COOPERATIVE WOLVERINE STUDY

SECOND ANNUAL REPORT

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and

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CALIFORNIA DEPARTMENT OF FISH AND GAME - UNIVERSITY OF CALIFORNIA, BERKELEY, COOPERATIVE WOLVERINE STUDY Second Annual Report, May 1992

Wolverines (Gulo gulo), the largest terrestrial mustelid, occur throughout the northern latitudes of both Eurasia and North America (Wilson 1982, Hash 1987). The wolverine's historic southern limit in North America was approximately the 38th parallel, with extensions farther south along montane areas, especially the Rocky Mountains and the Sierra Nevada and Cascade mountain ranges. Wolverine range has contracted over the past 150 years, particularly in the more southerly areas, beginning with the period of European expansion, the fur trade, and the extirpation of the bison (Hash 1987).

Today wolverine populations remain in much of northern Canada and Alaska, as well as parts of northern Europe, although nowhere are they abundant. In the conterminous United States, the largest population of wolverines is in northwestern Montana (Hornocker and Hash 1981). Reports of wolverines exist from Colorado, Nevada, Oregon, Utah, Washington, and Wyoming (Hash 19871), and wolverines were recently photographed, and subsequently captured for radio telemetry, in central Idaho (Bachman et al. 1990; G. Wills, Idaho Dep. Fish and Game, pers. commun.).

In California, the historic range of the wolverine included much of the north coastal area and the Sierra Nevada (Grinnell et al. 1937, Schempf and White 1977). Schempf and White (1977:25) described the modern range to include a broad arc from Del Norte and Trinity counties eastward through Siskiyou and Shasta counties, and then southward through the Sierra Nevada to Tulare County. Subsequent reports have enlarged this range to include the White Mountains in eastern Mono County (Kovach 1981).

Aside from these broad distributional data, largely based on early fur-trapping data and sporadic reports of unverified sightings, little is known specifically about wolverine occurrence or abundance, and nothing in detail is known about wolverine ecology, in California.

In North America, four ecological investigations of wolverines have been conducted. These include work in the arctic tundra of northwestern Alaska (Magoun 1985), in forested, montane areas of southcentral Alaska and southwestern Yukon Territory (Gardner 1985, Banci 1987), and in northwestern Montana (Hornocker and Hash 1981). These studies indicate that wolverines occur in low densities in a variety of habitats, are largely solitary, have large home ranges, and can travel extensively even in the most rugged areas. Hash (1987:579) described them as "scavenging predators", and Hatler (1989) summarized the wide variety of items, including both plant and animal material, found in the diet of wolverines as reported in the literature. Hatler (1989) also includes an annotated bibliography of much of the literature on wolverines.

The wolverine was classified as threatened by the State of California in 1981, and is a candidate for federal listing as threatened or endangered under the federal Endangered Species Act. In an attempt to begin to understand the ecology and distribution of wolverines in California, the California Department of Fish and Game (CDFG) and the University of California, Berkeley, in May, 1991, began a research effort designed to determine the presence of wolverines in California through the use of photographic bait stations. We subsequently solicited and received the participation of Region 5 of the U. S. Forest Service (USFS) and several National Forests in California.

The first field season of the California Department of Fish and Game - University of California, Berkeley Cooperative Wolverine Study occurred in the summer of 1991, and was described in a report prepared in November, 1991. In that report, we recommended that future efforts to detect wolverines take place in the winter, when black bears (Ursus americana) are not active, and when wolverines are more attracted to bait (Hornocker and Hash 1981). The present report describes the second field season of work, from December 1991 to May 1992.

ACKNOWLEDGEMENTS

A research effort of this scope is not possible without the assistance of many agencies and individuals; for precisely this reason we call it a cooperative study. Initial funding came from the CDFG (Contract FG 0467); Ron Schlorff of the Non-game Bird and Mammal Section administered the contract. Diane MacFarlane of the USFS was instrumental in acquiring Challenge Cost Share funding from her agency. Rick Williams of PG&E secured funding from his agency for helicopter time to access various stations in the central Sierra Nevada, and Cliff Threlkeld, of PG&E's Hydro Department in Auburn, facilitated the effort. We thank Duke Holocroft for his excellent flying skills. The Unified Sportsmen of Tehama County purchased four camera systems and loaned them to this effort. The Placer County Conservation Task Force, through the efforts of Gene Markley, funded the purchase of one camera. The Department of Forestry and Resource Management, University of California, Berkeley, supplied two camera systems and secretarial and administrative assistance (AES Project 5410MS).

