The Case of Forest Carnivores: Small Packages, Big Worries

by

Thomas E. Kucera and William J. Zielinski

Carnivores are important indicators of ecosystem integrity in that they influence the structure and reflect the vigor of the trophic levels upon which they depend (Eisenberg 1989). They are also sensitive to the abundance and behavior of the humans with which they coexist. Throughout much of the United States, concern for the conservation of mammalian carnivores has centered on two large species, the gray wolf (*Canis lupus*) and the grizzly bear (*Ursus arctos*) (Curlee et al. 1994). Much effort and money have been spent at first to eradicate and more recently to prevent the extinction of these large, well-known species in the northern and western United States.

Less well known are the ecology, distribution, and status of a suite of smaller but no less important carnivores. Often referred to as furbearers, reflecting the utilitarian flavor of humanity's traditional values of them, the Canada lynx (*Lynx canadensis*), wolverine (*Gulo gulo*), fisher (*Martes pennanti*), and American marten (*Martes americana*) are receiving increasing attention by wildlife scientists and managers and the larger conservation community. Because of their sympatry and association with forested habitats over much of their range, and because they are rarely trapped commercially in the western United States anymore, they are now more commonly referred to collectively as forest carnivores.

The rising swell of conservation concern is a product of our scientific ignorance of these species and the effects of habitat manipulations on them, combined with their association with late-successional forests. In this article we will briefly review current scientific knowledge of lynx, wolverine, fisher, and American marten and efforts to expand that knowledge, and describe attempts to give these species special administrative and legal protection. We will emphasize the western contiguous United States, with which we are most familiar.

Range and Natural History

Lynx, wolverines, fishers, and American martens occur in a wide band across the higher latitudes of North America, with conspecifics or close relatives in Eurasia (Koehler and Aubry 1994, Wilson 1982, Powell 1993, Gibilisco 1994). The single species of wolverine occupies tundra and taiga as well as forests in Eurasia and North America. The Canada lynx, and its Old World relative the Eurasian lynx (*L. lynx),* are restricted to forested habitats; Canada lynx occur south of the Arctic treeline from Alaska to Newfoundland. Both the fisher and American marten occur only in North America, also in a wide swath of forested areas from Alaska to eastern Canada.

It is the southern, largely peninsular distributions of these species that are currently of concern. Canada lynx historically occurred in the New England and Great Lakes states (McCord and Cardoza 1982); nineteenth- and early twentieth-century logging in these areas probably resulted in their extirpation early in this century (Quinn and Parker 1987). In the western United States, Canada lynx extend southward along the Rocky Mountains into Colorado and occur in the north Cascades and Okanogan Highlands of Washington (Koehler and Aubry 1994).

Canada lynx, which weigh about 10 kg, are closely associated with deep snow and with the snowshoe hare (*Lepus americanus*), their primary prey. The population cycles of hares, with those of Canada lynx lagging slightly behind, are well known throughout the boreal forest (Brand and Keith 1979, Keith 1990). However, at their more southerly latitudes, hare and lynx cycles are less pronounced or absent (Koehler 1990).

Wolverines, whose ferocity and association with wilderness are legend, are the largest terrestrial members of the Mustelidae, weighing up to 15 kg. They were extirpated from the upper Midwest in the early 1900's (deVos 1964), and were always rare or absent in the Great Plains and Great Basin. Wolverines extended southward in montane boreal habitats along the Rocky Mountains as far as New Mexico, and along the Cascade-Sierra Nevada axis to the southern Sierra Nevada of California (Grinnell et al. 1937, Wilson 1982). Best characterized as a "scavenging predator" (Hash 1987), the wolverine, with its powerful dentition, requires large-mammal carrion, particularly in winter.

Wolverines typically exist in low-density populations whose members have notoriously large home ranges. For example, current research in Idaho has found home ranges of wolverines as large as 3000 km2 (J. P. Copeland, Idaho Dep. Fish and Game, unpubl. data). The status of wolverines in the Rocky Mountains of Colorado and in the Cascade Range and Sierra Nevada on the west coast is uncertain at best. Recent efforts to document photographically their current existence in California were unsuccessful, although sporadic reports of sightings continue (T. E. Kucera, unpubl. data).

