PROGRESS REPORT

September 1984

EFFECTS OF THE BEAR CREEK BURN ON PINE MARTEN NEAR MCGRATH, ALASKA

Prepared by

Audrey J. Magoun

Cooperative Agreement

between

Bureau of Land Management

and

Alaska Department of Fish and Game

Contract No. AK-950-CA4-1

Methods

General:

Three study sites within the burn and 3 study sites adjacent to the burn will be selected for scientific sampling of vegetation, snow conditions, and small mammal populations. Within each of the 6 study sites, an attempt will be made to radio-tag 3 to 5 resident pine martens. Radio-locations and winter track counts will be used to compare marten use of burned and unburned habitat and to determine the relationship between pine marten use and vegetation types, small mammal populations, and snow conditions. At least 3 radio-tagged marten will be chosen for intensive radio-tracking to determine activity and movement patterns in relation to the mosaic of vegetation types, food availability, and snow conditions in their home ranges.

Vegetation Sampling:

A 2-stage sampling procedure using randomly selected transects and randomly selected sample points along the transects will be used to sample vegetation in the 6 study sites. Transect length will be 1,650 m (1 mi). The number of transects and sample points will be determined after preliminary sampling in July 1984.

At each sample point, a nest of 3 plots will be used to sample vegetation (Foote 1983). A 1-m^2 plot will be used to estimate cover for low-growing vegetation, exposed ground surface, and litter. A 4-m^2 plot

will be used to estimate cover and to count stems of tall shrubs and tree seedlings (Ohmann and Ream 1971). The point-centered quarter plotless method described by Cottam and Curtis (1956) will be used to count and measure live saplings, live adult and standing dead trees, and downed dead trees. The distance to downed dead trees will be measured from the point center to the tree base. Slope and aspect of the plot and litter depth at each plot will also be measured.

Small Mammal Sampling:

On each side of the vegetation plot center at a distance of 1.13 m from the center on a line perpendicular to the transect baseline, a marker will be placed and 2 museum special snaptraps will be baited with a mixture of peanut butter, rolled oats, and sunflower seeds. The 4 traps at each plot will be set for 3 nights and checked daily during early June and early September when the microtine population is at low density and at peak density, respectively (West 1979). The sex, age, weight, and reproductive condition of the captured animals will be recorded.

Snow Sampling:

Two markers, one at each small mammal trap site, will be used to measure snow depth at the plots through the winter. Each marker will be graduated in centimeters and an average snow depth recorded each time the transects are run in winter during track surveys. Two snow hardness measurements taken within the 4 m^2 plot will also be made when the transects are run, with new locations chosen each time the measurements are taken.

Radio-tagging:

Pine martens will be live-trapped and immobilized with a mixture of Ketamine hydrochloride, Xylazine, and atropine sulfate. Telonics Imp/200/L transmitters will be implanted in the abdominal cavity using sterile surgery techniques. The sex, age, body measurements, and reproductive condition of the martens will be recorded.

Aerial Radio-tracking:

Radio locations of all tagged martens will be made using small fixed-wing aircraft on an opportunistic basis when an aircraft is available. A minimum of 1 location per animal per day on 3 consecutive days each month will be made during at least 3 months in summer and 3 months in winter. Each location will be plotted on 1:60,000 NASA high altitude infrared photos. The vegetation type or types in proximity to the radio signal location will be recorded.

Winter Track Surveys:

Approximately 24 hours after a fresh snow when tracking conditions are good, the transect lines will be skied and marten tracks recorded. A track will be recorded each time it crosses the transect line regardless of the distance to the next track. Because the transect will already have been divided into segments according to habitat type during the summer, the habitat type in which the track falls can be recorded

regardless of snow cover and the density of tracks per habitat type can be calculated.

Intensive Ground-tracking of Selected Radio-tagged Marten:

Locations of selected radio-tagged marten will be determined by triangulation based on simultaneous readings by 2 observers located to optimize the angle of signal reception. Observers will be in constant contact by radio. Marten locations will be plotted on 1:60,000 scale NASA High Altitude Aerial Photos.

Radio-tracking will encompass the entire 24-hour period subdivided into short (approx. 4 hours) rotational blocks (tracking session). The allocation of the number of each tracking session within the 24-hour period will be based on an expected pattern of marten activity; i.e., more tracking sessions will be done during expected periods of activity rather than during rest periods. This information will be derived from preliminary data collected in July and August 1984 and from previous studies of marten activity.

The use of habitat types by marten will be described in terms of the distribution of telemetry locations, the distance and rate of travel in each vegetation type, and the activity engaged in (e.g., resting, foraging, traveling). The telemetry signals will be classified as to whether the marten is active or inactive based on changing or static signal strength, respectively. If possible, the vegetation type which the animal is in at the time the signal is received will be observed.

