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CURRENT DISTRIBUTION OF THE FISHER, *MARTES PENNANTI*, IN CALIFORNIA

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We describe the 1989-1994 distribution of the fisher, *Martes pennanti*, in California based on the results of detection surveys that used either sooted track-plates or cameras. Fishers were detected in two regions of the state: the northwest and the southern Sierra Nevada. Despite considerable survey effort, neither fisher tracks nor photographs were collected in the area between Mt. Shasta and Yosemite National Park. This represents a significant breach in the distribution formerly interpreted as continuous. Detection survey results suggest that the population in the southern Sierra Nevada may be isolated from populations to the north. We recommend that additional survey effort be focused on the southern Cascades and northern Sierra Nevada and that forests of the Sierra Nevada be managed to encourage the movement of fishers between these areas. We also recommend that descriptions of the current distributions of uncommon carnivores be based on techniques that produce verifiable records rather than summaries of incidental sightings.

INTRODUCTION

The fisher, *Martes pennanti*, historically occurred in forests from British Columbia to Quebec and as far south as Tennessee, Illinois, Wyoming, and central California (Hagmeier 1956, Gibilisco 1994, Graham and Graham 1994). Although the fisher became uncommon in the east and midwest early in this century, it has recovered throughout much of its eastern range due to the regulation of trapping, the increase in forest lands due to farmland abandonment, and reintroductions (Powell 1993). In the western United States, the fisher once occurred throughout the northern Rocky Mountains, Cascade Mountains, Coast Ranges, and Sierra Nevada, but significant

gaps in this distribution now occur (Gibilisco 1994, Powell and Zielinski' 1994).

The status and distribution of the fisher in California have been described on several occasions in the 20th Century. Grinnell et al. (1937) summarized 1919-1924 trapping records and anecdotal accounts and described the fisher as occurring in the northern Coast Range, Klamath (Siskiyou, Trinity, and Marble) Mountains, southern Cascades, and western slope of the Sierra Nevada. Yocom and McCollum (1973) summarized incidental fisher sightings in northwestern California but did not address the distribution in the southern Cascades and Sierra Nevada. Schempf and White[2] (1977) reviewed agency wildlife observations and concluded that fishers were "common and increasing" in the extreme northwestern counties, "decreasing" in the southern Sierra Nevada and "persisting at a very low density" in the northern Sierra Nevada. Gould[3] (1987) updated the Schempf and White database of sightings and concluded that fishers were "no longer distributed throughout their historic range in California." Information contributed by California Department of Fish and Game (CDFG) personnel in response to a mail survey conducted by Gibilisco (1994) indicated concern about the persistence of fishers in the Sierra Nevada.

Of the efforts described above, only the locations of trapped animals (Grinnell et al. 1937) represent observations that could be independently verified. Although the reliability of sightings can be screened on the basis of the qualifications of the observer (e.g. Aubry and Houston 1992), fishers can be easily mistaken for a number of other carnivores, especially American martens, *M. americana,* even by experienced observers (W. Zielinski, pers. obs.; R. Golightly, Humboldt State University, Arcata, California, pers .comm.).

Recent development of nonlethal detection methods permits the collection of verifiable evidence of occurrence, either tracks or photographs, from forest carnivores attracted to scent and bait (Barrett 1983, Raphael 1994, Fowler[4] 1995, Zielinski and Kucera[5] 1995). Since 1989, several efforts have occurred throughout the mountains of northern and central California to document empirically the distribution of fishers and other mammalian carnivores of conservation interest, such as the

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[1] Powell, R.A. and W.J. Zielinski. 1994. The fisher. Pages 38-73 *in*: L.F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski, editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. USDA Forest Service Rocky Mountain Research Station General Technical Report RM-GTR-254.

[2] Schempf, P.F. and M. White. 1977. Status of six furbearer populations in the mountains of northern California. Unpublished report, USDA Forest Service, California Region, San Francisco, California, USA.

[3] Gould, G. 1987. Job Final Report, Project W-45-R-4. Unpublished report, California Department of Fish and Game, Sacramento, California, USA.

[4] Fowler, C.H. 1995. Techniques for detecting and monitoring martens and fishers in forest habitats of California. M.S. Thesis, Humboldt State University, Arcata, California, USA.

[5] Zielinski, W.J. and T.E. Kucera, editors. 1995. American marten, fisher, lynx, and wolverine: survey methods for their detection. USDA Forest Service General Technical Report PSW-GTR-157.

