



Ecology of Merriam's turkeys in relation to burned and logged areas in southeastern Montana
by William Lawrence Thompson

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in
Biological Sciences

Montana State University

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Abstract:

Merriam's turkeys (*Meleagris gallopavo merriami*) were captured, equipped with radio transmitters, and monitored via telemetry to study their ecology in relation to burned (1988 wildfire) and logged areas in southeastern Montana, 1989-1991. Neither burned nor logged areas appeared to restrict seasonal movements of monitored turkeys during spring and fall. However, males and subadult hens in the burned study division moved farther than those in the unburned during spring/fall. Hens tended to nest more in burned areas with each subsequent year following the fire. Nest success was highest during the spring with largest amounts of precipitation. High levels of precipitation during spring likely promoted understory plant growth and increased nesting cover especially where fire opened the canopy to more sunlight and increased nutrient release to soils. Only 1 of 49 nests occurred in logged areas.

Clearcut logging may be more detrimental to nesting habitat in xeric (for example, southeastern Montana) than mesic regions because of slower vegetational growth and lower habitat structural diversity. Nests generally occurred in cover >6.5 dm high and on >20% slopes. Summer home range sizes were not correlated with percent burned or logged area that they contained. Roost trees within burned areas were larger in diameter than those in unburned areas. More "large" trees in severely burned areas may have become attractive to roosting turkeys through loss of dense canopy and simplified branch structure. Turkeys usually roosted in the taller (mean = 18 m) and larger diameter (mean = 41 cm dbh) trees available. On average, roosts occurred on 25% slopes with easterly or northeasterly aspects. Severely burned trees used for roosting may be lost over time because of their breakage and falling. No roosts occurred in forest stands subjected to any type of timber harvesting scheme. Survival rates of monitored turkeys were similar between burned and unburned areas. Overall, habitat quality for turkeys likely was lowered during the first year or 2 following the fire, but should generally increase (except roosting habitat) in subsequent years. The effects of logging on turkey habitat in southeastern Montana remain unclear; however, logged areas were rarely used by monitored turkeys during this study.

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This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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ABSTRACT

Merriam's turkeys (*Meleagris gallopavo merriami*) were captured, equipped with radio transmitters, and monitored via telemetry to study their ecology in relation to burned (1988 wildfire) and logged areas in southeastern Montana, 1989-1991. Neither burned nor logged areas appeared to restrict seasonal movements of monitored turkeys during spring and fall. However, males and subadult hens in the burned study division moved farther than those in the unburned during spring/fall. Hens tended to nest more in burned areas with each subsequent year following the fire. Nest success was highest during the spring with largest amounts of precipitation. High levels of precipitation during spring likely promoted understory plant growth and increased nesting cover especially where fire opened the canopy to more sunlight and increased nutrient release to soils. Only 1 of 49 nests occurred in logged areas. Clearcut logging may be more detrimental to nesting habitat in xeric (for example, southeastern Montana) than mesic regions because of slower vegetational growth and lower habitat structural diversity. Nests generally occurred in cover ≥ 6.5 dm high and on $\geq 20\%$ slopes. Summer home range sizes were not correlated with percent burned or logged area that they contained. Roost trees within burned areas were larger in diameter than those in unburned areas. More "large" trees in severely burned areas may have become attractive to roosting turkeys through loss of dense canopy and simplified branch structure. Turkeys usually roosted in the taller (mean = 18 m) and larger diameter (mean = 41 cm dbh) trees available. On average, roosts occurred on 25% slopes with easterly or northeasterly aspects. Severely burned trees used for roosting may be lost over time because of their breakage and falling. No roosts occurred in forest stands subjected to any type of timber harvesting scheme. Survival rates of monitored turkeys were similar between burned and unburned areas. Overall, habitat quality for turkeys likely was lowered during the first year or 2 following the fire, but should generally increase (except roosting habitat) in subsequent years. The effects of logging on turkey habitat in southeastern Montana remain unclear; however, logged areas were rarely used by monitored turkeys during this study.

