State of California
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MARTEN FIELD TRANSECT STUDY[1/], TAHOE BASIN, CALIFORNIA 1973

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ABSTRACT

Thirty-nine field transects were run on 20 transect sites in and around the Tahoe Basin from March 19 to March 29, 1973. Number of marten tracks per linear mile of transect is compared with trapping data for trap line locations in the same area for the years 1939-40, 1940-41, and 1941-42. Marten activity was highest at Kirkwood Meadows, where 32 sets of tracks were observed over approximately 10 miles of transect. Greatest correlation between number of tracks observed and marten trapped (1939-1942) was obtained at Blackwood Canyon and Big Chief. Recommendations for future furbearer transects are included.

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INTRODUCTION

The marten (Martes americanus) is one of several elusive furbearers found in the coniferous forests of California. Little information is available on the current abundance and distribution of the marten; Grinnell, Linsdale, and Dixon (1937) evaluated their status in 1937 from data available from trappers and Twining (1947) updated their information with his Marten Trapper Questionnaire which he sent to all licensed trappers who trapped marten in the years 1939-40, 1940-41 and 1941-42. Since then, no estimation of the statewide status of this species has been attempted. When the marten was given the status of a protected furbearer in 1953, the possibility of estimating their numbers from trappers reports was eliminated. Scattered observations of martens or marten sign, mostly by U. S. Forest Service personnel, are the only indication of their status in California for the past 20 years.

This field transect study was conducted to determine the feasibility of establishing a system of permanent transect sites which could be censused regularly to determine fluctuations in the distribution and abundance of marten in California.

PROCEDURE

Sixteen marten trap line locations in the Lake Tahoe area for the years 1939-40, 1940-41, and 1941-42 were determined from Twining's questionnaires and marked on a Tahoe National Forest (Truckee District) map (Table 1). The Tahoe area was chosen as the site of a pilot study for several reasons: (1) Grinnell, et al., (1937) shows the area northwest of Lake Tahoe as being highly productive for marten trappers; (2) Many of the old trap line locations were easily accessible from year-round highways; (3) Several martens have been observed and regularly fed by hand around the Tahoe area by California Parks and Recreation personnel; (4) The author observed marten sign in this area previously, and one marten was live-trapped near Emerald Bay in November, 1972; and, (5) Accommodations were provided by California Department of Parks and Recreation at Donner Memorial State Park.

Thirty-nine field transects were conducted from March 19 to March 29, 1973 at 20 different transect sites (Table 2) on cross-country skiis, snowshoes, or snowmobiles. All of the transects followed old trap lines, roads, trails, or water courses through typical marten habitat where marten observations have been made in the past. The majority of the transects were "straight-line" transects. The primary objective was to compare current indices of marten activity with the data available from Twining's marten questionnaire.

Marten sign observed along each transect, specific habitat, and weather conditions were recorded on standardized report forms. Distances were calculated from pedometers and map measurements. National live traps (6" x 6" x 19") were placed along several transects for varying lengths of time (Table 2). Canned fish was used for bait with a general mustelid food lure conspicuously exposed near the trap. The trap location was marked with red tape and checked daily; bait was added when traps were tripped and the bait stolen. It was hoped that the use of live traps would provide a more

accurate picture of the actual number of marten present. Other census methods are discussed later.

RESULTS

Transects

The number of miles covered, number of days per transect, and number of trap nights varied considerably from one transect to another. More effort was spent on transects that seemed more likely to support higher numbers of marten or where more sign was seen and time permitted.

The following is a brief discussion of each transect site with appropriate comparison to trapping data or previous observation reports. Trappers reporting from Twining's questionnaires are included by transect sites and may be referred to in Table 1.