American marten and wolverine, *Gulo gulo*, using standardized detection techniques. The incentive to conduct these surveys has increased due to two recent petitions to list the fisher under the Endangered Species Act[6,7] and the uncertain status of other forest carnivores in the western United States (Kucera and Zielinski 1995). Our objectives are to describe the current distribution of the fisher in California based on these recent surveys and to document the feasibility and value of such efforts for the management of rare or secretive carnivores.

METHODS

We compiled the results of surveys that used baited track-plates (Barrett 1983, Fowler and Golightly[8] 1993); line-triggered cameras (Jones and Raphael[9] 1993); and remote, 35-mm cameras (Kucera and Barrett 1993a) in our efforts to detect evidence of fishers in California. These techniques produce either a track or a photograph from a known location. A few recent records of road-killed animals also were included, but only at locations where there were few surveys or where surveys had not otherwise documented the presence of fishers.

We summarize data from several types of surveys. Most (n = 221 surveys) were efforts by federal, state, or private biologists to determine the presence of fishers in an area where habitat alteration, such as a timber sale or recreational development, was planned. We also included data from regional surveys (n = 15 surveys), often conducted as the first phase of a more intensive research project, that were conducted to understand fisher distribution across one or several watersheds. Finally, we summarized data from a statewide survey (n = 84 stations) to detect rare carnivores, particularly wolverines. Many of the local efforts were conducted according to the USDA Forest Service Region 5 protocol (Zielinski[10] 1992) in which baited track-plate stations (usually 12-24) are placed at 0.8-km intervals along roads in a proposed timber sale area. Some of these surveys were conducted with the goal of detecting martens, and thus may have been at elevations and in habitats where fishers were less common (Schempf and White[2] 1977, Buskirk and Powell 1994). Most regional surveys included considerably more stations than the local surveys (usually >50) and stations were distributed as either a grid or along roads across multiple watersheds. In the statewide survey, individual 35-mm cameras were

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[6] Central Sierra Aubudon Society, North San Juan, California, in litt. 1990.

[7] Biodiversity Legal Foundation, Boulder, Colorado, in litt. 1994.

[8] Fowler C. and R.T. Golightly. 1993. Fisher and marten survey techniques on the Tahoe National Forest. Final Report, Agreement No. PSW-90-0034CA, Humboldt State University and USDA Forest Service.

[9] Jones, L.L.C. and M.G. Raphael. 1993. Inexpensive camera systems for detecting martens, fishers, and other animals: guidelines for use and standardization. USDA Forest Service Pacific Northwest Research Station General Technical Report PNW-GTR-306.

[10] Zielinski, W.J. 1992. A survey protocol to monitor forest carnivores in proposed management activity areas. Unpublished report, USDA Forest Service, Pacific Southwest Forest and Range Experimental Station, Arcata, California, USA.

located in areas of historic or recent wolverine sightings specifically to detect this species (Kucera and Barrett 1993b) . All types of surveys were mapped as a single point regardless of the number of stations in the survey, with the exception of those conducted by the Sierra Pilot Project in Nevada County. In this study, a 35-mm camera was placed at each of 150 grid intersections (section comers) in a 800-km^2 area.

All work was conducted from October 1989 to March 1995. The first two types of survey were conducted most often during the snow-free seasons, the third type primarily during the winter. Surveys occurred through much of the historic range of the fisher in California, but some areas were surveyed more intensively than others due to variation in how important land managers considered the need for information. All tracks and photographs were verified by one of the authors. Tracks of a size that could be confused with those of martens were distinguished using a discriminant function (Zielinski and Truex 1995). Details on the specific survey locations, detection techniques, and results are on file at the Pacific Southwest Research Station, Redwood Sciences Laboratory, Arcata, California, and at the Department of Environmental Science, Policy, and Management at the University of California, Berkeley, California.

RESULTS

We report data from 510 survey sites, ranging from Del Norte, Humboldt, and Siskiyou counties in the north through the southern Cascades and Sierra Nevada to northern Kern County (Figs. 1 and 2). Ninety surveys detected a fisher at least once; most detections were in the northwest (northern Coast Range and Klamath Mountains) and on the west slope in the southern Sierra Nevada. No verifiable evidence of fishers was collected in the area from northeastern Shasta County south to Yosemite National Park, a linear distance of about 420 km, even though 66 track-plate surveys (each with multiple stations) and 184 35-mm camera stations (150 of which were used together in the Sierra Pilot Study) were deployed in this area.

