Harvest dynamics and winter habitat use of the pine marten in southwest Montana
by Craig William Fager

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Fish and Wildlife Management
Montana State University

Abstract:
A 1-year study of pine marten habitat use and harvest dynamics was conducted in 3 study areas in southwest Montana. The primary objective of the study was to obtain baseline information about a species thought to be an old growth forest inhabitant and highly susceptible to fur trapping. Marten were live-trapped and fitted with radiocollars in the fall of 1989. Trapper catches were monitored to evaluate the effects of trapping on marten populations. Additional marten were trapped during the winter months. Marten were located through radio telemetry and snow tracking to determine habitat preferences and the effects of habitat alteration on local marten populations. Relative density was established through track transects during the winter months. Habitat variables were measured at marten locations and comparable random sites during the summer, 1990. Trappers harvested 27% (Beaver Creek) to 100% (West Yellowstone Flats) of marked marten during a trapping season regarded as poor by trappers. Fur trapping effort varied between study areas but was highest in the Big Hole study area where harvest was greatest. Marten densities were highest in the Big Hole study area, intermediate in the Beaver Creek study area, and lowest in the Flats study area. Trapping had little impact on marten populations in 3 study areas in southwest Montana during 1989-1990. Marten populations were probably at low levels prior to the trapping season and marten remained in each study area after the trapping season. Large untrapped reservoirs adjacent to trapped areas may have provided surplus marten to restock trapped areas. Marten were located in every forested habitat in each study area. Habitat preference was for mesic lodgepole pine habitats in the West Yellowstone Flats area and mesic subalpine fir and Douglas-fir habitats in the Big Hole area. Marten rested primarily in subnivean sites created by woody debris. Physical measurements of habitat indicated the marten used a variety of sites with different structural attributes. The marten may be more flexible in habitat use than characterized in the literature.

HARVEST DYNAMICS AND WINTER HABITAT USE OF THE PINE MARTEN IN SOUTHWEST MONTANA

by

Craig William Fager

A thesis submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Fish and Wildlife Management

MONTANA STATE UNIVERSITY
Bozeman, Montana

September 1991

APPROVAL

of a thesis submitted by

Craig William Fager

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.

1 October 1991
Date

Lynn R. Irby
Cochairperson, Graduate Committee

1 October 1991
Date

Richard J. Douglass
Cochairperson, Graduate Committee

Approved for the Major Department

1 October 1991
Date

Robert S. Moore
Head, Major Department

Approved for the College of Graduate Studies

4 October 1991
Date

Henry L. Parsons
Graduate Dean

STATEMENT OF PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a master's degree at Montana State University, I agree that the Library shall make it available to borrowers under rules of the Library. Brief quotations from this thesis are allowable without special permission, provided that accurate acknowledgment of source is made.

Permission for extensive quotation from or reproduction of this thesis may be granted by my major professor, or in his absence, by the Dean of Libraries when, in the opinion of either, the proposed use of the material is for scholarly purposes. Any copying or use of the material in this thesis for financial gain shall not be allowed without my written permission.

Signature Craig W. Fager

Date 10-1-91

ACKNOWLEDGMENTS

I would like to thank the U.S. Forest Service, Montana Department of Fish, Wildlife, and Parks (MDFWP) and Montana State University for supporting this project. Furbearers Unlimited also provided funding at a critical time.

Mike Frisina, Kurt Alt, Mike Ross, Keith Aune and Phil Schladweiler provided logistical and/or laboratory support. Al Harmata loaned invaluable telemetry equipment. Ken Coffin deserves special credit for his efforts in the field.

Jeff Jones, Brent Costain, and Barbara Clemmens of the Wisdom Ranger District helped with logistics. Bob Hutton and crew helped with field work. Claude Coffin, Ron Neighbor, and Dan Trochta of the Hebgen Lake Ranger District provided logistic and field support. Roger Gowan and Sherry Metzger provided valuable assistance in data analysis.

