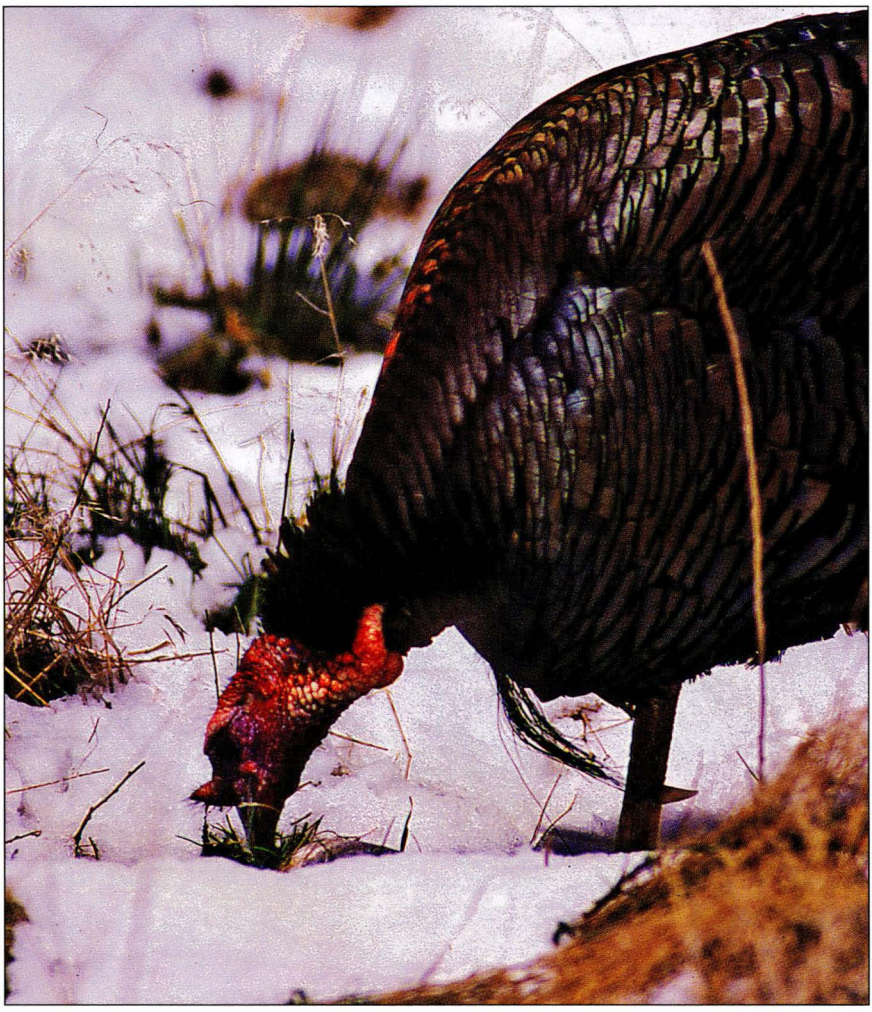


Fig 4-10. Wild turkeys commonly include grass and other herbage in their diet whenever available. (M. Tarby)

ern Black Hills remains in the forest and feeds on pine seed and other foods during the entire winter for all but a few critical weeks (Fig 4-10). The success of the pine seed crop and severity of the winter can greatly influence how many birds remain in the forest, away from human-associated food sources. Even in a good pine seed year, at least 50% of the Merriam's females in the southern Black Hills visited farmsteads to feed early each day for a portion of the winter (Lehman 2005).

Some wild turkeys in their native range in southeastern and south-central South Dakota may survive on natural foods and waste grain in harvested fields during all or most of the winter. Unfortunately, even with minimal snow cover, many wild turkeys can't resist the easy availability of cereal grains near farmstead storage and cattle feeding sites.

Most people, including most ranchers and farmers, like having wild turkeys around as long as the numbers are reasonable. However, too often a few wintering turkeys may grow to a few hundred birds and wear out their welcome. Research has not been conducted to evaluate agricultural damage from wild turkeys in South Dakota but there is much general information available. The costs for turkey depredation to the SDGFP is considerable in terms of hours of labor, mileage, and equipment. During the winter of 2003–2004, 22,897 miles and 2,036 person-hours were used in resolving wild turkey damage complaints. Equipment costs for wild turkey damage control and management, excluding vehicle costs, totaled $5,108, much less than the labor and travel costs.

The total cost to the SDGFP for wild turkey damage management came to $61,914 in 2003–2004 compared to $428,476 for deer, $358,500 for Canada geese, and $233,283 for elk (Art Smith, Pierre office, SDGFP, personal communication). We know of no estimate of the dollar damage to landowners suffering turkey depredation.

Wild turkey damage complaints are widespread in the state but also concentrated in certain areas with large numbers of birds (Dean Bisbee, Wildlife Damage Specialist, Chamberlain Regional Office, SDGFP, and Dennis Mann, Regional Habitat Manager, Rapid City Regional Office, SDGFP). For instance, areas of high damage in the central portion of the state are found northwest of Mobridge near the Missouri River, along the White River and Little White River in Mellette County, and in Gregory County.

Turkeys also tend to gather during winter along several of the other western drainages and rivers or streams where agricultural foods are available. Ranches near or in the Black Hills can have major concentrations as can urban areas bordering the National Forest.

Oats cut while green and baled are extremely attractive to wild turkeys, which can literally shred a stack of bales when two or three hundred birds are feeding on them. Wild turkeys also regularly feed on grain silage that is distributed for cattle in feed bunkers. They may also trample silage piles or stacks, causing spoilage by breaking the natural seal (crust). Silage consists of chopped corn, sorghum, and milo that is placed in pits, a pile, or silo and allowed to ferment.

While taking grain directly away from cattle or other livestock is of concern, a bigger problem and expense to landowners may be the soiling of livestock feed with turkey droppings (Fig 4-11).

Wild turkeys in the spring often are observed feeding in agricultural fields, including those already seeded for the new crop year. In Wisconsin and Iowa, turkeys in newly planted or sprouting corn fields fed almost entirely on waste grain with little use of seed corn and essentially no use of seedlings (Gabrey et al.

Fig 4-11. Wild turkeys feeding on silage (above) or grain bales (below) can cause appreciable damage when their numbers become excessive. Note patagial wing tags on two birds in top photo. (MAR, CPL)

1993, Paisley et al. 1996b). Apparently the easily available waste corn or other waste grains on the surface was their main interest.

Turkeys and Water

In South Dakota, turkeys do not generally require free-standing water, sometimes occupying home ranges lacking drinkable water such as ponds, puddles, seepages, or streams. The birds can obtain water from dew in the mornings, from food items that include succulent plants, berries, fruits, and insects, and from metabolic water.

Turkeys frequently ignore drinking water sources. In Alabama, eastern turkeys seldom crossed or approached water sources and broods remained away from open water sources for weeks at a time (Exum et al. 1985). There is evidence that the distribution of Rio Grande turkeys in dry regions of Texas is restricted by availability of water (Beasom and Wilson 1992), but these conditions are more extreme than normally occur in South Dakota. Merriam's turkeys typically occur in arid regions and may require free-standing or flowing water during dry warm periods.

In the southern Black Hills, female Merriam's turkeys were observed drinking free-standing water from cattle water tanks several times during one week in mid-August, but these were the only observations of water use during a 3-year field study. Approximately one water source per square mile should be available for Merriam's turkeys in case conditions become extremely dry (Hoffman et al. 1993). For most of the Black Hills and riparian woodlands of the prairies, natural sources of adequately dispersed water exist. Prior to going to the work and expense of placing water developments for turkeys, see if available water is limiting the distribution in a particular area.

Review

Wild turkeys eat a wide variety of foods including seeds, fruits, leaves, flowers, insects, and other invertebrates. Yet wild turkeys can be highly selective for certain items: pine seeds in the Black Hills during fall, new shoots of grass in spring, flowers and leaves of forbs such as dandelions and pasque flowers, grasshoppers in midsummer to early fall, and acorns in bur oak forest.

Because major food items fluctuate in availability from year to year, turkeys must adapt to finding alternate sources for energy and nutrition. Wintering turkeys have difficulty obtaining adequate high-energy foods. This can drive large wintering concentrations to gather near farmsteads and ranches where stored cereal grains are available.

In the wild, turkeys may not survive lengthy periods of deep snow and cold, particularly if high energy foods cannot be readily obtained. Wild turkeys in South Dakota generally find adequate water in dew and in the moisture in their food; under normal circumstances they show little dependence on drinking water sources such as ponds or streams.

Chapter 5

BEHAVIOR: FLOCKING, BREEDING, ROOSTING, MOVEMENTS, AND HABITAT USE

How members of a turkey flock interact with each other and to outside threats, how they conduct courtship, what their various calls mean, their responses to weather changes such as snow or extreme cold, their patterns of movement, and their preferences for certain habitats are all intriguing aspects of wild turkey behavior. Behavior, as treated here, selectively refers to several topics of general interest while avoiding some aspects such as nesting or brood rearing covered in other chapters.

Flocking Behavior and Sexual Segregation

Typically, by early fall flock members have established a pecking order (Watts and Stokes 1971). During late fall and winter, wild turkeys in South Dakota commonly form separate social groups consisting of juvenile, yearling, and adult hens; younger males; and adult males (almost 2 years of age or older) (Fig 5-1). Similar segregation into flocks of mixed-age hens, adult males, and young males in winter has been observed in Rio Grande turkeys in Texas (Watts and Stokes 1971).

The largest late fall or winter aggregations are usually made up of smaller flocks congregated near food sources. Large aggregations near farmsteads are usually female flocks, but young males and adult males are often found on the periphery.

Groupings by sex and by young and adult males are fairly obvious when observing the birds. Sexes probably segregate based on differing habitats used in winter or behavioral differences unrelated to habitat. For example, wintering flocks of adult male Merriam's in the southern Black Hills are more likely to remain in forest areas away from farmsteads than are flocks of mixed females and juvenile males. Wintering flocks remaining away from farmsteads and agricultural foods are usually in smaller, more dispersed social groups.

Females appear to tolerate humans more easily than do adult male turkeys. This could be the result of the increased exposure of adult males to hunting. Another plausible explanation is that males are larger and more capable of foraging for food and remaining away from farmstead food supplies during periods of

Fig 5-1. This flock is mostly adult gobblers and reflects the tendency for segregation of adult males from females and juvenile males during much of the year. (CPL)

extreme cold or snow. In the southern Black Hills, small flocks of adult males were typically found in the ponderosa pine forest away from farmstead sites. Dominant adult male flocks typically do not tolerate jakes, and this explains their ouster from adult male flocks during winter. Biologists will tell you that adult males are often cautious of drop nets or rocket nets and are harder to capture than females or young males.

In spring, as birds disperse to breeding and nesting areas, females break into small groups, as do males. During the breeding season, the flock structure is considered a roaming harem that includes one to a few mature males of which one is dominant and does most of the breeding (Watts and Stokes 1971). Females remain in small groups until they initiate laying, at which time they usually go off alone.

During the breeding season, small groups of jakes usually avoid the mixed female and dominant male flocks and often remain together throughout the breeding season and summer. If they are with flocks of females and adult males during the breeding season, they rarely strut or give any sign of interest in breeding activities—probably to keep from being beat up.

Sounds of Wild Turkeys

Wild turkeys are quite vocal and use calls as a method of locating and communicating with each other. Each wild turkey call or vocalization, of which 28 different vocalizations have been documented, has a different purpose or message

(Williams 1984), at different times indicating contentment, alarm, breeding activity, or location (Table 5-1). We base the meaning of their calls on behaviors observed during and following the calls.

Wild turkeys can recognize the voices of other turkeys. It has been demonstrated that newly hatched poults imprint to the sounds of the hen while still hatching and for approximately the first day thereafter (see Broods, Ch 8). Calls of individual turkeys also vary, and it is possible to discern different turkeys by the tone of their calls. Differences in pitch and raspiness of the yelps from hens is easily noticed.

In addition to gobbling, male turkeys make "drumming" sounds when they strut, often in view of females (Mosby and Handley 1943). There are two distinct sounds made during strutting: The first part is a short "chump" or "tick" followed

Table 5-1. Some wild turkey vocalizations and perceived purpose (adapted from *The Voice and Vocabulary of the Wild Turkey*, Williams 1984).

Call	Usual number of notes	Purpose of vocalization
Whistling	3–4	The lost call of poults
Kee-kee	3–4	The lost call of older poults and adult turkeys
Kee-kee run	4–10	A lost call combined with an assembly yelp
Tree yelp	3–5	A call to locate other turkeys before fly-down from the roost
Plain yelp	4–7	While in sight of other turkeys, also a mating call of hens
Lost yelp	8–20	Call to reassemble by adult turkeys after being scattered
Hatching yelp	8	By hen during hatching to imprint her call with peeping poults
Assembly yelp	6–10	Used by brood female to reassemble poults
Single note yelp	1	Usually used by gobblers while searching for flock mates
Double note yelp	2	Same as single note yelp
Plain cluck	1–3	To get the attention of other turkeys
Loud cluck	4–10	To get the attention of turkeys farther away
Alarm putt	1+	Alerts all turkeys to danger
Predator alarm	2–5	Warns the flock a predator is very close
Whit-whit	1–5+	Similar to the cluck, when one turkey is impatient with another
Cackle	10–15	When flying to or from roost, also by females to attract males
Gobble	15–30	By males to attract hens for mating
Distress scream	3+	When attacked by a predator
Peeping	6+	Made by poult to hen while inside the egg
Plain purring	10+	Contentment, also used to space individuals while feeding
Fight purring	15+	Signals another turkey it is too close
Rattle	15+	The last vocal warning before birds begin posturing to fight

by a soft "hum" or "drone." Biologists think the "chump" sound is made by the rapid movements of the primary wing feathers while strutting, and the subsequent "hum" may originate from a vocalization and vibration within or near the breast sponge, although this has not definitively been determined (Williams 1984). What is definite is that if the "chump-hum" can be heard, there is a strutting male around, usually within 50 yards.

Gobbling Activity

In the Black Hills and prairie woodlands, gobbling and strutting by males occur on warm sunny days as early as mid-February. About the middle of March, courtship begins in earnest and continues until mid-June (Fig 5-2). Infrequent gobbling can occur year-round.

Gobbling is a locating call primarily used to attract females. During the mating season, gobbling occurs at any time of the day but most often early in the morning before sunrise or at evening just before dark. Most gobbling activity during the breeding season is from adult males, although jakes also gobble occasionally, usually at higher pitches and for shorter times. However, a deep, full gobble does not always indicate a mature male. Turkeys gobble more frequently just before leaving the roost in the morning and immediately after entering the roost in the evening (Hoffman 1990).

Fig 5-2. Adult male courtship and gobbling activity in the Black Hills begins in mid-March and lasts until about mid-June. (CPL)

In southern Colorado, Merriam's gobblers fitted with radio transmitters showed two peaks in early morning gobbling activity (gobbles/hour): One peak occurred from mid- to late April, and the other occurred in mid-May (Fig 5-3, Hoffman 1990). The timing of these peaks may vary among areas and years. The first peak usually occurs before nesting when the males are attracting their harems. The second peak occurs when incubating females are no longer attending males. Surveys of gobbling activity in the southern Black Hills, as in Colorado, also indicated two periods of increased gobbling frequency (Lehman et al. 2006b). In Mississippi, only a single early peak of gobbling was observed with no peak in gobbling during incubation (Miller et al. 1997).

Gobbling activity is also related to weather conditions. Precipitation and hunting pressure are inversely related to gobbling by males (Kienzler et al. 1996). In the Black Hills, snow storms can occur any time during the spring hunting season, reducing but not curtailing gobbling activity altogether.

Gobbling is not exclusively done by male turkeys—occasionally, a female will emit a short abbreviated gobble.

Roosting

Once turkeys can fly (Ch 8), they begin roosting in trees. Tree roosts are common among forest game birds and are used primarily to escape predation.

Groups of wild turkeys roost in a wide variety of trees and may settle in a single tree or in multiple trees in close proximity. They may use a roost site repeatedly or for only a single night. Typically, turkeys roost at dusk and leave the roost about a half hour after first light. However, during severe cold and deep snow, turkeys might stay on the roost all day (Fig 5-4). Staying on the roost during severe weather conserves energy. In winter, distance from food and thermal protection can be especially important in roost site selection (Gerads et al. 2006).

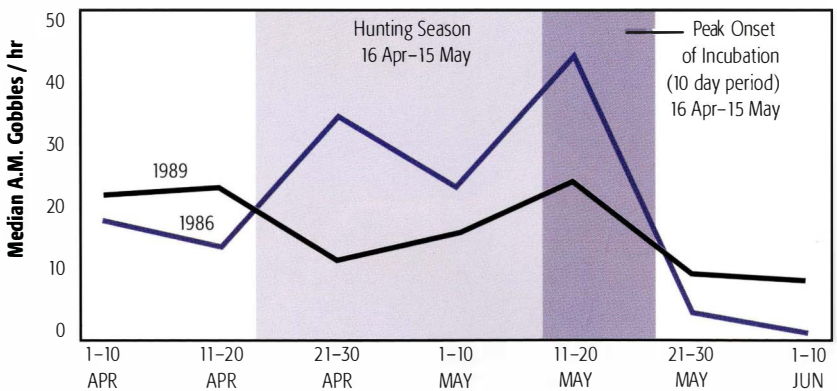


Fig 5-3. Chronologic distribution of gobbling activity of adult male Merriam's wild turkeys in Colorado and New Mexico (from Hoffman 1990).

Merriam's turkeys in coniferous forest habitats consistently seek roost trees with layered horizontal branches (at right angles to the trunk or bole) spaced at an interval of approximately 2 to 3 ft (giving room for a turkey to stand) (Fig 5-5). Where numerous roost trees are available, turkeys show certain preferences that are likely related to the importance of the roost site to their survival. In the Black Hills, Merriam's turkey roosts included trees as small as 6 inches diameter at breast height (dbh) but usually larger than 12 inches dbh (Fig 5-6).

Forest sites where roosts occurred in the Black Hills were more dense than stands recently logged but less dense than stands that were unmanaged for 40 years or more. Merriam's turkeys in the Black Hills usually select new roost sites each night unless the trees are close to agricultural food sources in winter (Rumble 1990, 1992).

In the southern Black Hills, roost trees averaged 13 inches dbh. Relative to unmanaged forested stands, turkeys in the southern Black Hills selected sites with a lower density of pine trees, perhaps for easier access to the roost (Thompson 2003). Turkey roosts in the Black Hills are usually about two-thirds of the way up a northeast- to southeast-facing slope. This would provide some protection from the prevailing northwest winds. Roost trees on slopes also make it easier for turkeys to access and exit the trees in most cases. Despite selecting larger diameter and older ponderosa pine trees for roosting, turkeys did not necessarily select

Fig 5-4. During snow and extreme cold, wild turkeys may stay on the roost all day to conserve energy. (M. Tarby)

Fig 5-5. These roosting Merriam's turkeys have found suitable limb spacing in this ponderosa pine snag. (M. Tarby)

Fig 5-6. Wild turkeys in the Black Hills sometimes roost in ponderosa pine that appears too small to provide adequate support. Turkeys are highly adaptable in terms of roost site selection. (M. Tarby)

the largest dbh tree or largest trees in a group. Diameters of trees (dbh) serving as roosting sites in the central Black Hills were much less than those reported for Merriam's roosting trees in the southwestern U.S. (Hoffman 1968, Boeker and Scott 1969). These data suggest that wild turkeys adapt to smaller trees if branch spacing is adequate.

Rio Grande turkeys in the shrub ecosystems of southwest Texas will use windmills, old buildings, power line poles, and even power lines for roosting (Kothmann and Litton 1975).

Wild turkey roosts in the prairie woodland regions of South Dakota are often located in trees along intermittent streams, permanent streams, or on moist east- or northeast-facing slopes. In the Missouri River breaks in Gregory County, over 80% of the roosts were in mature plains cottonwoods or American basswood-green ash stands (Flake et al. 1996) (Fig 5-7). Other deciduous trees such as American elm and bur oak can also be important for roosting if they have horizontal branches of sufficient size and spacing. Unfortunately, most of the mature American elm trees have been killed by Dutch elm disease and the few remaining snags are rapidly disappearing. There are larger bur oak trees in some areas of South Dakota, such as near Sica Hollow State Park and other areas of the northeast escarpment, and they are sometimes used for roosts. However, in other areas such as Gregory County, bur oaks are generally too small and scrubby for roost sites even as mature or old trees.

Fig 5-7. Cottonwood roosts in south-central and northeastern South Dakota were normally located in the bottom of ravines and were often used by flocks of turkeys for many consecutive nights during the colder months. (CPL)

The characteristics of roosts in woodlands must allow a large bird easy flight into the roost tree. Once in the tree, a bird frequently hops from branch to branch, moving up to a selected branch for the night. Repeated use of roosts in the prairie woodlands is common especially during winter. Two roosts studied in Gregory County were regularly used by 20 or more turkeys during the colder months. Even during summer, some roosts in south-central South Dakota were used repeatedly. Repeated use of roost sites in the prairie woodlands may be related to the limited distribution of woodland cover and suitable trees compared to the fairly contiguous conifer forests of the Black Hills.

Turkeys are sometimes said to roost near water, but the data from studies in South Dakota do not support this. It seems more plausible that turkeys look for trees with particular characteristics for roosting and, in prairie woodlands, the larger trees with horizontal branches are often near a waterway. Woodlands in prairie regions in South Dakota are restricted to streamsides, floodplains, ravines, and other places where increased moisture is available (Girard et al. 1987). Thus, we believe that roost site selection is a function of tree attributes and not streams or other water bodies.

Do Gobblers Defend a Territory?

Courting male turkeys do not seem to defend a specific area as occurs in birds with strong territorial characteristics. They do exhibit dominance relationships and fighting within small breeding groups of males, between small groups of courting males, and among lone males. Watts and Stokes (1971) termed the typical breeding social interaction of eastern turkeys a "harem" where males acquire females and defend them from other males until they are bred. Hunters many times have witnessed this type of defense while using jake decoys. When this apparent threat to domestic harmony is placed near a dominant male's harem of females, the dominant male will often approach and sometimes jump on and spur the fake jake. Although these are not territorial responses by definition, such behavior does represent aggressive defense of the harem by a dominant male or group of males (Fig 5-8).

Daily and Seasonal Home Ranges

Home range is the area used in the course of meeting the daily requirements of turkeys. Within this home range turkeys find their daily food; roosting, loafing, and dusting sites; escape cover; and grit. These needs and the size and location of the home range within the landscape change seasonally between summer and winter and during events such as brood rearing (Fig 5-9).

The distribution and characteristics of the habitat influence the size and shape of home ranges. In prairie and agricultural regions, forests are often linear, being

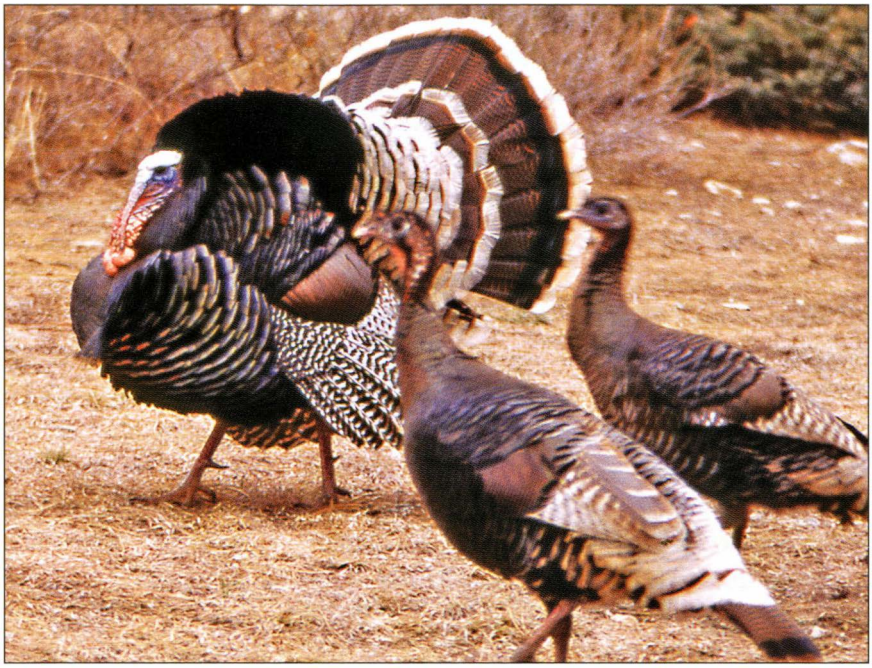


Fig 5-8. Gobblers, including singles or small groups, are primarily interested in aggressively defending a harem against other gobblers or gobbler groups but do not appear to set up a specific territory. If a group of gobblers stays together during the breeding season, one gobbler is generally dominant over the others. (CPL)

confined to drainages and riparian areas. Wild turkeys in these areas have long, narrow home ranges that allow them to remain close to woodland vegetation while also using the adjacent edges of grasslands and croplands.

Home range size can be a useful indicator of habitat quality and is often used by biologists in comparing populations from different regions. For example, turkeys in poorer quality habitat may be forced to use larger home ranges to find necessary resources.

Home ranges of wild turkeys are generally estimated using repeated locations from birds fitted with radio transmitters. These locations may be visually confirmed or may be estimated remotely by triangulation using a receiver and hand held or vehicle mounted antenna. Home ranges are typically estimated for biologically meaningful periods of the bird's life, such as during winter or brood rearing. In general, the locations provide a group of activity points that, if enclosed by an outer boundary, represent a home range area.