DISCUSSION

Currently the fisher appears to occur in two areas of California; it is widely distributed in the northwest (northern Coast Range an dKlamath Mountains) and has a restricted distribution in the southern Sierra Nevada. Although there have been occasional, unverified, sightings of fishers between Mt. Shasta and Yosemite National Park (E. Burkett, CDFG, pers .comm.), a considerable number of surveys in this region, using methods that readily detect fishers when they are present, have failed to detect them. This is not likely due to surveys being conducted at elevations above typical fisher habitat; mean elevation of the track-plate surveys in this region (n = 46) was 1650 m, similar to the mean elevation of fisher sightings reported by Schempf and White[2] (1977) for the northern Sierra Nevada. Despite our efforts to detect fishers, we have no quantitative measure of the probability that negative

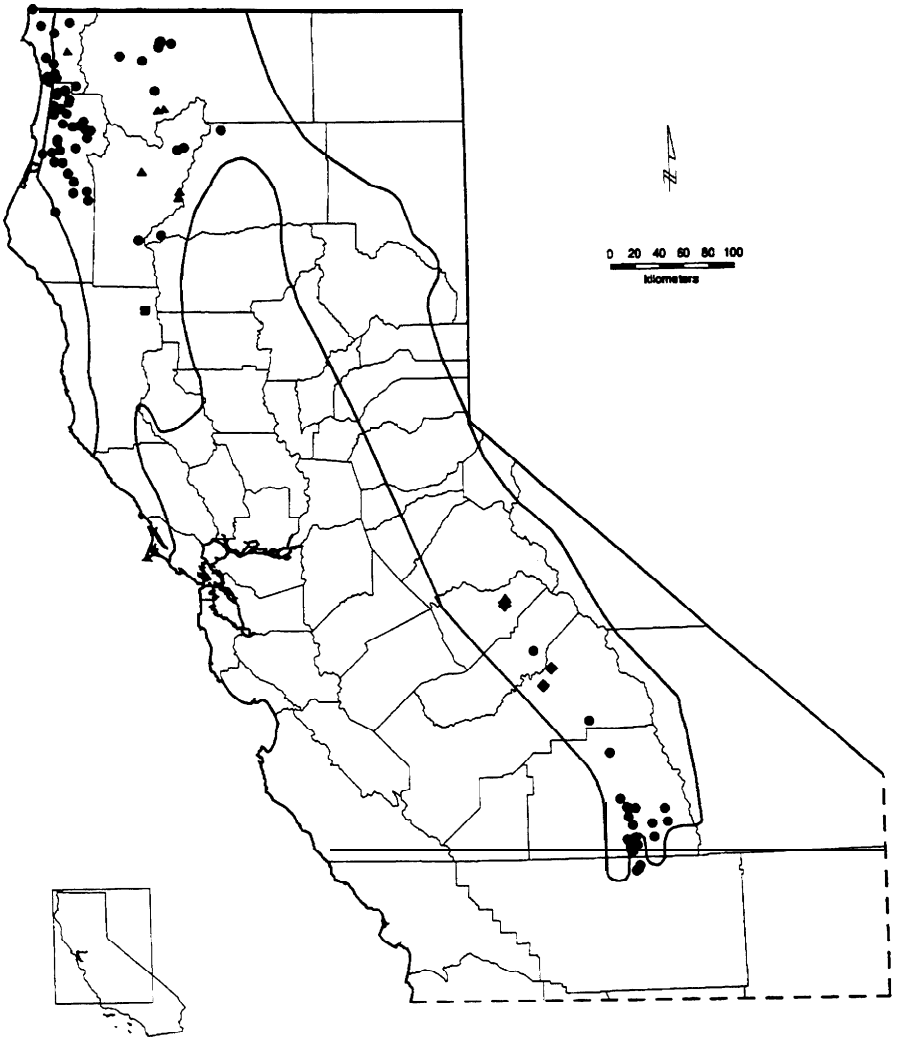

Figure 1. Locations in northern and central California where fishers were detected, 1989-l994. Circles indicate locations of surveys with multiple track-plate or fine-triggered camera stations. Triangles indicate locations of individual 35-mm camera stations. Diamonds are locations of road-killed fishers, noted only for areas in the Sierra Nevada north of Sequoia National Forest. Yosemite National Park, in Mariposa County, is the site of two roadkills and two photographs, the symbols for which overlap considerably. The one solid square in Mendocino County is the location of two fisher captures, 3 months apart, in leg-hold traps set for other species. The bold irregular lines enclose the limits of historic fisher distribution as described by Grinnell et al. (1937). Outlines of counties also are shown.