Transect Site #1 - While we only saw one set of marten tracks during 2 days of field work at this site, martens have been fed by hand by Ken Legg, Department of Parks and Recreation, at this location in the past. In addition, abundant marten sign was observed only 1 week prior to the census date by the author. Resident ranger, Al Whittington, reports seeing many tracks around Donner State Park and Donner Lake every winter. Oscar Schumacher trapped 6 martens in the 1939-40 season and 5 martens in the 1940-41 season west of the lake.

Transect Site #2 - Sterling Ralphs removed 3 martens from Pole Creek in the 1939-40 season. One set of marten tracks was observed on the first transect up the creek. Further tracks were not observed on subsequent trips. Low marten activity in this canyon could be attributed to human activity; several parties of cross-country skiers, some with dogs, were seen traveling the road which runs parallel above Pole Creek. It is possible, however, that this canyon does not support a large number of marten because the steep sides and few trees provide few den sites or prey items.

Transect Site #3 - Marten sign had been seen previously in certain areas along the Truckee River. Although 1 set of marten tracks was seen during this survey, the site was easily accessible to skiers as well as being adjacent to private property and was therefore abandoned after 1 night of trapping.

Transect Site #4 - Since several marten observation reports had been turned in for this area, 8 traps were placed along the transect route. In spite of heavy snow, 1 set of marten tracks was observed although no captures were made.

Transect Site #5 - Bill Johnston trapped 7 marten in this canyon during the 1939-40 season, and 1 marten during the 1940-41 season. Other trappers reported trapping marten "in the mountains west of Homewood." More effort was spent on this transect site than any other, primarily because it was the only site where martens were successfully trapped. An abundance of dead snags in this canyon offer potential winter dens for marten. Ideal for snowmobiles, nearly every open meadow received heavy snowmobile use on the weekends. While less marten sign was observed during the periods of heaviest

snowmobile use, which may indicate a reduction of hunting by marten during such periods, they are apparently not driven out of their habitat by such intense use.

Transect Site #6 - Drifts and treacherous snow conditions prevented snowmobile travel into this area. It was suspected of being prime marten habitat due to the number of reported observations.

Transect Site #7 - Two ski transects towards an area where marten observations had been reported were interrupted by snowstorms. In spite of this, marten sign was seen wherever transects passed through typical marten habitat, indicating this area could support a healthy marten population.

Transect Site #8 - Robert Wallace trapped a marten on nearby Rubicon Point in the 1939-40 season. Traps were laid along a transect up the creek in this canyon. Although no animals were captured, abundant marten sign was observed near dead snags on one arm of this canyon.

Transect Site #9 - This site was expected to have excellent marten habitat. Charles Pierce and his son trapped 33 marten in 1939-40 and three marten in 1940-41. Carl and Dewain Kent trapped 10 individuals during the 1939-40 season. Eleven sets of marten tracks were observed on a one-way snowshoe transect. Land on Martis Plateau is owned by the U. S. Forest Service and Fibreboard Corporation and is likely to be logged. Several bulldozer roads have recently been added and a large number of trees have been tagged.

Transect Site #10 - A marten was collected in this area for a museum several years ago by Ken Legg. Marten sign was observed in this area before this investigation by the author. The snow shelter and peg of an old trap set can still be seen on the leeward side of a large lodgepole pine above the falls. During this census, tracks were observed and 2 traps in this area were disturbed by marten.

Transect Site #11 - One transect was run through this canyon. Snow conditions were very poor and no positive marten sign could be found. The amount of development in this area and the easy access to dogs and skiers seem to indicate marginal habitat conditions for marten.

Transect Site #12 - Sign was observed here and a marten was live-trapped during November, 1972 by the author. Ken Legg reported feeding three marten at his cabin on Emerald Bay regularly for several years. He further reported numerous encounters with martens and marten sign in this area. Clifford Willett trapped 2 marten near Emerald Bay in the 1940-41 season. Snow shelters and trap pegs can still be found on the sides of trees in this area. Cedars and dead snags provide excellent den sites in this area. Abundant marten sign was observed on the first transect as traps were set along the line of travel. Although no martens were captured, 2 traps were disturbed by martens.