Additionally, researchers often define a smaller core area of high activity where turkeys spend much of their time. The core area generally makes up less than 25% of the total home range area and sometimes as little as 10%. It's expected the turkey will be within this small area half of all daylight hours.

Fig 5-9. The winter home range of wild turkeys in prairie woodland areas includes a variety of habitats to meet their daily needs such as a sumac patch with potential seeds or a more secluded woody draw. (LDF)

Examples of home range size and core area for eastern turkey hens in South Dakota may be of interest and are in Table 5-2. Winter home ranges in Grant County appeared to be particularly large, averaging 2,652 acres, more than double the home range areas along the James River or in Marshall and Roberts counties and 7.5 times the winter home range size on the James River near Mitchell (Leif 2001).

Mild winters during the study in Grant County may have allowed more extensive daily movements by the eastern turkeys, but it is interesting that the spring and summer home ranges were also larger in Grant County. We suggest that the distribution of resources necessary for eastern turkeys was more dispersed in Grant County than in the other prairie-woodland areas in South Dakota.

Winter home ranges of Merriam's hens in the southern Black Hills were also unusually large (Table 5-2). Dependence on farmstead food supplies can influence winter home range size. In Marshall and Roberts counties, wintering Rio Grande females, when compared to eastern females released in the same area, had home ranges only 11.3% as large and core areas 6.9% as large (Lehman et al. 2003). The Rio Grande birds were much more dependent on farmstead food supplies than the eastern subspecies. This was probably due to the Rio Grande's lack

Table 5-2 Home range (acres) and core area (acres) of eastern wild turkey hens in northeastern and east-central South Dakota. Core area represents a smaller portion of the home range where wild turkeys spend approximately 50% of their time.

Study area and source	Period	Home range	Core area
James River			
Forestburg	Winter (1 Dec.–31 Mar.)	988	114
	Breeding (1 Apr.–31 Jul.	1485	198
	Summer/fall (1 Aug.–30 Nov.)	633	99
Mitchell	Winter (1 Dec.–31 Mar.)	353	89
	Breeding (1 Apr.–31 Jul.	1231	131
	Summer/fall (1 Aug.–30 Nov.)	413	67
Marshall and Roberts counties			
	Winter (1 Dec.–31 Mar.)	736	91
	Pre incubation (1 April – start of incub.)	1023	124
	Post incubation (end of incub. – 31 Aug.)	204	57
Grant County	Winter (1 Dec.–31 Mar.)	2652	597
	Summer (1st day of incubation – Aug. 31)	1216	340
Southern Black Hills	Winter (Dec. 1–Mar. 31)	3232	

of adaptation to cold weather as well as possible hybridization with game farm and domestic bronze turkeys released by landowners.

In spring and summer, daily movements by hens are restricted when they are nesting and rearing broods. Biologists can tell if a hen is laying eggs by a sharp drop in her daily movements. Laying hens abruptly reduce their average distances between telemetry locations by 50% or more (Lehman et al. 2005). After the brood hatches, a female may move a considerable distance to find a suitable place to rear the poults (see Ch 8) but after that stays in a relatively small area until the poults are 4 to 7 weeks old.

Information on gobbler home ranges in South Dakota is based on a small number of gobblers carrying radio transmitters. Eastern gobbler home ranges near the James River were generally similar to those for hens in the same area, although gobbler movements in the post-breeding period were larger than those for hens, probably due to reduced hen activity during brood rearing (Leif 2001).

Gobbler home ranges in Grant County were smaller than for females in that area and more similar to those observed along the James River.

In southern Colorado, in habitat similar to the southern Black Hills, Merriam's gobblers used about 3,800 acres for their summer home range but only about 415 acres was considered core area (Hoffman 1991). Even their roosting sites presented evidence of considerable movement, with roosting sites averaging 1.3 miles apart each night.

In the composite home ranges (i.e., entire area enclosed by home ranges of multiple birds) of female eastern turkeys in Grant County, 15.3% of the home range was composed of woodland habitat compared to 20.1% in the composite area for all core areas combined. Turkeys arranged their activities to maximize the amount of woodland cover in this sparsely forested region. In the Mitchell and Forestburg areas along the James River, eastern hens likewise showed an increase in woodland habitat in the highly used core area of their home ranges (Leif 2001). However, woodland in both the home range and core area near the James River exceeded that for turkeys in Grant County.

While woodland receives preferential use as indicated by core area makeup, other habitats, even if normally not selected for, are still very important (Fig 5-10). For example, in a region with forest-grown food sources generally in short supply, pastures and cropland are critical components for feeding birds, and shrub patches within pastureland can also be critical to nesting.

Spring and Fall Dispersal Patterns, Site Fidelity from Year to Year

Wild turkeys in South Dakota often shift their seasonal center of daily activity according to dependable food sources. While many wild turkeys migrate in the

Fig 5-10. Wild turkeys, such as this eastern hen, have numerous habitat needs including sites for dusting and loafing. Her young will also dust and preen, especially as they obtain their juvenal plumage. (USDA Forest Service, Northeastern Research Station, Amherst, Mass.)

fall, some remain as year-round residents if resources are adequate. In early spring, many wild turkeys move to summer areas.

Spring-summer migrations from wintering areas and the fall returns of individual birds vary in distance but may be more than 30 miles each way in the Black Hills. One hen marked near Pactola Lake during winter was harvested the following fall hunting season over 30 miles away in Wyoming. Eastern females in Grant County dispersed an average of 2.7 miles for adults and 6.2 miles for young birds from winter to summer ranges (Shields 2001). In Marshall and Roberts counties, eastern and Rio Grande hens, mostly adults, dispersed an average of 3.0 and 1.4 miles from the center of their wintering home range to nesting sites, or if not nesting, to the center of their summer home range (Lehman 1998, Lehman et al. 2003). In Gregory County, Merriam's hens, almost all adults, averaged 1.9 miles from the center of their wintering site to the center of their early summer home range, while male dispersal averaged 1.2 miles for the same period. Total distances moved in the fall are similar to spring, particularly when birds return to wintering areas used the previous year (Laudenslager 1988).

Spring movements can be rapid. In the central and southern Black Hills, radiomarked hens have averaged 7 to 8 miles a day during migrations. Turkeys move from summer range to wintering habitats more leisurely and irregularly, depending on weather and food resources.

Fidelity to geographic terrain (i.e., annual use of the same areas) appears to be a part of turkey ecology, and it seems to be learned (Fig 5-11). Fidelity to specific areas occurs during winter, nesting, summer, and even to the dispersal routes between summer and winter ranges. Once turkeys develop a pattern, they usually repeat it.

Fidelity of hens to nesting areas from year to year can be strong and is discussed in Chapter 7. If wild turkey hens disperse to new areas, they often do so in the spring when they are yearlings.

Fidelity to wintering sites was observed in 77% (17 of 22) of adult female Merriam's turkeys that survived for two or more winters in south-central South Dakota (Laudenslager 1988). Use of the same wintering sites in subsequent years was also common in Rio Grande and eastern hens studied in northeastern South Dakota. However, fidelity to wintering sites in the southern Black Hills was only 46% in females (mostly adults) followed over two winters.

Fig 5-11. Wild turkeys commonly return to the same wintering sites from year to year. (LDF)

Review

Wild turkeys are highly social birds during much of the year. Outside of the nesting and brood rearing period, females of all ages commonly associate in flocks and, in the winter, large aggregations. Sexes appear to segregate to a considerable extent, and adult males generally segregate from jakes.

Wild turkeys communicate with at least 28 documented calls, each call carrying a particular meaning such as warning, contentment, gathering, or other functions. Gobbling is used to attract females and occurs most commonly from mid-March to mid-June in South Dakota with peak daily calling in the morning and evening. Gobbler calling rates are greatest on the roost and primarily originate from adult gobblers. Although there is much variability, seasonal peaks in gobbling activity in South Dakota occur during dispersal from wintering grounds and during peak laying-early incubation.

Wild turkeys generally seek roost sites at dusk and leave the roost at about 1/2 hour after first light. Roost sites for flocks may consist of multiple trees or a single tree. Turkeys usually change roosting sites each night in the Black Hills unless roosting near a farmstead in winter; in the prairie woodlands wild turkeys may also change sites nightly but it is not uncommon for them to use a single site repeatedly, perhaps due to reduced availability of suitable trees. Wild turkeys are highly adaptable in terms of roost sites but generally seek trees with 2–3 feet of spacing between the lateral branches. Roost tree size varies greatly.

Wild turkeys defend their harems as a group or as single gobblers but are not territorial in the classical sense of defending an area. Wild turkeys tend to establish seasonal home ranges (area of daily activity) that meet their daily needs for

food; roosting, loafing, and dusting sites; and escape cover. In early spring a large portion of wild turkeys disperse to their breeding and nesting areas. These dispersal movements are highly variable but are greatest in the Black Hills, with some birds moving 7 to 8 miles per day. Fall movements back to wintering areas occur more slowly than in the spring. In early spring and fall, wild turkeys often travel to traditional sites along previously used routes—this route appears to have been learned.

Chapter 6

SURVIVAL AND DEATH

Survival and mortality of adult wild turkeys are dependent on a variety of influences such as harvest, predation, and diseases (poult and brood mortality are discussed under Brood Ecology, Ch 8). Values for mortality or survival rates are presented as percentages but could also be given as decimal fractions—they are interchangeable. Survival plus mortality adds up to 1 (decimal) or 100% (percentages). For example, a survival rate of 0.70 (70%) indicates a mortality rate of 0.30 (30%).

Most survival and mortality rates are studied by monitoring turkeys that have been fitted with radio transmitters on their backs (backpack style) (Fig 6-1) or around the neck (necklace style) (see Ch 1, Fig 1-8). These transmitters weigh less than 3% of the bird's weight and have little or no effect on behavior, movements, and survival. In addition, radio transmitters can detect active movement and emit a different signal if the bird is dead or has not moved for several hours.

Fig 6-1. Backpack radio transmitters powered by batteries are larger and heavier than necklace-type transmitters but have a longer life span of 2 to 5 years. Hens with these transmitters appear to behave naturally and have good survival and reproductive rates. (CPL)

Annual Survival Rates

Females

Survival of female wild turkeys in South Dakota has been studied using radio telemetry in northeastern South Dakota, along the James River in the southeast, and in the central Black Hills (Lehman et al. 2001, Leif 2001, Shields 2001, Rumble et al. 2003). Studies on wild turkey survival have also recently (2001–2003) been completed in the southern Black Hills (Lehman et al. 2006a).

Annual survival rates for released eastern hens in Marshall and Roberts counties, Grant County, and along the James River were all near or above 70%; Rio Grande hens in Roberts County also demonstrated high survival rates (Table 6-1). Annual survival rates near or above 70% in wild turkeys are unusually high for a gallinaceous bird (Fig 6-1). In northeastern South Dakota, annual survival rates of females did not differ for birds first captured as adults and those captured as juveniles (Lehman et al. 2001, Shields 2001). The high survival of wild turkeys in northeastern South Dakota was assisted by closed hunting during the study years.

Annual survival rates for female Merriam's turkeys in the central Black Hills over a 6-year period ranged from 33% to 76% and averaged 67%; the 33% survival occurred in a year with basically no production of pine seeds, the primary winter food. Survival rates for female turkeys in the southern Hills over a 3-year period averaged 67%, the same as in the central Black Hills (Lehman et al. 2006a). The Black Hills populations were subject to annual fall hunting in both studies.

Table 6-1. Annual survival rates for female wild turkeys in South Dakota. Hens were either adults or were in their first winter after hatch when captured and fitted with radio transmitters at the start of these studies.

Study area	Years	Subspecies	Annual survival	Citation
Eastern South Dakota				
James River	1993–95	Eastern	78%	Leif 2001
Marshall-Roberts cos.	1996–98	Eastern	72%	Lehman et al. 2001
		Rio Grande	77%	
Grant Co.	1999–00	Eastern	69%	Shields 2001
Black Hills				
Central Hills	1986–91	Merriam's	67%	Rumble et al. 2003
Southern Hills	2001–03	Merriam's	67%	Lehman 2006a

Annual survival rates of hens in South Dakota are generally some of the highest observed in North America (Vangilder 1992).

The lowest seasonal survival rates for female wild turkeys in South Dakota generally occur during the spring-summer period and particularly during nesting and early brood rearing (Fig 6-2). Spring-early summer also is the highest period of mortality for turkey hens in most other regions (Speake 1980, Vangilder 1992). Wild turkey females are vulnerable to predators during this time.

In south-central South Dakota, 11% of Merriam's females were killed by predators during nesting while 6% were killed in the first 2 weeks of brood rearing (Day 1988, Flake and Day 1996). In the central Black Hills, predation losses of Merriam's hens during nesting may approach 20% (Rumble and Hodorff 1993). In the southern Black Hills, hen mortality during the year is also most severe during nesting (Lehman et al. 2006a). Unlike other populations, introduced eastern turkeys in Grant County experienced their lowest survival rates during the fall (Shields 2001).

In all South Dakota studies, the primary cause of female death during nesting was predation by mammals. In the Black Hills studies, coyotes were specifically identified as the primary predator of hens during nesting. Surprisingly, despite the cold, wind, and snow, winter survival is usually excellent in South Dakota.

Seasonal losses are sometimes higher in northern regions during severe winters if adequate agricultural grains are not available (Porter et al. 1980).

Fig 6-2 Wild turkey females have good to excellent survival in the Black Hills, in prairie woodland areas in northeastern South Dakota, and on the James River. Highest mortality is normally during nesting and brood rearing when the hens are most vulnerable. (K.C. Jensen, SDSU)

Males

What are the chances of the same males that were gobbling to a hunter's call in a particular spring season being around a year later?

Since most gobbler populations are hunted during a substantial spring season, we can expect male annual survival to be markedly lower than for females. The average annual survival rate for adult males in Kentucky was 26% (i.e., mortality of 74%) compared to 55% for juveniles (Wright and Vangilder 2001). In the Missouri Ozarks, average annual survival of adult gobblers was 44 and 36% on two study areas (Vangilder 1996). In Wisconsin, annual survival of males (ages grouped) was 51% (Paisley et al. 1996a).

Information on male wild turkey survival in South Dakota is based on sample sizes too low to provide dependable information, and the data represent unhunted populations. However, the results of such studies are of interest because no other gobbler survival rates are available in the state—all survival rates are for adults. Annual survival rates for nine male eastern turkeys released on the James River were 79% (Leif 1997). Five Rio Grande gobblers over a 2-year period had annual survival rates averaging 60% in Marshall and Roberts counties (Lehman 1998). Annual survival of six released eastern males averaged 80% during 2 years in Grant County (Shields 2001).

Sources of Mortality

Legal harvest, crippling loss, and illegal kill of hens

Hunting during fall resulted in harvest of 4% of marked females in the southern Black Hills over a 3-year period (Lehman 2005). We have no other information on legal harvest of hens for other hunting units in South Dakota.

Legal kill of eastern hens in the fall season in northern Missouri accounted for only 7% of all annual mortality of hens (Vangilder and Kurzejeski 1995). In West Virginia, fall harvest rates on eastern hens were 4.3% with a 4-week season and 12.3% with an 8- to 9-week season (Pack et al. 1999). In the Missouri Ozarks, harvest of females in a 2-week fall season removed only about 1% of the marked hens, despite a two-bird limit (Vangilder 1996).

Consequently, fall harvest of hens in areas where the population is healthy will not hurt the wild turkey population. Where reductions in the population are needed, the legal kill on hens would need to be much greater than the 4% reported for the southern Black Hills unless there is appreciable illegal kill.

Some female turkeys are killed accidentally or intentionally shot during the spring gobbler season or may be illegally taken at other times of the year. About one-fifth of all mortality of female wild turkeys in northern Missouri was due to illegal kill, mostly during the spring gobbler season (Vangilder and Kurzejeski 1995). In Florida, 14 to 18% mortality of marked females during the spring gob-

bler season appeared to be due to illegal kill (Williams and Austin 1988). Illegal kill of hens during the spring gobbler season was estimated at 6% in Virginia and 2.5% in West Virginia (Norman et al. 2001).

Appreciable illegal kill of hens during the spring gobbler hunt directly influences production (i.e., recruitment) of young turkeys and could have strong implications in reducing the population. Illegal hen kill in the spring could be reduced by delaying the start of the spring gobbler season until peak egg laying when hens are less likely to be associated with gobblers or other females (Norman et al. 2001).

There is minimal information on illegal hen kill in South Dakota but it does not appear to be a major mortality factor (Fig 6-3). In eastern South Dakota, temporary closures of spring and fall turkey hunting accompanied efforts to establish eastern turkeys. During that period, we found no evidence of illegal kill on remnant Rio Grande females or on introduced eastern hens carrying radio transmitters in Grant, Marshall, and Roberts counties (Lehman et al. 2001, Shields 2001). Along the James River, only 2% (1 of 60) of released eastern females were killed illegally, and this loss was in the fall (Leif 1997).

Hens marked with radio transmitters in the southern Black Hills had a 2% loss to illegal shooting during the spring gobbler season (Lehman 2005). Mortality of radio-marked hens in the southern Hills due to illegal kill was about 2% during the remainder of the year but was difficult to estimate because of deaths from unknown causes. In contrast, illegal annual mortality on radio-marked Merriam's hens averaged 10% in the central Black Hills (M. Rumble, unpublished data). The turkey population in the central Black Hills is much closer to urban population centers than the southern Black Hills turkey population and may be exposed to increased poaching along forest roads.

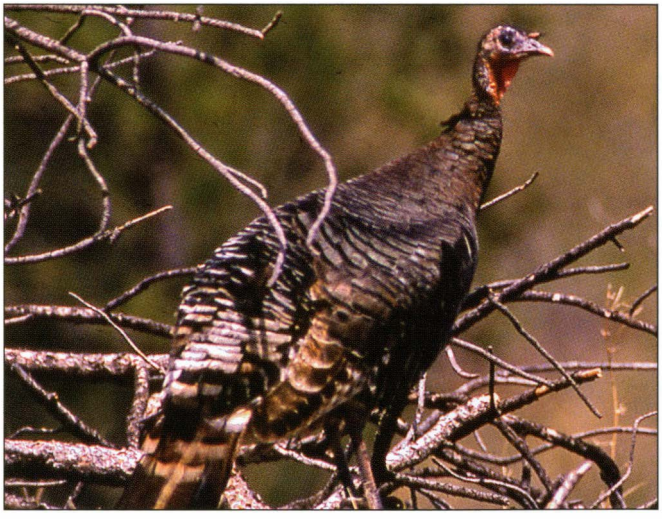


Fig 6-3. Information from radio-transmittered hens in the southern Black Hills indicates minimal mortality from illegal kill during the spring gobbler season. (M. Tarby)

Legal harvest, crippling loss, and illegal kill of males

There is almost no information on legal harvest, crippling loss, and illegal kill of male wild turkeys in South Dakota. Studies in other states can give us a general understanding of male mortality due to these causes.

Spring hunting season (1 month) mortality rates on eastern gobblers over a 5-year period averaged 62% for adults and 23% for yearlings in Kentucky; the hunting season kill on adults included 4.3% illegal kill and 4.8% crippling. Most estimates of crippling loss on males during the hunting season are under 10% (Wright and Vangilder 2001).

In the Missouri Ozarks, spring season (2 weeks) mortality of adult gobblers from legal kill on two densely wooded study areas was unusually low at 19% and 22% but the average annual mortality of 56% and 64% on the two study areas reflected considerable additional loss (Vangilder 1996). Illegal kill of adult gobblers in the Ozark study was estimated as 15% of total annual mortality (8-9.6% of population).

In Wisconsin, approximately 36% mortality of males (ages grouped) occurred during the spring hunt; annual mortality was about 49% (Paisley et al. 1996a). A review of mortality rates of adult gobblers from spring hunts in several regions revealed much variation, with most mortality rates from 20 to 50% (Vangilder 1992, Paisley et al. 1996a).

Male mortality due to legal kill has been only recently (as of 2005) studied in South Dakota. In the southern Hills some adult gobblers were leg banded and eight were fitted with radio transmitters. When six adult gobblers were banded between Custer and Hot Springs in spring of 2002, five bands from these gobblers were returned from hunters that same spring, indicating an unusually high harvest rate and high band return rates even without a reward offered. Of four gobblers fitted with radio-transmitters in winter of 2003 and followed weekly, two survived the 5-week spring hunting season, including one old gobbler that escaped hunting pressure for most of the season by moving into Wind Cave National Park. Ongoing studies of male harvest in the southern Black Hills as of 2005 indicate approximately 50% hunting mortality of adult gobblers during the spring season (K.C. Jensen, SDSU, unpublished data) (Fig 6-4). There is no information available on hunting mortality on males elsewhere in South Dakota.

Influence of predators on annual mortality

All ages of wild turkeys are susceptible to predation from great horned owls, golden eagles, coyotes, red fox, bobcats, dogs, and other predators (Fig 6-5). Predation during brood rearing is an important mortality factor and is discussed in Chapter 8. Coyotes and red fox were responsible for an estimated 45% and great horned owls for 9% of the annual mortality of wild turkey hens in north-

Fig 6-4. Ongoing studies (K.C. Jensen, SDSU) as of summer 2005 indicate that adult gobblers have approximately 50% mortality from hunting during the spring season in the Black Hills. (CPL)

Fig 6-5. This great horned owl (inset) was photographed by a remotely set, infrared camera as it killed a Merriam's turkey on the nest. Great horned owls are a common predator of wild turkeys, but kills on the nest are rare. Great horned owls would typically pull flesh away from the head and neck area. (CPL)

eastern South Dakota (Lehman et al. 2001). Turkeys appear to be most susceptible to great horned owls while on the roost. In south-central Iowa, coyotes, red fox, and other mammalian predators accounted for almost two-thirds of documented annual mortality in females (Hubbard et al. 1999b).

Predation is generally much less important than hunting mortality for gobblers. However, in two study areas in the Missouri Ozarks with low hunter kill of gobblers, predators caused 51% of the total annual mortality, an unusually high percentage (Vangilder 1996).

Predators of males are similar to those of females. Of four adult gobblers killed by predators along the James River, one predator was unidentified and a coyote, great horned owl, and mink each killed one male (Leif 1997). Even adult males on the roost can be killed by great horned owls. In Kentucky, great horned owls killed 17% of all adult males taken by predators, but the owls were secondary in importance to bobcats (Wright and Vangilder 2001).

Three interesting golden eagle attacks on Merriam's turkeys were closely observed in the Black Hills (Lehman and Thompson 2004). In one, a wintering group of Merriam's turkeys was observed feeding in a fairly open stand of ponderosa pine. When a golden eagle appeared overhead, the flock members warned each other loudly and often and moved into a dense patch of small ponderosa pine. The eagle folded its wings in a dive into the dog hair patch of pines and, instead of capturing a turkey, found itself stumbling awkwardly on the ground surrounded by unhurt but scrambling turkeys. The turkeys remained in the dense patch of trees while the eagle took flight again and made a second unsuccessful attempt at a kill.

In considering the role of predators on turkeys it is important to remember that predation is generally not severe on males and that annual survival rates for females are excellent in South Dakota (Fig 6-6). Thus, even though predation is a major cause of nonhunting mortality, it occurs at a low-enough frequency to

Fig 6-6. Coyotes were the primary predator on turkey eggs and nesting hens in the southern Black Hills, as indicated by hair caught on shrubs or woody debris around destroyed nests and, as in this case, photos from a heat-sensitive (infrared) camera set near the nest. (CPL)

allow excellent survival for birds once they reach ages beyond the poult stage (post 12 weeks).

An additional factor to consider is that predation on juvenile or older turkeys tends to be higher during or immediately after hunting seasons. Turkeys killed by predators during or soon after a hunting season may be crippled birds that would have soon died of shot wounds (Wright and Vangilder 2001). Researchers can generally tell if a turkey was scavenged (dead already) or still alive at the time the predator found it, based on hemorrhaging of the wounds.

Diseases and parasites

Wild turkeys also die from a variety of diseases, but serious losses from disease outbreaks have not been reported in the published literature nor are we aware of any such outbreaks in South Dakota.

Although massive die offs to diseases are uncommon, individual losses are still likely an important cause of mortality in wild turkey populations. Considerable published information is available on diseases of wild turkeys from other portions of their range (Davidson and Wentworth 1992).

Most of the diseases that can affect wild turkeys also occur in farm chickens and turkeys. The incidence of such diseases in domestic flocks cannot predict what will happen in wild turkeys because wild turkeys are much more dispersed than domestic turkeys. If disease problems do occur, they are likely related to overpopulation or concentration at winter food supplies where diseases can spread among birds.

Avian pox, a viral disease, is one of the most common wild turkey diseases in the eastern U.S., sometimes killing or making the birds more vulnerable to predation. This disease often results in prominent wartlike growths on unfeathered areas of the body including the head (Fig 6-7). Biting insects such as mosquitoes can transmit avian pox.

Antibodies in their blood reveal that wild turkeys are exposed to many other viral diseases, but in most cases these infections have not caused illness or death or, if so, only in a few birds. Evidence indicates that turkeys are not vulnerable to infection by West Nile virus nor do they act as significant amplifying agents in infecting mosquitoes (Swayne et al. 2000).

The blood serum of wild turkeys can serve as a sentinel (early warning) for some viral infections, such as equine encephalitis, that concern humans but do not seem to damage turkeys when exposed through various vectors (Trainer and Glazener 1975).