Fishers are the largest and most sexually dimorphic member of the genus *Martes;* males weigh about 5 kg, females about half that. They prey on medium-sized and small mammals and birds, most

notably the snowshoe hare and porcupine (*Erethizon dorsatum*), but also squirrels, voles, mice, carrion, and fruit (Powell 1993). Before European settlement, fishers occurred along the Appalachian Mountains as far south as Tennessee, and in the Midwest to southern Illinois, coincident with appropriate forest types. They ranged along the Rocky Mountains at least into Wyoming, and down the West Coast to the southern Sierra Nevada (Grinnell et al. 1937, Powell 1993, Powell and Zielinski 1994).

In the late nineteenth and early twentieth centuries, fisher numbers plummeted and their range shrank drastically, particularly in the southern portions (Powell 1993, Powell and Zielinski 1994, Graham and Graham 1994). They were and remain extirpated from the southern tier of states they historically occupied in the East and Midwest. Similarly, fisher numbers in the Rocky Mountains and on the West Coast dropped precipitously. Trapping and deforestation were responsible; these agents were simultaneous and complementary. Fishers are fairly easily trapped, and fisher pelts have always been valuable. Coincident with trapping was destruction of the fisher's forest habitat by logging, both for timber and to clear land for agriculture. As Powell (1993) points out, because logging increases access to forested regions for trappers, the two are often linked. The combined effect of trapping and logging was the reduction or extirpation of fishers over much of their range.

The American marten is the smallest of this trio of mustelids at less than 2 kg. Depending on season and locality, they live on a variety of small mammals and birds (Martin 1994). Distributed throughout Alaska and Canada, the American marten has experienced reductions in the southern and eastern parts of its range similar to but less drastic than those of the fisher (Gibilisco 1994, Graham and Graham 1994). In the Rocky Mountains the apparent patchy distribution of American martens reflects the patchy distribution of forested montane islands and is little changed from its historic pattern.

On the west coast, however, from Washington to California, there have been substantial reductions in the distribution of American martens. A subspecies from the Coast Range of northern California, the Humboldt marten (*M. a. humboldtensis*), may be extinct, although American martens in other areas, such as higher elevations of the Sierra Nevada, are relatively common (Kucera et al. in press). Buskirk and Ruggiero (1994) reason that because trapping for American martens has been illegal in California since 1953, the loss of the Humboldt marten in northwestern coastal California is due to the loss of late-successional redwood (*Sequoia sempervirens*) forests there.

Scientific Efforts

Concern for these species increased during the 1980's and stimulated several efforts by scientists and conservationists to address forest carnivores. In 1991, the First International Symposium on the Biology and Management of Martens, Fishers, and Sables in Laramie, Wyoming led to the recent summary volume by Buskirk et al. (1994). The *Martes* Working Group, which grew out of that symposium, produces a newsletter with items of interest regarding martens and fishers. The Second International *Martes* Symposium will be held in Edmonton, Canada in August, 1995.

Also in 1991, an ad hoc group of agency, academic, and forest-industry scientists and managers formed what became known as the Western Forest Carnivore Committee. Under the leadership of Bill Ruediger of the USDA Forest Service (USFS), the group meets several times per year to coordinate and facilitate efforts to increase scientific understanding of and to develop management programs for lynx, wolverine, fisher, and American marten in the western United States.

The USFS recently published *The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the Western United States* (Ruggiero et al. 1994a), which reviews and summarizes what is known about these forest carnivores. Its unifying theme is that our understanding of the ecology of these species is rudimentary at best. For example, Powell

Endangered Species UPDATE

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March 1995 Vol. 12 No. 3

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The *Endangered Species UPDATE is* published approximately ten times per year by the School of Natural Resources and Environment at The University of Michigan. Annual rates are $23 for regular subscriptions, and $18 for students and senior citizens (add $5 for postage outside the US). Students please enclose advisor's signature on university letterhead. Send check or money order (payable to The University of Michigan) to:

Endangered Species UPDATE
School of Natural Resources
and Environment
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Cover: Lynx *canadensis*
Photo by Susan C. Morse.

The views expressed in the *Endangered Species UPDATE* are those of the author and may not necessarily reflect those of the US Fish and Wildlife Service or The University of Michigan.

Production of this issue was made possible in part by support from the Chevron Corporation, US Fish and Wildlife Service Division of Endangered Species Region 3, National Fish and Wildlife Foundation, and Boone and Crockett Club.