Sara Chubb, Kathleen Nelson, Richard Perloff, and Ed Rodriguez of the Inyo National Forest, and Tom Lipp of CDFG, monitored bait stations in the southern Sierra Nevada. Vern Bleich of CDFG and Becky Pierce established camera stations at mule deer (Odocoileus hemionus) that had recently been killed by mountain lions (Felis concolor). Tina Mark of the Toiyabe National Forest monitored a station near Sonora Pass. Ross Carkeet of Columbia College and his students worked enthusiastically to monitor stations on the Stanislaus National Forest, with support from Cathy Burnett of the USFS. Cathy Irwin, Laurie Alessio, Helen Soderberg, and Dawn Palmer of the Lake Tahoe Basin Management Unit established and monitored stations above the west shore of Lake Tahoe. Ted Beedy of the North Fork Association allowed access into property around The Cedars, and transportation to it via their snow cat, driven by Mark Reynolds and Shorty Boucher of the University Jim Jensen. of California's Sagehen Creek Field Station monitored several stations in the Sagehen Creek Basin. George Stroud of The Nature Conservancy's McCloud River Preserve provided able personnel assistance, in the form of Shannon Schilling and Elayne Childers, to monitor several bait stations. Ann Raftery organized the effort on the Klamath Nationai Forest, and Sue Anderson and others established and monitored stations. Maria Ferrace worked diligently to automate our literature on wolverines. Chuck Lauer and Carey Petit assisted with snowmobiles.

Many other people, including CDFG hatchery personnel and wardens, USFS recreation and other staff, and Placer County Animal Control, were helpful in various ways.

Finally, we wish to thank Jim White for all the time and effort he volunteered on this project, and the enthusiasm that accompanied his knowledge of safe winter travel in the mountains.

METHODS

As we recommended in our Annual Report following last summer's effort, we employed a different type of photographic bait station during the winter of 1991-92. We used the Trailmaster camera system (Goodson and Associates, 10614 Widmer, Lenexa, Kansas, 66215 [913/345-8555], a commercially available product that couples an infra-red trigger to a weatherproof, 35mm, fully automatic camera.

The acquisition of camera systems was by several means. We applied for Challenge Cost Share funding from the USFS, and were funded at a level of \$20,000 to purchase camera systems on five national forests, including the Shasta-Trinity, Tahoe, Lake Tahoe Basin Management Unit, Stanislaus, and Inyo. The Klamath National Forest joined the effort using other funds. Additional camera systems were purchased by the Unified Sportsmen of Tehama County, the Placer County Conservation Task Force, and the University of California. Alpine Meadows, Inc., through EIP Associates, Sacramento, Calif., funded the purchase and servicing of two camera stations. Film and film processing were provided by the Cooperative Wolverine Study.

Due to delays in the budget process and in receiving

equipment once ordered, bait stations were established from December 1991 through April 1992, as equipment became available. The last station removed was in May.

Personnel who were to monitor the stations typically received a training session in the operation of the equipment, along with a set of guidelines for establishing and attending them (Appendix 1). These guidelines suggested that the stations be visited at least every two weeks; in practice, the frequency of station visits varied with their ease of access, weather and snow conditions, and personnel. Data sheets were provided (Appendix 2), in addition to the event-record sheets supplied with the Trailmaster. A 3-x-5 card with the site code was placed in the camera's view, and a sheet of paper in a plastic sleeve with an explanation of the project (Appendix 3) was attached to a nearby tree, in case the set was discovered by a member of the public. Access to the stations was by foot, truck, snowmobile, skis, snow cat, or helicopter, depending upon availability.

For bait, we used parts of the carcass of road-killed mule deer, or fish supplied by state fish hatcheries. Permission authorizing the possession and transport of wildlife was supplied by CDFG (Appendix 4). Baits were put in trees, approximately 2m off the ground or snow, in an attempt to keep them out of the reach of coyotes (Canis latrans). Larger baits, such as deer legs, were attached to the tree with wire or cable, to avoid having rodents chew through rope or string and allowing the bait to fall our of the camera's view. Fish and other smaller baits, such as deer livers, were hung in a chicken-wire sling. To increase the odor associated with the baits, on several sets we added fish emulsion, sold as fertilizer at garden-supply shops. The Trailmaster was positioned such that the infra-red beam passed approximately 3-8 cm below the bait and 5-10 cm off the trunk of the tree. In an attempt to determine if wolverines scavenged mule deer killed by mountain lions, Trailmaster camera systems were placed over recently lion-killed deer, left overnight, and examined the next morning, in association with a study of mountain lions on a deer winter range conducted by CDFG near Bishop, Inyo County.