Transect Site #13 - Marten sign was abundant along the steep slopes of this ridge. Numerous Douglas squirrel (Tamiasciurus douglasii) and snowshoe hare (Lepus americanus) tracks were observed.

Transect Site #14 - Warren Kelly, Wildlife Biologist for El Dorado National Forest, did the initial investigation of the possible impact by Kirkwood Meadows Ski Resort on marten populations in this area. Dick Reuter, head ski safety patrolman for Kirkwood Meadows who has experience trapping martens, fed several martens at the back porch of his cabin in this area for a few years. He reported seeing marten sign all over the various ski runs. With his permission we rode the lifts to the top and snowshoed down around Caples Lake. At least a dozen sets of distinct marten tracks were seen under lift #1 and several more under lift #2. According to Mr. Reuter, marten pick up food scraps dropped by skiers riding to the top of the ridge. Twenty sets of tracks were seen as we snowshoed down the drainage around Caples Lake. Apparently, this area supports a relatively high marten population, and they do not seem to be disturbed by human activity brought about by the ski resort.

Transect Site #15 - Charles B. Stambaugh, Jr. trapped 5 martens in this area during the 1940-41 trapping season. Snow conditions prevented positive identification of marten tracks. No further transects in this area were attempted.

Transect Site #16 - Five sets of marten tracks were seen in this valley circled by a railroad. Marten tracks were observed within 400 meters of the railroad tracks. Squirrel and snowshoe hare sign observed indicates an abundance of prey items for martens in this area.

Transect Site #17 - Dave Connell, Wildlife Biologist on the Tahoe National Forest, assisted on a snowmobile transect on the road east from California 89 to Weber Lake and Jackson Meadows. Numerous marten sightings as well as fisher (Martes pennanti) and wolverine (Gulo luscus) sightings have been reported in this area. Otto Hagen trapped 2 marten during the 1941-42 season along Cold Stream and Joe Dellera trapped 20 marten in Perazzo Canyon the same year. This area seems to be the center of the area northwest of Lake Tahoe which Grinnell, et. al., (1937) indicated as having a high marten density when 30 marten were trapped from 1919 to 1924. Seven sets of marten tracks were observed between Independence Creek and Weber Lake. Three sets were seen in the vicinity of Perazzo Canyon. This canyon may be another center of high marten density similar to Kirkwood Meadows. While 1 set of marten tracks was observed off to the side of the road, most were observed where marten had crossed the road.

Transect Site #18 - Floyd Cooper trapped 10 marten during the 1939-40 season and one marten during the 1940-41 season in Euer Valley, just north of the area of this transect. A forest fire in 1960 in this area eliminated much of the cover and probably reduced the carrying capacity for marten. Only 1 set of marten tracks was observed.

Transect Site #19 - Dave Connell assisted with snowmobiles south from Soda Springs to Onion Creek Experimental Forest and The Cedars. Much of the area is covered with a fairly heavy canopy of cedar. Many squirrel tracks were observed on a few short snowshoe transects off the road, but only one set of marten tracks was seen crossing the road. Russell C. Francis trapped 1 marten near this area in the 1939-40 season.

Transect Site #20 - Historically, marten have been trapped in the general vicinity of this transect, but a great deal of development has subsequently occurred throughout the area. Perhaps not surprisingly, no marten sign was observed along this transect.

Other Species or Sign Observed

Many coyote, Douglas squirrel, and snowshoe hare tracks were observed on nearly all transects. Porcupine (Erethizon dorsatum) sign was observed on transect site #8. Mountain beaver (Aplodontia rufa) and porcupine damage was seen on transect sites #8 and #14. Weasel (Mustela frenata) sign was observed on transect sites 2, 4, and 19. Mouse tracks were seen on transect sites 2, 4, and 14. Mountain lion (Felis concolor) tracks were identified along transect site #2.