Charlie Depas, Roland Whitman, Mike Ross, and Joe Clemmens deserve special credit for advice on trapping. I would also like to thank my committee members Lynn Irby, Rick Douglas, Harold Picton, Bill Gould and Bob Moore for field assistance and direction in manuscript preparation.

TABLE OF CONTENTS

TABLE OF CONTENTS--Continued

TABLE OF CONTENTS--Continued

LIST OF TABLES

LIST OF TABLES--Continued

LIST OF TABLES--Continued

LIST OF TABLES--Continued

LIST OF TABLES--Continued

LIST OF FIGURES

ABSTRACT

A 1-year study of pine marten habitat use and harvest dynamics was conducted in 3 study areas in southwest Montana. The primary objective of the study was to obtain baseline information about a species thought to be an old growth forest inhabitant and highly susceptible to fur trapping. Marten were live-trapped and fitted with radiocollars in the fall of 1989. Trapper catches were monitored to evaluate the effects of trapping on marten populations. Additional marten were trapped during the winter months. Marten were located through radio telemetry and snow tracking to determine habitat preferences and the effects of habitat alteration on local marten populations. Relative density was established through track transects during the winter months. Habitat variables were measured at marten locations and comparable random sites during the summer, 1990. Trappers harvested 27% (Beaver Creek) to 100% (West Yellowstone Flats) of marked marten during a trapping season regarded as poor by trappers. Fur trapping effort varied between study areas but was highest in the Big Hole study area where harvest was greatest. Marten densities were highest in the Big Hole study area, intermediate in the Beaver Creek study area, and lowest in the Flats study area. Trapping had little impact on marten populations in 3 study areas in southwest Montana during 1989-1990. Marten populations were probably at low levels prior to the trapping season and marten remained in each study area after the trapping season. Large untrapped reservoirs adjacent to trapped areas may have provided surplus marten to restock trapped areas. Marten were located in every forested habitat in each study area. Habitat preference was for mesic lodgepole pine habitats in the West Yellowstone Flats area and mesic subalpine fir and Douglas-fir habitats in the Big Hole area. Marten rested primarily in subnivean sites created by woody debris. Physical measurements of habitat indicated the marten used a variety of sites with different structural attributes. The marten may be more flexible in habitat use than characterized in the literature.

INTRODUCTION

In recent years, the pine marten (Martes americana) has moved from relative obscurity to a place of high visibility in the minds of resource managers. This is largely because the marten is perceived as a habitat specialist evolved to live in old growth forests, a community designation that evokes strong feelings from economic and environmental interests (Koehler et. al 1975, Franklin et. al 1981). This perception has prompted a majority of National Forests in the Northern Region to name the marten as an old-growth management indicator species (Code of Federal Regulations 219.19). Unfortunately, there are only limited basic biological data to justify this designation.

Buskirk (1983) stated that "the belief that Alaskan marten thrive on unbroken, pure stands of conifer forest belies our ignorance of the life requisites of this species." This statement may also be valid for marten in southwest Montana. No one knows how the marten fits into habitats in southwest Montana because no information on marten habitat use has been collected.

Marten habitat use has been extensively investigated over most parts of its range (Steventon 1979, Buskirk 1983, Raine 1983, Hargis and McCullough 1984). However, a gap is present in drier portions of the Rocky Mountains, including southwest Montana, where marten occur. With timber harvesting pressure mounting on the remaining old-growth forests in this region, the need to determine how the marten uses habitat in southwest Montana has never been greater.

For decades, the only information collected on marten in southwest Montana has been pelt-tagging data from trappers (Frisina, Pers. Comm.). These data are useful for establishing general population trends; however, they are subject to fluctuations induced by fur prices, trapper effort, and weather conditions that may be independent of population levels and habitat changes. Concern over the possible consequences of high harvest levels and the impacts of harvest on populations in areas with extensive habitat alteration due to logging has led to the need for a more accurate evaluation of trapping effects on marten populations.

The objectives of this study were to provide baseline information regarding marten habitat use, the effects of alteration of these habitats on population viability, and the effects of marten harvest on population structure in 3 sites in southwest Montana. Field work was initiated in September of 1989 and was completed in September of 1990.