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and Zielinski (1994:64) state "The primary reason for concern about the fishers in the western mountains of the United States is the utter lack of data on the ecology of the species". Ruggiero et al. (1994b) emphasize that our knowledge of the ecology of wolverines, lynx, and fishers in the western U. S. comes from a total of one, five, and four studies, respectively. With such a limited knowledge base, questions about the conservation status or population trends of these species are impossible to address with any reliability. As Ruggiero et al. (1994c:5) state, "Because the quantity and quality of information available for the western United States is limited ...the conservation status of forest carnivores is itself uncertain."

As discussed repeatedly in Ruggiero et al. (1994a), it is not only the more sophisticated questions regarding the ecology of these species that are impossible to answer. Basic knowledge of current distribution is lacking in many areas. Because these species are shy, inconspicuous, primarily nocturnal, occur at low densities, and are now rarely trapped in the contiguous United States, reliable data on current distribution are often unavailable. For example, much of the knowledge of the distribution of wolverines, fishers, and American martens in California is based on Grinnell et al. (1937). Other western states lack even this type of early data from scientific naturalists. Current reliable data on the distribution and abundance of these species are needed.

One attempt to address this need is a document titled *"Lynx, Wolverines, Fishers, and Martens: Survey Methods for their Detection"* (Zielinski and Kucera in press). This manual, which grew out of the Western Forest Carnivore Committee, describes several standardized, non-lethal methods for detecting these species using remote photographic bait stations, baited track plates, and snow tracking. We describe sampling strategies and discuss disposition and storage of data to promote understanding of regional distribution patterns. We also differentiate detection and population monitoring and suggest that the methods we describe may form the basis of programs to estimate population size and monitor population change in these species. In a recent paper (Kucera et al. in press) we demonstrate that such methods can be used to produce reliable, verifiable information on the regional distribution as well as local occurrence of rare carnivores. We hope that the detection manual will stimulate similar work in different areas and with other species.

Fisher (*Martes pennanti*) © Susan C. Morse

Current Management Status

Wolverine. The wolverine was listed as threatened in California by the California Fish and Game Commission in 1971, and was listed as endangered in Colorado in 1973. It was made a federal Category 2 Candidate ("C2") species in 1985. This category means that the listing of wolverines as threatened or endangered under the federal Endangered Species Act (ESA) may be appropriate but there is insufficient evidence to support a proposal to list. Oregon classified the wolverine as threatened in 1989. In most of its range in the lower 48, the wolverine is classified as a "Sensitive" species by the USFS (MacFarlane 1994). Montana is the only state in the lower 48 that permits trapping of wolverines, with a limit of one per trapper.

In August 1994, the Biodiversity Legal Foundation of Boulder, Colorado and the Predator Project of Bozeman, Montana petitioned the U. S. Fish and Wildlife Service (USFWS) to list the wolverine as threatened or endangered "across their entire known historic range in the 48 contiguous United States" (Biodiversity Legal Foundation 1994a). The 90-day finding by USFWS as to whether the petitioned listing "may be warranted," the first step in evaluating a petition, has not been issued as of March 1995 (L. Nordstrom, USFWS, pers. commun.). If the USFWS finds that listing may be warranted, it will conduct a status review and

Wolverine (*Gulo gulo*) © Susan C. Morse

issue a 12-month finding whether listing is warranted, not warranted, or "warranted but precluded by higher priority listing activities".

Canada lynx. The states of Colorado and Wisconsin classify the lynx as endangered, and Washington classifies it as threatened. The USFS lists lynx as Sensitive in National Forests in states within their historic range. In most northern states from Maine to Oregon lynx are protected from harvest. Montana allows trapping of lynx, with a statewide limit of 2 individuals per season. Idaho has a statewide quota of three lynx, but none has been taken there for several years (Koehler and Aubry 1994, MacFarlane 1994).

In August 1991, several conservation organizations petitioned the USFWS to list the Canada lynx in the North Cascades of Washington as an endangered species. In July 1993, the USFWS found that there was not substantial information to support listing the species. Subsequently, the petitioners challenged this finding in court. To settle the suit, in November 1993 the USFWS agreed to conduct a "status review" of the lynx throughout its entire range in the lower 48 states and to determine if it qualified for listing (USFWS 1994).