If unknown, the best estimate of the vegetation type will be the plotted location on a large-scale habitat map. The martens will be monitored at 10-15 minute intervals to closely follow activity and rate of movement. If a marten remains inactive for more than one hour, the observers will locate and describe the resting site.

Snow-tracking will be used in winter to further describe habitat use by the radio-tagged martens. The martens will be located by telemetry, then backtracked. At approximately 50 m intervals (along the trail), the vegetation type, snow depth and hardness, depth of track, and predominant activity (foraging, traveling, etc.) will be recorded. Behavioral patterns will be correlated with specific vegetation types.

Scats collected at resting sites and along snow tracking routes will be analyzed to determine food habits of the radio-tagged martens.

Data Analysis:

Univariate and multivariate ANOVA will be used to determine variability within and between habitat types and over time. Depending on the results of this analysis, ratio estimation techniques and weighted regressions will be used to test the relationships between habitat characteristics, including vegetation characteristics, snow conditions, and small mammal populations, and the various measures of marten use (i.e., track density, number of radio-tracking locations, distance, and rate of travel). Details of the analytical methods to be used will not

be available until after the results of preliminary surveys to be carried out in summer 1984.

Results

Field work was conducted from April through August 1984 in the northern end of the Bear Creek burn near the junction of the Pitka and Salmon Rivers.

Vegetation Sampling:

Vegetation sampling was carried out in the home ranges of 2 radio-tagged martens (M3 and M5) from 7 to 17 August. Using the methods described above, 19 vegetation plots were selected in M3's home range and 50 in M5's home range (7% of the total possible plots in each home range). Transects as well as plot centers were a minimum of 100 m apart.

Nine of the cover types which were inventoried on the vegetation plots averaged $\geq$10% cover on the plots (Table 1). Litter, herbaceous vegetation, and moss were the 3 major cover types in the home ranges of both M3 and M5.

The percentage occurrence and percentage cover of litter as well as the average depth of litter was similar in both marten home ranges. The distribution of litter depths and maximum litter depth was somewhat greater on the average in M5's home range.

The herbaceous categories which had the greatest percentage cover on either one or both marten's home ranges were sedges, grasses, Equisetum sp., and Epilobium angustifolium (Table 2). Sedges were much more common in M5's home range while Epilobium angustifolium occurred more frequently and with higher percentage cover in M3's home range. Herbaceous cover was generally more varied in M5's home range.

Differences in herbaceous species composition between M3 and M5's home range is not readily apparent from Table 2 because species of sedges, grasses, and Equisetum were lumped into the same categories. However, species differences were noted in the field between wet and dry sites. Since M5's home range had a greater proportion of wet sites than M3's, species of sedge, grass, and Equisetum that are more common on wet sites were noted more frequently in M5's home range. In addition, the occurrence of aquatic emergents (Potentilla palustris, Menyanthes trifoliata) was only recorded from vegetation plots in M5's home range. As noted in Table 2, standing water occurred on 27% of the plots in M5's home range and averaged 52% cover on these plots. The total cover by standing water in the 50 plots in M5's home range was 14% as compared to less than 1% for the 19 plots in M3's home range.

Cover by low shrubs was more common in M5's home range than in M3's (Table 1 and Table 2), probably due to differences in soil moisture and the proportion of burned habitat. Differences in the occurrences of tall shrubs in the 2 marten home ranges was not as clearcut (Table 3).

Tree cover was greater in M5's home range (16%) than in M3's (7%). Frequency of occurrence of trees on the plots was essentially the same for both marten home ranges (53% and 56% for M3 and M5, respectively), but the average percentage cover on plots where trees occurred was higher on M5's home range (29%) than on M3's (12%) (Table 1).

Tree cover included trees, saplings, and seedlings. The percentage occurrence of trees was considerably different between the 2 marten home ranges. For M3, 15% of the plots had live trees compared to 64% of the plots in M5's home range (Table 4). The average density of trees on the plots where trees occurred was 17 trees/hectare for M3 and 314 trees/hectare for M5. The major species of live trees in both home ranges were Picea glauca, Betula papyrifera, and Larix laricinia.

The percentage occurrence of saplings on the plots was essentially the same for M3 and M5 (95% and 90%, respectively), but the density of saplings was almost twice as high on M5's home range (Table 4). The most common species of sapling in M5's home range was Betula papyrifera, but Picea glauca and Larix laricinia were also important; however, 100% of the saplings sampled in M3's home range was Betula papyrifera. Betula papyrifera was also the most common seedling in both marten home ranges, though 4 other species were recorded in the 4-m^2 plots for both marten (Table 5).