results in a survey mean, in fact, that no fishers occur in a particular area. Most marked martens or fishers are readily detected at camera stations that are placed

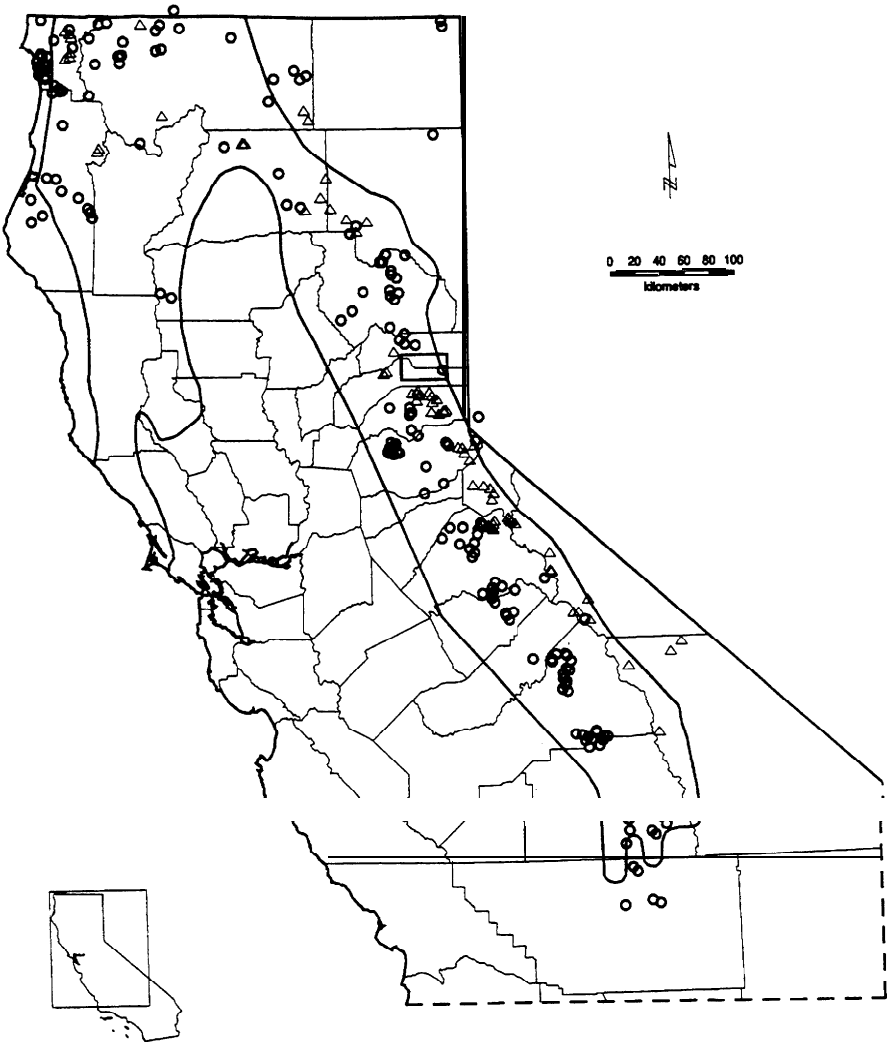

Figure 2. Locations in northern and central California where fishers were not defected, 1989-l 994. Circles indicate locations of surveys with multiple track-plate or line-triggered camera stations. Triangles indicate locations of individual 35-mm camera stations. The large, open rectangle includes the Sierra Pilot Project study area where a 35-mm camera was placed at each of 150 section comers throughout the 800-km² area. The bold irregular lines enclose the limits of historic fisher distri bution as described by Grinnell et al. (1937). Outlines of counties also are shown.

within their home range (Jones and Raphae l[11] 1990, Seglund and Golightly[12] 1993,

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[11] Jones, L.L.C. and M.G. Raphael. 1990. Ecology and management of marten in fragmented habitats of the Pacific Northwest. Progress report, USDA Forest Service, OIympia, Washington, USA.

[12] Seglund, A. and R.T. Golightly. 1993. Fisher survey techniques on the Shasta-Trinity National Forest. Progress report, Humboldt State University and USDA Forest Service, Pacific Southwest Research Station, Arcata, California, USA.

Fowler[4] 1995). This strongly suggests that the absence of fisher detections in the northern and central Sierra Nevada and in the southern Cascades is because they do not occur in the areas surveyed.