Biologists and wildlife managers have been concerned about a disease called mycoplasmosis that can reduce egg production, hatching success, and fertility in turkeys and can be spread through trap and transfer of birds from an infected

Fig 6-7. Disease does not appear to be a major factor controlling wild turkey populations in South Dakota nor in other portions of the range. However, some death from diseases does occur such as from a viral infection with avian pox (above) and a bacterial infection in the legs or feet called bumblefoot (below). (National Wild Turkey Federation).

flock. The disease, caused by an organism of the genus *Mycoplasma*, can occur in domestic chickens and turkeys. Antibodies for the disease have been found in wild turkeys but they are uncommon.

The concern is that infected wild turkeys could be chronic carriers that regularly shed and spread the organism. If mycoplasmosis were common in a wild turkey population it could potentially suppress reproductive success. Several Merriam's turkeys from Gregory County, South Dakota, were sampled for blood and tested for antibodies associated with mycoplasmosis in the early 1980s, but the results indicated no exposure to the disease. In Colorado, evidence of exposure based on antibody occurrence was found in Merriam's turkeys, but the

exposed birds did not differ in reproduction from nonexposed birds (Hoffman et al. 1996).

Mycoplasmosis does not appear to be a problem in wild turkey populations in South Dakota nor in other states at this time.

Blackhead or histomoniasis is a disease primarily of galliform birds caused by the protozoan *Histomonas meleagridis* and is spread through a specific kind of nematode (type of parasitic roundworm) and its eggs. Turkeys pick up the disease organism or its eggs while feeding or by direct contact (McDougald 2005). Even contaminated earthworms ingested by turkeys can spread the disease. Turkeys are highly susceptible and often die if infected. Birds such as chickens and ring-necked pheasants are less susceptible to histomoniasis but can act as carriers. For this reason, it is not a good idea to spread chicken litter as fertilizer in areas used by wild turkeys (Reid 1967).

Wild turkeys are also affected by various bacterial diseases, but generally the losses are scattered and do not cause massive population declines.

Salmonellosis in wild turkeys through infection with *Salmonella typhimurium* has caused isolated deaths, but the infection rate appears to be low. One death of a nesting female from salmonellosis was confirmed in the central Black Hills (unpublished record, Rocky Mountain Research Station, Rapid City, S.D.).

Swelling and incapacitation in the foot or leg area, called bumblefoot, can be caused by infection from bacteria such as *Bacillus* and *Staphylococcus* (see Fig 6-7) (Davidson and Wentworth 1992). Several Rio Grande gobblers with bumblefoot that could not walk due to swelling and infection were observed in northeastern South Dakota, and these birds died within a short time (C.P. Lehman, South Dakota State University, unpublished record).

A Merriam's female from the southern Black Hills died from acute septicemia (i.e., pathogenic bacteria in the bloodstream) with granulomatous lesions of the intestine and may have picked up a pathogenic strain of the bacterium *Escherichia coli* from domestic chickens or waterfowl at the ranchette she frequented (C.P. Lehman, South Dakota State University, unpublished record). One female eastern turkey found along the James River died of an intestinal infection of probable bacterial nature (Leif 2001).

The many internal parasites of wild turkeys include protozoans, flukes, tapeworms, nematodes, and thorny-headed worms. Most are not associated with turkey disease problems (Davidson and Wentworth 1992). Turkeys also carry lice, ticks, mites, and louse flies, lice being the most common of the external parasites (Fig 6-8).

Unless there are extreme levels of infestation, external parasites are just normal passengers making a living from tissues such as blood, skin, and feathers but not causing serious health problems. It would be unusual for internal or external

Fig 6-8. Lice, mites, ticks, and other external parasites are commonly found on wild turkeys such as this female but are seldom associated with health problems. The preening behavior seen here helps maintain feather condition and may also have value in control of ectoparasites. (M. Tarby)

parasites to cause the death of a wild turkey. Extremely high parasite loads are often signs of other health problems.

Dead or dying wild turkeys should be handled with caution and protective rubber gloves. Place the bird in a plastic bag if you are seeking a diagnosis. There is probably no health threat, but it is still a good recommendation for hunters to use latex gloves while cleaning any game bird and to adequately cook the bird before eating it.

Some livestock producers in South Dakota have expressed concern about disease transfer from wild turkeys feeding among livestock or on livestock feeds. Fecal droppings left on these food sources could potentially serve to transfer diseases or parasites. Because of the lack of published information, veterinary pathologists at South Dakota State University's Animal Disease Research and Diagnostic Laboratory (ADRDL) and with the National Poultry Improvement Plan (NPIP) were contacted regarding possible transfer of diseases from wild turkeys to domestic livestock such as cattle and sheep.

Disease transfer of any kind between wild turkeys and domestic livestock is very unlikely because bird and mammal digestive systems and physiology differ markedly (personal communication, Dr. Tanya Graham, pathologist and DVM with ADRDL). The disease species and strains infecting either cattle or wild turkeys are unique to their hosts, and transfer is unlikely (personal communication, Dr. Andrew Rhorer, epidemiology specialist with NPIP). Possible disease transfer that may occur includes influenza (type A influenza viruses), *Escherichia coli* (septicemia), or *Pasteurella multocida* (fowl cholera).

However, transfer of diseases associated with strains of *E. coli* and *P. multocida* from wild turkeys to domestic livestock such as cattle, horses, sheep, or swine has never been observed or documented and is unlikely (personal communications,

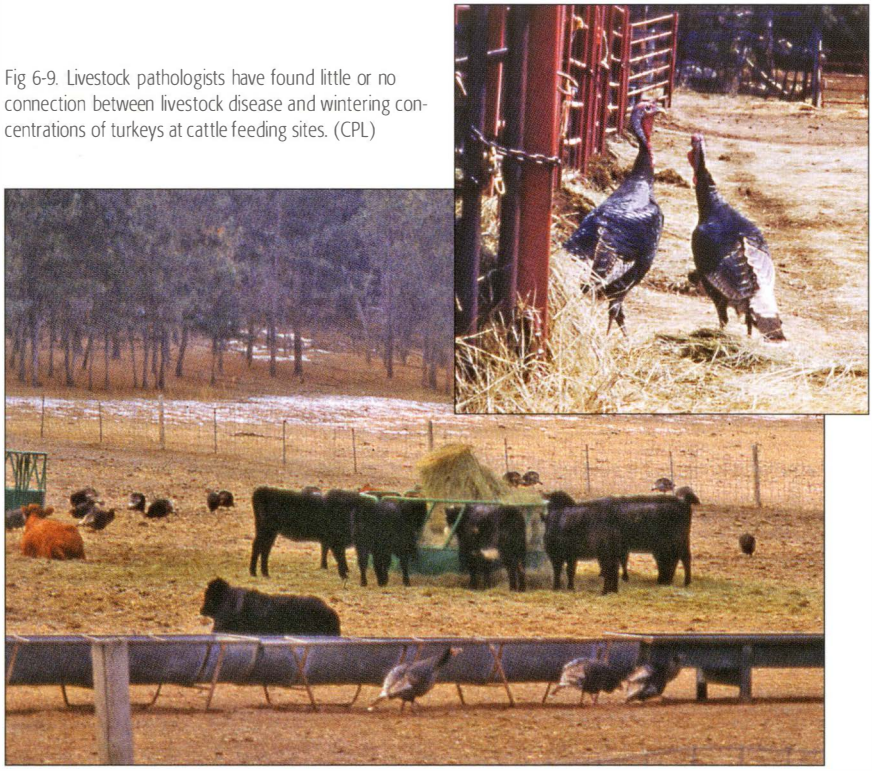


Fig 6-9. Livestock pathologists have found little or no connection between livestock disease and wintering concentrations of turkeys at cattle feeding sites. (CPL)

Graham and Rhorer). Swine influenza, a virus, has been transferred from swine to domestic turkeys (personal communication, A. Rhorer).

Our review of information and contacts with livestock pathologists do not implicate wild turkeys as a probable link to disease problems in cattle and other livestock. However, monitoring for possible linkages will continue because of the frequent close association of wild turkeys and cattle during winter (Fig 6-9).

Pesticides and other toxins

We know of only minor losses of wild turkeys due to pesticides or other toxic substances (such as oil spills), although some kills have probably gone unnoticed, particularly of young poults. Some organophosphate type pesticides can kill wild turkeys, particularly poults, but the evidence does not indicate serious effects on populations. When organophosphates cause death in turkeys it is likely due to direct contact with the chemical while feeding in crop fields or field edges or from eating dead or dying insects and other arthropods that had come in contact with the pesticide (Nettles 1976).

Since poults are difficult to locate unless radio marked and since they decompose quickly, the effect of pesticides on poults could easily go undetected. In prairie woodland areas, wild turkey brood hens and their poults commonly feed

on the edges of crop fields and pastures near woodland escape cover. Thus, pesticide treatments on crop fields and nearby edge cover during early brood rearing have the potential to kill turkey poults or to greatly reduce the many insect species and other arthropods upon which they feed.

Poults also feed heavily on the edge of pastures next to woody habitat in the prairies and in meadows within the Black Hills, and thus spraying of these areas for grasshoppers could kill young turkeys.

Other causes of mortality

Wild turkeys can die from a variety of accidents such as contact with hay mowers, colliding with vehicles, and hitting power lines. In Grant County in northeastern South Dakota, 24% of turkey deaths for which the cause was known were from haying machinery and vehicle collisions (Shields 2001). Along the James River, 1 of 13 (8%) deaths of radio-marked hens was caused by a haymower (Leif 1997). In the southern Black Hills, 2% of the female wild turkeys were killed by vehicle collisions (Lehman 2005).

Deaths from freezing on the roost or during daily activities are very uncommon and are often related to nutritional difficulties. For this reason, we have discussed freezing and starvation-related deaths in Chapter 4.

Management of Survival

The high survival of female turkeys tells us that conserving hens in areas where biologists are concerned about low production and reduced wild turkey populations is a viable option. For example, following several years with extreme spring weather and poor reproduction, the population of Merriam's turkeys in the Black Hills declined during the 1990s. Although harvest of females during the fall is not great, SDGFP closed the fall season to enable the population a quicker recovery. Where populations are in excess, increased harvest of females during fall to reduce breeding populations can likewise help meet population management objectives.

In most populations, annual survival rates of male turkeys are largely controlled by hunting. Management of survival in the male portion of the wild turkey population in South Dakota has primarily been accomplished by limiting numbers of spring permits in some popular prairie hunting units. There has been no attempt to limit numbers of hunters and harvest of gobblers in the Black Hills other than season length, since the birds became well established and spring seasons were initiated in the 1960s.

We have very little information on harvest rates and male survival, so restrictions on licenses are based on biologists' perceptions of gobblers available for harvest as well as landowner tolerance for hunters. Unrestricted licenses in the Black

Hills have likely increased the percentage of 2-year-old gobblers in the harvest and reduced numbers of trophy birds (i.e., based on spur length) surviving to 3 years and more. However, the actual effects of unrestricted license sales in the Black Hills on harvest of males and population age structure (relative numbers of males in each year class) is speculative at this time. Influence of hunting on the male population segment in the Black Hills is the subject of research initiated in 2005 (personal communication, K.C. Jensen, SDSU).

Review

Survival of wild turkeys is generally much higher in females than males due to selective and intensive harvest of males in the spring season. Survival in the female segment of turkey populations can provide a measure of habitat and landscape quality.

If this is true, then South Dakota has many excellent habitats and landscapes for wild turkeys because survival of hens, often near or above 70%, ranks among the highest in North America.

In comparison to the hens, there is very little information on male wild turkey survival in South Dakota. However, survival plus reproduction are clearly continuing to support a considerable harvest of gobblers from year to year. The primary cause of nonhunting mortality in juvenile, yearling, and adult female wild turkeys in South Dakota is predation by mammals—data from other states indicate the same is true for males.

Female mortality is generally highest during nesting and early brood rearing periods when hens are most vulnerable to predators, particularly coyotes. A variety of other predators such as red fox, great horned owls, bobcats, and golden eagles also may prey on wild turkeys. However, we do not encourage predator control as a management option.

Viral, bacterial, fungal, and other diseases can infect wild turkeys and cause some deaths, but there is no evidence that these are affecting turkey populations. Wild turkeys have a variety of external parasites such as mites, ticks, and many internal parasites such as nematodes, flukes, and tapeworms, yet these parasites are not usually associated with disease problems.

Wild turkeys may be killed by pesticides or other toxins but there is no evidence that these are serious problems except in isolated instances in South Dakota. However, pesticides often reduce invertebrate foods available for poults. Accidents with mowing machines, power lines, automobiles, and a few other human inventions also kill turkeys but in small numbers.

Management of female wild turkey survival and mortality through fall hunting seasons is potentially our most effective way of managing annual survival to reach reasonable turkey populations.

Chapter 7

NESTING

Food and habitat selections made by animals throughout the year are reflected in their survival and physiological condition and culminate in their effort to reproduce. For wild turkeys, this critical reproductive period begins in April with courting of females by males and continues through nesting into summer brood rearing.

The nesting portion of the reproductive period is a time of increased energy demand and danger for female wild turkeys and, along with brood rearing, is the critical link to sustain populations. Our understanding of nesting in wild turkeys is continually modified and expanded with new research information. Information on nesting performance for adult and yearling turkeys can help biologists understand whether habitat, predators, or weather limits turkey populations. A careful assessment of nesting in turkey populations can help prevent the undertaking of management actions that have little probability of success.

In this chapter, we summarize much of what is known about wild turkey nesting with emphasis on research in South Dakota. The relationship of gobbling and nesting chronology is covered in Chapters 5 and 10 and is not discussed in this chapter. We hope to dispel some myths and develop a better understanding of the nesting ecology of wild turkeys in South Dakota.

Definitions of Terminology Regarding Nesting

Nest initiation: When the hen has laid the first egg in the nest bowl.

Clutch: A group of eggs normally laid by one female turkey by the time incubation begins. Occasionally more than one female will lay eggs in the same nest. These are often referred to as double clutches or dump nests.

Renest: If the initial nest has been destroyed (full or partial clutch), hens may initiate another nest. Depending on many factors, hens may initiate a second, third, or rarely a fourth nest.

Nest success or nest survival: These terms are used interchangeably in the literature and are the percentage or proportion of nests initiated that hatch at least one egg. For example, if half of all nests that were initiated hatched at least one egg, the nest success or nest survival would be 0.50 (or 50%). Nest survival may be reported as a daily rate or various periodical increments.

Hen success: The percentage of hens that hatch at least one egg in a breeding season. Hen success is usually higher than nest success because of renesting by hens.

Fidelity: The tendency for an animal (in this case a hen) to return to a site in successive years.

Nesting Behavior

Even with the aid of radio-telemetry, finding nests before incubation begins is difficult. During the laying period, hens are at the nest slightly less than 1 hour per egg laid, but that may increase with the laying of the last few eggs (Williams et al. 1974). Observations in the southern Black Hills suggest that hens usually visit their nest for 7–10 minutes to lay an egg early in the laying period and will gradually spend more time at the nest as the clutch nears completion.

Accurate estimates of population parameters are important in understanding factors that may limit turkey populations. Therefore, we must correctly identify nests initiated but destroyed or abandoned before incubation. Studies that only evaluate survival of nests that are incubated underestimate the percentage of hens that attempted to nest, the percentage of nests destroyed or abandoned, and how often hens renest.

Knowing what percentage of hens attempt to nest can indicate physiological condition coming into the nesting season, and that in turn can tell us something about habitat quality (Rumble and Hodorff 1993, Hoffman et al. 1996, Rumble et al. 2003). Too many wild turkeys in an area can reduce habitat quality and associated food supply and, thus, condition of females at nesting.

The first indication that a hen turkey has initiated a nest is her localized or restricted daily movements (Williams et al. 1971, Williams et al.1974). These localized or restricted movements have been used to indicate nest initiation and to develop less biased estimates of nest survival in several studies, including three in South Dakota (Rumble and Hodorff 1993, Lehman et al. 2001, Leif 2001). Typically, hens reduce their daily movements by more than half when they begin laying. Accurate determination of nest initiation requires locating radio-transmittered hens at daily intervals (Fig 7-1). Comparing movements of hens that are laying to movements during pre-laying allows accurate predictions of nest initiations (Lehman et al. 2005).

Hens that renest are frequently observed with gobblers before initiating a second nest and probably copulate during that period. However, most turkey eggs laid within 30 days of copulation are fertile (Burrows and Marsden 1938). Thus, the hen may not need to be bred for renesting, even if the initial nest has been incubated or hatched (Lewis 1973; E. Keinholz, deceased, Colorado State University, personal communication to M.A Rumble).

Fig 7-1. This lone Merriam's turkey hen is silently approaching her nest (arrow) in the Black Hills. (CPL)

Timing of Nest Initiation, Site Fidelity

Timing of nest initiation by wild turkeys depends on latitude, altitude, female condition, and weather (Fig 7-2). Nest initiation tends to be delayed at northern latitudes (Vangilder et al. 1987). However, the relationship between nest initiation and latitude is altered in Merriam's turkeys because of the wide range in migration patterns that include large changes in elevation from winter range to summer range. Some Merriam's hens in the Black Hills remain yearlong residents in one locality, but most migrate between lower and higher elevations. Migrations by Merriam's turkeys of 30 miles and encompassing a change in elevation of approximately 3,300 feet are common.

The wide variations in weather from northwest to southeast in the Black Hills (Orr 1959) also presumably affect nest initiation dates and may obscure effects of elevation or latitude on nest initiation dates in South Dakota and elsewhere.

Fig 7-2. Wild turkeys are well camouflaged and generally difficult to see on the nest. This bird has a white identification tag (patagial tag) attached to the skin near the front of her wing. (LDF)

Nesting by Merriam's turkeys in the Black Hills usually begins the third week of April and, depending on the extent of renesting, few nests are initiated after 1 July (Fig 7-3). This is almost identical to the start of laying in southern Colorado (Hoffman 1990). Nest initiation for Merriam's turkeys in southeastern Montana and the Missouri River breaks in south-central South Dakota occurred about 10–20 April, depending on annual weather (Jonas 1966, Wertz and Flake 1988, Flake and Day 1996). Nest initiation for eastern and Rio Grande turkeys in woodlands east of the Missouri River in South Dakota occurs in late April to early May (Leif 2001, Shields 2001, Lehman et al. 2001). Date of the earliest nest for eastern or Rio Grande turkeys in eastern South Dakota varies among studies but ranged from 14 April (Lehman et al. 2001) to 29 April (Leif 2001). Nest initiation dates in these studies were weather dependent; cooler springs delayed nesting onset (Flake and Day 1996, Shields 2001) (Fig 7-4). Most hens in eastern South Dakota nest by mid-May, and nests initiated after mid-May were usually renest efforts. Occasionally renesting by hens occurs into July. The latest renesting effort documented in the central Black Hills hatched on 14 August. This particular hen had incubated two previous nests, both of which were destroyed by predators.

Female turkeys often show strong fidelity to their nest sites (Hayden 1980, Liedlich et al. 1991). While common, nest site fidelity is not universal to all hens in a population, appearing to be an attribute of individual hens (Flake and Day

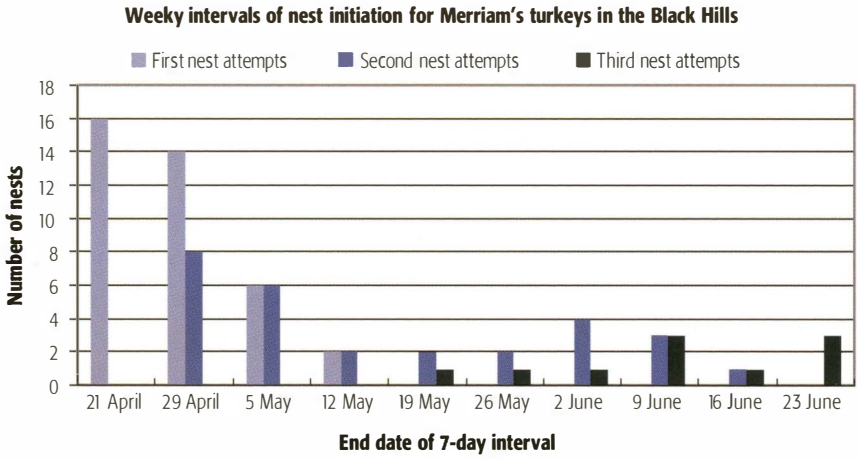


Fig 7-3. Number of first, second, and third nest attempts during weekly intervals by Merriam's turkeys in the Black Hills, 1986–1991. (from Rumble and Hodorff 1993).

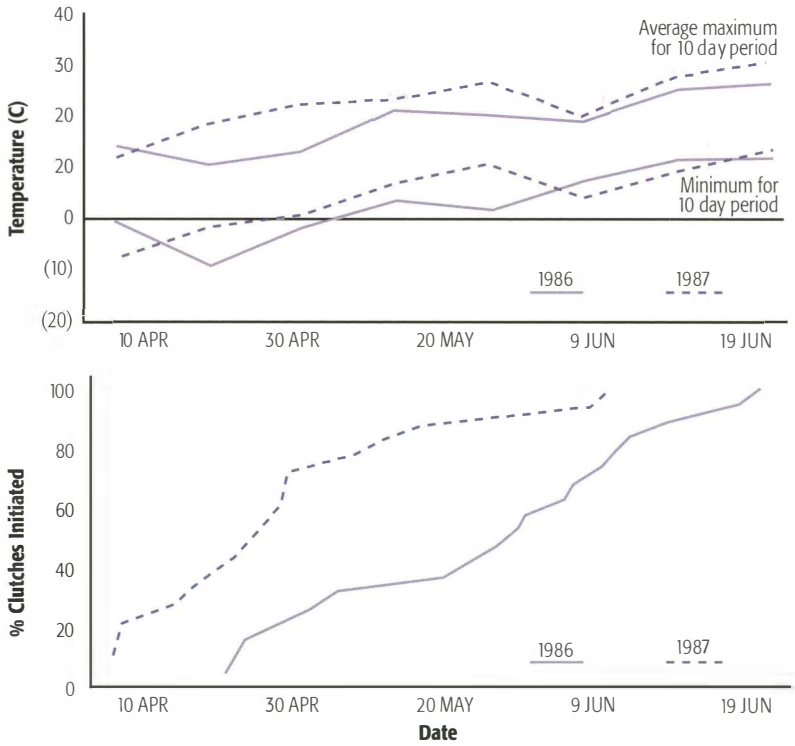


Fig 7-4. Minimum and average maximum temperatures by 10-day periods (i.e., preceding 10 days)(above) and cumulative percentage of wild turkey hens initiating nesting (below) in Gregory County, South Dakota, 1986–87. (from Flake and Day 1996)

1996). During studies in the central Black Hills, hens were occasionally observed nesting within 55 yards of the nest from the previous year and frequently within 440 yards. One hen in the southern Black Hills was observed nesting in the same nest bowl on 2 successive years; several hens nested within 10 feet of the previous year's nest bowl (C.P. Lehman, personal observation).

Clutch Size

Hens usually return to the nest and lay an egg each day, occasionally skipping a day. Some observers have documented hens laying 10 eggs in 11 days (C. P. Lehman, personal observation). The egg laying period for a nest will last 10 to 15 days depending on the number of eggs in a nest. Wild turkey eggs can endure harsh temperatures before incubation, even temperatures near 0°F (Ligon 1946). Eggs in the southern Black Hills endured temperatures of 8°F before hatching (C.P. Lehman, person observation).

Wild turkeys in South Dakota typically lay 9 to 12 eggs in a nest (Fig 7-5). On rare occasions, researchers have found 16 to 20 eggs in some nests, but these may be the result of more than one hen laying eggs in a nest (called a double clutch or dump nest).

There does not appear to be any consistent explanation for the variation in clutch size among studies. For example, Peterson and Richardson (1975) reported an average clutch size for nests in the Black Hills of 11.4, while Rumble and Hodorff (1993) reported an average clutch size of 9.2 eggs per nest, more than 2 eggs difference. In central South Dakota, average clutch size was 11.2 eggs per nest (Flake and Day 1996). In northeastern South Dakota, the clutch size of Rio

Fig 7-5. Wild turkeys typically lay 9–12 eggs. The hen begins incubating continuously after laying the last egg. (LDF)

Grande and eastern turkeys averaged 10.5 eggs over a 3-year period, but in one year, clutch size was over 11 for both subspecies (Lehman et al. 2001). Typically, over 90% of wild turkey eggs are fertile and hatch if a nest is not destroyed during incubation.

Incubating Behavior and Incubation

The amount of time a hen spends at her nest increases as the clutch nears completion and she begins incubating the eggs for short intervals (Williams and Austin 1988).

A hen will begin incubating her clutch nearly continuously after laying the last egg, turning and repositioning her eggs several times each day (Williams et al. 1971, Williams and Austin 1988). The incubation period varies from 25–29 days (Williams et al. 1974, Healy and Nenno 1985). Healy (1992a) attributed the variation in incubation time to the amount of time spent incubating during the laying stage and the length of time the hen remained at the nest after the young hatched. Twenty-eight days is a reasonably good estimate of incubation time for most turkey nests (Fig 7-6).

Once hens begin incubating continuously, they are attentive to their nests and usually only leave for defecating, feeding, and possibly watering (Healy 1992a). Hens leave their nests on average every 1.9 days and may be gone from a few minutes to two or more hours (Hillestad and Speake 1970, Williams et al. 1974). On cool days, hens are off the nest for shorter periods than on warm days. While off the nest, hens leave characteristically large droppings about the size of a biscuit; these indicate a nest is nearby.