RESULTS

A total of 57 camera stations were established in the winter of 1991-92 (Table 1, Figures 1-8). No wolverines were detected. At least twenty species were detected at the stations, including marten (Martes americana), fisher (M. pennanti), mountain lion, bobcat (Felis rufus), black bear (Ursus americana), spotted skunk (Spilogale putorius), gray fox (Urocyon cinereoargenteus), coyote, ringtail (Bassariscus astutus), raccoon (Procyon lotor), Peromyscus sp., Douglas' squirrel (Tamiasciurus douglasii), flying squirrel (Glaucomys sabrinus), chipmunks (Tamias sp.), California ground squirrel (Spermophilus beecheyi), hairy woodpecker (*Picoides villosus*), Clark's nutcracker (*Nucifraga*, nucifraga), raven (*Corvus corax*), and turkey vulture (*Cathartes aura*). At the 10 lion-killed deer at which cameras were placed, only mountain lions were detected, except for one black-billed magpie (Pica pica). One animal photographed along the McCloud River was tentatively identified as a fisher; however, its identity as a mink (*Mustela vison*) remains possible. Example photographs are presented in Figures 10-17.

Martens were the most widespread of the species detected, occurring at 18 of the 57 (32%) stations (Figures 1-8). They were attracted by baits that included deer, fish, and road-killed white-tailed jackrabbits (*Lepus townsendi*). The most northerly location at which martens were detected was at site PG-6, just south of Mt. Lola, Nevada County, at an elevation of 8300 ft. The most southerly marten was at IN-4, west of the town of Independence, at 7600 ft, which was also the lowest elevation at which we detected martens. The highest elevation at which martens were photographed was 10,100 ft at IN-1, near Saddlebag Lake, Mono County. No martens were detected over a large area of the west slope of the central Sierra Nevada (Figure 6), although they were present on adjacent areas of the east slope (e.g., sites WA-2, WA-3, WA-4), and martens are known to occur farther west (C. Fowler, pers. commun.).

Fishers were detected unequivocally at one site, in northern California on the north slope of the Trinity Alps on the Klamath National Forest (Figures 8, 10), and tentatively at two other sites along the McCloud River in southern Siskiyou County, adjacent to the Shasta-Trinity National Forest. However, one or both of these latter animals may in fact be minks; the photographs upon which the identifications are based are presented in Figures 10 and 11. To our knowledge, these are the first fishers to be detected with this method.

Once bears became active in the spring, many of the stations attracted them. A bear often would remove the entire bait package, and occasionally knock the camera sideways or hit the infra-red transmitter or receiver. One camera was damaged in this way. In several instances, the cable leading from the receiver to the camera was chewed through, probably by a squirrel. There was no serious vandalism to the cameras; however, at one location near Tioga Pass, someone did find the set and took several pictures, without damaging the equipment.

Publicity was generated by the study, which stimulated the reporting of other wolverine sightings. Newspaper articles that described the study, including one front-page article from the Sacramento Bee, are shown in Appendix 5.

We have automated much of the literature on wolverines, placing it in a computerized bibliography. This will be made available to other researchers.

DISCUSSION

Although no wolverines were photographed, we did learn much about methods necessary to conduct a study such as this, and were able to expand the scope of coverage by including various agencies and volunteers. We also generated positive public interest. We demonstrated the value of the remote photographic technique to document the presence of rare carnivores, such as the fisher, as well as more common ones, such as the marten and ringtail. Thus, as a pilot project, this year's effort was quite successful.

It became obvious that the biggest obstacle to regular monitoring of the camera stations was the difficulty of access to remote areas in the winter. Establishing and monitoring a large number of such stations in remote, mountainous terrain in winter is necessarily a laborious undertaking. Aside from inclement weather, personnel availability was the main cause of infrequent monitoring of stations. This was compounded by our need to rely on volunteers and agency personnel with other priorities and demands on their time.

Accessing the stations by the helicopter provided by PG&E was by far the most productive method. We could readily get to 7 stations in one day, using about three hours of flight time. Doing the same from the ground would have taken from 5 to 7 days.

Snowmobiles also were valuable to get into remote sites, and for carrying bait. However, we had no snowmobiles dedicated to this project, and had to rely on volunteers, or on USFS staff with other primary duties, for access to snowmobiles. This constrained our schedule and limited the ability to monitor stations.

The newspaper articles about the study generated public awareness about the wolverine and stimulated the reporting of new sightings. In addition, we acquired a poster produced by the Idaho Department of Fish and Game and the USFS designed to solicit information about wolverine sightings, and have received their permission, along with that of the artists, to modify it for use in California (Appendix 6). We anticipate that it will be used at trailheads and in USFS offices to educate the public regarding the possibility of wolverines in backcountry areas. We also have received permission from Steve Kroschel, a wildlife cinematographer, to reproduce his video footage of wolverines, so that CDFG and USFS personnel can educate the public as well as their own personnel regarding wolverine identification and behavior.

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FUTURE ACTIVITIES

In the fall of 1992, assuming continued funding, there should be no delays in establishing bait stations. We will have all the camera equipment that we need, and will stockpile roadkilled deer and hatchery fish. Coordination and training of personnel will occur during November, so that stations can be established as soon as possible, and the length of the field season maximized. In approximately December, when the bears become inactive, we will establish stations, and maintain them into the spring. We should have equipment for approximately 50 stations, which will be placed from the Klamath National Forest in Siskiyou County through the Shasta-Trinity National Forest and down to the southern Sierra Nevada on the Inyo National Forest in Inyo County.