Study Areas

Three study areas in southwest Montana were selected.

Representative habitat types, land use pressures, and trapper activity were all given consideration in area selection.

Upper Big Hole

The upper Big Hole study area comprised 153 km^2 of the Anaconda range in the Beaverhead National Forest (Fig. 1). The area included the Tie, Johnson, Shultz, and Bender Creek drainages. Approximate boundaries were defined by Highway 43 to the South, the Continental Divide to the North and West, and the sagebrush-grassland of the upper Big Hole to the East (Fig. 1)

Elevation varied between 1950 and 2500 m. Annual average precipitation at the town of Wisdom, 15 kilometers to the east, is 30 cm. Average temperature at Wisdom for the month of January is -10.3 $^{\circ}C$ and for July is 14.4 $^{\circ}C$.

Spruce (Picea spp.) and subalpine fir (Abies lasiocarpa) habitat types dominated drainage bottoms and higher elevation sites in the study area. Lodgepole pine (Pinus contorta) and Douglas-fir (Psuedotsuga menziesii) habitat types were dominant in drier and lower elevation sites.

Logging, livestock grazing, and recreation were the primary land uses within the study area. Clear-cut logging and associated road building have been extensive in the last 2 decades, and, consequently, motorized vehicle access to a majority of the study area was good.