The Biodiversity Legal Foundation filed a petition in April 1994 requesting that the Canada lynx in the conterminous United States be listed as threatened or endangered, and that the lynx population in the southern Rocky Mountains be protected by emergency listing because of its low numbers and geographical isolation from other populations (Biodiversity Legal Foundation 19946). In their 90-day finding published in August 1994, the USFWS found that the emergency listing of the southern Rocky Mountain population "was not warranted" but that listing the population in the conterminous US "may be warranted" (USFWS 1994).

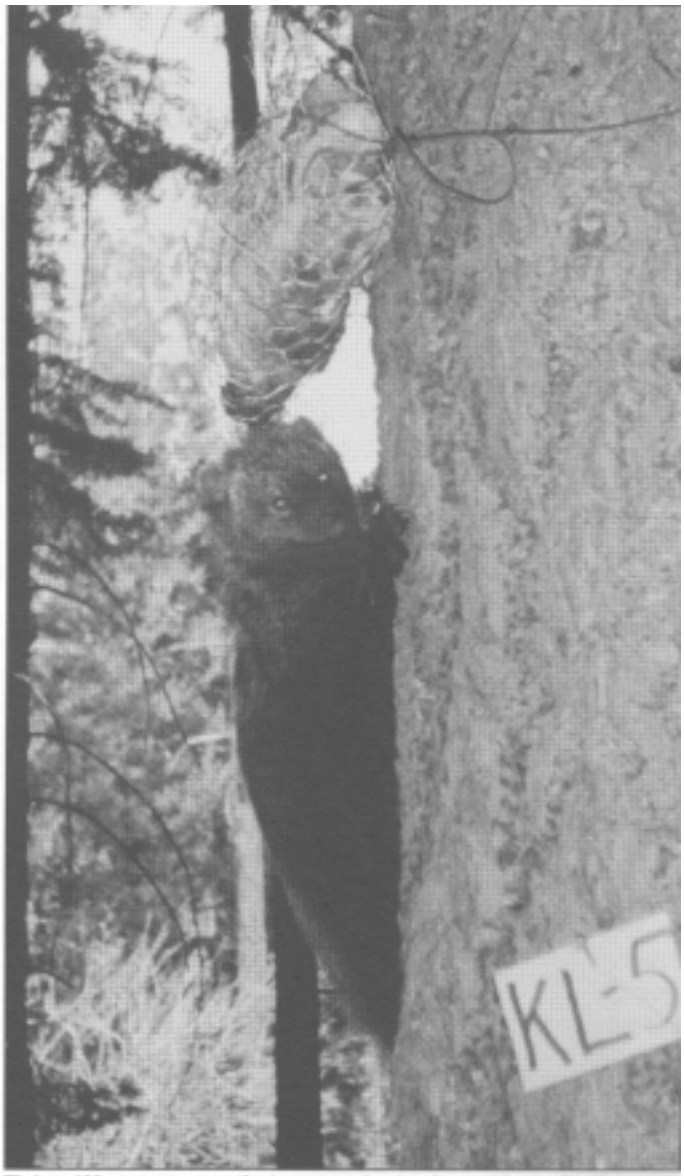
In late December 1994, the USFWS announced their 12-month finding that "listing of the Canada lynx in the 48 contiguous States is not warranted" (USFWS 1994). The USFWS argued that the lynx was never common south of the Canadian border, occurring in most states due to dispersal from the north during cyclic population highs. They found no substantial evidence that hunting, trapping, or habitat destruction threaten its continued existence, including the breeding populations in Washington, Montana, and Maine. Shortly after this finding, the Biodiversity Legal Foundation announced its intention to sue Secretary of Interior Bruce Babbitt and the USFWS for failing to list the lynx (Biodiversity Legal Foundation 1994c). They charged that the decision against listing was made at the Washington level for political reasons and reversed the recommendations of biologists at the local and regional levels. The Canada lynx remains a C2 species in the conterminous United States.