CHAPTER 1

INTRODUCTION

Merriam's turkey originally inhabited ponderosa pine-oak (scientific names for plant species are given in Appendix A, Table 1) forests in mountainous areas of Colorado, New Mexico, western Texas, and Arizona (Ligon 1946). State wildlife agencies have introduced this subspecies into non-native areas throughout the West. Merriam's turkeys now occur in North and South Dakota, Nebraska, Colorado, New Mexico and all states west to the Pacific coast (Kennamer and Kennamer 1990).

Wild turkeys were first introduced into Montana in 1954 when 13 Merriam's turkeys were translocated from Colorado to the Judith Mountains of central Montana (Rose 1956). The second introduction occurred in the Long Pines Division of Custer National Forest in southeastern Montana where 18 Merriam's turkeys from Wyoming were released during 1955. Rose (1956) initially evaluated these 2 introductions, whereas Jonas (1966) conducted more intensive ecological studies in the Long Pines. There has been no further

detailed research on the status and ecology of Merriam's turkeys in either the Long Pines Division or the adjacent Ekalaka Hills Division (where 13 turkeys were released in 1958, Jonas 1966) during 1963-1988. Currently, both divisions have viable turkey populations.

During 8-21 June 1988, 2 lightning-generated wildfires burned approximately 20,920 ha (74%) of the Long Pines Division creating a mosaic of burned and unburned timber and grasslands (Fig. 1) (Havig et al. 1988). The effect of these wildfires on habitat¹ use by Merriam's turkeys was unknown. Prior to 1988, there had been no research on effects of fire on habitat use by this species anywhere in its range. Although Gobeille (1992) studied habitat use by turkey broods in relation to burned areas in southeastern Montana during 1989-1991, the effects of wildfire on habitat use by non-brood flocks of turkeys during summer and on ecology of turkeys during the rest of the year was unknown.

In response to the 1988 wildfire, Custer National Forest (Sioux Ranger District) of the U.S.D.A. Forest Service developed a Fuels Management Program (FMP) to alleviate further threat of wildfire in the Long Pines and avoid

1

I defined habitat as the physical space that contains the environmental and ecological components necessary for an organism to survive and reproduce (adapted from Morrison et al. 1992).



Fig. 1. Mosaic of burned and unburned stands of ponderosa pine in the Long Pines Division of Custer National Forest, 1990. The Ekalaka Hills Division is in the background.

catastrophic fire in the Ekalaka Hills. Specifically, the objective of the FMP was to "manipulate vegetation and fuels in specific treatment areas or zones by opening ponderosa pine forests, by separating continuous fuels, and by reducing the amount of fuels on the ground through various treatment methods while continuing to protect natural resources, forest facilities, improvements, and private property." As part of the FMP, 895 ha were scheduled for timber harvest (type of harvest determined by stand characteristics) or prescribed burning in the Ekalaka Hills during 1992-1995. Furthermore, 437 ha of timber had been harvested in the Ekalaka Hills during 1981-1991 (D. Sandbak, U.S. Forest Service, pers. commun.).

Effects of logging on habitat use by Merriam's turkeys have been reported for southern ranges, including New Mexico (Schemnitz et al. 1985), Arizona (Scott and Boeker 1975, Scott and Boeker 1977), and Colorado (Hoffman 1973). In the north, such research has been conducted only in Oregon (Lutz and Crawford 1987).

My study evaluated habitat use, movements, and survival of Merriam's turkeys in relation to both burned and logged areas in southeastern Montana. Chapter 2 summarizes vegetative communities located in the study area. Chapter 3 describes yearly use of wintering sites in unburned and unlogged lowlands. Chapters 4-6 describe spring/fall and summer habitat use and movements of turkeys. Chapter 7

reports both overall and disturbance-related survival rates. Chapter 8 describes research and management implications as related to both southeastern Montana and burned and logged habitats in the West.