Grinnell et al. (1937:215) described the fisher as occurring "....south from Mt. Shasta and Lassen Peak *throughout* the main Sierra Nevada...." (italics added). Dixon (1925) concluded that the California fisher population was dangerously close to extinction and proposed that measures be taken to protect the species; in 1946 trapping for fishers was prohibited. Schempf and White[2] (1977) summarized fisher sightings in California through 1974 and indicated that the fisher was still at very low density in the northern Sierra Nevada. Gould (1987) suggested that, based on lack of sightings in the Sierra Nevada, the fisher be listed as threatened or endangered in the state. These reports, together with the absence of recent detections in the southern Cascades and northern Sierra Nevada reported here, suggest that the fisher population in this region has declined since the early 1900s. We hasten to add, however, that none of the methods used to describe distribution are suitable indices of abundance and that differences in the type and quality of data available over the 60-yr period make interpretation of distributional changes difficult.

Elsewhere in California, fisher detections occurred consistent with previous reports of fisher distribution. Detections were common in the Coast Range in Del Norte and Humboldt counties (several occurring within 7 km of the ocean), the Klamath Mountains, and as far east as near Mt. Shasta. Detections also were common in Sequoia National Forest, but decreased in frequency north to Yosemite National Park. In Yosemite, two road-killed fishers were collected in 1993 and 1994 and, after several years of effort, fishers were photographed at two baited camera stations (L. Chow, National Biological Service, pers. comm.). Fishers were detected at track-plates only once in the Sierra National Forest, where two road-killed fishers were recovered during 1991-94 (Fig. 1). In contrast, the majority of surveys farther south in the Sequoia National Forest detected fishers and road-killed fishers are relatively common there (S. Anderson, USDA Forest Service, pers comm.).

A few surveys have been conducted in the Sierra Nevada since our maps were made. These include a regional track-plate survey in the Kings River Ranger District, Sierra National Forest, Fresno County, that detected fishers (R. Golightly, pers. comm.) and another regional track-plate survey in Tuolumne County that did not (D. Applebee, Sierra Pacific Industries, pers. comm.). Neither of these results appreciably change the mapped distribution.

Several areas of the historic distribution of fisher were inadequately surveyed. No surveys were conducted in southern Humboldt, Mendocino, or northern Lake counties where Grinnell et al. (1937) reported fishers trapped between 1919-1924. The accidental captures of two fishers in leg-hold traps in northern Mendocino County during the winter of 1994-1995 (C. Furrer, Mendocino National Forest, pers. comm.) indicate that surveys in Mendocino and Lake counties are necessary to define the southern boundary of the Coast Range population. Western Nevada, Placer, and El Dorado counties, and much of the eastern slope of the Sierra Nevada, also were poorly sampled. We strongly encourage increased survey effort in these

regions of California, as well as in southern Oregon to define the northern boundary of the northwestern California population.

In the late 20th century, the fisher appears to be distributed over a much smaller area in California than described in the early 1900s. Furthermore, its once continuous distribution is now apparently fragmented into two areas separated by a distance that greatly exceeds reported fisher dispersal ability (Arthur et al. 1993). Although the fisher always has occurred in the southern Sierra Nevada, the apparent current isolation renders this population vulnerable to catastrophic events in the short term and, possibly, inbreeding depression in the long term. This population is crucial to the restoration of the fisher in California because it is the one most likely to recolonize the remainder of the Sierra Nevada. Moreover, it is a likely source for transplants should reintroduction to the central and northern Sierra Nevada be considered. Although research on the habitat associations of fisher elsewhere in California may help explain why the fisher is uncommon in the northern and central Sierra Nevada, studies of remnant populations are an insufficient conservation strategy. It is more important that forests in the Sierra Nevada and southern Cascades be managed to encourage the natural dispersal of fishers into the area we currently believe is unoccupied.

We emphasize that the data reported here are based on verified tracks or photographs of fishers; they do not include reports of sightings. Sighting data need to be treated cautiously because they are impossible to verify, although reliability indices can be developed (Aubry and Houston 1992; E. Burkett, pers. comm.). We recommend that detection surveys using either track-plates or cameras be conducted at sites where fishers and other uncommon forest carnivores are reportedly observed and that standardized methods of these types be used during future efforts to assess the distribution of such species. Visual observations that are screened for reliability should be used to augment, not substitute for, surveys using cameras or track-plates.

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