Fig 7-6. The incubation process takes approximately 28 days in wild turkeys with the hen turning the eggs as much as once per hour and leaving the nest every 1 to 2 days to feed. This Merriam's hen nested in ponderosa pine slash produced in abundance by logging and by heavy snows in the spring that caused limbs to break off. (CPL)

Fig 7-7. In the Black Hills, over 95% of wild turkeys initiate at least one nest attempt during the reproductive season. This hen (arrow) has found good camouflage against a shrubby mountain juniper, small logs, and slash. (MAR)

Nesting Rates and Success

Yearling and adult nesting rates and renesting

Most studies show that wild turkey hens 2 years or older have high nesting rates. In South Dakota, adult nesting rates in the Black Hills averaged 97%; for birds in deciduous woodlands, adult nesting rates were nearly 80% (Fig 7-7).

It was believed, from earlier research within the historical range of Merriam's turkeys, that yearling Merriam's turkey hens did not nest (see reviews in Hoffman et al. 1993, Rumble et al. 2003). This presumption prevailed among biologists until the early 1990s (Healy 1992a). However, research in South Dakota has shown that yearling wild turkeys, including Merriam's turkeys, frequently nest.

Yearling nesting rates vary among areas. In the central Black Hills, 77% of yearling Merriam's turkey hens attempted to nest (Rumble and Hodorff 1993). In comparison, yearling Merriam's turkeys in the Missouri River breaks in Gregory County had low or no nesting effort, depending on year. In Grant County, 91% of yearling and 94% of adult eastern turkeys initiated nests (Shields 2001). In Marshall and Roberts counties, greater than 80% of both Rio Grande and eastern hens, regardless of age, initiated a nest (Lehman et al. 2001, Lehman et al. 2002).

When nesting rates were compared among several studies of Merriam's turkeys in the western U.S., nesting by yearling hens was nearly nonexistent unless adult hens demonstrated nesting rates in excess of 40%; beyond that threshold, nesting rates of yearling hens increased with increases in adult nesting rates (Rumble et al. 2003).

Like Merriam's turkeys, some populations of other subspecies of wild turkeys have little or no reproduction from yearling hens if the habitat is poor or over-populated with turkeys (Hillestad 1973, Still and Bauman 1990).

Turkey nesting is very likely related to habitat quality, perhaps in the form of availability of nutritious foods. In Colorado, heavier adult Merriam's nested more often than lighter birds, suggesting that nutrition controlled the proportion of

females nesting and renesting (Hoffman et al. 1996). Annual changes in weather patterns can influence vegetation growth and thus influence the quality of the habitat, including food abundance for nesting turkeys. In this regard, increased spring precipitation in the Black Hills improves growth and abundance of nutritious grasses and forbs and may explain annual differences in nesting effort (Rumble and Hodorff 1993) and in numbers of young turkeys added (recruited) to the population.

Yearling Merriam's turkeys in Arizona exhibiting low nesting also had nutrient deficiencies (Wakeling and Rogers 1995). Thus, habitat quality may be manifested through nutrition, which in turn may control nesting rates in wild turkeys.

When a wild turkey abandons the nest or it is destroyed, she may initiate another nest (renest). If a renest is destroyed or abandoned, subsequent renests are possible but less common. Persistency in renesting appears to be related to habitat as influenced by spring precipitation or other factors, but the precise mechanisms are not yet fully understood. For example, in the central Black Hills, nest attempts per hen increase when spring precipitation increases (Rumble 1990, Rumble and Hodorff 1993). In dry years in the Black Hills there is very little renesting, even if nest success is low.

Renesting is common among all subspecies of turkeys in South Dakota. Renesting rates in South Dakota may exceed 60% but also may be only 20–30%, and renesting by yearling hens is usually lower than for adult hens (Rumble and Hodorff 1993, Lehman et al. 2001, Leif 2001). Eastern and Rio Grande turkeys in Marshall and Roberts counties had renesting rates of 64% and 88% for adults; 50% of yearling Rio Grande hens renested. No information was collected on juvenile eastern turkeys. These rates indicate strong renesting efforts (Fig 7-8).

Along the James River, only 27% of eastern turkeys (adults and juveniles combined) with failed nests renested (Leif 2001). Renesting rates in the central Black Hills were high with an average of 1.2 renests per adult female and 0.6 per yearling female. Some hens persisted through continuing failures and renested a third time (Rumble and Hodorff 1993).

Although common in some gallinaceous birds, renesting after loss of a brood is rare in wild turkeys. Renesting by Merriam's turkey hens that lost their poults has been observed once in the southern Black Hills (Lehman 2005). In a recently introduced Rio Grande turkey population in Oregon, renesting after brood loss occurred on several occasions (Keegan and Crawford 1993). To our knowledge there are no documented cases of rearing multiple successful broods in wild turkeys.

Fig 7-8. Nesting effort in hens is influenced by their condition coming out of winter and by the availability of new forbs, grasses, and other sources that provide high protein and energy during the spring. (K.C. Jensen, SDSU)

Nest success

Wild turkey nests are inherently vulnerable to predation. Nest success rates for adult or mostly adult hens in South Dakota were 41% for eastern turkeys on the James River, 59% and 70% for Rio Grande and eastern turkeys in northeastern South Dakota, 36% for Merriam's turkeys in the central Black Hills, and 44% for Merriam's turkeys in the Missouri River breaks. Yearling nest survival may be similar or lower (Fig 7-9).

Predators of turkey nests include a wide variety of mammals and birds. American crows accounted for 65% of the nest predation in the central Black Hills and during one year accounted for 100% depredation of first nests that were initiated. Black-billed magpies also are effective nest predators, particularly in prairie woodlands. Coyotes were the main predator on turkey nests in the southern Black Hills (Fig 7-10). In the central Black Hills, coyotes and to a lesser extent red fox were the primary mammals that destroyed turkey nests. Nest predation by these and other carnivores frequently resulted in mortality to the hen as well.

The months of April, May, and June (nesting season) were times of highest mortality to Merriam's turkey hens in the central and southern Black Hills and in southeastern Montana (Thompson 1993, Rumble et al. 2003, Lehman et al. 2006a). In northeastern South Dakota, the highest mortality rate for eastern and Rio Grande hens came in the spring nesting period in Marshall and Roberts counties but not in Grant County (Lehman et al. 2001, Shields 2001).

Fig 7-9. Studies in South Dakota indicate that nest success for wild turkeys is generally 40% or better. Both of these clutches have hatched. (CPL, LDF)

Fig 7-10. This nest was destroyed by a coyote, based on evidence from hair at the nest site (caught in shrub branches). Inset: Coyote destroyed egg. (CPL,MAR)

Severe spring snowstorms can cause substantial loss of turkey nests. These late spring snowstorms are more common in western South Dakota and the Black Hills than in the rest of the state. Nonetheless, hens have been observed incubating nests during spring snowstorms and after (Fig 7-11). Spring snowstorms accounted for 71% of the nest losses during one year but over a 6-yr period only accounted for an average of 16% of nest losses in the central Black Hills (Rumble and Hodorff 1993).

Weather can also have an indirect effect on nest survival. Nest success generally decreases and nest predation increases when spring precipitation, especially during incubation, is high (Roberts and Porter 1998, Lehman et al. 2006a), giving rise to the hypothesis that predators are more efficient at finding nests during wet weather. Whether or not the hypothesis is valid is still being studied, but anyone who has held a wet turkey knows that it stinks!

Because of large clutch sizes and renesting, turkeys generally have high reproductive ability. Due to renesting, hen success usually is greater than nest success. Hen success in a population of introduced eastern turkeys and a resident population of Rio Grande turkeys in northeastern South Dakota averaged 78% for eastern turkey hens and 91% for the Rio Grande hens (Lehman et al. 2001). In the Black Hills, hen success over a 6-year period averaged 41% but adults had greater hen success (48%) than yearlings (24%) (Rumble and Hodorff 1993). Along the James River, hen success averaged 47% for eastern turkeys (Leif 2001). The difference in hen success between adults and yearlings in the Black Hills was attributed to greater renesting efforts by adults and the higher success of renests.

Fig 7-11. Spring snow storms accounted for 16% of nest failures (6-year study) in the central Black Hills but did not contribute to nest failures in the southern Black Hills (3-year study). This clutch (arrow) located under pine slash hatched successfully. (CPL)

Nesting Habitat

Turkey nests consist of shallow depressions in the ground with some surrounding cover to provide concealment. Turkeys use a wide variety of substrates to provide cover for nests (Fig 7-12).

Early descriptions of turkey nests were largely skewed by the methods used for finding nests and where the nest searches occurred. Early descriptions from the Black Hills suggested a large proportion of hens used logging slash to conceal the nest (Peterson and Richardson 1975). We believe the primary reason turkey nests were often found in logging slash was because this was where researchers were looking. Recent studies in which turkeys were outfitted with radio transmitters provide a broader picture of turkey nest sites. Most wild turkey nests are well concealed and difficult to spot.

Hens usually place nests where they are concealed from the side and frequently from above (Day et al. 1991a, Rumble and Hodorff 1993, Lehman et al. 2002). Turkeys will nest within prairie woodlands but will also nest away from the woodlands in pastures (shrub inclusions), Cropland Reserve Program (CRP) fields, or other idle lands (Day et al. 1991b, Leif 2001).

The most important features influencing selection of nest sites appear to be vegetation and physical characteristics within a very small area around the nest. Horizontal concealment of nests usually extends outward from a nest approximately 3 to 7 feet. Logs, logging slash, sapling trees, shrubs, rocks, grasses, and forbs can provide concealment.

Shrubs are, perhaps, the most important part of nest concealment throughout South Dakota. Snowberry, chokecherry, sumac, wild plum, common juniper, and other shrubs provide good concealment for nests (Fig 7-13). Deciduous shrubs are increasingly selected for nest cover later in the season when they have leaves (Day et al. 1991a, Rumble and Hodorff 1993). Renest attempts beneath deciduous shrubs in the Black Hills had greater probability of hatching than earlier nests not under shrubs.

Wild turkeys in South Dakota do not need to nest near water. Nesting females usually get their water needs from water content in their food, metabolic by-products, or dew that collects on leaves (see Ch 4).

Fig 7-12. Shrub cover and a large rock (guard object) provide concealment for this wild turkey nest in the Black Hills. (CPL)

Some researchers have hypothesized that hens select nest sites that are near brood rearing areas. This has not been demonstrated in South Dakota, perhaps because habitats important for brood rearing are well dispersed throughout the forested areas. Nonetheless, sometimes hens with broods will move 2 to 5 miles in a few days to new home ranges with excellent habitat for poults (see Ch 8) (Rumble and Anderson 1993). These movements shortly after hatching did not result in high mortality to poults and suggest that hens with poults have little difficulty reaching preferred brood rearing habitats, even if they nest a considerable distance away.

One might logically expect predation on turkey nests to be related to the habitat and concealment around the nest. This was not the case in the central Black Hills, where there was no difference in vegetation characteristics and concealment at successful and unsuccessful nests (Rumble and Hodorff 1993). Similarly, in Gregory County no difference in nesting success was noted between hens nesting in grassland shrub patches and those in woodlands, despite greater nest concealment in the former (Day et al. 1991b, Flake and Day 1996). In contrast, Lehman (2005) found greater concealment of the nest as well as greater shrub cover at successful compared to unsuccessful nests in the southern Black Hills. Some other researchers have also found that hens that successfully hatched a clutch were more likely to have nests well concealed by vegetation or other obstructions

Fig 7-13. Wild turkeys often place their nests where they will be concealed by the leaves of deciduous shrubs or saplings. Two eggs in this clutch failed to hatch. (LDF)

than those with destroyed nests (Badyaev 1995, Wakeling et al. 1998). Laying hens commonly provide additional nest concealment by covering their eggs with debris between visits to the nest (Fig 7-14).

Wild turkeys select nest sites on slopes facing all different directions (i.e., aspect of the terrain) and on terrain varying from flat to steep (i.e., slope of the terrain). Slope and aspect do not appear important to hens during the process of selecting a nest site in South Dakota.

However, there may be circumstances where slope and aspect could affect selection of nest sites. In New Mexico and Arizona, Merriam's turkeys selected areas on steep slopes with shrubs or other vegetation for nesting (Schemnitz et al. 1985). In the Black Hills, a few hens appeared to select unusually steep, rocky terrain for their nest sites that was difficult to traverse for mammalian predators; such sites also may have made scent detection of the hen and nest more difficult (Fig 7-15). In the southern Black Hills, turkeys that selected steeper slopes for nest sites were found to have higher nest success (Lehman 2005).

Nesting habitat was not a limiting factor for Merriam's turkeys in the central or southern Black Hills, nor does it appear limiting in other regions of South Dakota where wild turkeys have been studied.

Potential for Nest Disturbance by Hunters

Because the spring gobbler season overlaps the nesting season, turkey hunters occasionally find a hen on the nest. The outcome of that encounter between hunter and nesting hen will largely depend on the level of disturbance and stage of the nesting cycle.

Fig 7-14. A turkey usually conceals her clutch with debris from around the nest between visits to the nest during laying. (CPL)

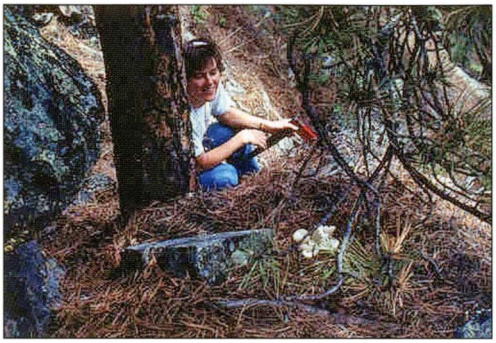


Fig 7-15. Some hens in the Black Hills selected unusually steep slopes for placement of nests. This nest was on a ledge over 150 feet up a steep, rocky slope. (MAR)

Biologists in early research studies relied on intensive searching and luck to find nests. They recorded that hens frequently abandoned their nest if disturbed to the point where they flushed from the nest, particularly early in the nesting period. One-third of the nests found in early Black Hills studies were abandoned because of disturbance to the nests by observers (Peterson and Richardson 1975).

Many hens that are close to hatching will continue to incubate after being flushed from the nest. Hunting seasons across the nation were structured for many years to minimize the potential of hunters disturbing nesting hens. Studies have shown that encounters between nesting hens and hunters are uncommon and that delaying the spring season until midway in the laying period can reduce illegal kill of hens since most hens are no longer accompanying gobblers.

If hunters find a nest, they should move away and not return to the site to determine the fate of the nest.

Review

Nesting wild turkey females restrict their activities to near the nest site, separate from the flock, and become secretive during the laying period. To determine if hens attempt to nest it is necessary to capture them in advance and fit them with radio transmitters. Wild turkeys will often return to the same area from year to year for nesting.

Most females remain fertile for more than a month after insemination. Nesting of wild turkeys generally begins around the second or third week in April. If wild turkey nests are destroyed, hens may attempt to nest a second or even third time. The renesting effort appears to depend on habitat quality and condition of the hen.

Clutch size varies from 9–12 eggs of which more than 90% are fertile. In general, 2-year-old or older hens have higher nesting rates than yearlings, but both often have high nesting rates in South Dakota. Low nesting effort by yearling hens may be indicative of overpopulated areas or poor habitat conditions.

Incubating hens are highly attentive to the nest and only take recesses on average every other day. Nesting success rates in South Dakota varied from 36–70%, and most nest failure was due to predation by coyotes or American crows. Most turkey nests are well concealed by vegetation with shrubs providing the most important cover. Nests are also frequently placed next to logs, rocks, or other guard objects. Nests do not need to be near good brood rearing areas because the birds are highly mobile.

Chapter 8

BROODS

The first few weeks of life are a vulnerable time for a young turkey or poult. Poults can die from starvation, predators, or exposure to inclement weather. Survival, regardless of the habitat or region, is always a chancy thing, and it has a major influence on recruitment of young to a population.

Hatching and Nest Departure

Approximately 28 days after incubation is initiated, the poults will begin chipping their way from their oval homes in a process known as pipping. A transitory pipping tooth on the tip of the upper mandible helps a poult to break through the egg shell. While the poults work their way out of the egg, the hen calls softly, helping to synchronize hatching and enabling the young to learn the voice of the mother (Healy 1992a, Williams and Austin 1988). The process of pipping can take up to 24 hours for an individual poult (Healy 1992a). Once the poult emerges from the egg, it begins drying itself by preening the down. The chick reaches the "fluffy down" stage about 6 hours after hatching (Fig 8-1) (Williams and Austin 1988).

Because eggs are laid over a 10- to 15-day period and incubated for short stints while the last few eggs are being laid, not all poults from the same clutch are at the same stage of development. The variation in hatching between brood mates results in the entire process sometimes lasting more than a day. Although turkeys generally have high hatchability, it is not uncommon for one or two of the eggs to remain unhatched either due to delayed development of the embryo or improper fertilization.

The process of pipping and drying to the point where the precocial poults are capable of moving about with the hen takes about 2 days (Healy 1992a). Poults learn quickly to recognize the hen and her calls in an innate learning process known as filial imprinting. Filial imprinting forms a social bond between the hen and her poults and must occur within about 24 hours of hatching or it will never occur (Healy 1992a). The newly hatched poults imprint to the first thing that provides parental care, including human caretakers. Once the young poults have

Fig 8-1. Poults are in the fluffy downy stage shortly after hatching. (USDA Forest Service, Northeastern Research Station, Amherst, Mass.)

Fig 8-2. Within 24 hours of hatching the female usually leads the young away from the nest in search of food. (USDA Forest Service, Northeastern Research Station, Amherst, Mass.)

imprinted to the hen and are able to walk, the hen leads them away from the nest in search of food (Fig 8-2).

Foods and Feeding Habits

Upon hatching, poults have an emergency food supply in the form of unused fats and proteins contained in the remnants of the yolk sac. The remnant yolk sac is resorbed into the gut and taken up by the blood plasma where it is used for growth in the first few days posthatch. Recently hatched poults can survive a few days on reserves while learning to feed.

For the first few days after nest departure, poults also use the reserves during cold or wet periods when they spend less time feeding and increased time under the brooding hen. After the yolk sac is gone, food availability and nutrition are integrally linked to the physical condition of the young poults. Finding the right foods and in sufficient quantity is one of the most important facets of this period of life for poults.

Turkey poults require 28% dietary protein for optimal muscle and feather development (National Research Council 1977). To obtain essential protein, poults must feed nearly continuously early in life, but they also need to choose the right types of food. The learning process of what to eat and what not to eat is rapid, but pecking at suboptimal food sources does occur the first few days posthatch.

Growing poults feed heavily on insects to obtain their protein requirements (Fig 8-3). In the central and southern Black Hills, turkey poults consumed upward of 80% arthropods in their diet until they reached at least 4 weeks of life, with the majority of food intake still consisting of insects until 7 weeks of age (Rumble and Anderson 1996a, Lehman 2005). Poults showed a taste for beetles and grasshoppers in the central Black Hills (Table 8-1) as well as the southern Black Hills (Lehman 2005). This in part shows that the poults are keying in on certain insect species to maximize their protein intake.

Growth and Development

Poults grow rapidly until around 7 months of age. Newly emerged poults weigh approximately 1.6 ounces (45 g) and will gain just over 1 pound per month for the first 3 months of life (Pelham and Dickson 1992). By this time they are small adults in terms of their behavior, habitat, and food.

Rapid growth continues between 3 and 7 months; developing turkeys may average as much as 1.1 lb gained every 2 weeks. When the juveniles reach 7 months of age, females average about 8 lb and males 12.5 lb (Pelham and Dickson 1992).

Fig 8-3. Poults feed voraciously on small insects and other invertebrates to obtain the high amounts of protein needed for growth. (USDA Forest Service, Northeastern Research Station, Amherst, Mass.)

Table 8-1. Percent composition of Merriam's turkey poult diets by age classes from the Black Hills, South Dakota 1986–1988. Diet composition was based on microscopic analysis of fecal droppings (Rumble and Anderson 1996b).

Food Types	0 – 3 wk average	4 – 7 wk average	8 – 12 wk average
Coleoptera (beetles)	29.4	24.4	7.0
Orthoptera (grasshoppers)	38.8	48.8	43.0
Hemiptera (leafhoppers)	2.0	0.1	0.0
Hymenoptera (wasps,ants)	9.2	1.5	6.0
Total invertebrates (insects, spiders, worms)	81.4	76.5	61.1
Total grass foliage	8.2	7.9	5.1
Grass seeds	5.2	5.7	13.4
Forb foliage	1.8	1.1	0.9
Forb seeds/flowers	1.4	2.0	4.8
Soft mast	1.0	5.8	4.0
Hard mast	0.7	0.9	10.6

One of the major transformations a poult goes through is the gaining of flight feathers (see Fig 3-3) and other juvenal plumage. After hatching, poults are covered with natal down, along with newly emerging primary flight feathers (Williams 1981). Several secondary flight feathers begin erupting the first day posthatch (Fig 8-4) (Williams and Austin 1988). Primary and secondary flight feathers grow rapidly and, at 3 weeks of age, the primaries look too large for the body and can extend beyond the erupting tail feathers.

By the first winter the developing turkey will go through four plumages and three molts (see Ch 3); these consist of some complete and some partial molting and feather replacement. The down is initially replaced with partridge-like juvenal plumage (see Fig 8-6). The poult will attain feather characteristics similar to that of adults with the first basic (postjuvenal) plumage at about 3 months of age (Pelham and Dickson 1992).

Poults are generally capable of flight up to 5 feet at 8 days of age but actually make short hop flights as early as 6 days (Williams 1974, Williams and Austin 1988). Based on our observations in the southern Black Hills, poults could fly a distance of 10 feet or more as early as 8 days of age, although some, when approached, would not take flight until 12 or 13 days. Variation in days until flight attainment is most likely an indicator of individual poult condition, as poults with delayed flight may not be receiving the proper nutrition needed for maximum growth and development.

Fig 8-4. The growth of juvenal flight feathers is evident on this poult of less than 3 days of age. Some flight feathers actually start emerging by hatch. (CPL)

Habitat and Movements

Habitat is the primary factor influencing poult condition and survival. The availability of forbs and grasses to support insects and other arthropods and escape cover governs how many poults in a brood, if any, will survive to make more turkeys.

A nearly universal conclusion is that meadows and other forest openings are critical brood feeding areas. In the central Black Hills, hens with poults less than 4 weeks old spend most of the daytime in meadows rather than dense wooded habitat (Rumble and Anderson 1996a) (Fig 8-5). In northeastern South Dakota, the meadow complex is somewhat different, but turkeys with broods are still associated with prairie edges, alfalfa fields, and even edges of row-crop fields (Lehman 1998, Shields 2001). Row crops and alfalfa also provide overhead cover from avian predators as poults feed or loaf, although the trade-off is increased danger from pesticide spraying and mowing. In Gregory County near the Missouri River, broods make heavy use of prairie edges along woodlands for feeding.

Turkeys using meadows, forest edges, and other open habitats are seeking out areas with abundant insects and other arthropods (Rumble and Anderson 1996a, 1996c). The insects so vital to growth and development are found in much higher numbers in meadows than in forests or prairie woodlands (Day et al. 1991a, Rumble and Anderson 1993). Poults often find young grasshoppers abundant in these meadows and forest openings.

Hens with young poults are usually within 5 to 10 yards of woodland or other protective cover and generally feed parallel to some type of nearby forested cover for escape from potential predators. There is a tradeoff between optimal feeding sites and safety. Studies have noted broods feeding along edges of meadow or

Fig 8-5. Meadows and other forest openings serve as critical feeding areas for poults, especially in the first month of life. Poults are primarily seeking insects and other small invertebrates during this time period. (CPL)

other grasslands, compromising between insect abundance and woody escape cover (Day et al. 1991a, Rumble and Anderson 1993).

In the central Black Hills, 1,124 lb/acre of herbaceous vegetation was recommended for adequate poult cover in meadows (Rumble and Anderson 1996a). In the southeastern United States biologists felt that less than 357 lb/acre herbaceous cover was not providing poults with enough food, but more than 2,677 pounds/acre was too dense for poults to navigate through (Healy 1985).

The movements of a hen and her poults soon after hatch are generally limited by the distance a small poult can move in the course of a day. Initial movements of the brood are toward optimal foraging habitat, generally meadows or grassland edges. In the Black Hills, one hen took her poults 3.5 miles in less than 4 days to a large meadow. The longest movement of a brood was 14.5 miles over a span of 6 weeks (Rumble and Anderson 1993). In Gregory County broods moved up to 2.2 miles from their nests to the center of their brood rearing areas (Day et al. 1991a).

As the brood matures, feeding habits and habitat selection patterns change (Fig 8-6). In the Black Hills, the amount of insects eaten started to decrease around 4 weeks of age, accompanied by a notable shift to plant material (i.e., berries, grass blades, and seed heads) after 7 weeks of age (Rumble and Anderson 1996b).

This shift of diet also means a gradual shift of habitat. As poults grow older, their food consumption more closely resembles that of adult birds. Consequently they begin a move from meadows and meadow edges toward forested habitats (McCabe and Flake 1985, Day et al. 1991a, Rumble and Anderson 1993).

Poult Survival

Estimating the survival of poults can be difficult because multiple hens and their poults will often form gang broods (Fig 8-7). The best estimates come from observing poults in the roost with hens, but wild turkeys frequently will flush from the roost if approached too closely. Poult survival in South Dakota has been estimated by periodic counts of poults from hens fitted with radio transmitters (Table 8-2).

Survival of South Dakota poults to 4 weeks of age has ranged from 27% to 55%, with most mortality occurring during the first 1 to 2 weeks after hatching. Poult survival to 4 weeks in Iowa averaged 52% (Hubbard et al. 1999a), while 36% of poults survived to 8 weeks in Wyoming (Hengel 1990). Survival rates of 20% through poult rearing were adequate to maintain a hunted turkey population in New York (Glidden and Austin 1975).