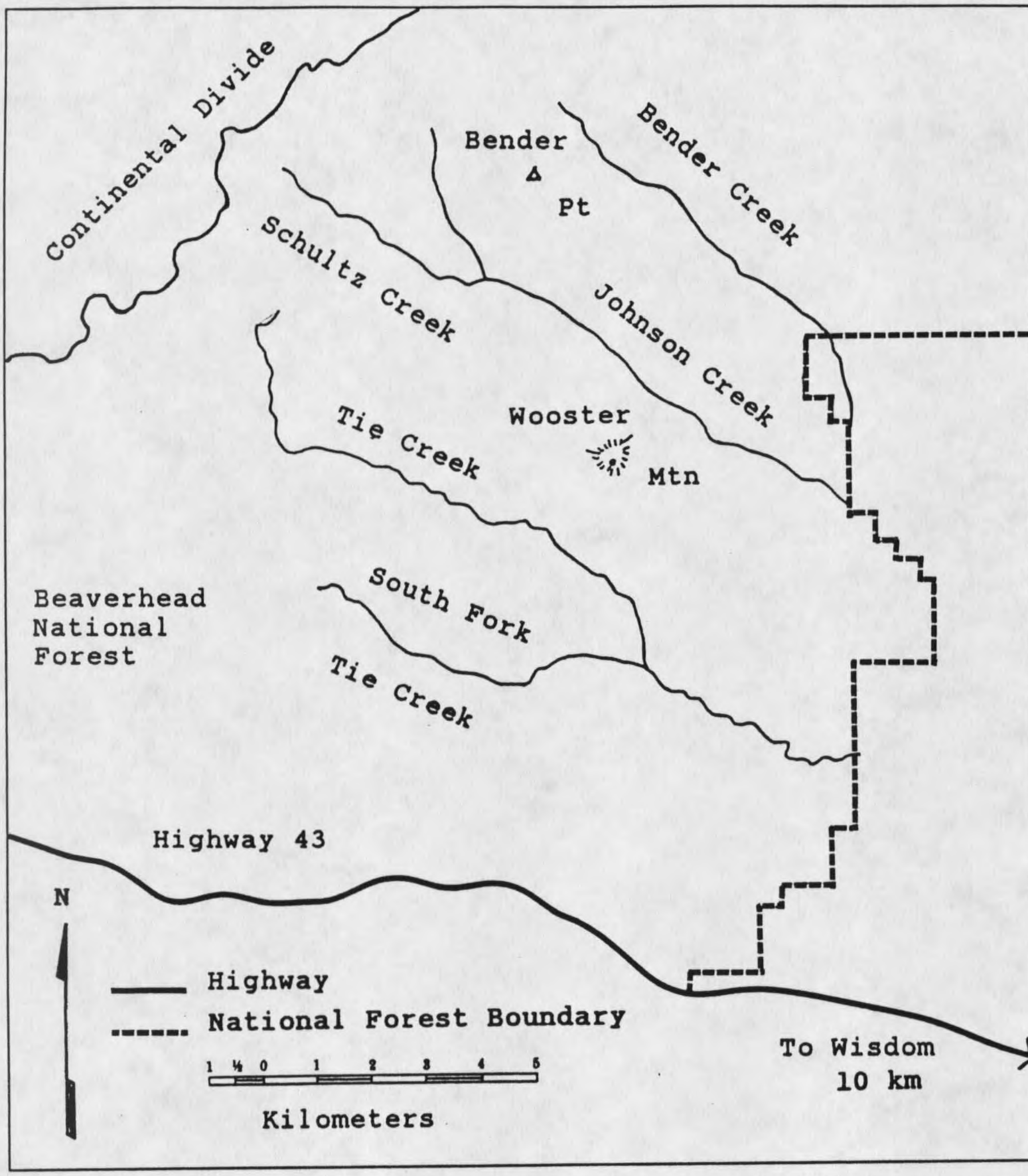

Figure 1. Boundaries and drainage patterns in the Big Hole study area.

West Yellowstone Flats

The 64-km^2 Flats-Horse Butte study area (Fig. 2) was located immediately North of the town of West Yellowstone, on Gallatin National Forest and Yellowstone National Park land. The area was characterized by a mosaic of grassland and forest and was dominated by a lodgepole pine-bitterbrush (Pinus contorta-Purshia tridentata) habitat type that is unique to the West Yellowstone area. Approximate boundaries were Hebgen Lake in the West, Yellowstone National Park in the East, and Cougar Creek in the North.