Standing dead trees were more common in M3's home range than in M5's, occurring on 100% of the plots in M3's home range and 70% in M5's, but the average density of dead trees was essentially the same (Table 6).

Picea mariana was the most common species of standing dead tree on both marten home ranges.

Log debris (≥5 cm diameter) was assessed on the plots. The average diameter of logs was 12 cm in M3's home range and 10 cm in M5's; the average maximum height above the ground was 39 cm and 29 cm, respectively. The percentage occurrence of log debris on the plots was 79% for M3 but only 26% for M5.

Small Mammal Sampling:

Preliminary small mammal sampling was carried out in late August. Four transects were run, 2 each in burned and unburned closed conifer forest along the Pitka River. At each of 25 points (10 m apart) along the transects, 2 small mouse traps and 1 museum special trap was set and baited with peanut butter and rolled oats. A total of 119 voles and shrews were captured; Clethrionomys rutilus was the most common species. Analysis of species composition by habitat type is being conducted. Small mammal sign (diggings, runways, droppings, and vocalizations) were numerous in most areas surveyed during vegetation sampling.

Snow Sampling:

Snow sampling will be carried out from February through April 1985.

Radio-tagging and Aerial Radio-tracking:

Five pine martens (4 males, 1 female) were captured in livetraps and tagged with implant transmitters in April 1984. No mortalities occurred during surgery. A total of 87 locations for these martens were made by the end of July 1984. No signal was picked up for F4 (female) after April, so only 6 locations are available for her. Loss of signal could have been due to radio malfunction, dispersal of the animal, or death of the animal and subsequent destruction of the transmitter. The death of male M1 occurred sometime in May 1984. Marten fur and the transmitter were found in the area where the animal had been tagged and relocated 13 times.

Transmitters remained functional in male martens M2, M3, and M5 at least through August 1984. The home range size for these martens were approximately 6.5 km^2, 2.5 km^2, and 7.0 km^2, respectively. All 3 marten remained in the area where they were trapped near the junction of the Pitka and Salmon Rivers.

Habitat in all 3 home ranges includes burned and unburned stands of trees and bog meadows. Most of M3's home range has been burned and has very few stands of live trees, which were usually less than 50 m across with less than 10 live trees per stand. M3's home range could be considered totally burned. M2 and M5's home ranges were partly burned and partly unburned. Locations for M2 tended to be in unburned portions of its home range, but locations for M3 were evenly distributed between burned and unburned habitat.

The preburn habitat in the marten home ranges could be roughly divided into 2 types: (1) riparian closed conifer, mainly mature Picea glauca, and (2) a mosaic of bog meadow and stands of Picea mariana or Larix laricinia. The majority of M3's locations occurred within the riparian closed conifer which was almost entirely burned. M2 and M5 were located more often away from the rivers which accounted, in part, for the larger home range size for these animals. The martens readily swam across the rivers in summer to cross between burned and unburned habitat. A more detailed analysis of habitat utilization by the marten will be prepared.

Winter Track Surveys:

Winter track surveys will be conducted from February through April 1985.

Intensive Ground-tracking of Selected Radio-tagged Marten:

Preliminary ground-tracking techniques were tested by graduate student Don Vernam in August 1984. Refinements of the tracking techniques will be developed during the winter and intensive ground-tracking will be resumed in February when additional martens are radio-tagged.

Data Analysis:

Analysis of the data, particularly statistical tests, is ongoing and will be presented in the final report.

Table 1. Total percentage cover, average percentage cover[a], and percentage occurrence of 9 cover categories with ≥10% cover per plot on 2 pine marten home ranges in the Bear Creek Burn in August 1984.

	M3			M5		
	Total % cover	Average % cover	% occurrence	Total % cover	Average % cover	% occurrence
Litter	66	70	95	72	73	98
Herbaceous	55	58	95	62	62	100
Moss	37	41	90	58	64	90
Total tree	7	12	53	16	29	56
Tall shrub	11	34	42	16	22	70
Mercantia	15	29	52	2	18	12
Low shrub	1	6	21	14	59	48
Standing water	<1	3	10	14	27	52
Log debris[b]	10	13	63	10	8	22

[a] Total percentage cover refers to the percentage cover averaged over the total plots sampled. Average percentage cover refers to the percentage cover averaged for those plots on which the cover category occurs. The percentage occurrence is the percentage of plots on which the cover category occurs.

[b] Branches or logs ≥5 cm diameter.

Table 2. Percentage occurrence and average percentage cover of herbaceous vegetation and low shrubs having ≥10% cover on 2 marten home ranges in the Bear Creek Burn in August 1984.