Factors Affecting Survey

Weather

Snow storms had a considerable effect on the abundance of discernable sign. It snowed sporadically from the 19th through the 21st and from the 27th through the 28th. During storms, only tracks made four hours prior to the time of observation were identifiable. Warm temperatures on sunny days melted the snow and disguised the tracks.

Faulty Traps

One marten trapped at Blackwood Canyon managed to open the door and escape as we approached. Other marten may have escaped the same way, as several traps were sprung with the bait stolen. Some of the traps were bent from disturbance by larger animals, possibly dogs. Often, the trap would be rolled or moved indicating marten or other animals may have reached in to retrieve the bait from the outside. This could be prevented by chiseling holes in dead stumps to house the trap. This technique would reduce exposure to sub-freezing temperatures for prolonged periods in an open situation. It would also reduce disturbance by larger animals that frequently maul an easily accessible trap.

CONCLUSIONS

No correlation exists between transect effort and amount of marten sign observed. Marten populations appear to be randomly distributed; optional habitat areas support higher numbers of marten. Therefore, it is assumed that highly productive transects indicate areas of optimal or near optimal marten habitat. This shows that a few transects conducted in optimal marten habitats (centers of high density) would give a more accurate picture of their population status than regularly spaced transects with a calculation of number of marten sign per linear mile. In the absence of known high density centers, what constitutes optimal marten habitat is not readily determined. It is relatively easy to determine some of the desired components of habitat such as hunting sites in exposed talus on sunny south slopes or tree wells, abundance of prey items, available winter dens in dead snags or dead falls, and some degree of canopy cover.

However, other characteristics of optimal habitat are not clear. For example, martens tend to avoid human activity in some areas. When snowmobiles come into Blackwood Canyon on the weekends, no marten tracks can be found. However, in other areas, such as Kirkwood Meadows, martens seem not to be affected by human activity; in fact, it seems they may thrive on it. More study is needed on the impact of various types of human activity to furbearer populations.

The initial assumption was that marten trappers knew where to catch the highest number of marten and that we could set up transect sites in these areas assuming they were optimal habitat areas. While this may have been true 30 years ago, an incredible amount of developing, logging and miscellaneous human activity has changed the habitat of many of the old trap lines, so that other sites may have to be considered for permanent censuses. The result is that those sites which seem most likely (based on similarity of habitat) to support martens should be censused first. In this respect, old trap lines that have had a minimum of human disturbance can still be used as a census site.

Each mode of travel has certain advantages and disadvantages. Snowshoes are great for dense stands of conifers when traps must be set in close quarters such as a well under a dead fall. However, they are a slow means of travel compared to skiis or snowmobiles; much less habitat can be censused per man hour labor. Cross-country skis offer certain advantages over snowshoes, especially when long downhill treks are required. However, they are of little use when traveling up a stream course with irregular terrain due to snow covered boulders, or when setting traps in dense conifer forests. Skiing often means staying on an easily traversed road or open flat meadow (not necessarily where martens are prone to travel). Snowmobiles are the only answer for long distance census transects; many more miles of road and meadow can be covered on snowmobiles in a day than on cross-country skis. On the other hand, visibility is often restricted to less than 50 yards into the forest on either side of the road. One must be content to count what crosses the road, thus introducing obvious bias into the results. Snowmobiles are also extremely noisy and undoubtedly have an impact on any animals in the vicinity. If they must be used, they should be used only to transport investigators between snowshoe transect sites. The chances are slim that martens will frequent established snowmobile routes.

Preliminary conclusions of this investigation concurs with Formozov (1965) that the most practical method of censusing marten is coupling a line of travel census with a sample plot census. The line of travel method simply involves recording the number of tracks made 24 hours prior to the time of census over a known distance of travel. This method allows for comparison of relative indices of several species, while sampling diverse habitats. The sample plot method can be used to determine more precise density estimates in optimal habitats subsequent to a calculation of relative density over the total area. In the sample plot method, all marten tracks within a small area ($<5 km^2$) are traced and the number of martens within that area is determined. According to Formozov, this operation can usually be accomplished without much difficulty by two men in one day.