Fisher. East of the Great Plains, fishers have reoccupied much of their historical range following the reforestation of abandoned farmland and prohibition of trapping (Gibilisco 1994, Powell and Zielinski 1994). However, fishers in many areas of the western United States are not doing as well. In the mountains of Idaho and Montana, fisher populations appear to be expanding as a result of several relocation efforts, but fisher status in Wyoming, especially around Yellowstone National Park, is questionable. The distribution of the Pacific fisher (*M. p. pacifica*) on

the West Coast in Washington, Oregon, and California is most worrisome (Gibilisco 1994, Powell and Zielinski 1994). Aubry and Houston (1992) believe that fishers may be on the verge of extinction in Washington. Sightings of fishers in Oregon have been extremely rare (Maj 1994), but a population near Crater Lake may have been established from a recent reintroduction (K. Aubry, USFS, pers. commun.). In California, fishers are known from the Klamath Province in northwestern California, and a smaller population is known to inhabit the extreme southern Sierra Nevada, several hundred miles to the south (Zielinski et al. 1994). Between these two populations, large areas that formerly contained fishers appear no longer to do so.

The fisher is a candidate for listing as threatened or endangered in Washington, but has no other official state status. It is listed as Sensitive by the USFS, and in the west is legally trapped only in Montana with an annual quota of 20 animals (Powell and Zielinski 1994, MacFarlane 1994). In May 1990, a petition to list the Pacific fisher in Washington, Oregon, and California as endangered was filed (USFWS 1991). The 90-day finding by the USFWS was that "the petition to list the fisher does not present substantial information indicating that the requested action may be warranted" (USFWS 1991:1161). They did "believe that there may be reason for concern ...[but]... insufficient scientific information exists to determine whether regulatory protection ...may be justified" (USFWS 1991:1161). The fisher on the West Coast became a C2 species.

In February 1994, the Natural Resources Defense Council filed a petition with the Regional Forester of the USFS in San Francisco to suspend logging of late- successional forests until a plan ensuring the viability of forest carnivore populations, particularly fishers, is in place (Yassa and Edelson 1994). The Regional Forester's response was that no change in direction was warranted (Stewart 1994). A draft Environmental Impact Statement (EIS) on managing habitat for the California spotted owl (*Strix occidentalis occidentalis*) (USDA Forest Service 1995) would provide guidance for forests in the Sierra Nevada; the Regional Forester said that additional action would be considered if warranted after evaluation of the EIS. In December 1994, the Biodiversity Legal Foundation petitioned to list the fisher in the western states as endangered (Biodiversity Legal Foundation 1994d). The USFWS has not issued its 90-day finding as of March 1995 (L. Propp, USFWS, pers. commun.).



Fisher (*Martes pennanti*) photographed using a 35 mm Trailmaster camera at bait station in Klamath National Forest. Photo courtesy of Klamath National Forest.

American marten. As with fishers, American martens in the northeastern and north central states have reoccupied much of their former range, although they are extinct in much of the Maritime Provinces of Canada due to deforestation and trapping (Buskirk and Ruggiero 1994, Gibilisco 1994). Martens in the Rocky Mountains occupy most of their historic range, as do martens in the Sierra Nevada (Kucera et al. in press). However, in the Pacific Northwest, American martens have suffered significant losses. The Humboldt marten of the northern coast range of California is at best extremely rare, if not already extinct (Kucera et al. in press).

The American marten is listed as endangered in New Mexico, and is a USFS Sensitive species in many forests. Trapping is prohibited in California, Nevada, New Mexico, South Dakota, and Utah (Buskirk and Ruggiero 1994, MacFarlane 1994).

Conclusions

The oft-mentioned desirability of planning for species conservation before a crisis, before the environmental "train wreck" whose archetype is the case of the northern spotted owl (*S. o. caurina*), is widely affirmed, as is a multi-species or ecosystem approach. However, effective conservation planning requires knowledge. The ESA requires that petitioners present "substantial scientific or commercial information" that show listing may be warranted, and requires that listing decisions be based "solely on the basis of the

American Marten (Martes americana) © Susan C. Morse

best scientific and commercial data". Even a critic of the ESA such as Idaho's Senator Kempthorne believes that "The listing of a species should be based solely on science" (Reichardt 1995:9).

In the listing process, the burden of providing the scientific data is increasingly on the petitioner. Acquisition and development of that knowledge require resources that are difficult to obtain before the train wreck happens. With the forest carnivores, a group of species that are by nature low-density and shy, there is a particularly insidious Catch-22: listings are denied because of the lack of scientific information, and budgets to acquire that scientific information are not forthcoming because the train is not yet wrecked. Can you hear a train coming?

Literature Cited

Aubry, K. B. and D. B. Houston. 1992. Distribution and status of the fisher in Washington. Northwest Nat. 73:69-79.