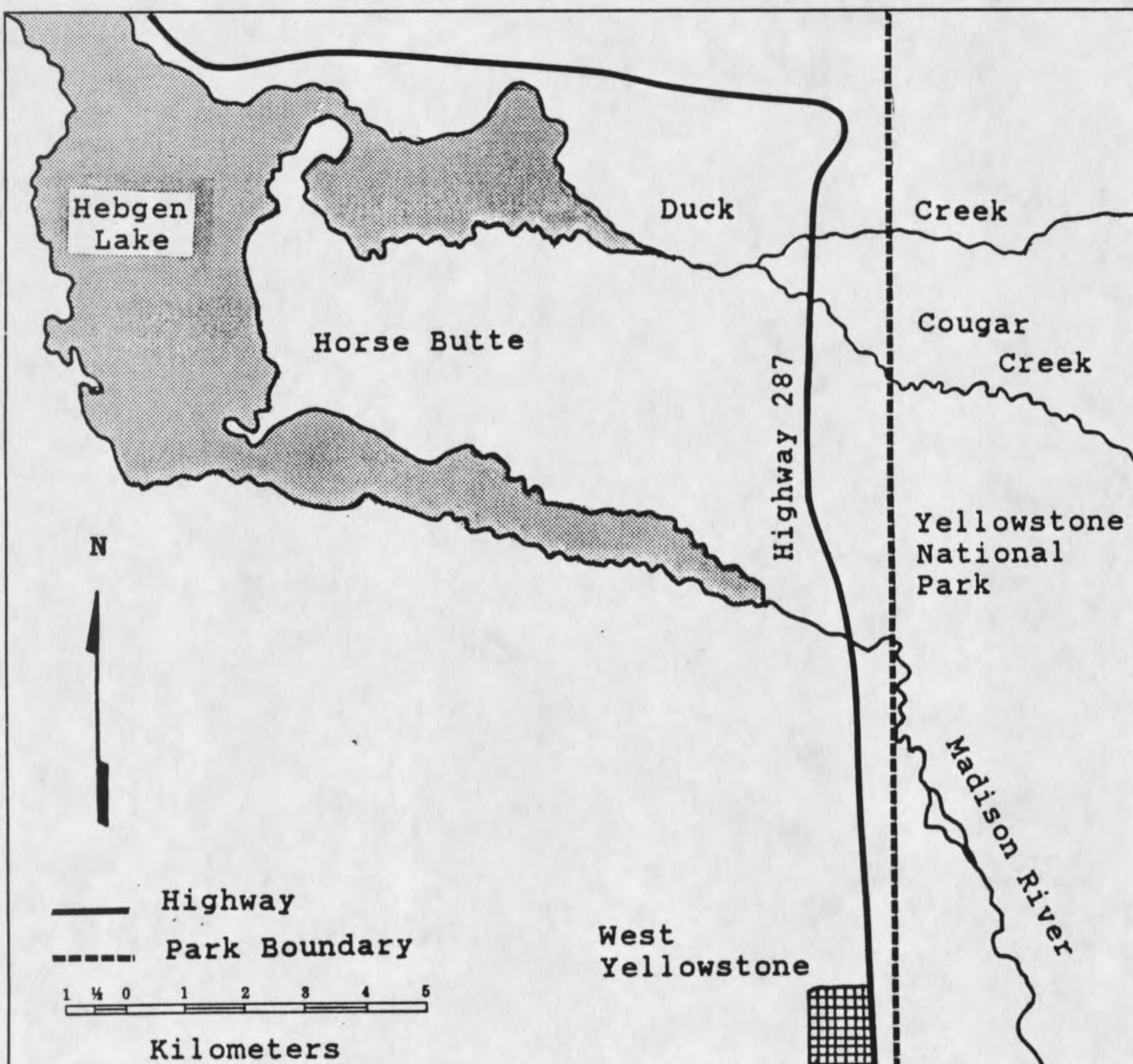

Figure 2. Boundaries and drainage patterns in the West Yellowstone Flats study area.

Most of the study area was located on a high elevation basin (2000m). Horse Butte, on the western edge of the study, with an elevation of 2088 m formed the one exception. Average temperature for the month of January at West Yellowstone is -11.3 °C and for July is 15.6 °C. Precipitation in this area occurs primarily as snow and averages 56.7 cm.

Recreation, logging, and firewood cutting were the primary land uses. One livestock grazing permit was maintained on Horse Butte. The flat open nature of the area allowed almost unlimited motorized access in the lodgepole habitats outside Yellowstone National Park.

Beaver Creek.

The Beaver Creek study area (Fig. 3) was in the Madison Range, between Quake and Hebgen Lakes. Part of the 32-km^2 study area was within the Taylor-Hilgard Wilderness Area of the Gallatin National Forest. Steep topography limited most research activities to within 1 km of the road. U.S. Forest Service trails allowed some access into the Cabin-Beaver Creek Divide and the Sentinel Creek drainages.

Study area elevation varied between 1980 and 2500 m. Precipitation and temperature data were unavailable; however, snow depth was generally deeper and persisted longer in the spring than at West Yellowstone.

The primary land use practiced within the study area was recreation. A limited amount of clear-cut logging has taken place on the study area. U.S. Forest Service trails provide the primary means of access to much of the area. Motorized vehicle access was limited to less than 10 km of summer-passable, unpaved roads.