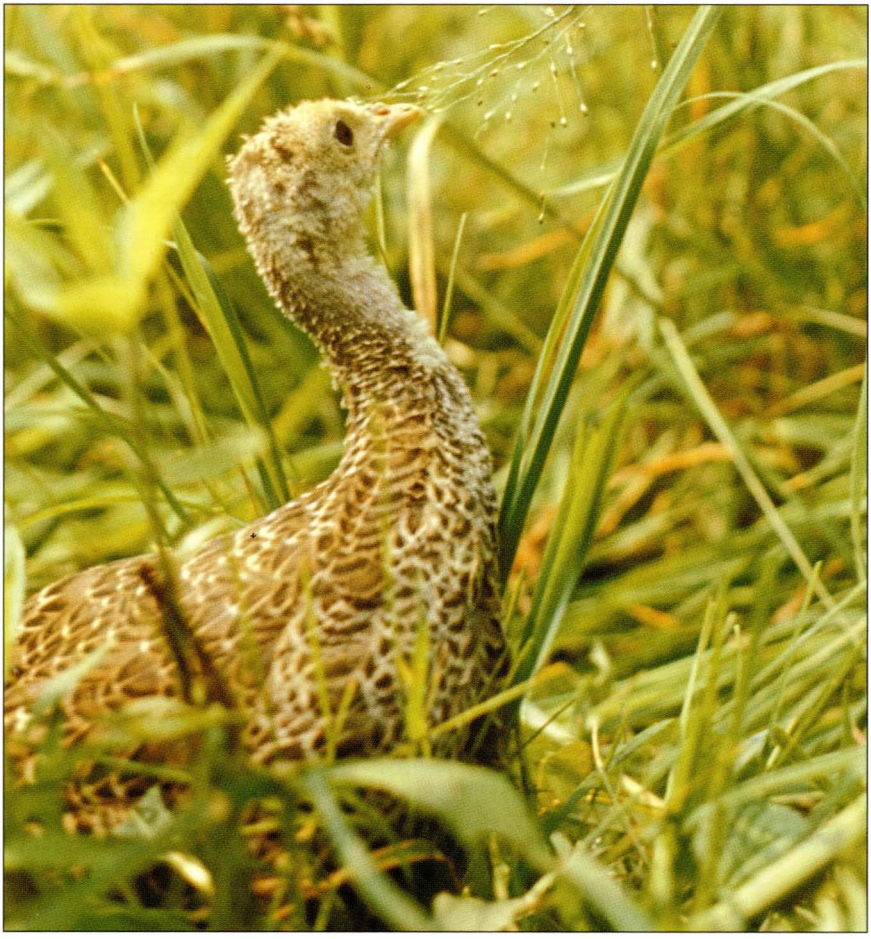


Fig 8-6. As poults get older, the proportion of seeds, leaves, fruits, and other plant materials in the diet begins to increase. This eastern turkey poult is 5–6 weeks old. (USDA Forest Service, Northeastern Research Station, Amherst, Mass.)

Fig 8-7. Multiple brood hens and their poults will often group together to form gang broods, as these Gregory County birds are doing. (LDF)

Table 8-2. Survival rates of wild turkey poults throughout South Dakota 1996–2002.

Location	Year(s)	Subspecies	0– 2 week survival rates	0–4 week survival rates
Gregory County[a]	1986	Merriam's	0.43	0.43
Marshall County[b]	1996	Eastern	0.63	0.47
Roberts County[b]	1996	Eastern	0.56	0.42
Marshall County[b]	1996	Rio Grande	0.50	0.42
Marshall County[b]	1997	Eastern	0.51	0.35
Roberts County[b]	1997	Eastern	0.64	0.55
Marshall County[b]	1997	Rio Grande	0.34	0.29
Grant County[c]	1999–2000	Eastern	0.41	0.36
Southern Black Hills[d]	2001–2002	Merriam's	0.31	0.27

[a] Flake and Day 1996
[b] Lehman 1998
[c] Shields 2001.
[d] Thompson 2003.

Poult Mortality: Inclement Weather and Predation

Extreme conditions during early brood rearing such as high amounts of rain, hail, or snow and unseasonably cold temperatures can cause poult mortality. The hen will use her body and wings to shield her poults from cold and/or precipitation, a process referred to as brooding, but frequently cannot provide shelter to all brood members. Poults unable to regulate their temperatures die (Fig 8-8) .

Precipitation and low temperatures for more than 12 hours caused mortality in poults in West Virginia (Healy and Nenno 1985). In the Black Hills, entire broods were lost after several days of rain and cold weather (Thompson 2003; M.A. Rumble, personal observation.).

Predation is an additional factor affecting poult survival. In South Dakota, mammalian predators of wild turkey poults are primarily coyotes and red fox.

In the first few weeks, poults are also vulnerable to smaller ground predators such as weasels or mink. Avian predators include red-tailed and Cooper's hawks and Northern goshawks. In Alabama, predation caused 82% of the mortality for which the cause of death was known (Speake et al. 1985). In Iowa, most known poult mortality came from predation, with mammals accounting for nearly 93% of overall predation and weasels, mink, red fox, and coyotes the primary predators (Hubbard et al. 1999a).

Fig 8-8. Mortality on poults is high, with over half of the young normally dying by 4 weeks of age. Most of the mortality occurs within the first 2 weeks of hatch. (USDA Forest Service, Northeastern Research Station, Amherst, Mass.)

Generally, the first defense used by preflight poults is to hide. The hen gives an alarm putt when sensing danger, signaling to the brood to freeze where they're at—this reaction is innate to the newly hatched poult. The cryptic feather coloration on poults allows them to blend in well with their surroundings. If a predator comes too close, the hen will usually try to draw the attention of the predator away from her brood and to herself, using a distraction display called "wing feigning" that represents an injured turkey—further drawing the predator's attention to her and not the vulnerable poults (Fig 8-9). Hens have been observed defending their broods from goshawks to the point of flying after the goshawk and chasing it away from the area (Lehman 2003).

Poult Roosting

During their early flightless stage and until about 10 days of age, the brood cannot roost in trees. Until poults can fly, they roost on the ground under a brooding hen at night. These ground roosts frequently have surrounding vegetation characteristics similar to nests. Hens will select dense vegetation consisting of grass, shrubs, or perhaps a log or stump to provide concealment while ground roosting.

Fig 8-9. Wild turkey brooding females instinctively give a distraction display (act injured) to lead predators away from their young. (DJT)

Once all brood mates are capable of flying up to the mid-portions of a tree, the brood generally begins tree roosting. Roosting in trees occurs as early as 10 days in the southern Black Hills, but in years of lower abundance of food resources and consequently slower development by poults, tree roosting may not occur until as late as 17 days (Thompson 2003).

In similar habitat near the Laramie Range, Hengel (1990) recorded mean ages for first tree roosting of 14 days and 17 days during a 2-year study—the 17 days seems like an unusually late average age for initial tree roosting. In Florida, poults began tree roosting at from 12–19 days (Williams and Austin 1988).

Poults generally roost in the mid-portions of trees for the first few nights, eventually moving to the upper portions. Young poults usually roost with the hen, either under her wings or occasionally on her back (Fig 8-10). As the poults grow, they become more independent, roosting on separate branches, but generally remaining in the same tree. Roost trees used by hens with poults are frequently as large or larger than those selected by adult turkeys without broods (Hengel 1990, Rumble 1992). Roosts typically include openly spaced branches that allow easy access.

Habitat Management Implications

The importance of meadows in providing cover and food (i.e., invertebrates) to young turkeys cannot be overstated (Fig 8-11). Maintaining herbaceous cover and vegetation height in meadows and other open areas is essential to providing poults the invertebrates they need. Troubles can arise from overgrazing, where the meadow/pasture is reduced to the point of decreasing invertebrate abundance and hiding cover for poults. With rotational grazing systems and/or application of moderate grazing practices, grassland, woodland, and forest habitats can be managed to benefit both cattle and turkey broods.

Invasion of meadows by dense stands of sapling ponderosa pine represents a threat to brood habitat in the Black Hills. In the southern Black Hills, some

Fig 8-10. Tree roosting in poults begins as early as 10 days and as late 17 days after hatching and may depend on available nutrition and condition of the poults. (National Wild Turkey Federation)

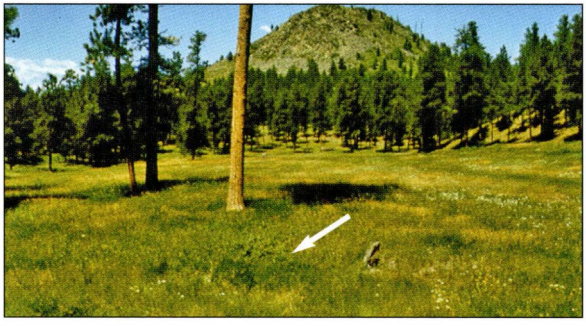


Fig 8-11. This Black Hills meadow provides good feeding habitat for broods. Overgrazing by livestock and invasion by ponderosa pine saplings will greatly reduce value of meadows for wild turkeys and especially for young poults. A hen and six poults are hidden in the foreground (see arrow). (MAR)

landowners are creating more open habitat for turkeys by thinning and prescribed burning of dense stands of sapling ponderosa pine. However, the influence of large fires on wild turkey broods in the Black Hills is poorly understood. By providing adequate habitat for developing broods, we can help ensure a healthy, huntable wild turkey population in South Dakota.

Review

Wild turkey poults develop quickly and are ready to follow the hen from the nest within about 2 days after hatching. Young poults require about 28% protein in their diet for proper growth and development. This high level of protein is primarily acquired by feeding heavily on insects and other arthropods. Insects and other invertebrates remain important in diets throughout the poult stage, but decline slowly as poults grow older and increase their intake of leaves, seeds, and other plant material. Poults gain an average of just over 1 pound per month for the first 3 months after hatching.

Meadows, other forest openings, pasture edges, and even cropland edges are important feeding areas for poults. Adequate growth of grasses and forbs of moderate density is needed to support insect or other invertebrate food sources as well as to provide some concealing cover.

Poults can usually fly 10 feet or more by the eighth day after hatch. Until flight is sufficiently developed between 10 and 17 days after hatch, the brood hen roosts on the ground with her young.

Survival of turkey poults to four weeks of age in South Dakota ranged from 27–55% in various studies. Most mortality of poults occurs in the first 2 weeks after hatch when young are especially vulnerable to predators and prolonged periods of cold, wet weather.

Chapter 9

STATISTICS ON HUNTING

Wild turkey hunting and numbers harvested in South Dakota have changed remarkably since Merriam's turkeys were first introduced in the Black Hills and prairie woodlands in the late 1940s and early 1950s. Those changes include spring hunting for gobblers, adjustments of spring hunting seasons based on research, large increases in South Dakota turkey populations, increased hunter opportunity and participation, and large increases in number of birds harvested.

Historical information on harvest statistics is limited and only occurs in an early publication containing data from the Black Hills (Peterson and Richardson 1975) and in documents of unpublished data for various regions throughout the state (unpublished data, SDGFP). Recent hunter surveys (SDGFP), augmented by computer technology and the Internet, permit more extensive and efficient data collection on harvest statistics, hunter demographics (characteristics), and economics (Smith 2000–01, Huxoll 2002–05, Southwick 2003). Our intention is to provide sufficient historical data to indicate trends in various harvest statistics, to present information on turkey hunter demographics, and to document the value of turkey hunting to state and local economies.

Setting Season Dates

Following successful introductions of Merriam's turkeys, South Dakota had its first hunting season in the fall of 1954 in the Black Hills (Petersen and Richardson 1975). The first fall hunting season within prairie units occurred in 1957, and season dates were similar to those of the Black Hills (Fig 9-1).

Hunting units in South Dakota typically follow county boundary lines; however, some, such as the Black Hills unit, overlap more than one county. Within the prairie units, most of the wild turkey habitat is restricted to a small part of the landscape, usually along riparian corridors (cottonwood bottoms) or river break habitats.

Fall hunting seasons were generally held from mid-October through mid-November in the 1950s and 1960s. The fall seasons were shortened in the 1970s and typically ran from mid-October through late October. Recently, fall turkey hunting has varied by unit, with prairie units in areas where turkeys are causing

Fig 9-1. Fall hunting seasons in prairie units can be important in reducing turkey populations where needed, especially if hunters primarily harvest hens. Private landowners with excess wild turkeys are usually very cooperative in allowing fall turkey hunting. (CPL)

depredation having seasons lasting a month or more. The Black Hills fall season is typically one week long in mid- to late October (Smith 2000–01, Huxoll 2002–05). Fall seasons have always been for either male or female turkeys.

The first spring gobbler season began in the Black Hills in 1962, and the first spring gobbler hunt within a prairie unit occurred in 1964 (Petersen and Richardson 1975). Black Hills and prairie unit season dates have typically occurred at the same time. From 1962 through 1991, hunting season dates were based on tradition, with seasons opening the first Saturday in April (Petersen and Richardson 1975, McPhillips 1989–91).

Many western states set season dates based on tradition because they had limited information on female nesting chronology and gobbling activity (Kennamer 1986, Hoffman 1990). By the early 1990s, information on female nesting chronology was reported in Wyoming (Hengel 1990, Lanka 1990) and South Dakota (Day 1988, Rumble and Hodorff 1993) and provided needed information on when hunting seasons occurred in relation to female nesting.

Around this same time, information pertaining to Merriam's gobbling activity in relation to hen nesting activity and hunting season dates also became available (Hoffman 1990). This new information prompted SDGFP to delay the opening day of spring gobbler season one week to the second Saturday in April through the third Sunday in May (McPhillips 1991–96, McPhillips and Schlueter 1997, Schlueter 1998–99, Smith 2000–01, Huxoll 2002–05). The development of an adaptive harvest management plan (SDGFP Statewide Turkey Management Plan 2001) allowed wild turkey biology and harvest information to be used in setting future hunting season dates.

Spring gobbler seasons in some states were set to include the initial gobbling peak that occurs prior to hens initiating incubation (Fig 9-2). Most states also extend the spring season to include a second gobbling peak, to give hunters more opportunity for harvesting a gobbler or to hear gobbling (see Figs 5-3, 10-4). In

Fig 9-2. Research in the Black Hills showed that gobblers had both an early and late peak in gobbling, with the second peak coinciding with hens incubating clutches. Hens are less vulnerable to accidental kill by hunters during the latter period. (M. Tarby)

regions where it occurs, this second peak of increased gobbling corresponds with peak nest incubation (Porter and Ludwig 1980, Hoffman 1990). During incubation, fewer hens are available to gobblers, increasing the likelihood of gobblers calling if gobbling is not diminished by intensive hunting pressure (Kienzler et al. 1996). Delayed spring seasons provide increased protection for females since most females are incubating clutches and are less likely to be seen and mistakenly or intentionally shot during the spring gobbler hunt.

Data on gobbling activity collected from 2001–04 in the southern Black Hills confirmed that two gobbling peaks occur during spring (Lehman et al. 2006b). This information on gobbling activity coupled with nesting chronology provides improved means for evaluating the effectiveness of spring hunting season dates.

Fig 9-3. These young men accompanied their father on a successful gobbler hunt in a prairie woodland area. This type of experience will likely capture their interest in turkey hunting and teach appropriate skills. (MAR)

Spring Harvest

Prairie harvest (prairie hunting units)

Hunting for wild turkeys in prairie woodlands is a challenge. Hunters try to call in gobblers in a variety of habitats ranging from deciduous ravines, slopes, and riparian areas to highland areas such as the North Cave Hills with ponderosa pine-grassland mosaics (Fig 9-3).

Turkey hunters have a great opportunity to harvest birds in prairie woodlands, and spring harvest success in these prairie units is usually high, fluctuating between 48 and 62% (Table 9-1). Since 1993, spring prairie gobbler harvest has more than doubled in South Dakota prairie units, and average harvest estimates from 2000 to 2005 have been 3,629 gobblers per spring (Smith 2000–01, Huxoll 2002–05).

Black Hills harvest

The Black Hills area is recognized by many hunters as "the best location in the country to harvest a Merriam's gobbler." The combination of 1.2 million acres of public land managed by the U.S. Forest Service and good turkey populations results in an ideal situation for turkey hunters. Top that with a superb hunting experience because the turkeys are wary, secretive, and able to move long distances through the contiguous ponderosa pine habitat without the hunter's knowledge. The steep slopes, rocky ridges, and deep ravines are another challenge; these features can be physically hard on hunters.

Table 9.1. Data from spring (gobbler) and fall (either sex) turkey hunting seasons. Harvest success columns include both males and females for fall hunts. Hen harvest in the fall is reported as a footnote for Black Hills and prairie categories.

Categ.	Season	Years [a]	Licenses issued (range)	Gobbler harvest (average)	Gobbler harvest (range)	Harvest success (average)	Harvest success (range)
Prairie	Spring	1993–2005	2,844–5,663	2,818	1,510–4,220	54%	48–62%
Black Hills	Spring	1997–2005	2,574–6,397	1,586	937–2,666	37%	29–43%
Prairie	Fall[b]	1997–2004	3,212–3,734	1,661	1,463–2,006	54%	48–60%
Black Hills	Fall[c]	1999–2004	325–750	144	104–206	59%	54–65%
Archery	Spring	1993–2005	506–2,179	240	54–588	23%	11–31%

[a]McPhillips 1993-1996, McPhillips and Schlueter 1997, Schlueter1998-1999, Smith 2000-2001, Huxoll 2002-2005.

[b]Number of hens harvested in fall (1997-2004) averaged 1,233 with a range of 1,113–1,512.

[c]Number of hens harvested in fall (1999-2004) averaged 189 with a range of 78–270.

Fig 9-4. Hunter success in bagging a gobbler during the spring Black Hills season has fluctuated between 29 and 43% from 1997–2005. Only about 3% of the spring gobbler hunters are women. (CPL)

Hunters in the spring have a great opportunity to harvest a gobbler in the Black Hills (Fig 9-4). Harvest success since 1997 has fluctuated between 29 and 43% (Table 9-1). Data indicate that about 19% of the spring harvest occurs on opening weekend (Huxoll 2003). Spring Black Hills gobbler harvest has steadily increased since 1997, and recent harvest estimates indicate an average of 1,798 gobblers harvested each year since 2000 (Smith 2000–01, Huxoll 2002–05).

Fall Harvest

Prairie harvest

Fall hunting in prairie units provides hunters opportunities to harvest turkeys of either sex during longer seasons and to hunt turkeys while pursuing other game such as deer or upland game. A carefully managed fall harvest can reduce problems of too many turkeys and damage to livestock feed sources around prairie farmsteads (Fig 9-5).

Fall prairie success in harvesting turkeys since 1997 has fluctuated between 48 and 60% (Table 9-1). Most fall turkey hunters harvested their birds on private lands (86.7%), with 10.6% on public land, and 2.7% on walk-in areas leased for public use. Since 1997, fall prairie harvest has included a slightly higher harvest of males than females; from 2000 to 2004, fall prairie harvest was roughly 57% males (average harvest = 1,645) and 43% females (average harvest = 1,246) (Smith 2000–01, Huxoll 2002–04).

Black Hills harvest

Fall hunting seasons for turkeys in the Black Hills have been held in most years since 1954 (Petersen and Richardson 1975). Game managers monitor reproduction of Merriam's turkeys in the Black Hills using annual brood surveys. As a conservation measure, the SDGFP may close the fall season if reproduction

Fig 9-5. Hunter success in prairie hunting units in the fall varied from 48 to 60% from 1997 to 2005. Most hunting opportunities in prairie units are on private lands. (MAR)

is unusually poor or if severe winter weather the previous year caused higher than normal winter mortality. Recently, fall hunting for Merriam's turkeys was discontinued in the Black Hills from 1995 through 1998 and again in 2001.

As in the prairie seasons, fall hunting can reduce populations where turkeys cause financial losses to livestock feed. Harvest success rates (either sex) have fluctuated between 54 and 65% from 1999 to 2004 (Table 9-1).

Most fall turkey harvest in the Black Hills occurs on public lands (87%). Since 1999, fall Black Hills harvest has included a slightly higher harvest of females than males. Harvest proportions (1999–2004) show that approximately 43% of the harvest consists of males. However, fall harvest for the same period is low and only averaged 144 males and 189 females per year (McPhillips 1994, Smith 2000–01, Huxoll 2002–2004).

Archery Harvest

Hunting a turkey with bow and arrow is probably the most challenging way to get a gobbler (Fig 9-6). In South Dakota, archery turkey hunting permits are statewide, giving archers more flexibility to hunt different regions and habitats throughout the state.

Spring archery harvest success has varied since 1993 between 11 and 31% (Table 9-1) with an average of 14.1% of the harvest occurring on opening weekend. As in fall prairie turkey hunting, a high proportion of successful archery hunters in the spring harvested birds on private lands. Since 1993, spring gobbler harvest from archers has continued to increase and averaged 353 gobblers per year from 2000 to 2005 (Smith 2000–01, Huxoll 2002–2005).

Hunter Demographics: Statistics About Turkey Hunters

An estimated average 10,959 hunters participated annually in spring turkey hunts in South Dakota in 2002 and 2003 (National Wild Turkey Federation Database 2004, Duda 2003). Information on hunters was taken either from a national survey (Duda 2003) or from a South Dakota survey (Gigliotti 2000). In the U.S., most spring turkey hunters were from rural areas (38%) or small cities or towns (34%), and 25% were from suburban or city areas. Mean age of spring turkey hunters was 47.3 years, and they were overwhelmingly male (97%).

Turkey hunters from the Midwest and West strongly preferred spring hunting (preference for spring: Midwest, 72%; West, 73%) over fall hunting (preference for fall: Midwest, 5%; West, 4%). Nationwide, primary motivations for spring turkey hunting were for the challenge (42%) and to be close to nature (37%) (Fig 9-7). In South Dakota, primary motivations for hunting wild turkeys were to enjoy nature (30%) and for the excitement (29.5%).

Fig 9-6. Success in the spring archery harvest from 1993 until 2005 has ranged from 11 to 31% with 79% of the harvest occurring on private lands. Archery hunters need to call gobblers into close range to accurately place the arrow in a vital spot. (M. Tarby)

Fig 9-7. This young man harvested his first gobbler in this prairie unit along the Cheyenne River after his father called it onto a juniper-grassland slope (large photo) from riparian woodlands in the deeper draws. (MAR)

Nationwide, spring turkey hunters had hunted an average of 10.9 years. Within South Dakota, nonresidents have similar spring turkey hunting experience compared to residents (2–5 years: nonresidents, 27.9%; residents, 28.6%; and 6–10 years: nonresidents, 9.1%; residents, 13.4%). It appears residents and nonresidents hunt a similar number of days for spring prairie turkeys, but residents hunted more days during the spring Black Hills season compared to nonresidents (residents, 4.6 days; nonresidents, 3.5 days). Nonresidents were more successful than residents during the spring prairie season (12% greater success) and during the spring Black Hills season (11% greater success). Overall, a spring turkey hunter had harvested an average of 13.2 turkeys during his lifetime.

Spring turkey hunters in the Black Hills and in prairie units both reported an average satisfaction rating of 2.4 on a scale of 1 (most satisfied) to 7 (least satisfied) (Smith 2000–01, Huxoll 2002–03). Archery hunters reported a positive hunting experience with an average satisfaction of 2.6 on a scale of 1 to 7.

For 2002–03, spring gobbler hunters in the Black Hills averaged 3.8 days hunting compared to 2.6 days for those in prairie units. Fall turkey hunters in South Dakota averaged 2.2 days hunting each fall of 1999–2004 in the Black Hills compared to 2.6 days in prairie units (Schlueter 1999, Smith 2000–01, Huxoll 2002–04). Archery hunters averaged 4.7 days of hunting during the spring season. The national average for the number of days spent spring turkey hunting (7.6 days) was notably higher than for South Dakota, while 2.1 days per fall turkey hunter was similar (Gigliotti 2000).

Most South Dakota spring turkey hunters use a turkey call (89.5%) and most hunters wear camouflage (92.1%). Many South Dakota hunters use a turkey decoy (59%), and most hunters prefer shot size number 4 (36.9%), followed by number 6 (20.4%) and number 5 (18.1%). Most use lead shot (77.9%) and prefer a 3-inch shell (64.7%).

Fig 9-8. Hunters are evenly split on a rifle ban even though over 80% choose shotguns for turkey hunting. All four turkey hunting fatalities in South Dakota have been caused by rifles. Note the smoke phase hen in this photo. (CPL)

Nationwide, the majority of hunters use a shotgun (89%) when hunting spring turkeys, 10% use a rifle, and 6% a bow. In the Black Hills, 84.7% of hunters choose shotguns, 8.5% rifles, and 2.6% archery as their method for hunting turkeys. In prairie woodlands, 80% choose shotguns, 12.5% rifles, and 3.1% archery (Smith 2000–01, Huxoll 2002–03). The percentage using rifles increases slightly in open prairie landscapes but not as much as one might expect. In the fall, turkey hunters in South Dakota demonstrated greater use (18–25%) of rifles for hunting turkeys than in the spring (Fig 9-8).

In recent years a number of suggestions have been made to eliminate rifles as a legal method for harvesting turkeys. Hunting accidents occur because hunters dress in camouflage clothing and imitate the bird they are seeking.

Nationally, approximately 50% of turkey hunters favor eliminating use of rifles; 37% oppose. Among South Dakota residents there appears to be an even split as 43% favor a ban of rifles and 43% were opposed to a ban. Differences regarding the ban on rifles/handguns were related to safety concerns, ethical concerns, loss of tradition, and loss of recreational opportunity. The greatest concern appears to be related to hunter safety.