We will seek additional support from various sources, to increase our ability to use helicopters to access stations, to acquire snowmobiles for use exclusively on this project, and to support other personnel. Funding of one additional, full-time field person, and being able to support additional personnel, or at least paying travel and expenses, would greatly facilitate more regular monitoring of stations. A project of this scope is not possible without a large effort, and we will seek funding as appropriate.

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Code	Forest or Ownership	N-S	E-W	(feet)	Date Activity/ Species
	Inyo				 14 Dec 91 Installed 19 Dec 91 Marten 8 Jan 92 Marten 9 Jan 92 Marten 10 Jan 92 Marten 31 Jan 92 Marten 6 Feb 92 Marten 14 Feb 92 Removed
IN-Ib	Inyo	4203000	301500	9800	11 Mar 92 Installed 19 Mar 92 Removed
IN-Ic	Inyo	4204000	301800	9800	19 Mar 92 Installed 12 Apr 92 Removed
IN-2a	Inyo	4170000	322000	8000	18Dec91Installed21Dec91Marten1Jan92Marten3Jan92Marten7Jan92Marten10Jan92Marten12Jan92Marten13Jan92Marten14Jan92Marten15Jan92Marten16Jan92231Jan92Removed
IN-2b	Inyo	4170000	318000	9200	6 Feb 92 Installed 8 Feb 92 Marten 9 Feb 92 Marten 10 Feb 92 Marten 12 Mar 92 Removed
IN-2c	Inyo	4163500	330600	7500	12 Mar 92 Installed 25 Mar 92 Removed
IN-2d	Inyo	4180000	330000	7100	2 Apr 92 Installed 13 Apr 92 Removed
IN-3a	Inyo	4143000	404000	8000	 Dce 91 Installed Dec 91 Gray fox Dec 91 Gray fox Dec 91 Gray fox Feb 92 Peromyscus Feb 92 Striped skunk Feb 92 Removed

Table 1.Photographic bait stations, and species detected at them,
December 1991 through May 1992.

Table 1, continued; page 2.

Site Code	Forest or Ownership	UTM N-S	UTM E-W	Elevation (feet)	Date	Activity/ Species
IN-3b	Inyo	4135000	395000	8600	20 Mar 92	Installed
					24 Mar 92	Grey fox
					25 Mar 92	Grey fox
					26 Mar 92	Grey fox
					28 Mar 92	Grey fox
					8 Apr 92	Removed
IN-4	Inyo	4070500	383000	7600	12 Dec 91	Installed
					18 Dec 91	Marten
					19 Dec 91	Marten
					21 Dec 92	Marten
					22 Dec 92	Marten
					26 Dec 92	Marten
					27 Dec 92	Marten
					29 Dec 92	Marten
					2 Jan 92	Removed
IN-5	Inyo	4124500	360500	7600	20 Mar 92	Installed
					25 Mar 92	Marten
					26 Mar 92	Ringtail
					26 Mar 92	Marten
					27 Mar 92	Marten
					1 Apr 92	Ringtail
					2 Apr 92	Ringtail
					3 Apr 92	Ringtail
					5 Apr 92	Raccoon
					6 Apr 92	Ringtail
					6 Apr 92	Raccoon
					16 Apr 92	
					1 Apr 92	Removed
TO-1	Toiyabe	4245000	271000	7500	12 Apr 9	
						Removed
ST-1	Stanislaus	4243400	256200	8500	24 Jan 92	Installed
					11 Feb 92	
					12 Feb 92	Marten
					14 Feb 92	Marten
					26 Feb 92	
					26 Feb 92	
					1 Mar 92	Removed

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Table 1, continued; page 3.

UTM Elevation Date Site Forest or UTM Activity/ N-S E-W (feet) Code Ownership Species ST-2 Stanislaus 4241200 251200 7600 25 Jan 92 Installed 10 Mar 92 Marten 29 Mar 92 Coyote 23 Apr 92 Marten 28 Apr 92 Black bear 1 Mar 92 Black bear 2 Mar 92 Black bear 11 Mar 92 Removed ST-3 Stanislaus 4241000 254200 25 Feb 92 Installed 7800 16 Mar 92 Marten 23 Mar 92 Marten 1 Apr 92 Removed 6500 3 Mar 92 Installed ST-4 Stanislaus 4243500 244000 6 Mar 92 Douglas' squirrel 16 Mar 92 Douglas' squirrel 23 Mar 92 Douglas' squirrel 24 Mar 92 Peromyscus sp. 25 Mar 92 Peromyscus sp. 1 Apr 92 Douglas' squirrel 2 Apr 92 Peromyscus sp. 13 Apr 92 Douglas' squirrel 14 Apr 92 Peromyscus sp. 5 May 92 Removed Stanislaus 4245000 246200 6600 17 Mar 92 Installed ST-5 25 Apr 92 Peromyscus sp. 11 May 92 Removed 17 Mar 92 Installed 7300 Stanislaus 4244500 248200 ST-6 8 May 92 Black bear 11 May 92 Removed 9 Apr 92 Installed ST-7 Stanislaus 4242750 252000 7800 29 Apr 92 Removed ST-8 Stanislaus 4241250 250500 7600 10 Apr 92 Installed 19 may 92 Removed Stanislaus 4239500 256000 8100 IO Apr 92 Installed ST-9 19 may 92 Removed 11 Apr 92 Installed ST-10 Stanislaus 4246500 9500 269500 27 Apr 92 Bobcat 2 May 92 Clark's nutcracker 6 May 92 Black bear 6 May 92 Removed