RECOMMENDATIONS

1. Regularly censused transects be established through representative habitats, using the line of travel method to determine the density of marten populations. Such transects should include the following considerations:

    a. Locations of historical trap lines

    b. Observation reports and current information gained from field personnel and trappers

    c. Census be done annually in late winter (February-March)

2. The sample plot method be used to census representative plots of optimal marten habitat which has been identified by the line of travel method on permanent transects.

3. Snowmobiles be used for long trips (>8 km) between isolated transect sites which should be run on snowshoes or skis.

4. Cross-country skis be used for short trips (<8 km) between transect sites.

5. A capture-release investigation be initiated in a high density marten area to determine population dynamics and life history information on marten populations.

LITERATURE CITED

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Grinnell, Joseph, Joseph S. Dixon, and Jean M. Linsdale. 1937. Fur-bearing mammals of California. University of California Press, Berkeley, California. 2 vol., 777 pp.

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TABLE 1

Marten Trap Line Data for the Tahoe Area

Map Code[1]	Trapper	Year(s)	Marten Trapped	Trap Effort/ Marten[2]
A	Oscar Schumacher	1939-40; 1940-41	6; 5	
B	Floyd Cooper	1939-40; 1940-41	10; 1	
C	Otto Hagen	1941-42	2	616
D	Joe Dellera	1941-42	20	1,781
E	Sterling Ralphs	1939-40	3	2,088
F	Charles Pierce, Jr. & Sr.	1939-40; 1940-41	33; 3	3,007; 3,950
G	Carl & Dewain Kent	1939-40	10	367
H	Charles Pierce, Sr.	1940-41	7	10,329
I	Robert Wallace	1939-40	2	4,740
J	Carl & Dewain Kent	1940-41	2	6,300
K	C. A. Swanson	1939-40	1	3.9
L	Bill Johnston	1939-40; 1941-42	7; 0	11,829; 5,456
M	Russell C. Francis	1939-40	1	5,103
N	Robert Wallace	1939-40	1	2,370
O	Clifford H. Willett	1940-41	2	590
P	Chas. B. Stombaugh, Jr.	1940-41	5	1,064

1/ See attached Tahoe District Map.
2/ Trap effort per marten was computed by multiplying the number of traps used by the number of miles of trap line, by the number of days trapped, and dividing by the number of martens trapped.

TABLE 2

Marten Transect Site Census Data

March 19-29, 1973

Map No.	Transect Site	Transect Miles	Transect Days	Marten Tracks Observed	Trap Nights
1	S. of Donner State Park	3	2	1	4
2	Pole Creek	5	4	1	12
3	Truckee River	2	2	1	4
4	N. of Soda Springs	6	2	3	8
5	Blackwood Creek	14	5	15	18
6*	Rattles Creek Rd.	2	1	0	0
7	Peter Grubb Trail	3½	2	4	0
8	General Creek	3½	3	3	12
9	Big Chief/ Cedar Fl.	7½	2	11	0
10	Eagle Creek	5	4	3	9
11	McKinney Creek	2	1	0	0
12	Emerald Bay	3	3	2	8
13	Schallenberger Ridge	5	3	5	8
14*	Kirkwood Mdws.	10	1	32	0
15	Cascade Lake	2	1	0	0
16	Coldstream Valley	5	1	5	0
17	Weber Lake Rd.	18	1	7	0
18	Donner Ridge	2½	1	1	0
19	Onion Creek Exp. For.	10	1	2	0
20*	Cold Creek	7	1	0	0

* Not on Tahoe District Map.

FIGURE 1

Map of Tahoe area showing location of transects surveyed in 1973 (1, 2, 3...) and marten traplines 1939-1942 (A, B, C...).