	M3		M5	
	% occurrence	Average % cover	% occurrence	Average % cover
HERBACEOUS				
Sedge spp.	5	92	52	56
Grass spp.	53	46	34	34
Equisetum spp.	42	36	34	23
Epilobium spp.	37	23	8	14
Potentilla palustris	5	10	16	28
Menyanthes trifoliata	0	0	6	25
Rubus chamaemorus	0	0	2	10
Cornus canadensis	0	0	4	12
Linnaea borealis	0	0	4	20
LOW SHRUB				
Chamaedaphne calyculata	0	0	16	43
Ledum palustre	0	0	12	20
Andromeda polifolia	0	0	8	11
Oxycoccus microcarpus	0	0	6	17
Myrica gale	0	0	2	55

Table 3. Percentage occurrence, percentage cover, and stem counts[a] of tall shrubs on 4-m^2 plots in 2 marten home ranges in the Bear Creek Burn in August 1984.

	% occurrence	Average % cover	Total % cover	Average stems	Total average stem	% occurrence of plots with ≥10% cover	Average % cover on plot with ≥10% cover
M3							
Salix spp.	53	6	3	8	4	5	25
Alnus spp.	10	38	4	2	<1	10	38
Betula spp. (*nana*, *glandulosa*)	5	30	2	35	2	10	54
Rosa acicularis	16	3	<1	2	<1	5	15
M5							
Salix spp.	40	10	4	32	13	10	21
Alnus spp.	16	29	5	9	2	18	41
Betula spp. (*nana*, *glandulosa*)	34	16	5	23	8	12	20
Rosa acicularis	20	17	3	19	4	4	38
Viburnum edule	2	2	<1	5	<1	0	0

[a] % occurrence = % of plots on which the tall shrub occurs.
Average % cover = average % cover of the tall shrub on plots where it occurs.
Total % cover = average cover of the tall shrub for all plots sampled.
Average stems = average number of stems counted on a 4-m^2 plot for those plots where the tall shrub occurs.
Total average stems = average number of stems for all 4-m^2 plots.
% occurrence of plots with ≥10% cover = % of plots on which the tall shrub cover is ≥10% of the plot.
Average % cover on plots with ≥10% of occurrence = average % cover of the tall shrub for those plots where it covers ≥10% of the plot.

Table 4. The percentage occurrence, density, and species composition of trees and saplings on 2 pine marten home ranges in the Bear Creek Burn in August 1984.

	M3	M5
LIVE TREES		
% occurrence	16	64
Trees/hectare overall	10	204
Trees/hectare on plots where trees occur	17	314
% *Picea mariana*	0	18
% *Picea glauca*	20	30
% *Betula papyrifera*	40	24
% *Larix laricinia*	40	25
% *Populus tremuloides*	0	2
LIVE SAPLINGS		
% occurrence	95	90
Saplings/hectare overall	426	754
Saplings/hectare on plots where saplings occur	449	838
% *Picea mariana*	0	5
% *Picea glauca*	0	15
% *Betula papyrifera*	100	51
% *Larix laricinia*	0	28
% *Populus tremuloides*	0	<1

Table 5. Percentage occurrence, percentage cover, and stem counts of tree seedlings on 2 marten home ranges in the Bear Creek Burn in August 1984.[a]

	% occurrence		Average % cover		Average stem count		Total % cover		Total average stem count	
	M3	M5	M3	M5	M3	M5	M3	M5	M3	M5
Picea glauca	21	4	1	2	4	28	<1	<1	1	1
Picea mariana	36	16	4	4	4	5	1	1	2	1
Betula papyrifera	63	28	19	10	35	39	12	3	22	11
Populus tremuloides	--	4	--	1	--	1	--	<1	--	<1
Larix laricinia	5	10	10	1	1	2	<1	<1	<1	<1

[a] % occurrence = % of plots sampled on which the seedling species occurred.
Average % cover = average % cover by the seedling species on those plots where the species occurred.
Average stem count = average number of stems of the seedling species on those 4-m^2 plots where the species occurred.
Total % cover = average % cover of the seedling species for all plots sampled.
Total average stem count = average stem count of the seedling species for all plots sampled.

Table 6. Percentage occurrence, density, and species distribution of standing dead trees on 2 pine marten home ranges in the Bear Creek Burn in August 1984.

	M3	M5
% occurrence	100	70
Dead trees/hectare overall	86	67
Dead trees/hectare on plots with trees	86	95
% *Picea mariana*	65	58
% *Picea glauca*	20	22
% *Betula papyrifera*	4	12
% *Larix laricinia*	4	8
% *Populus tremuloides*	4	1