Accidents while turkey hunting occur regardless of the harvest method, and most are due to misidentification of the target. No fatalities have been reported in South Dakota resulting from injuries sustained from shotguns, but some shotgun injuries have been severe; there have been four fatalities reported from rifles (Al Bahe, SDGFP, Safety Statistics Coordinator). We discuss hunter safety in more detail in the hunting chapter (Ch 10).

Economic Values

In this section we gathered information from a national project (Southwick 2003) that quantified the 2003 economic benefits of spring turkey hunting to national, regional, and state economies. We also used demographic information collected by the SDGFP (Gigliotti 2000, Huxoll 2003).

Nationally, 2,289,000 spring turkey hunters spent an estimated $1.8 billion on retail sales for the 2003 season. There are extensive multiple effects on other portions of the economy and impacts on state sales taxes. A national and regional summary of economic impacts for spring turkey hunting is given in Table 9-2.

Estimates suggest there are over six million wild turkeys in North America and approximately 2.6 million turkey hunters. Turkey hunting has become the second highest participated type of hunting and is the fastest growing form of hunting (National Wild Turkey Federation Database 2004).

Spring turkey hunting occurs when other hunting opportunities are almost nonexistent and provides hunters more days in the field after spending significant amounts of money on equipment and travel. Much of this money is spent prima-

Table 9-2. Average annual expenditures of spring turkey hunters by region, 2003. Table information adapted from Southwick (2003).

Category	Region:				
	Midwest	Northeast	South	West	U.S.
Food, Drink & Refreshments	$53.79	$47.45	$100.43	$100.72	$72.07
Lodging (Motels, Cabins, Campgrounds, Etc.)	$20.90	$10.67	$16.56	$18.51	$16.59
Public Transportation (Airfare, Car Rentals, Etc.)	$5.31	$27.56	$6.15	$5.12	$11.24
Transportation By Private Vehicle	$46.59	$45.45	$92.60	$93.38	$65.95
Guide Fees, Pack Trip Or Package Fees	$8.72	$0.32	$14.58	$16.39	$9.21
Public Land Use Or Access Fees	$11.31	$1.99	$66.60	$7.39	$28.53
Other Trip Expenditures	$3.30	$3.06	$4.75	$3.07	$3.74
Firearms	$75.54	$69.78	$80.85	$72.81	$75.80
Archery Equipment	$13.92	$4.15	$12.45	$6.81	$10.44
Sights, Scopes, Etc.	$10.13	$6.26	$8.48	$9.74	$8.53
Turkey Calls	$17.71	$11.65	$22.48	$24.60	$18.35
Ammunition, Handloading Equip., & Supplies	$14.55	$17.37	$32.55	$16.12	$21.83
Decoys	$7.75	$5.20	$8.30	$10.08	$7.46
Camping Equipment	$3.18	$9.15	$24.90	$8.48	$12.84
Binoculars	$11.04	$11.43	$7.53	$18.41	$10.37
Special Clothing	$34.96	$37.40	$34.42	$37.38	$35.54
Taxidermy & Processing	$14.30	$3.85	$13.60	$18.93	$11.71
Books & Magazines	$6.71	$4.70	$7.60	$11.67	$6.85
Dues And Contributions To Non-Profits	$38.05	$7.07	$37.36	$112.51	$34.95
Miscellaneous Items (Knives, Gun Cases, Etc.)	$5.28	$4.63	$5.68	$15.92	$5.97
Trucks, Campers, Boats, etc.	$83.76	$32.05	$118.80	$91.06	$83.73
Habitat Improvement Expenditures	$33.30	$117.08	$168.61	$56.67	$104.66
ATV & Off-road Vehicles	$25.60	$22.79	$55.07	$59.74	$37.76
Other Special Equipment (Ice Chests, GPS, Etc.)	$2.28	$4.68	$10.53	$15.57	$6.74
Licenses, Tags, Permits And Other Similar Fees	$33.42	$19.87	$24.10	$31.25	$26.50
Land Leased or Owned For Spring Turkey Hunting	$32.83	$1.12	$116.41	$116.41	$57.02
TOTALS:	$614.20	$526.72	$1,091.37	$928.21	$784.38

rily in rural or less populated areas, and these contributions can be especially important to local economies (Table 9-2).

Nationwide, spring turkey hunters have spent the most on habitat improvement ($239.5 million), trucks and other vehicles ($182.8 million), and firearms ($173.5 million). Also, there are significant sales related to food and beverages ($164.9 million) and hotel and lodging ($38.0 million).

Extrapolating the Midwest economic data and applying those figures to the South Dakota demographic data, we estimated some economic values for spring turkey hunting in South Dakota. We used number of license sales from 2003 (Huxoll 2003) and applied the 40% "hunt close-to-home rule" for South Dakota residents (Gigliotti 2000) in creating a resident expenditures value. Since 40% of residents hunt near home we did not include the average values for lodging, guiding fees, and trucks-campers-boats categories from Table 9-2 for that segment of the population. We also cut the food-drink-refreshments value in half for 40% of the residents. Therefore, 40% of resident expenditures within local economies were somewhat less than that of other residents and nonresidents, which is to be expected. We also used resident or nonresident tag expenditures (2003 nonresident tags: spring prairie, $100; Black Hills, $85) where appropriate in calculations. We calculated average expenditure values for spring prairie, Black Hills, archery, and overall categories (Table 9-3).

A grand total of $6,458,070 is projected for all spring turkey hunting expenditures in South Dakota. The two largest figures were for spring prairie hunters ($2,955,206) and spring Black Hills turkey hunters ($2,794,068) for a total of $5,749,274.

Monies spent by spring turkey hunters are significant for local economies in South Dakota (Fig 9-9). In addition to local businesses benefiting from turkey hunting, taxes on ammunition and firearms are put into a fund established

Table 9-3. Summary of economic impacts from resident (res) and nonresident spring turkey hunting in South Dakota, 2003. Table information utilized national data from the Midwest (Southwick 2003) and South Dakota survey data (Gigliotti 2000, Huxoll 2003). Number of hunters (N) and expenditures ($) for prairie (Pr), Black Hills (BHs), archery, and overall categories.

Category	N Pr	Pr $	N BHs	BHs $	N archery	Archery $	N overall	Overall $
Res. near home (40%)	1780	$843,578	1190	$563,965	382	$181,037	3352	$1,588,580
Res. travel (60%)	2671	$1,640,528	1786	$847,278	572	$351,322	5029	$2,839,128
Non-residents	692	$471,100	2077	$1,382,825	265	$176,437	2769	$2,030,362
All hunters	5143	$2,955,206	5053	$2,794,068	1219	$708,796	10,196	$6,458,070

Fig 9-9. Turkey hunting brings income from resident and nonresident hunters and boosts local economies, particularly during the spring gobbler hunt. Note how Merriam's males, like females, have extensive light-colored tipping on the upper surface tail coverts and adjoining rump feathers. (M. Tarby)

through the Federal Aid in Wildlife Restoration Act (Pittmann-Robertson or P-R funds). P-R funds are used for habitat projects and scientific research projects in South Dakota and other states, benefiting both game and nongame species.

Review

Before information pertaining to wild turkey gobbling activity and nesting chronology was available, South Dakota based its hunting season dates on tradition. In recent years seasons have changed somewhat to better correspond with nesting chronology and peak gobbling activity.

Spring turkey hunters have a better opportunity to harvest birds in prairie woodlands (48–62% harvest success) than in the Black Hills (29–43% harvest success); however, the Black Hills provides 1.2 million acres of public land and a great hunting experience within scenic ponderosa pine habitat. In the fall, turkey hunters in prairie units have enjoyed 48 to 60% harvest success and those in the Black Hills a 54 to 65% harvest success rate.

Turkey hunters prefer spring turkey hunting over fall hunting, and South Dakota hunters hunt primarily because they enjoy nature and for the exciting hunting experience. Turkey hunters spend significant amounts of money ($6,458,070) in South Dakota and thereby benefit local economies and wildlife management programs.

Chapter 10

HUNTING WILD TURKEYS

Few hunting experiences match the thrill of calling in a wild gobbler. That thrill can be made even more intense by knowing the general behavior and habitats of wild turkeys. Learning turkey vocalizations, gobbling intensity, hen attendance by the gobblers, and hen nesting chronology can only aid in the pursuit of this wary bird.

Successful hunting techniques can vary depending upon the region and landscape of the hunt. We have tried to provide some techniques that may be useful for different regions. We also have information on care of game and some cooking tips.

Hunting History

Native Americans of many tribes hunted wild turkeys primarily by netting, snaring, or trapping in pens (Schorger 1966, Kennamer et al. 1992). They fashioned the wing bones (radius and ulna) together to make a call to lure turkeys within bow range and used the turkeys for food, ceremonies, and clothing, their feathers to fletch arrows, and their spurs as arrow points (reviewed in Kennamer et al. 1992).

In the early 1940s in western Tennessee, archaeologists began excavating a massive Native American village known as the Eva Site (Lewis and Kneberg Lewis 1946). Among the thousands of projectile points and pottery were wild turkey wing bones, which had been cut and ground to fit together as a turkey call—these artifacts dated back 6,500 years (Lewis and Kneberg Lewis 1946).

Although extirpated from South Dakota in the early 1900s, wild turkeys are now abundant within their native range in southeastern South Dakota as well as many other areas of the state outside of the wild turkey's presettlement range. Populations of Merriam's turkeys, native eastern wild turkeys, Rio Grande turkeys, and hybrids provide hunters from all over the United States with opportunities to call and hunt turkeys in many different landscapes and habitats throughout South Dakota.

Turkey Hunting Safety

Turkey hunting is an exciting sport but there are some safety concerns. The most serious turkey hunting accident usually occurs when a hunter is mistaken for a wild turkey. During the excitement of the hunt a few careless hunters may make the mistake of not clearly identifying their targets, and such mistakes may prove to be fatal or cause serious injury.

Hunting is statistically safer than football, swimming, and fishing (National Safety Council unpublished statistics 1994–95). In comparison with other types of hunting, turkey hunting has one of the highest accident rates (National Safety Council unpublished statistics 2003). This is not surprising since hunters are usually dressed in camouflage and imitating the quarry. In South Dakota, since 1979 there have been 13 total turkey hunting incidents reported, of which four were fatal (Al Bahe, SDGFP, Safety Statistics Coordinator). Of the four fatalities, all four victims were shot with rifles (three in spring and one in fall). Since 1979 there have been 0.46 turkey hunting accidents/year in South Dakota.

Nationally, the number of turkey hunting accidents continues to decrease even as turkey hunters flock to the woods in increasing numbers (Fig 10-1). Spring turkey hunting accidents have decreased from a high of 8.1 per 100,000 in 1991 to 2.9 per 100,000 in spring of 2003, even while the number of turkey hunters has climbed to an all-time high of 2.6 million (National Wild Turkey Federation Database 2004).

Fig 10-1. A tree trunk breaks up the hunter's outline and provides some protection from a possibly careless hunter stalking the sound of a turkey. If a hunter approaches, forget the turkey and call out to the other hunter—safety first. (CPL)

The following was adapted from the National Wild Turkey Federation's Code of Conduct for defensive turkey hunting:

1. Do not let peer pressure for success or the excitement of the hunt cloud your judgment. Stay calm.
2. Positively identify your target as a legal bird and insist on a close ethical shot—never take long shots.
3. Never shoot at sound or movement.
4. Never stalk a turkey sound because it could be another hunter. Assume another hunter is nearby, especially on public land.
5. Learn and practice safe hunting techniques such as eliminating the colors of red, blue, white, and black from your hunting clothing.
6. Protect your back by sitting against a large tree or rock while calling.
7. Know the capability and limitations of your firearm and use it appropriately.
8. Follow state game laws, which are developed with ethical hunting techniques in mind. Don't hunt from a vehicle or near occupied buildings.
9. Report all wildlife law violations.
10. Always ask for permission before hunting on private property. Ask if other hunters are sharing the same land.
11. Avoid interfering with other hunters and respect the rights of others. If another hunter approaches your position, try not to make rapid movements; rather, call out in a loud voice to let the other hunter know your location.
12. Share responsible and safe turkey hunting practices with others.

Turkey hunting accidents have decreased by over 50% since 1991 due to hunter education programs and public awareness regarding safety (National Wild Turkey Federation Database 2004). Increased hunter awareness of the Safe Code of Conduct could further minimize the possibility of injury or death due to shooting accidents while hunting turkeys.

Hunting The Black Hills for Spring Gobblers

Since their successful introductions in the late 1940s and early 1950s, Merriam's turkey populations have increased in the Black Hills and provided exciting hunting action. Successfully hunting these birds in their ponderosa pine habitats requires consideration of several factors:

1. **Get in shape**. Rugged terrain such as steep slopes and rocky ravines and ridges can make hunting the Black Hills a physical challenge. Prepare by regular hiking or jogging before you attempt to hunt the Black Hills (Fig 10-2). Hunters residing at lower altitudes may also need to acclimate themselves to the altitude change.

2. **Preseason scouting**. Finding hunting areas requires time afield because these birds can cover large areas. Just finding birds is half the battle. Early in the

season try scouting within a mile or two of farmsteads that supply livestock feeds and look for sign such as scratching or turkey droppings. Once you have located active turkey sign stay high atop ridges and hills so you can hear gobbling or yelping. A favorite technique of many hunters is to walk or drive to ridge tops in the evenings when the birds have flown to roost and use coyote howls or other loud noises to entice a "shock gobble" (Fig 10-3). Once you locate the roost, GPS or mark the position and return the next morning for a great hunt.

3. **Calling**. Compared to South Dakota prairie woodlands, you can get closer to gobbling birds in the Black Hills. Turkeys rely mostly on sight to alert them to danger but they also have excellent hearing, and any noise that is unusual to the turkeys' environment can instantly bring them to "alert status." However, turkeys are inherently noisy and social animals and constantly make vocalizations as well as sounds associated with scratching for food. Be alert yourself, because sound does not travel far in forested habitats and birds may be closer than they sound.

Understanding the vocalizations a turkey uses and skill in imitating those sounds can make a big difference in whether a hunter is successful. Early in the season before nesting, many Black Hills birds will still be in large mixed flocks, and splitting gobblers away from these flocks can be difficult. In areas with high densities of hunters, gobblers may become call shy late in the season.

Fig 10-2. Turkey hunters traveling to the Black Hills should be physically conditioned for steep topography and, if necessary, a period of acclimation to higher altitude. (CPL)

Fig 10-3. Gobblers can often be located in the evening as they go to roost if you use a call that will cause them to react by gobbling. Once located, select a calling site adjacent to the roost and be set up by early light. (M. Harberg)

Gobblers seem to know a hen in hand is better than another up the hill. A good technique in these situations is to imitate and attract the dominant or vocal hen in the flock. If she is interested and comes to investigate your calling, she will often lead the gobbler to you.

By about the first week in May, many hens are laying eggs or incubating nests. Hens that are laying, unlike those that are incubating a clutch, will often accompany adult males for a few minutes to several hours after leaving the roost. Generally, gobbling activity will again intensify (Hoffman 1990, Lehman et al. 2006b) during incubation because fewer hens are available for mature gobblers (Fig 10-4) (also see Fig 5-3). Note the annual and seasonal variation in gobbling frequency and intensity. If the gobblers are alone, this should aid in calling a bird into your set-up.

Late-season birds have likely been called or shot at, and aggressive calling may scare birds off. Start with some soft calling, using clucks, purrs, and soft yelps, and increase your calling intensity with some cutting and louder yelps, depending on the gobbler's response.

If he gobbles, try to answer him immediately with some yelping and clucks, as if you were an interested hen, and when he approaches close to your position quit calling so he tries to find you.

An excellent technique for hunting spring gobblers is to use a move-and-call tactic (Williams 1989). This technique actually involves more time standing and listening than moving and was originally developed for hunting the eastern turkey. Williams (1989) recommends that a hunter move every 15 to 30 minutes, and call every 1 to 3 minutes, moving slowly through the woods and stopping every 100 yards or so to give a lost yelp call.

At this pace a Merriam's turkey hunter in the Black Hills would not cover much ground. We recommend less time standing and listening (1 to 2 minutes) and more time moving trying to locate birds. You may want to stop and call every

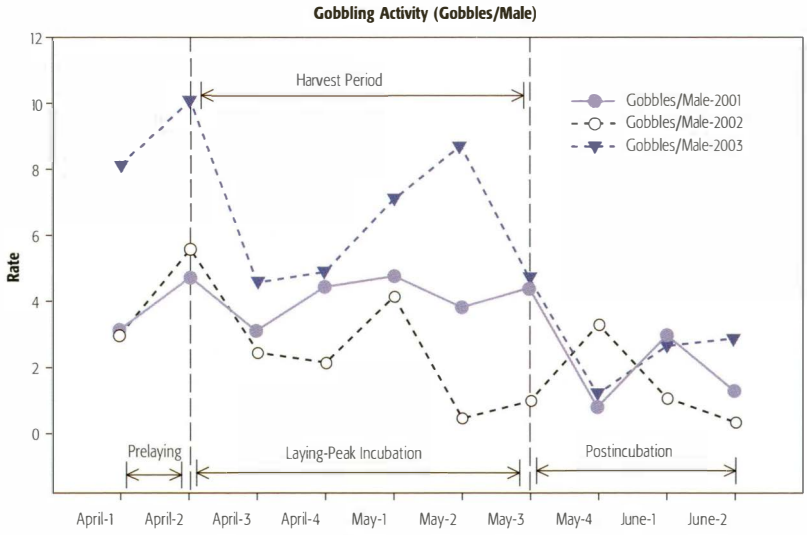


Fig 10-4. Morning gobbling activity during pre-laying, laying-peak incubation, and post-incubation periods in the southern Black Hills, South Dakota. The second gobbling peak occurs during the peak laying-incubation period (typically the first or second week in May), and hunters may have excellent opportunities to call in lone gobblers at this time. (from Lehman et al. 2006b)

200–400 yards in the Black Hills. In the Hills, this is an effective technique because you can cover quite a bit of turkey habitat throughout the day, and you will eventually move into hearing range of a responsive gobbler. Additionally, it lets you scout for sign while moving slowly through the forest (Fig 10-5).

Hunting the Prairie Woodlands for Spring Gobblers

Translocated wild turkeys and their progeny have adapted well to the sparser woodlands in prairie regions of South Dakota (Ch 1 and 2). Merriam's, eastern, and Rio Grande turkeys and hybrids occur in various areas outside the Black Hills (Fig 10-6). Turkeys with Rio Grande characteristics (phenotype) in South Dakota have probably hybridized with other subspecies or game farm released turkeys to some degree.

To be successful hunting turkeys in deciduous river bottom areas and woody ravines and draws, there are several factors to consider:

1. **Preseason scouting**. Often, these birds can be seen several hundred yards out in the open away from trees. This can make getting close to turkeys very difficult due to the wild turkey's keen vision. A skilled hunter will do some preseason scouting and learn the birds' movements so as to possibly get ahead of the birds and set up before they can detect human presence.

2. **The wind factor**. It is an unusual day when it isn't windy to some extent in prairie woodland areas, so be prepared to have poor calling conditions. Where

Fig 10-5. While scouting or while moving through woodland or forest areas calling birds, look for fresh scratchings where turkeys have been actively feeding. Scratchings are readily evident in layers of pine needles or deciduous leaves. (CPL)

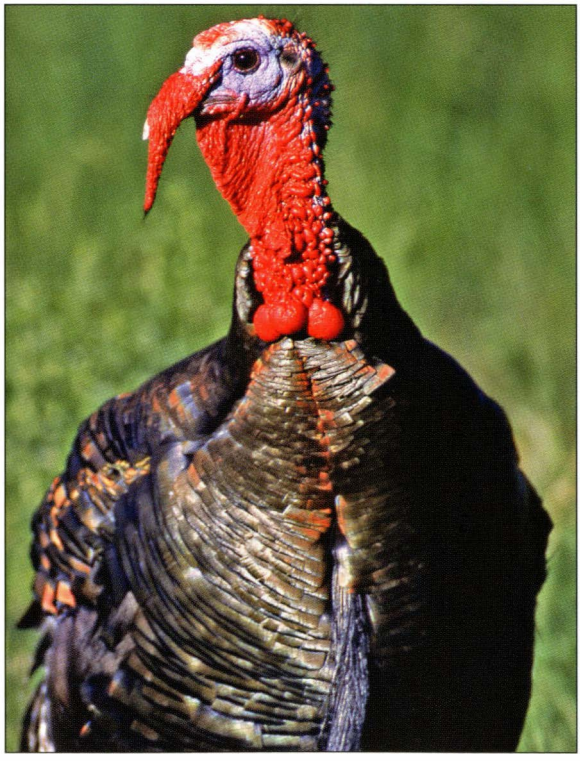


Fig 10-6. There are great hunting opportunities for turkeys in prairie hunting units outside of the Black Hills, but most are on private land. Prior contact of landowners is recommended. Public areas in prairie hunting units include much of the pine-covered uplands or buttes in Harding County. (M. Tarby)

feasible, try to get upwind of the birds so they can hear you calling. Use loud box calls or similar calls that carry on windy days.

3. **The visual factor**. Because of the open prairie habitat, turkeys can see other birds or your decoys from a considerable distance. Compared to the Black Hills or other areas with more trees, a decoy is probably even more important on the prairie. In certain situations, simply setting the decoys out in an area visible to gobblers is all that is needed for them to come to you, and calling is superfluous.

4. **Calling**. Depending on the time of the breeding cycle, males may or may not be actively gobbling. Many times gobblers can see all their hens and they do not need to gobble. Typically, you do not want to get closer than 300 yards from the birds to set up decoys and begin calling unless you have trees or hilly topography to block them from seeing your approach. Mix your calling, starting with soft calling and increase to more aggressive calling if needed. Many times gobblers will be "henned-up," especially early in the season before females begin nesting—this can make calling a gobbler from his hens very difficult. Early in the season be patient and sit and call in areas where birds frequently travel. Many times, midday calling can split the gobblers from the hens and over to your position. Keep a good variety of calls in your vest, because sometimes only a certain sound will get gobblers to respond. Many hunters have box, slate, diaphragm, wing bone, or other calls available in case the gobblers respond better to a particular one (Fig 10-7).

Fall Hunting for Wild Turkeys

Fall hunting is much different from spring turkey hunting, as females and their broods typically stay segregated from gobbler groups. These large flocks can be found concentrated around fall food sources.

In the Black Hills, these feeding areas are often associated with stands of ponderosa pine that have recently cast pine seeds (see Ch 4). Also, in the Black Hills wild turkeys may concentrate in late October near farmsteads that have grain storage areas.

In prairie hunting units, areas that have mast-producing shrubs or trees, harvested crop fields, or farmsteads are prime feeding areas for turkeys. Islands of ponderosa pine on uplift areas in prairie units in western South Dakota can also attract feeding turkeys.

Once you have found a feeding site with abundant sign, such as turkey droppings or scratching, hunt that area until you find a flock. A good technique is to flush the flock so the birds disperse in different directions. Calling scattered turkeys in the fall is usually easy because the young birds are impatient and want to assemble quickly. Adult hens also respond well to calling but adult gobblers are more difficult.

After the flock scatters, sit down in the area where you flushed the turkeys with your back up against a structure such as a big tree wider than your shoulders and begin calling. Typically, you will hear the first lost kee-kee calls from the turkeys trying to assemble roughly 10–15 minutes after you flushed the flock. Williams (1989) advises that fall hunters respond immediately with "kee-kee" vocalizations to every bird they hear calling.

Once the brood hen or dominant turkey does an assembly yelp it will be harder to call turkeys to your location because they will be looking for the brood hen. Use of the kee-kee, kee-kee run, lost yelp, or assembly yelp will hopefully gather scattered turkeys to your position (Fig 10-8).

Fall hunting can require a lot of patience and, if you don't call in birds immediately after breaking up the flock, wait 45 minutes to an hour. If the birds still do not come in then move slowly and quietly through the area and listen for birds calling. Then approach the calling bird or birds and sit down again and begin calling once more. Repeat this process until a bird comes to your calling.

When hunting adult gobbler flocks in the fall it is also advisable to flush the flock. As with the mixed brood flocks, try flushing the birds in many directions. However, a big difference between adult gobblers and young birds is that older birds are not as eager to gather back together immediately. You may need to be more patient and wait 2–3 hours after flushing the gobbler flock before one of the males comes to your calling position.

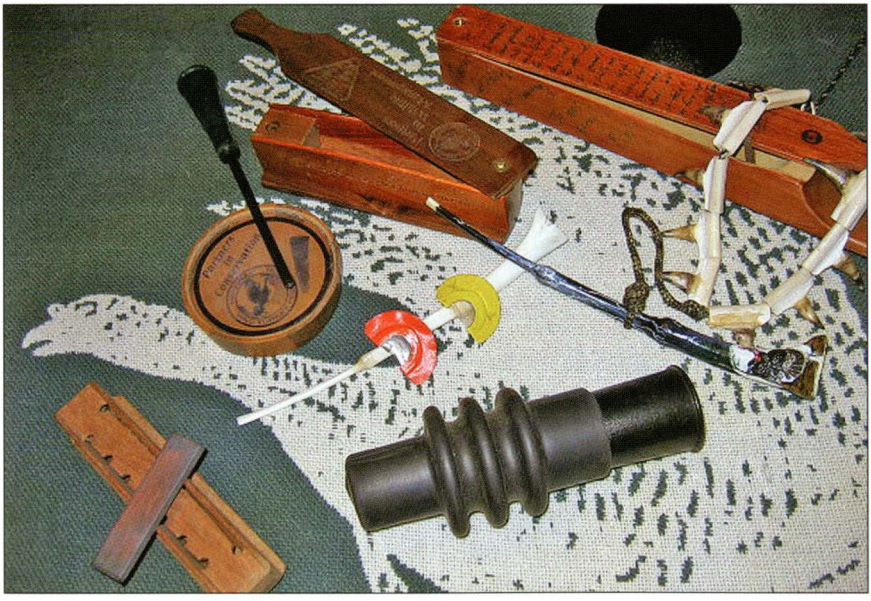


Fig 10-7. Have a variety of calls available in case a gobbler responds better to a particular one on that day. Wind can influence how far sound carries and thus the call you need, particularly in prairie units (CPL).