Table 1, continued; page 4.

Code	Forest or UTM Ownership N-S	E-W	(feet)		Species
	Stanislaus 4246200				
				14 Apr 92	Douglas' squirrel
				17 Apr 92	Douglas' squirrel Removed
ST-12	Stanislaus 4248200	268500	9600	22 Apr 92	Installed
				•	Clark's nutcracker
				5 May 92	Black bear
				10 May 92	2 Clark's nutcracker
				11 Nay 92	Marten
EL-1	El Dorado 4302000	756000	7800	7 Mar 92	Installed
				11 Mar 92	Marten
				17 Mar 92	Marten
				18 Mar 92	Marten
				20 Mar 92	Marten
				21 Mar 92	Marten
				22 Mar 92	Marten
				25 Mar 92	Marten
				26 Mar 92	Marten
				27 Mar 92	Marten
				28 Mar 92	Marten
				30 Mar 92	
				11 Apr 92	
				13 Apr 92	
				14 Apr 92	
				15 Apr 92	
				22 Apr 92	
				2 May 92 9 Nay 92	2 Marten 2 Removed
LA-1	Lake Tahoe 4308000	764000	6700	24 Eab 01	2 Installed
LA-1	Basin	764000	6700	24 Feb 92 28 Feb 92	
LA-2	Lake Tahoe 4305800	754500	7500	25 Feb 92	2 Installed
6772	Basin	104000	1000	25 Feb 92	
	Baom			26 Feb 92	
				2 Mar 92	
				8 Mar 92	
				22 Mar 92	
				23 Mar 92	e .
				24 Mar 92	
				26 Mar 92	2 Douglas' squirrel
				4 Apr 92	
LA-3	Lake Tahoe 4296000	760500	7680	26 Feb 93	2 Installed
	Basin			13 Mar 93	2 Flying squirrel
				14 Mar 93	2 Marten
				28 Mar 9	2 Removed

Table 1, continued; page 5.

. Activity/ Site Forest or UTM UTM Elevation Date Code Ownership M-S E-W (feet) Species . 27 Feb 92 Installed 7000 LA-4 Lake Tahoe 4306300 751000 Basin 7 Mar 92 Marten 8 Mar 92 Marten 9 Mar 92 Marten 12 Mar 92 Marten 19 Mar 92 Marten 24 Apr 92 Removed WA-I Lake Tahoe 4335300 7389000 7800 30 Jan 92 Installed 25 Feb 92 Removed; set damaged Basin 6800 30 Jan 92 Installed WA-2 Lake Tahoe 4335800 740700 17 Jan 92 Marten Basin 18 Jan 92 Marten 21 Jan 92 Coyote 22 Jan 92 Coyote 23 Jan 92 Coyote 23 Jan 92 Removed 739200 7100 10 Mar 92 Installed WA-3 Lake Tahoe 4334500 10 Mar 92 Marten Basin 11 Mar 92 Marten 10 Apr 92 Removed Lake Tahoe 4335000 8000 20 Mar 92 Installed WA-4 738500 20 Mar 92 Marten Basin 21 Mar 92 Marten 22 Mar 92 Marten 23 mar 92 Marten 24 Mar 92 Marten 25 Mar 92 Marten 26 Mar 92 Marten 5 Apr 92 Removed 5 Apr 92 Installed WA-5 Lake Tahoe 4333900 739200 7200 5 Apr 92 Basin Marten 10 Apr 92 Removed 19Dec 91 Installed 6600 TA-1 Tahoe 4380000 723200 2 2 Feb 92 Removed 12 Dec 91 Installed TA-2 4373500 731000 '7000 Tahoe 31 Dec 91 Douglas' squirrel 20 Jan 92 Hairy woodpecker 26 Feb 92 Removed TA-3 Tahoe 4365400 734500 7100 20 Dec 92 Installed 28 Dec 92 Removed; malfunction

Table 1, continued; page 6.