CHAPTER 2

STUDY AREA

The study area is comprised of the Long Pines (total area = 27,424 ha) and Ekalaka Hills (total area = 2,150 ha) Divisions of Custer National Forest located in Carter County in southeastern Montana (Fig. 2). Each is an upland area that rises up to 350 m above the surrounding prairie. Both are vegetated by ponderosa pine-meadow parklands (Fig. 3) with scattered quaking aspen stands. Steep sandstone cliffs and outcroppings are common.

Major drainages in the study area include Little Beaver Creek to the northwest, Boxelder Creek in the center, Little Missouri River to the east, and Tie Creek to the south (Fig. 2). Numerous hardwood draws extend from upland areas to the prairie. Many drainageways branch out across the prairie, but most lack standing water except during spring. Permanent water sources include stock ponds, stock tanks, and natural springs. Upland soils are fine-silty, calcareous, well-drained, and sedimentary in origin (Montagne et al. 1982).

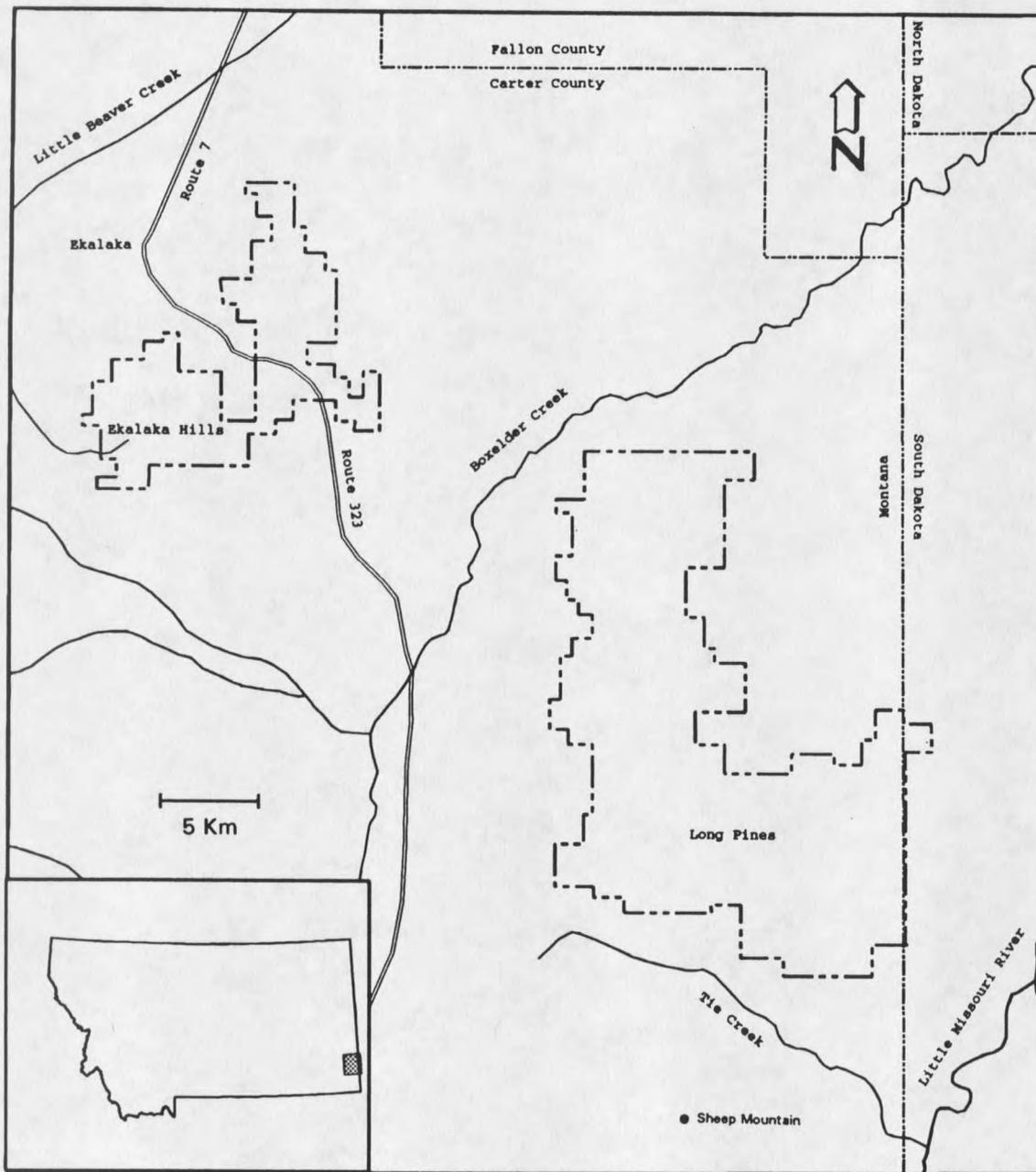


Fig. 2. The Long Pines and Ekalaka Hills Divisions (Sioux Ranger District) of Custer National Forest, Carter County, Montana.



Fig. 3. Ponderosa pine-meadow parkland in the Long Pines Division of Custer National Forest, Montana.

Extensive mixed grass and sagebrush prairie surround the study area. The prairie terrain is level to rolling. Soils are clayey, calcareous, well-drained, and sedimentary in origin (Montagne et al. 1982).

The climate of the study area is semi-arid; mean annual air temperature is 5.6 °C. Long-term mean air temperature is -7.2 °C during winter (December-February) and 18.5 °C during summer (June-September) (MAPS: Montana Agricultural Potential Systems, Montana State University Agricultural Extension Service). Mean annual precipitation is 39.4 cm; long-term means are 1.2 cm during winter and 8.3 cm during summer (EarthInfo 1992).