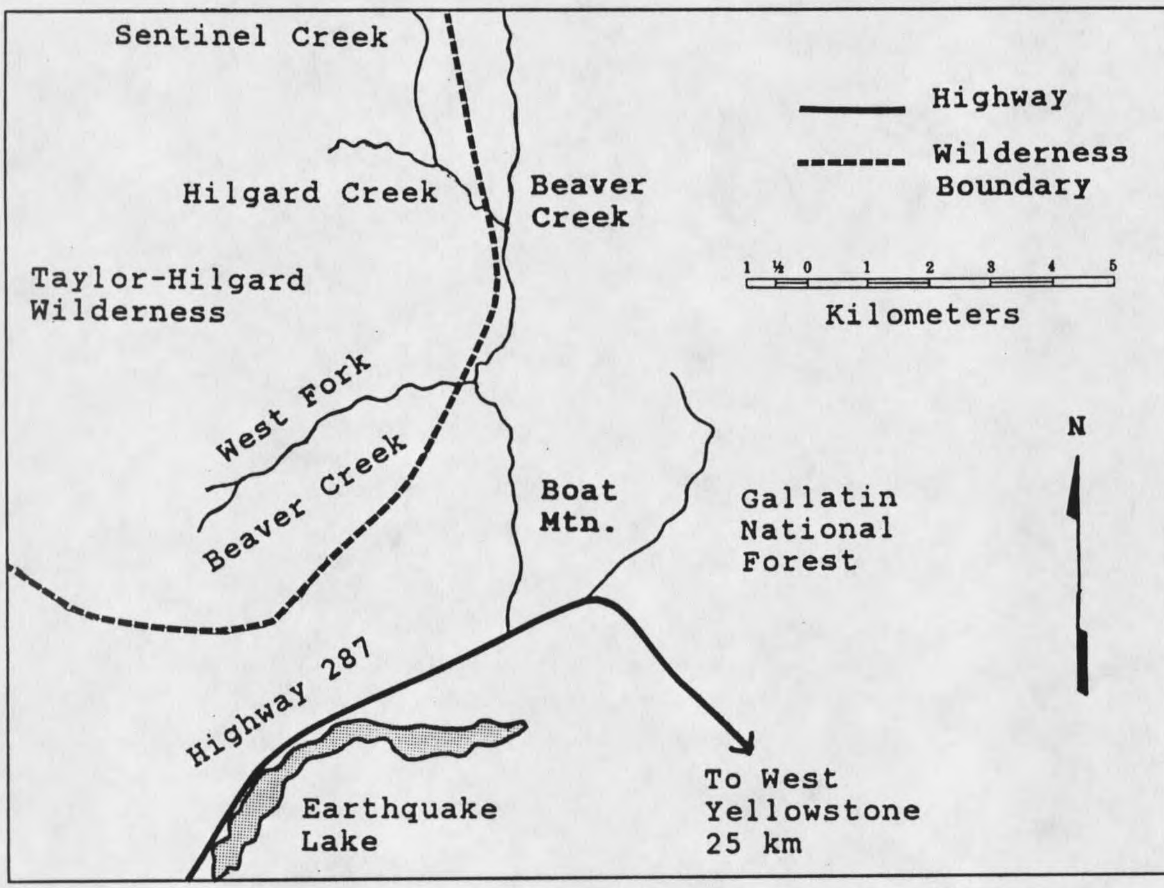

Figure 3. Boundaries and drainage patterns in the Beaver Creek study area.

METHODS

Field Procedures

Live Trapping

Marten were initially live-trapped in October and November 1989 with single door, wire-mesh traps placed in favorable habitats. In order to evaluate the effects of trapper harvest on marten populations, I tried to place traplines in areas regularly used by trappers. Traps were baited with a variety of natural baits and commercial or homemade lures. Traps were checked daily. All sets were covered with evergreen boughs, bark, or placed in natural cavities to protect captured animals from the elements.

Trapping after November was conducted intermittently in the Big Hole and Beaver Creek study areas. The West Yellowstone Flats area was trapped continuously during the winter months except for periods when trappers were actively working their lines. Live-trapping effort was recorded by study area and season in trap-nights (1 trap set for 24 hours).

The first 2 animals captured were handled without the aid of immobilizing drugs. Thereafter, all captured marten were immobilized with 0.12-0.40 cc of ketamine hydrochloride (100 mg/ml). All adult marten and most juvenile marten were fitted with 148 MHZ radiotransmitters (AVM type P2-B). Most marten were ear-tagged. Sex was noted, and individuals were assigned to juvenile or adult age categories based on sagittal crest examination (Marshall 1951) and wear on canines. Body weights were obtained for a few marten in the upper Big Hole area.

Fur Trapping.