Biodiversity Legal Foundation. 1994a. Petition to list the North American wolverine (*Gulo gulo luscus*). Biodiversity Legal Foundation, Boulder, CO.

Biodiversity Legal Foundation. 1994b. Petition to list the lynx (*Fells lynx canadensis*) as threatened or endangered. Biodiversity Legal Foundation, Boulder, CO.

Biodiversity Legal Foundation. 1994c. Press release. Lawsuit to protect the imperiled lynx announced. Biodiversity Legal Foundation, Boulder, CO.

Biodiversity Legal Foundation. 1994d. Petition to list the fisher (*Martes pennanti*) as threatened. BiodiversityLegalFoundation, Boulder, Co.

Brand, C. J. and L. B. Keith. 1979. Lynx demography during a snowshoe hare decline in Alberta. J. Wildl. Manage. 40:827-849.

Buskirk, S. W. 1992. Conserving circumboreal forests for martens and fishers. Conservation Biology 6:318-320.

Buskirk, S. W., A. S. Harestad, M. G. Raphael, and R. A. Powell (eds.). 1994. Martens, sables, and fishers: biology and conservation. Cornell Univ. Press, Ithaca, NY.

Buskirk, S. W. and L. F. Ruggiero. 1994. American marten. In: The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine, pp. 7-37. L. F. Ruggiero et al. (eds.) USDA Forest Service General Technical Report RM-254.

Curlee, A. P., T. W. Clark, D. Casey, and R. P. Reading. 1994. Large carnivore conservation: back to the future. Endangered Species Update 11(3 and 4):1-4.

deVos, A. 1964. Range changes in mammals of the Great Lakes region. Am. Midl. Nat. 71:210-231.

Eisenberg, J. F. 1989. An introduction to the Carnivora. In: Carnivore behavior, ecology, and evolution, pp. 1-10. Cornell Univ. Press, Ithaca, NY.

Gibilisco, C. J. 1994. Distributional dynamics of modern *Martes* in North America. In: Martens, sables, and fishers: biology and conservation, pp. 59-71. S. W. Buskirk et al. (eds.). Cornell Univ. Press, Ithaca, NY.

Graham, R. W. and M. A. Graham. 1994. Late Quaternary distribution of *Martes* in North America. In: Martens, sables, and fishers: biology and conservation, pp. 26-58. S. W. Buskirk et al. (eds.). Cornell Univ. Press, Ithaca, NY.

Grinnell, J., J. S. Dixon, and J. M. Linsdale. 1937. Furbearing mammals of California. Vol. 1. Univ. California Press, Berkeley, CA.

Hash, H. S. 1987. Wolverine. In: Wild furbearer management and conservation in North America, pp. 683-694. N. Novak et al. (eds.). Ontario Trappers Association and Ministry of Natural Resources, Toronto, Ontario.

Keith, L. B. 1990. Dynamics of snowshoe hare populations. Pages 119-196 in H. H. Genoways, ed. Current Mammalogy. Vol. 2. Plenum Press, New York.

Koehler, G. M. 1990. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Canadian J. Zool ogy 68:845-851.

Koehler, G. M. and K. B. Aubry. 1994. Lynx. In: The scientific basis for conserving forest carni vores: American marten, fisher, lynx, and wol verine, pp. 74-98. L. F. Ruggiero et a1. (eds.). USDA Forest Service General Technical Re port RM-254.

Kucera, T. E., W. J. Zielinski, and R. H. Barrett. In press. The current distribution of American martens in California. Calif. Fish and Game.

MacFarlane, D. 1994. National Forest System status information. In: The scientific basis for conserving forest carnivores: American mar ten, fisher, lynx, and wolverine, pp. 176-184. L. F. Ruggiero et al. (eds.). USDA Forest Service General Technical Report RM-254.

Maj, M. 1994. Fisher, lynx, wolverine summary distribution information. In: The scientific basis for conserving forest carnivores: Ameri can marten, fisher, lynx, and wolverine, pp. 169-175. L. F. Ruggiero et al. (eds.). USDA Forest Service General Technical Report RM-254.