Fig 10-8. In the fall hunting season these older poults will be about 16 weeks old and should still assemble to a kee-kee run call after the brood or flock is flushed. (USDA Forest Service, Northeastern Research Station, Amherst, Mass.)

Williams (1989) recommends that fall hunters flush the adult gobbler flocks in the evening and return the next morning to the point of the flush and try calling. The gobblers may have roosted the night alone and will perhaps be more eager to gather the following morning.

Another technique is to watch gobbler groups from a distance and figure out what direction they are moving and try and get in front of the moving birds for a set up. Try aggressive calling as if you were another gobbler or jake flock in their path. Fight-purring vocalizations can be very effective. Because the photoperiod in the fall is somewhat similar to when you are hunting spring birds, fall turkeys will actually start strutting and fighting if you get them worked up enough with your calling. It takes some different techniques, but fall turkey hunting can be just as exciting as spring hunting.

Spring Permits and Success by Unit or County

Opportunities to hunt spring gobblers are plentiful; Table 10-1 provides some information on permits available by region, drawing success, and corresponding harvest success (Huxoll 2003, SDGFP unpublished data 2004). In 2003, the lowest harvest success rate by unit was the Black Hills unit at 29% and the highest harvest success rate was within a prairie unit in Todd County at 87%.

The key to success in many of the prairie units is to gain access to private land. Many private landowners will allow access if hunters ask for permission.

Table 10-1. Licenses available for spring 2004 and the previous year's first choice drawing success and harvest success rates from that county or unit. Double tag units have first bird success rates.

County or unit	Res. lic. avail.	Res. draw succ.	Nonres. lic. avail.	Nonres. draw succ.	Harvest succ. by unit
Bennett	20	100%	2	22%	64%
Black Hills Unit	Unlim.	100%	Unlim.	100%	29%
Bon Homme	150	56%	0	-	58%
Brookings	10	No data	0	-	No data
Butte	300	70%	24	29%	70%–1st Bird
Charles Mix	150	45%	0	-	57%
Clay	52	39%	0	-	45%
Corson	150	100%	12	100%	58%–1st Bird
Custer	50	100%	4	33%	57%
Davison and Hanson	30	26%	0	-	70%
Deuel	12	No data	0	-	No data
Dewey	130	100%	10	67%	46%
Fall River	250	100%	20	27%	50%
Grant	72	23%	0	-	66%
Gregory	700	91%	56	24%	61%
Haakon	200	100%	16	100%	59%
Harding	150	100%	12	41%	43%
Hughes	30	100%	0	-	60%
Hutchinson	40	75%	0	-	50%
Jackson	50	100%	4	33%	31%
Jones	200	100%	16	100%	55%
Lincoln	60	20%	0	0%	70%
Lyman	60	56%	5	56%	53%
Marshall	120	58%	0	-	55%
Meade	250	100%	20	24%	63%–1st Bird
Mellette	500	100%	40	51%	64%–1st Bird
Pennington	300	100%	24	56%	62%–1st Bird
Perkins	200	100%	16	33%	53%–1st Bird
Roberts	100	54%	0	-	77%
Sanborn	20	50%	0	-	45%
Shannon	50	100%	4	100%	55%
Stanley	50	100%	4	80%	39%
Todd	50	100%	4	21%	87%
Tripp	400	100%	32	48%	51%
Turner	10	No data	0	-	No data
Union	72	55%	0	-	59%
Yankton	120	62%	0	-	61%
Ziebach	200	100%	16	46%	60%–1st Bird

Fig 10-9. Bottomland forest and woody draws support wild turkeys along the lower Cheyenne River. This land is under jurisdiction of the Cheyenne River Sioux Tribe and at this site extends south to the Cheyenne River visible in the background. (W.C. Johnson, SDSU; inset, MAR)

Birds will often be within 1 mile of farmsteads and grain storage areas early in the hunting season; later in the spring season, prairie turkeys may disperse 3 to 8 miles from farmsteads. Locating birds may require more hiking and time afield.

Drawing success is 100% in the Black Hills unit because licenses are unlimited and, with 1.2 million acres of public land to hunt, the Black Hills provides some great opportunities for spring turkey hunters. Prairie units that have high drawing success for both residents and nonresidents include Corson, Haakon, Jones, and Shannon counties or hunting units. Hunters can also pursue turkey hunting opportunities on tribal lands (Fig 10-9).

Cleaning, Preparing, and Cooking Wild Turkeys

Following a successful hunt, pay careful attention to processing your wild turkey for eating. Keep the bird cool and out of sunlight. Removal of the entrails is not necessary unless you plan to travel for several hours without cooling the bird down.

Pluck or skin wild turkeys depending on how the bird will be cooked. Plucking the feathers from a turkey can be laborious; however, scalding the bird in boiling water will make removal of the feathers an easy task. Once you have plucked your turkey and removed the entrails, clean it thoroughly with water. If the turkey will be oven baked or smoked, keeping the skin on is important so that the bird does not dry out. Leaving the skin on the turkey may also help prevent freezer burn.

If you plan to grill, you can simply skin the turkey. Following skinning, you can save the wings and legs and remove the breast fillets. Make sure to cut away any excess fat from the body or breast sponge before washing and freezing.

You have several cooking options once the turkey is cleaned and prepared. Birds that were plucked can either be deep fat fried or smoked. A bird without its skin can also be successfully deep fat fried. We recommend avoiding oven baking wild turkey unless using an oven bag, because of the problem of overcooking wild birds. Overcooked wild turkey is often dry and poor tasting. For smoking wild turkey, you can inject marinades before placing the bird in the smoker or smoker cooker. We recommend covering the bird with seasoning to enhance the flavor during the smoking process.

Injecting marinades also works well before you place a whole plucked bird in a deep fat fryer.

Here is one of our favorite methods for grilling. First prepare the breast meat by cutting it into smaller portions, 4–5 inches long by 2–3 inches wide. Marinate the turkey for several hours before grilling. A marinade of 2 cups pineapple juice and 2 cups apricot-pineapple marmalade will give the turkey a sweet taste. A marinade of Italian dressing, onions, and seasonings will give the bird a more seasoned flavor.

Place the breast pieces in a plastic bag with marinade and marinate for at least 3–4 hours before grilling. Then wrap the pieces of turkey with bacon and attach the bacon strips with toothpicks, completely covering the breast with bacon. This process will prevent the meat from drying on the grill. Grill at low to midlevel heat, periodically turning the pieces until done. Try not to over-grill the bird. Remove toothpicks and the bird is ready for the table.

Wild turkey is excellent served in a variety of casseroles. It also makes a good stroganoff either by itself or mixed with other meat such as venison or elk. There

are several excellent recipes for turkey jerky that are easy to follow and provide a delicious field snack.

Our primary recommendation for cooking wild turkey is to be careful not to overcook or dry out the meat. The best tasting turkey is almost always moist.

Review

Similar to Native Americans thousands of years ago, modern-day turkey hunters still use the wing bone call effectively. Unlike turkey hunting of old, today's South Dakota turkey hunters have the opportunity to hunt two and possibly three different subspecies within a variety of habitats. Hunters that understand turkey biology and pay close attention to seasonal changes in turkey behavior, such as attendance of males to females and gobbling activity peaks, will have more success than less experienced hunters. Also, hunters need to be creative and have a variety of calls available and change tactics, if need be, to harvest a wise longbeard.

Prairie units vary markedly in both drawing and harvest success, and in the highest drawing-success units, both residents and nonresidents can increase their odds of drawing a spring prairie license.

Wild turkeys are excellent eating but be especially careful not to overcook or dry out the meat unless you are making jerky.

Chapter 11

MANAGEMENT AND THE FUTURE

Of the many topics that could be discussed about the management and future of the wild turkey in South Dakota, we have chosen five: population monitoring, habitat management, population management, future outlook, and management vision. We hope that portions of this chapter will be particularly interesting for readers 20–40 years from now. Similarly, we appreciate the work of Petersen and Richardson (1975) that allows us to look back at their thoughts on the status, management, and future of wild turkeys in the Black Hills 30 years ago.

Population Monitoring

Monitoring wild turkey populations is a necessary part of evaluating management progress and directing management and research efforts (Kurzejeski and Vangilder 1992, Healy and Powell 1999). It is also an important objective and goal in the South Dakota Statewide Turkey Management Plan (2001). Different states use different census and survey techniques to estimate population characteristics such as relative abundance, density, and recruitment rates (i.e., young added to the fall population). Some techniques include roadside surveys, bait-site and winter flock counts, gobbling counts, and brood surveys. Helicopters have even been used to survey wild turkeys in areas of mixed deciduous forest and farmland (Kubisiak et al. 1997).

Estimates of young added to the fall population can be valuable in projecting the status of a population from year to year. Recruitment also acts as an indicator of habitat conditions and the health of the wild turkey population. The SDGFP has used brood surveys conducted from 15 May–30 September to estimate the average number of poults per hen. For groups of young with multiple females, group size is divided by number of females to estimate brood size.

The brood survey technique has been in effect in the Black Hills since 1963 and in some prairie units since 1987 (South Dakota Statewide Turkey Management Plan 2001). Personnel with the SDGFP are given survey sheets in which they record number of hens and poults observed; personnel with the U.S. Forest Service assist on these surveys in the Black Hills. These brood surveys provide a rough but untested indicator of recruitment (Fig 11-1). The information

Fig 11-1. Brood surveys on wild turkeys have been conducted by the SDGFP since 1963 in the Black Hills (some U.S Forest Service personnel also assist) and since 1987 in selected prairie hunting units. These surveys provide an index of year-to-year poult:hen ratio. (USDA Forest Service, Northeastern Research Station, Amherst, Mass., inset, CPL)

allows managers to compare poult:hen ratios and numbers of hens with and without broods between years.

Because of the gregarious nature of turkeys during winter, flock counts during this time can also provide insight into population increase/decrease between years. Conservation officers make estimates of numbers of wintering wild turkeys at farms and ranches for the Annual County Wildlife Assessment Report. Fairly accurate counts of winter turkey flocks can be conducted at farms and ranches for populations inhabiting prairie woodland areas during the winter (Fig 11-2). These techniques can also be valuable in the Black Hills for monitoring turkey populations; however, dependence on farmsteads in the Black Hills varies in relation to the pine seed crop from year to year. There is also variation related to winter severity among years affecting concentration of wild turkeys at farmsteads in prairie regions as well as pine dominated habitats. To overcome some of these problems, aircraft have been used for winter flock counts.

Under the South Dakota Statewide Turkey Management Plan (2001), current research and survey information such as winter flock counts and brood and harvest surveys are emphasized in determining harvest quotas. In the Black Hills, SDGFP personnel are monitoring the geographical distribution of turkey hunters and turkey harvest. This effort is expected to increase as hunter densities and the demand for a limited resource increase.

Fig 11-2. Concentrations of wild turkeys in prairie units can often be censused in winter near farms and ranches. (A. Lindbloom, SDGFP) Inset: View from east escarpment of the Prairie Coteau. (CPL)

Habitat Management

Habitat is key to the future of wild turkeys in South Dakota.

In South Dakota's prairie woodland regions, the mixture of croplands and pastureland near woodland habitat has supported successful wild turkey populations. Even here, landowners and wildlife managers can sometimes improve brood rearing or other habitat features to increase wild turkey numbers in areas with too few birds.

For example, moderate grazing practices benefit livestock while still providing nesting and brood rearing habitat for wild turkeys in prairie woodland regions; avoiding overgrazing also protects native woodlands. Where there are too many birds, habitat management, coupled with measures to reduce turkey populations, can potentially alleviate some situations by leasing critical wintering areas or establishing winter food plots that may draw turkeys away from farmsteads (South Dakota Statewide Turkey Management Plan 2001).

In the Black Hills, management and manipulation have the potential to strongly affect Merriam's turkeys or to be relatively benign. Summer habitat for

adult Merriam's turkeys in the Black Hills consists of moderate to open forest stands with a herbaceous understory of grasses and forbs. Consequently, summer habitat of Merriam's turkeys is compatible with the timber management programs administered by the U.S. Forest Service.

Timber harvest has the potential to affect roosting habitat of Merriam's turkeys in the Black Hills. Merriam's turkeys select forested stands for roosting that have slightly higher tree densities and larger diameters of trees (12–14 inches) than usually occur following timber harvest. However, we do not believe that timber harvest as currently practiced would cause roosting habitat to become limiting to Merriam's turkeys.

Timber and livestock management in the Black Hills could negatively affect Merriam's turkeys in two ways—endangering habitat for poults and winter habitat.

Habitat for poults and brood hens requires substantial herbaceous vegetation in meadows and an adjacent forest that is relatively dense to provide escape cover. We encourage removal of trees from meadows but do not endorse the thinning of the forest adjacent to the meadow below 100 ft^2 per acre basal area.

Livestock consume herbaceous vegetation and concentrate their grazing in meadows. Livestock stocking rates that produce near total removal of the herbaceous vegetation result in a loss of cover for poults and a loss of food resources because the numbers of invertebrates they feed on have a direct correlation to the amount of herbaceous vegetation (Healy 1985, Rumble and Anderson 1996b). Ensuring that meadows have at least 1,200 lb of herbaceous vegetation per acre at least 8 inches tall through mid-July should meet the needs of poults (Fig 11-3) (Rumble and Anderson 1996a).

When there is poor winter habitat for Merriam's turkeys in the central Black Hills, the birds become vulnerable. During years of ponderosa pine seed failure, birds will select habitats in open stands of ponderosa pine and consume kinnikinnick fruits and grass seeds. During these years, turkeys in the Black Hills may be in poor physiological condition and susceptible to predation or starvation. Turkeys will increasingly use farmsteads for food to avoid starving (Lehman 2005).

In years when there is a good crop of ponderosa pine seeds, Merriam's turkeys in the central Black Hills select pine stands that are relatively dense with mature trees and about 100–120 ft^2 per acre basal area while those in the southern Hills select moderately open stands of mature pine with about 80-100 ft^2 per acre basal area.

Unfortunately, mature stands are frequently targeted for timber harvest because they have larger diameter trees. These stands are also susceptible to infestations by mountain pine beetles and, under extremely dry conditions, wildfires. We recommend that the forest managers maintain a balance of forest stands in

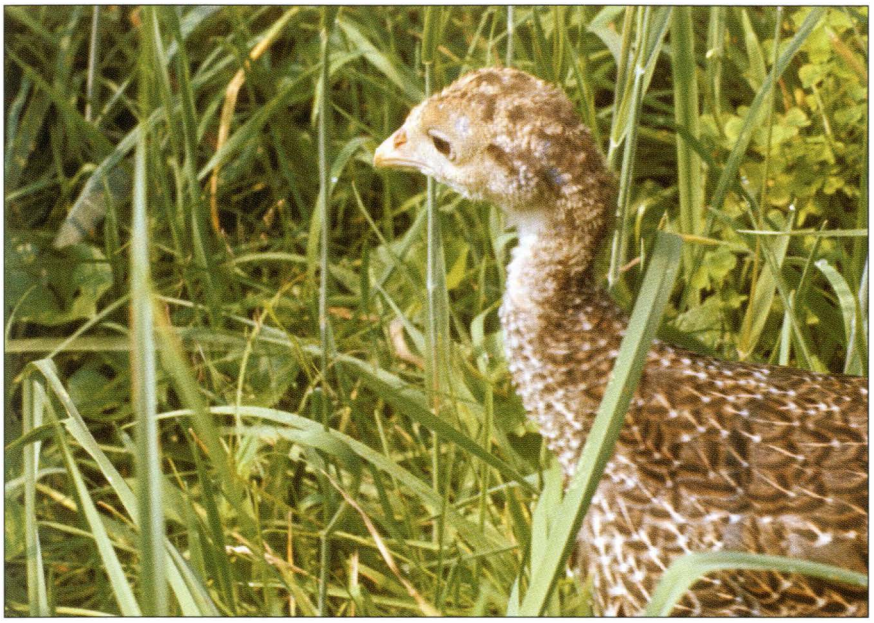


Fig 11-3. Ensuring adequate amounts of herbaceous cover in meadows, forest edges, or other small openings is key in providing sites that produce adequate numbers of invertebrates, especially insects, for younger poults. (USDA Forest Service, Northeastern Research Station, Amherst, Mass.)

terms of both size and density of trees. Mature stands of ponderosa that provide pine seeds for Merriam's turkey during winter should be separated spatially to prevent catastrophic events from spreading; these stands may require localized treatments to maintain them.

Recent concern regarding forest health and dense forest conditions in the Black Hills should not be used to justify harvest of all mature dense forest. Dense forest areas were widespread for a number of years in the Black Hills before the recent outbreaks of mountain pine beetles and forest fires. Spatial placement on the landscape and management of these dense and mature forest stands to benefit wild turkeys and other wildlife will require some creative and innovative approaches to forest management.

Prairie woodlands present some unique situations for habitat management. Most of these woodlands are in private ownership. Maintaining the woodland and condition of the understory is critical to providing habitat for Merriam's, eastern, and Rio Grande turkeys. That usually means wise livestock and range management. Livestock tend to concentrate in prairie woodlands during the summer because the forage is greener and the trees provide shade (Fig 11-4).

Woodlands that are not regenerating due to excessive livestock grazing or trampling will eventually disappear (Uresk and Boldt 1986). As in the Black Hills,

Fig 11-4. Cattle ranching in the breaks of the Missouri River in Gregory County is generally of moderate intensity and is largely compatible with wild turkey populations as well as many other wildlife species. (LDF; inset, G. Wolbrink, SDGFP)

herbaceous vegetation near or in these woodlands is necessary to support the invertebrates that poults require and to provide cover.

The cottonwood riparian woodlands along free-flowing reaches of the Missouri River as well as some major West River tributaries are in jeopardy of disappearing due to regulated water levels and the lack of flooding necessary for regeneration of this woodland type. Although cottonwood trees are often preferred for roosting by wild turkeys in these prairie woodlands, turkeys will roost in other tree species (see Ch 5).

Some cottonwood riparian woodlands will succeed to green ash, boxelder, or bur oak, all of which provide good habitat for wild turkeys. However, cottonwood woodlands that do not succeed to another woodland type or regenerate will eventually disappear, and the result will be a loss of suitable wild turkey habitat.

Population Management

Goals for turkey populations are determined by the potential of the habitat in an area and then by the wants, needs, and desires of interested people, often referred to as "stakeholders"—hunters, farmers, ranchers, or those who just like to see and hear turkeys. SDGFP is responsible for establishing population goals for turkeys throughout the state, with input from citizens and groups like the National Wild Turkey Federation.

Fig 11-5. Wild turkeys will depredate grain bales, particularly baled oats, and may begin depredation early in the fall if they have developed a pattern in previous years. (CPL)

Population goals are generally not exact numbers or even densities of turkeys. More often, population goals are set in terms of altering the current turkey population in an area. For example, the population goal in one area of the state may be to reduce numbers to minimize the effects of depredating turkeys while another population goal might be to establish a new flock in unoccupied habitat.

Depredation and population control

Damage caused by wild turkeys to silage, oat bales, and other stored cereal grains or crops has been discussed earlier (Ch 4). Most of the conflicts between turkeys and producers occur in winter when birds congregate in and around farmsteads where producers are feeding livestock near woodland habitat.

The accumulation of livestock feed attracts wild turkeys in search of the nutrition necessary to survive the winter. After a year or two, turkeys may develop a pattern of returning to the same farm or ranch in the late fall or early winter regardless of weather severity. Thus, some landowners may face the problems posed by too many turkeys on an annual basis (Fig 11-5).

Information from northeastern (Lehman et al. 2003) and east-central South Dakota (Wolbrink 2003) indicates that populations of eastern turkeys are less likely to develop farmstead wintering patterns than populations of Merriam's, Rio Grandes, or their hybrids. Also important is the availability of alternate food sources. These food sources can include hard mast such as acorns and pine seeds, and more commonly waste grain found in harvested crop fields or food plots (standing grain crops planted for wildlife). Wild turkeys near harvested grain crops have much more waste grain available in winter than those primarily near rangelands.

Some hunters might say that having a problem with too many turkeys in an area is a good problem to have. Yet these hunters are often home relaxing during cold winter days when the overly abundant turkeys are causing inconvenience and property damage to some farmers and ranchers. At the same time, some farmers and ranchers willingly host hundreds of turkeys in and near their farm or

ranch while the next landowner down the creek complains that 10 turkeys wintering near the farmstead is too many.

Generally, the amount of feed consumed by turkeys is less of a concern than what the turkeys leave behind after they eat. Livestock are reluctant to eat silage and other feeds that turkeys have defecated on, and most farmers don't like to have their yards littered with turkey droppings.

There is also landowner concern that turkeys have or could spread diseases to livestock through defecation or close contact. However, we found no evidence to support this concern in the scientific literature or in conversations with veterinary pathologists (see Ch 6).

The SDGFP has identified the control of damage caused by wild turkeys on private lands as a major objective in the South Dakota Statewide Turkey Management Plan (2001). Different approaches are currently used for reducing damage problems caused by wild turkeys.

One method is to place protective netting over oat bales or other stored food sources that tend to attract wild turkeys. Protective netting for these operations is often provided by the National Wild Turkey Federation (Fig 11-6). Another method is either-sex fall hunting. Hunters can be of great help by removing turkeys in areas where damage has become a problem.

Current information indicates that the legal kill (harvest plus crippling loss) on hens in the fall, at least in the southern Black Hills, is too low to help control overabundant wild turkey populations and the damage they can cause. Various

Fig 11-6. SDGFP personnel place protective netting provided by the National Wild Turkey Federation over oat hay bales to reduce depredation problems where a landowner has requested assistance. (D. Bisbee, SDGFP)

options can be used to increase the harvest of wild turkey hens in the fall. There is always the potential for hen-only seasons in areas with appreciable damage from wild turkeys. If demand is not great enough, as seems to be the case in most units with surplus birds, then license costs could be reduced along with allowing multiple hens per license or multiple licenses per hunter. If gobblers are allowed in the fall harvest, hunters often will select for males.

One option for increasing harvest that is sometimes used in South Dakota is to issue fall tags that can be filled during a long period, including the deer season. In this manner, hunters who would not make an extra trip to harvest turkeys can do so while on their normal deer hunt.

Conservation officers, state trappers, wildlife damage specialists, and other SDGFP personnel, as needed, are given standing kill permits for a limited number of turkeys to help disperse birds and reduce damage. A few birds shot on the roost can chase the birds off for a short time but they soon return if not continually harassed. Harassment of turkey flocks causing depredation with other means such as cracker shells has a similar temporary effect. Birds repeatedly scared from farmstead roost sites with cracker shells or live shotgun shells will temporarily leave, move to a nearby undisturbed roost, or move to another farmstead (Dean Bisbee, SDGFP, personal communication). Even if the turkeys move their roost site farther away from a farmstead, they will usually travel back to the farmstead to feed.

Scare tactics and harassment are not very effective in controlling depredation problems, although they could help in forcing birds to roost away from roosts over buildings, machinery, or other sites where droppings cause problems.

Trap and transfer operations have been used by SDGFP to reduce wild turkey populations at specific damage sites. Drop nets are used to capture turkeys at farm or ranch sites where winter concentrations are causing serious damage.

Trapping sites are baited with corn or other grains until many turkeys begin to feed on the area. Drop nets are then released while the birds are on the feed under the net, sometimes capturing over 100 birds in one drop (Fig 11-7). Since gobblers are more wary than females, the captured birds often consist of females, and that allows for a greater effect on reproduction the following summer.

In many cases turkeys have been given or traded to other states that are interested in starting wild turkey flocks. In other cases, birds have been shipped to areas of South Dakota where populations have dwindled or where new populations of the particular subspecies being trapped are considered desirable. Most turkeys trapped at damage sites in central or western South Dakota have the color characteristics of the abundant Merriam's subspecies.

As turkeys have become established in other states, opportunities for trading have become more limited. Within South Dakota there are fewer places where

Fig 11-7. Drop nets are effective at capturing wild turkeys attracted to bait under the net. Sometimes over 100 turkeys can be caught in a single drop of the net. (National Wild Turkey Federation)

landowners are requesting wild turkey releases. Where other options are not available, lethal removal of excess wild turkeys may sometimes be needed.

Unfortunately, the answer to depredation by turkeys is seldom simple, and damage can be difficult to control. Some landowners may leave standing corn or sorghum just for the turkeys and this can be a worthwhile practice for attracting the birds to feeding sites other than silage piles or grain stores where damage would likely occur. Sportsmen's groups interested in wild turkeys could help reduce damage by sponsoring winter food plots in areas close to woodland roosting areas in the prairies—such sites could help keep birds away from farmsteads.

In northern regions of the wild turkey's range such as South Dakota, the availability of agricultural grains can mean the difference between survival or death for wild turkeys. In many of these cases the agricultural or other human provided food sources are maintaining the populations by keeping the birds alive during critical cold periods. It is doubtful that wild turkey populations could survive without waste grains and other agricultural foods in deciduous woodlands of South Dakota outside of the original eastern turkey range in the southeast and south-central portions of the state.