Site Code	Forest or Ownership	UTM N-S	UTM E-W	(feet)	Date	Activity/ Species
TA-4	Tahoe	4366700	731900	7900	20 Dec 91	Installed
					21 Dec 91	Marten
					22 Dec 91	Marten
					3 Jan 92	Marten
					9 Jan 92 29 Jan 92	Douglas' squirrel Removed
TA-4a	Tahoe	4366800	732800	7600	29 Jan 92	Installed
					29 Jan 92	Marten
					1 Feb 92	Marten
					2 Feb 92	Marten
					1 Mar 92	Removed
PG-1	Tahoe	4332500	735000	6100	9 Mar 92	Installed
					10 Mar 92	Douglas squirrel
					11 Mar 92	Douglas squirrel
					12 Mar 92	Douglas squirrel
					13 Mar 92	Douglas squirrel
					14 Mar 92	Douglas squirrel
					15 Mar 92	Douglas squirrel
					18 Mar 92	Douglas squirrel
					19 Mar 92	Douglas squirrel
					2 Apr 92	
					7 Apr 92	
					18 Apr 92 19 Apr 92	
					19 Apr 92 20 Apr 92	Removed
PG-2	Tahoe	4334000	728800	6200	9 Mar 92	
					23 Mar 93	, , ,
					25 Mar 92	7 5 1
					26 Mar 92	0 1
					26 Mar 92 20 Apr 92	Removed
50.0	- .	40.40000	700500	7400	9 Mar 92	Installed
PG-3	Tahoe	4342000	729500	7400	20 Apr 92	
PG-4	Tahoe	4343000	716400	3300	11 Mar 92	
					18 Mar 92	
					23 Mar 92	Removed
PG-5	Tahoe	4349000	717000	5700	11 Mar 92	Installed
					20 Apr 92	Removed
PG-6	Tahoe	4365100	727100	8300	11 Mar 92	Installed
					20 Mar 92	Marten
					25 Mar 92	Marten
					20 Apr 92	Removed

Table 1, continued; page 7.

Site Forest or UTM UTM Elevation Date Activity/ Code Ownership N-S E-W (feet) Species - - - - -PG-7 Tahoe 4349000 712800 6400 23 Mar 92 Installed 24 Mar 92 Black bear 10 Apr 92 Black bear 19 Apr 92 Black bear 20 Apr 92 Removed 7000 23 Mar 92 Installed PG-8 Tahoe 4372200 719000 20 Apr 92 Removed 4347100 729000 5800 31 Jan 92 Installed CE-1 Private 10 May 92 Removed (The Cedars) 4350500 727000 6200 31 Jan 92 Installed CE-2 Tahoe Douglas squirrel 10 May 92 Removed MC-1a Private 4549000 574000 2000 27 Jan 92 Installed 2 Feb 92 Ringtail (The Nature 4 Feb 92 Ringtail Conservancy, McCLoud R.) 4 Feb 92 Fisher? 6 Feb 92 Ringtail 7 Feb 92 Removed MC-lb Private 4549000 573000 2000 7 Feb 92 Installed 8 Feb 92 Ringtail (The Nature 9 Feb 92 Ringtail Conservancy, McCloud R.) 19 Feb 92 Ringtail 21 Feb 92 Ringtail 22 Feb 92 Ringtail 10 Mar 92 Ringtail 12 Mar 92 Ringtail 14 Mar 92 Ringtail 15 Mar 92 Ringtail 16 Mar 92 Ringtail 18 Mar 92 Ringtail 20 Mar 92 Ringtail 28 Mar 92 Removed 4549400 573500 1800 28 Mar 92 Installed MC-lc Private 29 Mar 92 Ringtail (The Nature 15 Apr 92 Ringtail Conservancy, 19 Apr 92 Ringtail McCloud R.) 19 Apr 92 Black bear 19 Apr 92 Removed

Table 1, continued; page 8.

Site Code	Forest or Ownership	UTM D N-S	UTM E-W	Elevation (feet)	Date	Activity/ Species
MC-2	Private 4 (The Natur Conservand McCloud R.	re cy,	575000	2240	11 Mar 92 11 Mar 92	Removed Installed
KL-1a	Klamath	4569800	509400	5000	25 Mar 92 30 Mar 92 1 Apr 92 2 Apr 92 3 Apr 92 7 Apr 92 7 Apr 92 8 Apr 92 8 Apr 92 11-21 Apr 21 Apr 92	California ground s Gray fox California ground s California ground s Fisher Peromyscus sp. California ground s
KL-1b	Klamath	4570200	508500	6000	21 Apr 92 29 Apr 92 30 Apr 92 4 May 92	Flying squirrel
KL-1c	Klamath	4568500	504500	6960	14 May 92 29 May 92	Flying squirrel Black bear Black bear
KL-2	Klamath	4644000	490500)	6 May 92 15 May 92 20 May 92	

APPENDIX 1

GUIDELINES FOR ESTABLISHING AND MONITORING PHOTOGRAPHIC BAIT STATIONS

GUIDELINES FOR ESTABLISHING AND MONITORING PHOTOGRAPHIC BAIT STATIONS

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- I. Establishing the station.
 - A. Before you go out, read the Trailmaster and Olympus manuals. Play with the Trailmaster so that you get comfortable with its operations and commands; know how to program it, read out the event data, clear it, change batteries, and where in the manual to look for instructions for the particular topic you need help on. This is much more easily done in the warmth of home or office than in the field.