Martin, S. K. 1994. Feeding ecology of American martens and fishers. In: Martens, sables, and fishers: biology and conservation, pp. 297-315. S. W. Buskirk et al. (eds.). Cornell Univ. Press,

Ithaca, NY.
McCord, C. M. and J. E. Cardoza. 1982. Bobcat and lynx. In: Wild mammals of North America. Biology, management, and economics, pp. 728-766. J. A. Chapman and G. A. Feldhamer (eds). Johns Hopkins Univ. Press, Baltimore, MD.
Powell, R. A. 1993. The fisher: Life history, ecology, and behavior. 2nd ed. Univ. Minnesota Press, Minneapolis, MN.
Powell, R. A. and W. J. Zielinski. 1994. Fisher. The scientific basis for conserving forest camivores: American marten, fisher, lynx, and wolverine, pp. 38-73. L. F. Ruggiero et al. (eds.). USDA Forest Service General Technical Report RM-254.
Quinn, N. W. S. and G. Parker. 1987. Lynx. In: Wild furbearer management and conservation in North America, pp. 683-694. N. Novak et al. (eds.). Ontario Trappers Association and Ministry of Natural Resources, Toronto, Ontario.
Reichardt, T. 1995. Protecting wildlife becomes endangered act. Nature 374:9.
Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski (eds.). 1994a. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine. USDA Forest Service General Technical Report RM-254.
Ruggiero, L. F., S. W. Buskirk, K. B. Aubry, L. J. Lyon, and W. J. Zielinski. 1994b. Information needs and a research strategy for conserving forest carnivores. In: The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine, pp. 138-152. L. F. Ruggiero et al. (eds.). USDA Forest Service General Technical Report RM-254.
Ruggiero, L. F., W. J. Zielinski, K. B. Aubry, S. W. Buskirk, and L. J. Lyon. 1994c. A conservation assessment framework for forest carnivores. In: The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine, pp. 1-6. L. F. Ruggiero et al. (eds.). USDA Forest Service General Technical Report RM-254.
Stewart, R. E. 1994. Letter to Edelson and Yassa, Natural Resources Defense Council, dated June 20.
U. S. Department of Agriculture, Forest Service. 1995. Draft Environmental Impact Statement. Managing California Spotted Owl Habitat in the Sierra Nevada National Forests of California. USDA Forest Service, Sacramento CA.
U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; notice of 90-day finding on petition to list the Pacific fisher as endangered. Fed. Register 56:1159-1161.
U. S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; 12-month finding for a petition to list as endangered orthreatened the contiguous United States population of the Canada lynx. Fed. Register 59:66507-66509.
Wilson, D. E. 1982. Wolverine. In: Wild mammals of North America. Biology, management, and economics, pp. 644-652. J. A. Chapman and G. A. Feldharner (eds). Johns Hopkins Univ. Press, Baltimore, MD.
Yassa, S. and D. B. Edelson. 1994. Petition with request for stay to the Chief of the USDA Forest Service and the Regional Forester of the Pacific Southwest Region. Natural Resources Defense Council, San Francisco, CA.
Zielinski, W. J., R. H. Barrett, A. P. Clevinger, and R. L. Truex. 1994. Southern Sierra Nevada fisher and marten study. Progress Report I. USDA Forest Service Pacific Southwest Research Station, Arcata, CA.
Zielinski, W. J. and T. E. Kucera. In Press. Lynx, wolverines, fishers, and martens: Survey methods for their detection. USDA Forest Service General Technical Report.

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Keeping Track, Inc.

Some photographs for this article were provided by wildlife habitat specialist and tracker Susan C. Morse, who is Executive Director of Keeping Track, Inc, a newly formed non-profit organization dedicated to wildlife habitat protection through field research, conservation education, and planning. Keeping Track, Inc. works to:

1. Educate the public about appropriated land use planning so that the biodiversity and ecological health of public and contiguous private lands will be ensured. Local volunteers are trained in wildlife track and sign identification, and their data is used to aid local and regional planners in making informed decisions about habitat protection for wildlife.
2. Encourage cooperation among wildlife and natural resource interest groups to help them appreciate their common priorities in reaching for long-term goals. This is achieved through presenting slide lectures, leading how-to workshops, and serving as panelists at national and regional conferences.
3. Identify and protect travel corridors critical for the long-term well-being of the large and wide-ranging carnivores. This entails performing wildlife track and sign surveys.

Keeping Track, Inc., is seeking financial support and can be contacted at RFD 1, Box 263, Jericho, VT 05465; phone (802)899-2023