Fur trapping effort in each study area was quantified as trap-nights, number of days spent trapping, and total number of traps employed. In addition, fur trappers were asked to provide specific information about the location and approximate date of capture of any marked animals that were harvested. Overall harvest and sex ratio figures were also obtained from trappers. Differences in techniques between those of fur trappers and my live-trapping were noted.

Marten Locations

Marten were located in each study area through the use of radio telemetry and snow tracking. Telemetry locations were obtained through aerial searching with a fixed wing aircraft, ground triangulation, or pinpointing the signal origin through ground searching. Snow tracking locations were obtained while conducting other project activities. Tracks encountered while travelling on roads or trails were followed a randomly selected number of paces and marked.

Radio telemetry locations obtained from ground searches were separated into resting or foraging categories based on the directional stability of the radio signal, animal observation, and physical evidence at the location. Snow tracking locations were all classified as foraging. Ground search and snow tracking locations were marked with flagging so they could be accurately identified for additional measurements during summer. All locations were recorded using Universal Transverse Mercator (UTM) coordinates on 1:24,000 U.S. Geological Survey maps.

Track Transects

To establish relative population density by study area, 13 1-kilometer (km) track transects were established and monitored by methods described by Thompson et. al (1989). Transects were run 12 to 72 hours after a snowfall that was likely to have obliterated existing tracks. Results were standardized by the number of activity periods (12 hours) that had passed since the last track obliterating snowfall.

Habitat Analysis

Detailed analysis of vegetation and terrain features at flagged radio telemetry and snow tracking locations was conducted during the summer months of 1990. For comparative purposes, a randomly located set of points was analyzed in an identical manner in the Big Hole and West Yellowstone Flats study area. Modified U.S. Forest Service stand examination procedures (U.S.D.A. 1985) were used to quantify habitat variables.

Habitat Type Determination. Forested habitat types were delineated according to the Pfister et. al (1977) classification. Non-forested habitat types were delineated according to the Mueggler and Stewart (1980) classification. These systems worked well except for one forested habitat type in the West Yellowstone Flats study area which failed to meet the criteria for any Pfister habitat type. I grouped this habitat with the existing lodgepole pine (*Pinus contorta*) habitat series and designated it habitat type 960, a designation that was strictly my own.

Clear-cut Evaluation. Habitat types were determined for random points that fell within clear-cuts. However, because clear-cuts lacked the overstory features that forested environments in mature and climax condition assigned to the same habitat types possessed, these points were examined separately. Random points falling in clear-cuts were pooled across all habitat types and examined for ground structural features (logging slash, woody debris) not directly dependent on a mature or climax canopy.

Overstory and Canopy Evaluation. Data related to overstory and canopy features at marten and random locations were collected using a variable plot technique (a plot in which radius increases with increasing diameter of trees. See U.S.F.S manual FSH 2409). A 20 basal area factor (BAF) prism or angle gauge was used to determine specific trees included in the variable plot. Plot center for marten locations was the point where the marten was located unless the animal was up a tree or snag in which case the point on the ground directly underneath the location was used. Plot center for random points was determined by pacing an estimated distance along a compass bearing from a known map location to the point as indicated on a map.

Height, diameter at breast height (dbh), and species were recorded for each tree ≥ 12.7 centimeters (cm) dbh detected in the variable plot. Each tree was classified according to crown class, crown ratio, and merchantability. Canopy cover was determined by ocular estimation from plot center.

Age was determined by boring and counting growth rings for the largest and smallest living trees ≥ 12.7 cm dbh in the plot. Standing dead trees (snags) ≥ 12.7 cm dbh were tallied in a 0.04-hectare (ha) (11.4-meter (m) radius) fixed plot.

Understory and Ground Cover Evaluation. Trees less than 12.7 cm dbh were evaluated in a 0.001-ha (2-m radius) fixed plot. All trees within the plot were tallied. Small trees of the same species, size, and condition were tallied in groups. Live crown ratio was estimated for trees that were intermediate or co-dominant in crown class.

Ground cover was estimated to the nearest 5% through