Program the trailmaster receiver for the correct date and time, for **pulses = 10**, and for camera delay = 2.0 (**cd = 2**). Make sure that it is also programmed to activate the camera (see the manual, p. 12). On the back of the Olympus camera, synchronize the date and time with the Trailmaster receiver, and set it so that the date (day number) and time are displayed, not month or year or other configuration.

Identify a general, area in which to establish the station, considering historic and recent reports of wolverines, minimum human presence, trees on which to place the equipment, speculations on prey or animal movements, etc. Very important is the access to the site: if it is too easily accessible, it is more likely to be discovered and possibly vandalized; if it is too remote, it will not be monitored frequently enough. It is much easier to arrange one's schedule to allow a half-day trip, by snowmobile, skis, or hiking, than a more major effort. Remember that ease of access can change drastically as snow conditions change.

B. In the field, do not go alone; tell someone where you are going and when you will return, and what to do if you do not return by a certain time. Be aware of the weather forecast, have appropriate gear, and expect the worst. Be sure you have all the necessary equipment; a list of equipment is supplied below.

Within your general target area, find a spot that is not likely to be found by people. Go off whatever trail you are on, up or down a slope, for 50-100 yards or more; most people will not casually leave a trail, particularly if there is some difficult terrain. The ideal site has three trees, 6-15" in diameter and 5-20' apart, lined up in a north-south direction with the middle tree slightly offset, and fourth tree or a branch 5-10 feet from the middle tree with a good view of it. The transmitter goes on the northernmost tree, facing south; the receiver goes on the southernmost tree, facing north. This is important to minimize the amount of infra-red radiation from the sun reaching the receiver and causing false events to be recorded.

Put the bait in the middle tree, so that it is about 6 feet off the ground, in order to prevent coyotes from reaching it. Or, as an alternative, position the bait about 2 feet off the ground, to allow red foxes access to the bait. A deer leg from a road kill, or frozen fish in a bag, work well, but probably anything that smells like food will work. (We have also used road-killed rabbits, so keep an eye out along the highway, and keep your permission paper handy to demonstrate to law-enforcement folks your legitimacy.) Attaching the bait to the tree with wire will avoid losing the bait as a result of string or rope being chewed through.

Position the transmitter and receiver so that the infra-red beam passes about 6" below the bait, and about 3" off the tree. Any animal climbing the tree to get the bait must pass through the beam. When the approximate positions of the transmitter and receiver are established (using the receiver in **setup** mode with its flashing red light), tighten the receiver strap. Loosen the transmitter strap and move it up and down, and side to side, watching when the red light on the receiver stops flashing. This is to determine where the central portion of the infra-red beam is; fasten the transmitter so that this central portion of the beam hits the receiver. Check the position of the beam relative to the tree and bait by passing your hand through the beam to simulate an animal coming to the bait and watching when the red light on the receiver goes out, showing that the beam is broken. Remember, after 4 minutes, the receiver automatically leaves the **setup** mode and the red light stops flashing.

Attach the camera to the tree-pod, with the metal bracket shielding the top of the camera. Be sure that flash is set on AUTO, and the CONTinuous mode is off. (These will reset to the appropriate conditions when the lens cover is closed and opened, which also resets the lens to wide angle.) Attach the camera and tree-pod to a tree or branch, ideally 5-10 feet from the bait, with the viewfinder centered on where the beam passes the tree (i.e., where you expect the animal to be). Tighten the attachment of the tree-pod to the camera, and to the tree. Duct tape is often helpful to secure the tree-pod to the tree. A 2-foot length of 1 x 2" board can be nailed to an appropriate tree to provide an attachment for the tree-pod.

Run the camera cable from the receiver to the camera, winding it several times around the trees on which the camera and receiver are placed, so that any tugging on the cable (from snow, animals, you falling down) pulls on the tree and not the equipment. Run the cable at least 6' off the ground so that animals and most people pass below it. Tack a non-white, 3 x 5 card with the station's ID (first two letters of the National Forest plus a number) to the tree in the field of view, and tack a "Please Do Not Disturb" poster to a nearby tree, positioning it out of view except when close to the set.