Upland game birds in the study area include wild turkey, sharp-tailed grouse (*Tympanuchus phasianellus*), sage grouse (*Centrocercus urophasianus*), ring-necked pheasant (*Phasianus colchicus*), gray partridge (*Perdix perdix*), and mourning dove (*Zenaida macroura*). Potential avian predators of subadult and adult turkeys include bald eagle (*Haliaeetus leucocephalus*) (winter and spring only), golden eagle (*Aquila chrysaetos*) and great-horned owl (*Bubo virginianus*) (Bergeron et al. 1992). Potential mammalian predators include mountain lion (*Felis concolor*) (Riley 1992), bobcat (*Felis rufus*), coyote (*Canis latrans*), and red fox (*Vulpes vulpes*) (Lampe et al. 1974).

The following summarizes vegetational characteristics of plant communities in and around the study area. More thorough descriptions are given in Jonas (1966) and Hansen and Hoffman (1988). Selected terms used in descriptions are defined in Appendix B, Table 2.

Upland Grassland Communities

The western wheatgrass/green needlegrass community occurs on more mesic, productive sites; for example, north-facing slopes and non-wooded draws (Havig et al. 1988). Needle-and-thread, rather than green needlegrass, was the codominant on most sites during my study (Fig. 4). Associated grasses included prairie junegrass, red threeawn, and blue grama. Threadleaf sedge also occurred. Apparently, blue grama and threadleaf sedge were more dominant in this community in the Long Pines during the early 1960's (Jonas 1966) than at present. Associated forb species included silver sagebrush, lambstongue groundsel, groundplum milkvetch, silvery lupine, low fleabane, plains wallflower, and field pussytoes (Hansen and Hoffman 1988). Areas subjected to heavy grazing by livestock often were dominated by needle-and-thread, woolly indian wheat, and plains pricklypear.



Fig. 4. Western wheatgrass/green needlegrass community in the Long Pines Division. Some plant species pictured include western wheatgrass, needle-and-thread, silver sagebrush, and common snowberry.