Although not native to the Black Hills, we suggest that Merriam's wild turkeys without agricultural food supplies could maintain a lower but substantial population in the southern Black Hills and low level populations in the northern Black Hills. Even in the original wild turkey range within the state, agricultural foods help maintain higher wild turkey populations than would probably exist otherwise. It is interesting to note that grains such as maize, at least in portions of

North America including the east and southwest, were likely used by wild turkeys prior to European settlement in the last few centuries. Maize or corn has been grown as a crop by Native Americans for several thousand years. Wild turkeys would not have ignored such a resource.

Population expansion

The long-term level that a population can sustain is largely dictated by the amount and quality of habitat in an area, although annual fluctuations may occur due to various weather patterns.

If woodland habitats are contiguous, turkeys can pioneer to fill unoccupied areas on their own. However, in many cases, vast areas of prairie unsuitable for supporting turkeys separate woodlands that could maintain turkey populations. In these cases, turkeys must be trapped and transplanted if a wild population is to be established (Fig 11-8).

Our knowledge of the necessary habitat requirements, particularly the amount of woodland habitat needed to support wild turkeys, has evolved considerably in the past 50 years. It was once thought that only large blocks of forest could support turkeys. Even now we are unsure of the smallest block of habitat needed to support wild turkeys in South Dakota because turkeys have established populations in nearly every habitat in which they have been released. Yet, a few lessons have been learned.

In addition to the basic habitat component of woodlands, research along the James River taught us that ideally, the remainder of land use should be equally split between cropland and pasture (Leif 2001). The cropland provides an essential source of food for turkeys, especially in winter, and pasture provides both food and breeding habitat. The value of pastures and shrub inclusions for nesting and brood rearing was evident in research conducted in Gregory County (Day et al. 1991a, b) and northeastern South Dakota (Lehman et al. 2002, Shields and Flake 2004).

Another sometimes overlooked habitat characteristic that may be important to wild turkeys in South Dakota is terrain, in particular irregular terrain. Prairie woodlands and shrub patches are often found in association with rolling or steep topography, which is less likely to be in agricultural production. A lesson learned from following radiomarked turkeys along the James River is that steep terrain with minimal woodlands is attractive to wild turkeys. Within 3 months of their release, three eastern hens and one male dispersed from the river floodplain to the vicinity of Enemy Creek, a tributary of the James River. Unique to this tributary was its predominately open grassland, sparse woody cover, and steep terrain. These turkeys remained in this area for the breeding season and then returned to the James River floodplain in the fall.

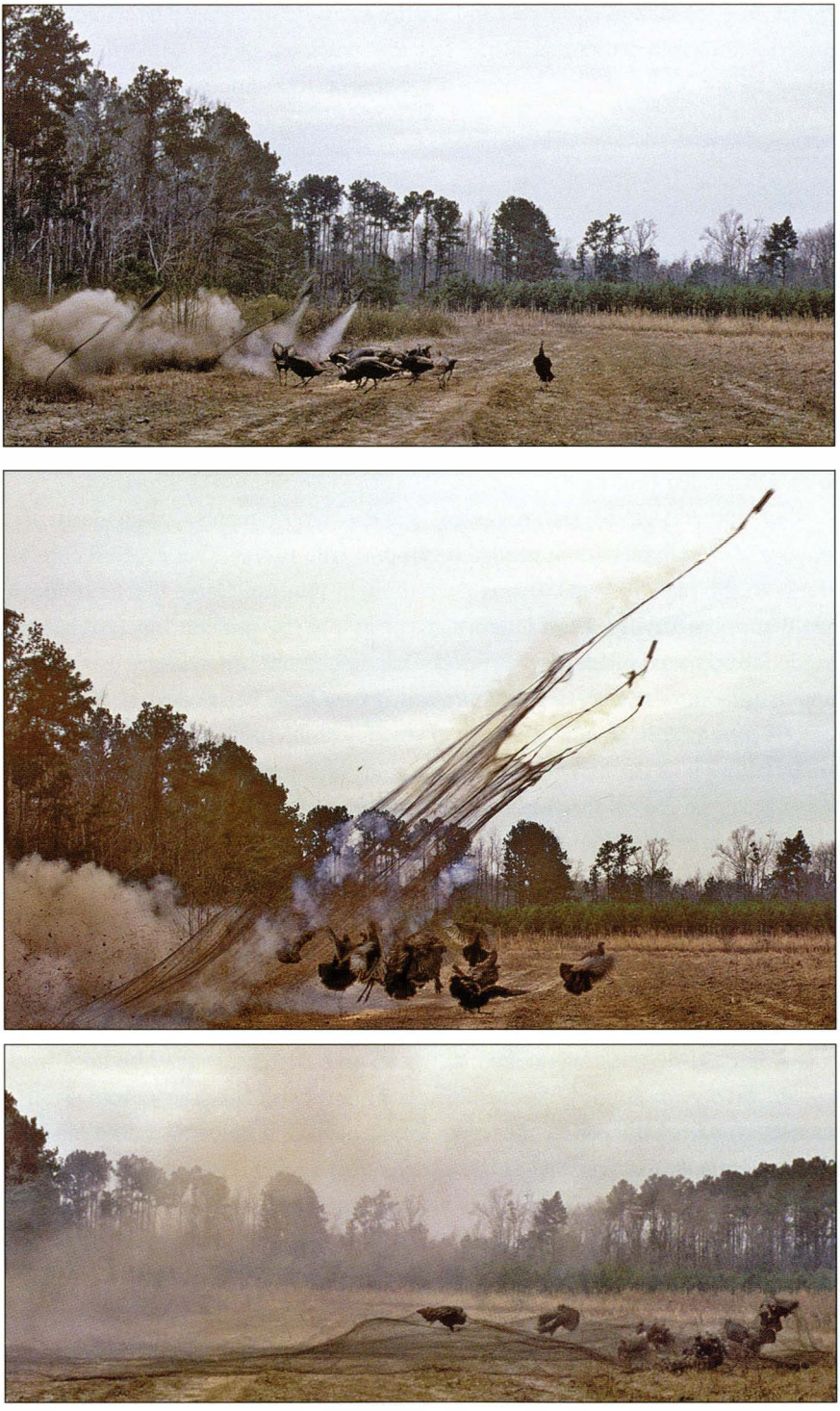


Fig 11-8. Wild turkeys are captured using a rocket net. (National Wild Turkey Federation)

Irregular terrain is likely beneficial to turkeys as an aid in escaping predators. It doesn't take very long or a lot of effort for a bird as large as a turkey to be sailing across a valley when danger gets too close. In contrast, the effort and energy necessary to gain flight on level terrain would exceed that necessary from a hillside. Irregular terrain also makes it easier to fly into the roost from a nearby slope. Latham (1956) further postulated that irregular terrain was beneficial to turkeys for protection from human disturbance and as refuge from the wind during cold periods (Fig 11-9).

While newly released turkeys have a tendency to disperse and investigate their surroundings during the first spring following their release, they exhibit a much more sedentary behavior immediately following their winter release. This lack of mobility led to the death (due to starvation or exposure) of over half of a flock of eastern wild turkeys released in the upper hills of Sica Hollow State Park. While the release area held one of the most extensive deciduous forests found in

Fig 11-9. Sparsely forested habitat along prairie streams and associated slopes, draws, and steep terrain can support surprisingly strong wild turkey populations outside of their original range in South Dakota. However, these populations only survive winters by finding cereal grains associated with agricultural operations. (LDF; inset K.C. Jensen, SDSU)

Fig 11-10. Turkeys trapped and moved to new areas in winter or early spring need to be released close to harvested crop fields that can provide winter feed as they adjust to the new area. This rocket net was fired from the box in the background. (CPL)

South Dakota, the availability of food in the area was severely restricted due to a thick blanket of snow.

During that same winter, another group of wild turkeys was released at the base of the Sica Hollow area near agricultural fields, and none of these birds succumbed to starvation or exposure.

The lessons learned from these winter releases were that food is just as important as forests in meeting the needs of recently released wild turkeys and that it is important to have these resources immediately available where turkeys are released (Fig 11-10).

Trap-and-transfer will continue to play an important role in turkey management in South Dakota. Although the largest contiguous blocks of woodland habi-

tat in the state already support turkeys, some isolated pockets of habitat in eastern South Dakota remain unoccupied. Even though the population potential of these blocks of habitat may be small, the long-term recreational value of establishing turkey populations in these areas is high.

Future Outlook: Recreational Opportunities and Economics

In the U.S., wild turkeys have increased from an estimated 1.3 million in 1973 to over 6 million by 2003, while turkey hunters have increased from 1.5 million to 2.6 million during the same period (National Wild Turkey Federation 2004).

In 1962 there were an estimated 63 turkeys harvested during South Dakota's spring turkey season compared to over 2,200 in 1985, or an amazing 3,392% increase in harvest. An increase in harvest of 231% from 1985 to 2003 indicated a decline in the pace.

Increased hunter participation and expanding wild turkey populations in South Dakota reflect the trend across the nation. Nationwide, spring harvest has increased by 160% between 1985 and 1999, but the annual rate of increase in total harvest has begun to slow over this period (Tapley et al. 2001).

Maintaining quality hunts without hunters interfering with each other will likely become an important management issue (Tapley et al. 2001). As suitable wild turkey habitats become occupied, populations will soon stabilize, and long range projections indicate stable harvests through 2045 (Flather et al. 1999).

While stable harvests will occur for most eastern states and many other areas, limited range expansion is still occurring in South Dakota. We expect moderate increases in eastern turkey populations through trap-and-transplant programs and natural movements that will help expand their range in eastern South Dakota. Increased eastern turkey populations can support moderate increases in hunters without decreasing hunting quality and harvest success. Likewise, several of the prairie units could support additional hunting and increased spring harvest of gobblers.

Wild turkeys are viewed and enjoyed by hunters and nonhunters. Some smaller towns and cities support wild turkeys in and around city limits. Many ranchette or country homeowners have witnessed gobblers strutting and gobbling in their horse pastures or below their bird feeders. Urban turkeys have made homes near our human homes and will be another future challenge for game managers, especially as home and business development continues farther into areas of wild turkey habitat.

Turkey hunting has become the second highest participatory hunting and is the fastest growing form of hunting in the United States. The economic benefits to local economies based on this rapid growth are impressive. It was estimated

Fig 11-11. The number of resident plus nonresident licenses sold for spring gobbler hunting in the Black Hills increased 125% from 1997 to 2004. The hunter shown had success in calling and harvesting this gobbler, but success and quality of the spring Black Hills hunt will likely decline if numbers of hunters continue to increase at a rapid rate. (Mike Mueller, Rocky Mountain Elk Foundation)

that in 2003, $6,458,070 was spent by spring turkey hunters in South Dakota. Nationwide expenditure by turkey hunters was $1.8 billion in 2003. As turkey hunting continues in popularity, hunter expenditures and benefits to businesses will continue to grow, particularly in rural areas.

The Black Hills has become a favorite location for nonresident and resident turkey hunters seeking Merriam's turkeys because of the extensive public land and beauty of the area (Fig 11-11). From 1997 to 2004, license issuance for spring turkey hunting has doubled (125% increase) in the Black Hills. If hunter participation continues to grow at this pace, an estimated $6 million dollars could be spent in the Black Hills alone in 2009.

Management Vision

Efforts to restore wild turkeys to their original range in southeastern South Dakota and to introduce them into previously unoccupied habitats have been successful beyond expectations. Many of us have benefited greatly from the foresight of those biologists and managers who carried out early introductions of wild turkeys in the state.

Continued success with recent and ongoing releases of eastern turkeys can be expected in many areas of South Dakota, including habitats along the James and Big Sioux rivers, Wessington Hills, the northeastern counties and several other localized sites in eastern South Dakota. Some of these will be nearly pure eastern subspecies and others will hybridize with existing Rio Grande turkeys, Merriam's turkeys, or hybrids.

The influence of eastern subspecies genetics may also increase along the lower Missouri in southeastern South Dakota, but these populations will remain of mixed subspecies background. Opportunities for wild turkey hunting closer to home should continue to improve in the next decade for residents in eastern

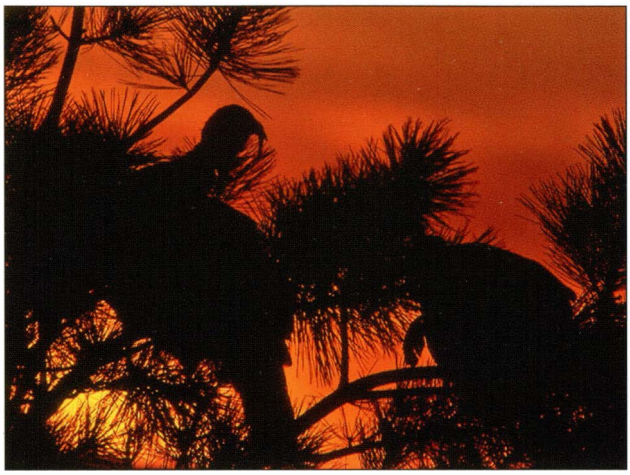


Fig 11-12. These roosting Merriam's turkeys are well adapted to ponderosa pine habitats in the Black Hills and throughout their native range in Colorado, New Mexico, and Arizona. Supplemental releases of wild turkeys of unknown lineage in the Black Hills region could dilute the genetics of this Merriam's turkey population and should be avoided. (M. Tarby)

South Dakota as releases of wild birds continue in new areas and as recently established eastern turkeys spread and increase in numbers.

Wild turkey populations in the western portion of the state will remain dominated by Merriam's turkeys with limited pockets of Rio Grande turkeys and overlapping areas of hybridization (Fig 11-12). Because of the probable mixed genetics in some areas of western South Dakota and the probable strong Merriam's turkey genetics in the Black Hills, we recommend not releasing excess birds captured in prairie units into the Black Hills. The Black Hills has one of the most productive populations of Merriam's turkeys in North America and dilution of the subspecies genetics in that population would be negative in terms of economics and aesthetics. Analysis of genetic structure of wild turkey populations in the Black Hills and prairie management units would provide valuable baseline data (Mock et al. 2001).

The prairie management units are becoming increasingly popular as destinations for hunting wild turkeys. Demand for licenses in areas outside of the Black Hills will increase as numbers of resident and nonresident turkey hunters increase and wild turkey populations begin to level off or at least slow in their rate of expansion in South Dakota. Providing hunter access to private lands in these prairie units will become increasingly important in future years. Out-of-state hunters would likely make much greater use of hunting opportunities in prairie units if they were familiar with the various units and confident about obtaining access.

We expect hunting pressure to continue to increase in the Black Hills with a corresponding decrease in hunter success; however, success will still be high enough to sustain strong demand for hunting in the Black Hills. The Black Hills will likely become even more important as a destination for out-of-state hunters specifically seeking to hunt the Merriam's subspecies.

Some aspects of wild turkey nutrition could change rapidly if markets, federal programs, or other factors cause changes in crop types.

Waste corn is particularly important to wild turkeys, and recent changes favoring conversion to soybeans (Higgins et al. 2002) could affect turkey populations by changing the nutritional base for overwintering birds in many prairie woodland areas. Changes in cropping practices that reduce waste grain could also influence wild turkeys. Food plots developed for wildlife could be a strong plus for turkey management in future years (South Dakota Statewide Turkey Management Plan 2001). Food plots can potentially help keep wild turkeys away from stored grains and silage. Additionally, programs that promote ranching, such as federal grassland easements or other conservation easements, can help preserve turkey habitat along prairie streams and rivers.

We currently have excellent annual survival in female turkeys. In the areas where survival has been studied, we see minimal evidence of illegal kill during the spring hunting season or during the remainder of the year. Hopefully, low illegal kill is a reflection of the quality of the state's citizens to a large degree and will continue in future years. Nesting effort and nesting success are generally high in all turkey populations that have been studied in South Dakota.

Reproductive success can change over time with altered landscapes and changing predator populations. It is not unusual for initial reproductive success to decline after a few years in recently introduced populations. Increasing population size can lead to greater competition and stress during winter or other periods, and these stresses may have negative influences on percentages of adult and juvenile hens attempting to nest or, if their clutch is destroyed or abandoned, to renest.

Expansion of wild turkeys into extensive farmland regions in eastern South Dakota is unlikely unless natural woodlands are nearby (Fig 11-13). We have observed no significant expansion from woodlands on the Prairie Coteau escarpment into farmland-shelterbelt areas in the northeast.

Wild turkeys do periodically move out to individual farmsteads to winter or may disperse across farmlands but almost all of these observations are within a mile or two of natural woodlands. All available information indicates that wild turkey populations will remain centered near natural woodlands although they will make use of steep topography and river breaks that are dominated by shrub and grass cover as long as they still have scattered woodland patches in the vicinity for roosting and escape cover.

Many challenges face future wild turkey managers in South Dakota. These challenges include management of an expanding wild turkey population in the eastern part of the state and potential overpopulation along riparian areas in the western portions of the state.

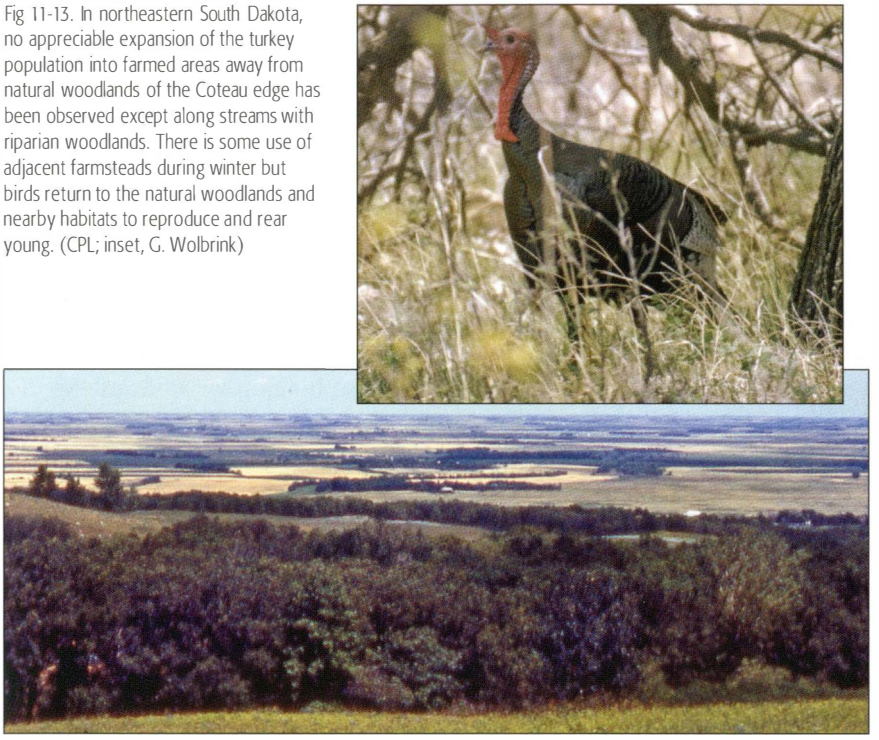


Fig 11-13. In northeastern South Dakota, no appreciable expansion of the turkey population into farmed areas away from natural woodlands of the Coteau edge has been observed except along streams with riparian woodlands. There is some use of adjacent farmsteads during winter but birds return to the natural woodlands and nearby habitats to reproduce and rear young. (CPL; inset, G. Wolbrink)

In eastern South Dakota, a primary challenge of managers will be to identify unoccupied habitats that can support wild turkeys and find a source of the eastern subspecies to fill them (South Dakota Statewide Wild Turkey Plan 2001).

Throughout the state, hunter opportunities and competition between hunters for space is likely to grow and need the attention of future managers. A serious concern involves the development of commercial operations for turkey hunting and the associated lengthy seasons and release of pen-reared turkeys for hunting purposes (South Dakota Statewide Turkey Management Plan 2001). Although the release of domestic turkeys, including dark colored game-farm stock, is legal in South Dakota, this practice could cause loss of heritable wildness in wild turkey populations and should be prohibited wherever wild turkeys are found.

The western prairies of South Dakota will continue to experience problems with controlling turkey populations until managers find a way to increase fall harvest rates on hens. Managers also need to continue to identify ways to protect landowner's stored feeds and establish alternate foraging areas for wintering turkeys.

The ideal combination of abundant turkey populations and vast areas of public land make the Black Hills a turkey hunter's paradise. Yet managers should consider the potential effects of the current trend of expanding turkey hunter num-

bers in the Black Hills. These expected impacts include a reduction in hunter success, increased conflicts between turkey hunters for space, and a subsequent decline in hunter satisfaction.

If the trend in number of hunters does not level off soon, managers may need to impose license restrictions that reduce hunter competition and improve hunt quality. Some of these options include restricting tag numbers, dividing the spring hunting season into two or more separate units by time period or dividing the Black Hills geographically into management units. Undoubtedly, each of these management options will be met with both wide resistance and support from those with a stake in Black Hills turkey hunting.

South Dakota will continue to offer excellent hunting for wild turkeys in a diversity of interesting landscapes on both private and public lands. Additional opportunities for turkey hunting in South Dakota may also be available on tribal lands under the jurisdiction of tribal authorities. With wisdom and vision, managers must ensure that hunter opportunities remain high for the current generation while enhancing or at least preserving opportunities for future generations of wild turkey enthusiasts.

As Meriwether Lewis found along the Missouri in his great expedition with William Clark some 200 years ago, the wild turkey is a prolific bird that can populate and even flourish in a state like South Dakota that has minimal woodland habitat. In the words of Meriwether Lewis, "In this area we observed a greater quantity of turkeys than we had before seen, a circumstance which I did not much expect in a country so destitute of timber" (Dillon 1965).

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APPENDIX

Common and scientific names for plants and wild vertebrates mentioned in this book. Genus, species, and subspecies of wild turkeys are given in the text when the common name is first used.

Birds

Canada geese, *Branta canadensis*
common crow, *Corvus brachyrhynchos*
Cooper's hawk, *Accipiter cooperii*
black-billed magpie, *Pica pica*
black-headed grosbeak, *Pheucticus melanocephalus*
blue grosbeak, *Guiraca caerulea*
great horned owl, *Bubo virginianus*
golden eagle, *Aquila chrysaetos*
greater sage-grouse, *Centrocercus urophasianus*
northern goshawk, *Accipiter gentilis*
red-tailed hawk, *Buteo jamaicensis*
ring-necked pheasant, *Phasianus colchicus*
sharp-tailed grouse, *Tympanuchus phasianellus*

Mammals

bobcat, *Lynx rufus*
coyote, *Canis latrans*
elk, *Cervus elaphus*
fox squirrel, *Sciurus niger*
mink, *Mustela vison*
red fox, *Vulpes vulpes*
weasel, *Mustela* spp
white-tailed deer, *Odocoileus virginianus*

Grasses and Forbs

bluegrass, *Poa* spp.
corn, *Zea mays*
dandelion, common, *Taraxacum officinale*
downy brome, *Bromus tectorum*
false gromwell, *Onosmodium molle*
hoary vervain, *Verbena stricta*
Kentucky bluegrass, *Poa pratensis*
knotweed, Douglas, *Polygonum douglasii*
needlegrass, *Stipa* sp.
oats, *Avena sativa*
pasqueflower, *Anemone patens*
pigeongrass, *Setaria* spp.
smooth brome, *Bromus inermis*
sorghum and milo, *Sorghum* spp.
sunflower, *Helianthus* spp.
Virginia groundcherry, *Physalis virginiana*
Westerm ragweed, *Ambrosia psilostachya*
wheatgrass, several genera
wild onion, *Allium* spp.

Shrubs and Trees

American basswood, *Tilia americana*
American elm, *Ulmus americana*
big sagebrush, *Artemisia tridentata*
black walnut, *Juglans nigra*
boxelder, *Acer negundo*
bur oak, *Quercus macrocarpa*
chokecherry, *Prunus virginiana*
eastern redcedar, *Juniperus virginiana*
grapes, *Vitis* spp.
green ash, *Fraxinus pennsylvanica*
hackberry, *Celtis occidentalis*
hawthorn, northern, *Crataegus chrysocarpa*
ironwood, *Ostrya virginiana*
juniper, *Juniperus* spp.
kinnikinnick (bearberry), *Arctostaphylos uva-ursi*
peachleaf willow, *Salix amygdaloides*
plains cottonwood, *Populus deltoides*
poison ivy, *Toxicodendron rydbergii*
ponderosa pine, *Pinus ponderosa*
quaking aspen, *Populus tremuloides*
raspberry (red), *Rubus idaeus*
rose, *Rosa* spp.
Russian olive, *Elaeagnus angustifolia*
sumac, *Rhus* sp.
smooth sumac, *Rhus glabra*
snowberry, *Symphoricarpos occidentalis*
sugar maple, *Acer saccharum*
white spruce, *Picea glauca*
wild currants, *Ribes* spp.
wild plum, *Prunus americana*

After traveling to the mouth of the White River in south-central South Dakota, Meriwether Lewis recorded his surprise at the abundance of wild turkeys, "... we observed a greater quantity of turkeys than we had before seen, a circumstance which I did not much expect in a country so destitute of timber (Dillon 1965: 159)."

By the 1920s the once abundant eastern wild turkey had been exterminated from South Dakota. Since then, efforts to restore this magnificent bird to its original range and to introduce other turkey subspecies into the Black Hills and other regions outside of their original range have proved successful beyond imagination.

If you enjoy watching, listening to, or hunting wild turkeys, if you host wild turkeys on your land, or if you are a wildlife manager, you will find the historical, behavioral, ecological, and management information in *The Wild Turkey in South Dakota a* valuable resource. Assuredly, you will enjoy the many spectacular turkey photos.

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