Finally, when you think all is ready, clear the receiver, run your hand through the beam where you expect the animal to be, and be sure a picture is taken and an event recorded. If they are not, check the programming of the receiver (p. 12 of manual), the camera cable, or the alignment of the beam. Make sure it's right, and remember the 2-minute camera delay: a picture will not be taken for 2 minutes after the last picture is taken. If necessary, gather your gear, eat a sandwich, review the manual, take some notes, or look at the scenery for several minutes, then try again.

Record the information indicated on the data sheets, especially the number of pictures taken and the event number left on the Trailmaster receiver, when you leave. A sketch of the set on the back of the data sheet will help identify what configuration works. and what does not. Be generous in taking field notes; these will be used in the future to reconstruct what happened, and what went wrong and right. Use flagging tape to mark the way to the site, but do not flag the site itself.

II. Monitoring the station

- A. Frequency of monitoring will probably depend upon the access to the site and the schedule and fervor of those doing it. Ideally, one should return to the site within several days of establishing it, to ensure that it is working and that a marten or other animal has not immediately found it and shot up all the film. Two weeks is probably the longest that any set should be left unattended. Once per week is probably the best, but more often would not hurt.
- B. Before you leave, be sure you have new bait and replacement film and batteries. Do not go alone; do check the weather, and bring appropriate gear. A list of equipment is provided below.

- C. When you approach the set, look for and identify, describe, measure, photograph, and collect, as appropriate, tracks, scat, or any other sign of what may have been there. Note if the bait is still present, if it has been consumed, etc. Has the tree been scratched up, or any string or wires chewed or broken?
- D. Take out the event data pad and a pen, and press R/O ADV to cycle through the "events" (i.e., interruptions of the beam). Record on the pad the event number, date and time, and mark with an asterisk which events caused a photograph to be taken (i.e., which have a decimal between the first and second digit locations on the receiver's display; see p. 6 of the manual). If you miss something, cycle through the data again.

If you have a surprisingly large number of events, many within a few minutes, feel free to condense your notes (e.g., "#430-485 @ 0321-0325"), and suspect that the receiver is not in the center of the beam.

- E. When you have the event data recorded, check to see if the film has been shot. Replace the film if all or most frames are shot, or if you suspect that something particularly interesting (e.g., wolverine, fisher, red fox) has been at the set.
- F. <u>Changing batteries</u>. The batteries in the Trailmaster transmitter and receiver are supposed to last for 30 days in the field. When the batteries in the transmitter are low, the red indicator light on its base will immediately come on and quickly turn off when the unit is turned off; the light will stay on, or will not flash, when the unit is turned on. The receiver has a **L o b** ("low on batteries") display, and will not record events.

If the batteries have more than 20 days' use, or if either the transmitter or receiver indicates low batteries, replace the batteries in both units with 4 new alkaline C-cells. Do this over a jacket or cloth, to avoid losing the tiny allen screws or allen wrench when your numb fingers drop them into the snow or forest litter.

The Olympus camera has a battery display on its LCD panel. A solid battery figure indicates that the batteries are OK; an outline of a battery, either flashing or on continuously, means that the batteries must be changed. Replace them with 2 "DL123A" or "CR123A" lithium batteries.

G. Replace and align the transmitter, receiver, and camera. Take a test photo to determine that all is operating correctly, and record the frame and event numbers left on the units.

H. Either take the exposed film to an instant-developing store, or get it to Tom Kucera (address and phone at the beginning of these pages). To save money, try to get contact prints made first, then have reprints made of just the desired frames. Or, just have the film developed, and then decide from looking at the negatives what to have printed. Use discount coupons whenever possible. If you get a wolverine, fisher, or red fox, call Kucera immediatelv. In other cases, have the prints made that you wish to keep, and send the film and whatever prints to Kucera (2909 Regent #2, Berkeley CA 94705), along with the receipts. I'll reimburse you promptly for film processing, as well as any other supplies, such as film or batteries,

If you find that a bear, marten, coyote, or grey fox has found the station and is frequently returning, move the station, trying to get at least one home-range diameter away.

EQUIPMENT LIST

- Trailmaster transmitter, receiver, and camera, all with fresh batteries, already programmed; allen wrench and spare allen screw; cable to the camera
- Photocopies of the Trailmaster and Olympus manuals
- Data sheets and event data pad; waterproof pen
- Spare batteries (8 alkaline C-cells, 2 123A lithium camera batteries) and film
- Bait, wire, wire cutters, parachute cord or string, duct tape
- Pruning saw, to clear branches
- 3 x 5 cards, waterproof magic marker, push pins, Do-not-disturb signs in clear plastic sleeve
- 1" x 2" x 2' board, hammer and nails
- Flagging tape, if the location is not very well-known and easy to find, or if different people will be servicing the station.
- Personal gear, maps, lunch, water

- APPENDIX 2 (Not included with this report)
- APPENDIX 3 (Not included with this report)
- APPENDIX 4 (Not included with this report)
- **APPENDIX 5** (Not included with this report)
- APPENDIX 6 (Not included with this report)